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The Journal of Pediatric Research is a peer-reviewed, open access journal, which publishes original research articles, invited review articles, clinical reports and case reports in all areas of pediatric research.

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PRISMA statement of preferred reporting items for systematic reviews and meta-analyses (Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group. Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. PLoS Med 2009; 6(7): e1000097.) (http://www.prisma-statement.org/);

STARD checklist for the reporting of studies of diagnostic accuracy (Bossuyt PM, Reitsma JB, Bruns DE, Gatsonis CA, Glasziou PP, Irwig LM, et al., for the STARD Group. Towards complete and accurate reporting of studies of diagnostic accuracy: the STARD initiative. Ann Intern Med 2003;138:40-4.) (http://www.stard-statement.org/);

STROBE statement, a checklist of items that should be included in reports of observational studies (http://www.strobe-statement.org/);

MOOSE guidelines for meta-analysis and systemic reviews of observational studies (Stroup DF, Berlin JA, Morton SC, et al. Meta-analysis of observational studies in epidemiology: a proposal for reporting Meta-analysis of observational Studies in Epidemiology (MOOSE) group. JAMA 2000; 283: 2008-12).

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To ensure controllability of the research findings, the study design, study sample, and the methodological approaches and applications should be explained and their sources should be presented.

The "p" value defined as the limit of significance along with appropriate indicators of measurement error and uncertainty (confidence interval, etc.) should be specified. Statistical terms, abbreviations and symbols used in the article should be described and the software used should be defined. Statistical terminology (random, significant, correlation, etc.) should not be used in non-statistical contexts.

All results of data and analysis should be presented in the Results section as tables, figures and graphics; biostatistical methods used and application details should be presented in the Materials and Methods section or under a separate title.

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Study Limitations: Limitations of the study should be discussed. In addition, an evaluation of the implications of the obtained findings/results for future research should be outlined.

Conclusion: The conclusion of the study should be highlighted.

Acknowledgements: Any technical or financial support or editorial contributions (statistical analysis, English evaluation) towards the study should appear at the end of the article.

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Case Reports

Case reports should present cases which are rarely seen, feature novelty in diagnosis and treatment, and contribute to our current knowledge. The first page should include the title in English, an unstructured summary not exceeding 50 words, and key words. The main text should consist of introduction, case report, discussion and references. The entire text should not exceed 1500 words (A4, formatted as specified above). A maximum of 10 references shall be used in case reports.

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JPR
The
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Official Journal of Ege University Children's Hospital

Contents

Original Articles

Case Reports

The
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Editorial

Dear JPR Readers,

We are pleased to inform you that the new issue of Journal of Pediatric Research has been published. Since 11th March, Turkey has been widely affected from COVID-19. Coronaviruses have been known to cause outbreaks. However, humankind have not lived such a coronavirus pandemic which has effects worldwide. Particularly, doctors and their families experienced bad days due to the transmission risk of COVID-19 to their families. Children those having parents being healthcare workers had been seperated from their families. And also, there are embowered heroes of this pandemic which go on working. As a Pediatric Infectious Disease Specialist, I want to draw our readers' interest and want to thank all of doctors, nurses and hospital staffs who carried out heavy burden. Despite COVID-19 pandemic, we proceed to publish new articles and hope our readers will read this issue with a great interest.

We present you 15 articles including 14 original researches, and one case report from different disciplines. We hope our readers may read the article entitled "Evaluation of 6 Patients with Chromosome 18 Structural Anomalies and Novel Findings" and this article can enhance knowledge about this rare chromosomal abnormality. Another interesting article is "Early Neonatal Outcomes in Premature Rupture of Membranes beyond 28 Weeks of Gestation in a Tertiary Care Hospital of Coastal Karnataka". Early membrane rupture is a major risk factor for early neonatal sepsis which can alter neurological development of premature neonates. As all paediatricians know, hypertension is not only major problem for adults and also for children. Therefore, children above 3-year of age should be monitored for hypertension. Our readers can find information about the article blood pressure percentiles in healthy children and adolescents in this issue. Also, this issue covers the topics including Turkish version of children's emotional manifestations scale, children's tooth health, the effects of nurse education on infiltration and extravasation and articles from other disciplines. Also one case report, which discussed transfusion-related acute lung injury, has been included in this issue that can draw attention of all paediatricians.

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We would like to acknowledge the authors, the reviewers, editorial team and Galenos Publishing House for their support in the preparation of this issue. We look forward to your scientific contributions in our future issues.

Zümrüt Şahbudak Bal

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Original Article

Evaluation of Six Patients with Chromosome 18 Structural Anomalies and Novel Findings

Esra Işık, Bilcağ Akgün, Tahir Atik, Ferda Özkınay, Özgür Çoğulu

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ABSTRACT

Aim: Structural chromosome 18 anomalies are characterized by multiple congenital anomalies and intellectual disability. In this study, 6 cases with structural anomalies of chromosome 18 diagnosed by using conventional and molecular cytogenetic analyses are presented.

Materials and Methods: Six cases who were carrying structural chromosome 18 abnormalities were enrolled in the study. Developmental milestones, growth parameters and dysmorphologic features were evaluated by experienced clinical geneticists. Laboratory analysis including genetic tests, imaging studies, and eye and hearing examinations were obtained from the medical records, retrospectively.

Results: All cases had karyotype analysis, 2 cases had fluorescence in situ hybridization analysis and one case had microarray analysis, which were performed by using peripheral blood. A total of 6 cases in which del (18p) in one case, del (18q) in 4 cases and i (18q) in one case were evaluated.

Conclusion: Although a wide range of phenotypic findings, depending on the affected chromosomal region and size, can be seen in patients who carry structural chromosome 18 anomalies, some additional novel features are presented in our series which will contribute to the literature.

Keywords: Chromosome 18, structural anomalies, deletion, duplication, isochromosome

Introduction

The most common structural chromosome 18 anomalies are deletions of both the p and q arms, ring chromosome, isochromosome and inversions. The first three anomalies occur in approximately 1 in 40,000 live births (1). Clinical findings of all these anomalies vary depending on the genes found in the affected region.

Although deletions on the proximal part of the q arm of chromosome 18 show a wide range of clinical pictures, they all fall under the term "18q Deletion syndrome" (2). This is similar for "18p Deletion syndrome" as well. However, cases with ring chromosome 18 and isochromosome 18q present with more specific features (3). Here, we report the findings of 6 cases with deletions of the p and q arms of chromosome 18, and isochromosome of the q arm of chromosome 18.

In this study, 6 cases with structural anomalies of chromosome 18 diagnosed by using conventional and molecular cytogenetic analyses are presented.

Materials and Methods

Six cases who were carrying structural chromosome 18 abnormalities were enrolled in the study. These cases were collected from the archive of the Ege University Faculty of Deparment of Pediatric Genetics. These cases and their files were evaluated by experienced clinical

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geneticists. Dysmorphologic features, growth parameters and developmental milestones were noted. Laboratory tests, imaging studies, and eye and hearing examinations were obtained from the medical records, retrospectively. All cases had karyotype analysis, 2 cases had fluorescence in situ hybridization analysis and one case had microarray analysis, which were performed by using peripheral blood. Descriptions of these cases are as follows.

The study was approved by the Ethical Committee of the Ege University Medical Faculty (approval number: 20-3T/28, date: 04.03.2020). Written informed consent was obtained from all the patients or their parents/guardians.

Statistical Analysis

Descriptive analysis was used to evaluate the data in the study.

Results

Case 1

A 2-year-old girl was referred because of developmental delay (Figure 1a). She was born to non-consanguineous healthy parents at the 38th week of gestation by cesarean section. Her birth weight was 2,800g and birth length was 50 cm.

On physical examination, her weight, length, and occipitofrontal circum ference (OFC) were 10,600 g (25-50th centile), 77 cm (3-10th centile), and 44 cm (25-50th centile), respectively. Hypertrichosis, round face, short neck, low hair line, flared eyebrows, hypertelorism, broad nasal bridge, prominent columella, high palate and teeth abnormalities were observed. She had also X-bain deformity and pes equinovarus. Severe developmental delay was detected using the Ankara Developmental Screening Inventory. A cranial magnetic resonance image (MRI) revealed thin corpus callosum, cortical atrophy and ventricular dilatation. Her laboratory tests, abdominal ultrasonography, echocardiography, skeletal survey, and eye and hearing examinations were all normal. The peripheral leukocyte karyotype was 46,XX,del(18)(p11.2) and subtelomeric FISH confirmed 18p deletion (Figure 1b).

Case 2

The patient was a 6-month-old girl born at the 40th week of gestation by normal spontaneous vaginal delivery with a birth weight of 2,200 g. She was the second child of healthy non-consanguineous parents. She was hospitalized for lower respiratory tract infection at the second month of age and, at that time, a secundum atrial septal defect (ASD) was detected using echocardiography.

On physical examination, her weight, length, and OFC were 4,500 g (10th centile), 58 cm (3-10th centile), and 35.7 cm (<3rd centile), respectively. On neurological examination, generalized hypotonia and spasticity in the lower extremities were noted. Deep tendon reflexes were found to be decreased. Her developmental milestones were delayed. Additional dysmorphic features included brachycephaly, midface hypoplasia, hypertelorism, depressed and wide nasal bridge, low set ears, long philtrum, micrognatia and overlapping toes. The patient's eye contact was decreased and an eye examination showed posterior embryotoxon. Atrophy of corpus callosum was detected on cranial MRI. Standard karyotype analysis revealed 46,XX,del(18)(q21.1) (Figure 2). Her picture was not available.

Case 3

A 2 and half-year-old girl was born to consanguineous healthy parents at the 35th week of gestation by cesarean section due to oligohydramnios (Figure 3). Her birth weight was 2,470 g (50th centile) and her birth length was 49 cm (75-90th centile).

On physical examination, her weight, length, and OFC were 8,600 g (3-10th centile), 75 cm (10th centile), and 41 cm

Figure 1a and 1b. Facial appearance of case 1 and karyotype analysis

Figure 2. Karyotype analysis of case 2

(<3rd centile), respectively. Microcephaly and dysmorphic facial features such as hypertelorism, epicanthus, low set and posterior rotated ears, depressed nasal bridge, anteverted nares and thin upper limb were noted. She also had tapered fingers, finger pads, unilateral simian line, rocker bottom feet and lymphedema on bilateral hands and feet. Eye examination showed bilateral chorioretinal atrophy and a cranial MRI revealed delayed myelination on the cerebral white matter. The peripheral leukocyte karyotype was 46,XX,del(18)(q21.3).

Case 4

A 2 and half-year-old boy was born to non-consanguineous healthy parents at the 40th week of gestation by cesarean section. His birth weight was 3,500 g (25-50th centile) and his birth length was 51 cm (25-50th centile).

On physical examination, his weight, length, and OFC were 14 kg (25-50th centile), 94 cm (50-75th centile), and 49 cm (50th centile), respectively. Coarse face, broad forehead, facial hemangioma, hypertelorism, upslanting palpebral fissures, depressed nasal bridge and micrognathia were noted (Figure 4a). He also had proximal placement of the thumb, long thin fingers and overriding toes. His laboratory tests, abdominal ultrasonography, echocardiography, skeletal survey, and hearing examination were all normal. Eye examination showed infantile nystagmus and hypermetropia and a cranial MRI revealed hypomyelination on the cerebral white matter and thin corpus callosum. The peripheral leukocyte karyotype was 46,XY (Figure 4b). Subtelomeric FISH analysis revealed subtelomeric deletion on the long arm of chromosome 18.

Figure 3. Facial appearance of case 3

Case 5

A 7-year-old-girl was referred due to her dysmorphic facial features. She was born at the 38th week of gestation. Her birth weight was 2,750 g (10-25th centile) and her birth length was 50 cm (50-75th centile).

On physical examination, her weight, length, and OFC were 16.8 kg (<3rd centile), 116 cm (3-10th centile), and 49 cm (3-10th centile), respectively. Thin upper lip, large mouth, high-arched palate and 2-3 syndactyly of the toe were observed. Her laboratory tests, cranial MRI, abdominal ultrasonography, skeletal survey, hearing examination and eye examination were all normal. Echocardiography revealed mild mitral-tricuspid insufficiency and pulmonary stenosis. The peripheral leukocyte karyotype was 46,XX,del(18)(q22.1) (Figure 5). DNA microarray analysis revealed a 13MB deletion at 18q22.1-q23 location which contains 27 *online mendelian inheritance of man* (*OMIM*) genes and 12MB duplication at 11q24.1-q25 location which contains 54 *OMIM* genes.

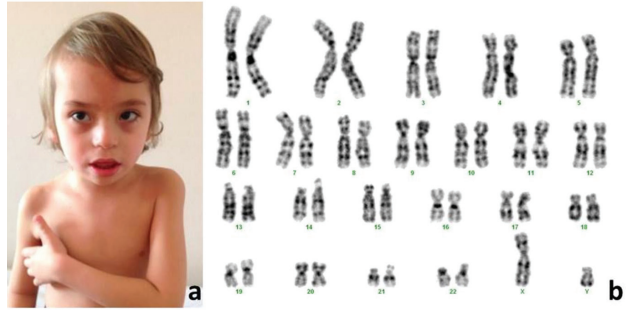

Figure 4a and 4b. Facial appearance of case 4 and karyotype analysis

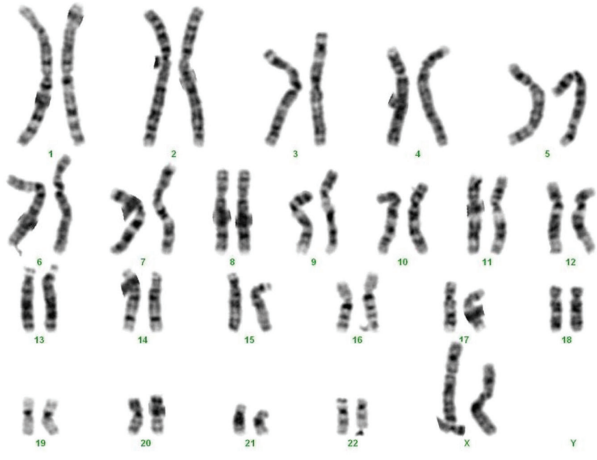

Figure 5. Karyotype analysis of case 5

Case 6

A 6-month-old girl was born to non-consanguineous healthy parents at the 36th week of gestation by cesarean section. Her birth weight was 2,200 g (10-25th centile) and her birth length was 45 cm (10-25th centile). Following birth, she was admitted to hospital due to respiratory insufficiency and followed in the neonatal intensive care unit for 15 days. After discharge from hospital, she suffered from recurrent respiratory system infections.

On physical examination, her weight, length, and OFC were 4,800 g (<3rd centile), 53 cm (<3rd centile) and 38 cm (25th centile), respectively. Short stature, exophthalmos, ptosis, blue sclera, low set ears, long philtrum, high arched palate, and micrognathia were noted. She also had pectus excavatum, fusiform fingers, hallux valgus and pes equinovarus. Her laboratory tests and abdominal ultrasonography were normal. She had sensorineural hearing loss and auditory evoked potentials detected high hearing levels, 60 dB on the right ear and 75 dB on the left ear. Eye examination was normal, however visual evoked potential revealed bilateral partial conduction defects. Coxa valga and bilateral delayed ossification of the proximal capital femoral epiphysis were detected on skeletal survey. Echocardiography showed a 2 mm ventricular septal defect, and a cranial MRI revealed thin corpus callosum. The peripheral leukocyte karyotype was 46,XX,i(18)(q10) (Figure 6). The clinical features and molecular findings of the all patients were given in Table I. Written informed consent was obtained from all the patients or their parents/guardians.

Discussion

Chromosome 18 is one of three chromosomes in which trisomic individuals survive to term. It has the lowest gene density among all chromosomes. Trisomy of chromosome 18, Edwards syndrome, is the second most common autosomal trisomy following Down syndrome, and is characterized by growth retardation and severe congenital abnormalities such as holoprosencephaly and congenital heart defects (4). To date, besides trisomy 18, many cases with structural abnormalities of chromosome 18 such as deletion and duplication, inversion, isochromosome and ring chromosome have been reported in the literature. In this study, we present 6 cases with chromosome structural anomalies in which one had p arm deletion, 4 had q arm deletion and one had isochromosome.

Figure 6. Karyotype analysis of case 6

Chromosome 18p deletion was first described in 1963 by de Grouchy (3). It is one of the most frequent autosomal abnormalities. The incidence of the deletion 18p syndrome can be estimated to be about 1:50,000 live born infants. About 2/3 of cases with this anomaly are de novo deletions. Similar to the information in the literature, chromosomal anomaly in our case occurred de novo. The breakpoint in this syndrome clusters at 18p11.1. Although the phenotype is highly variable, the clinical picture is mostly very moderate. It is mainly characterized by intellectual disability, short stature, facial dysmorphism including round face with short philtrum, palpebral ptosis and large ears with detached pinnae, hearing impairment, and genitalia and foot deformities (5,6). As is described in the literature, round face was typical in our case. Unusual phenotypic findings such as hypertrichosis and pes equinovarus were present besides the main clinical findings reported in this syndrome. The breakpoint of the deletion on chromosome 18p in our case seems to be in 11.2 band. The region between 11.21 and 11.1 has been suggested to be a critical region for intellectual disability by Wester et al. (7). Developmental delay in our case also supports this suggestion.

Long arm deletion of chromosome 18 may occur in different regions of the long arm of chromosome 18 (2). In our series, 4 children were found to have long arm deletions. Three of them were carrying the most common breakpoints for chromosome 18 which is described as 18q Deletion syndrome. The breakpoints in this syndrome may start from 18q21.1, 18q21.3 or 18q22.2 extending to 18qter. Although the phenotype is highly variable, some characteristic findings are intellectual disability, short stature, hypotonia, hearing impairment, and foot deformities. At the same time, cardiac and immunologic features may also be observed in these cases (8). Embryotoxon and facial hemangioma were additional findings in our case 3 and case 4, which have not been previously reported in the literature. Delayed myelination and tapering digits as presented in these 2

cases may also be taken into consideration in the diagnostic approach to 18q deletion syndrome. The 18q22.3 region has been reported as the critical region for palate abnormality (9). Case 5 had a high arched palate and showed a deletion between q22.1 and q23 which comprises this critical region. Seizures can also be seen in both the deletion syndromes of chromosome 18 p and q arms (10), however none of our patients with these deletions had a history of seizures.

Case 5 was found to be carrying a duplication at 11q24.1-q25 location in addition to 18q22.1-q23 deletion. 11q24.1-q25 duplication is a rare cytogenetic anomaly. It has been described in a 15-year-old male with ASD (11). His father and affected twin sister were found to have the same duplication. No symptom of ASD was observed in our patient.

Isochromosome 18q is another rare chromosome 18 structural abnormality. The incidence is reported to be 1 in 8,000. The clinical findings of iso(18q) resemble Edwards syndrome. Intellectual disability, marked growth deficiency, typical facial anomalies such as prominent occiput, faun-like ears, micrognathia, cardiac anomalies, and skeletal findings are the characteristic features of iso(18q). Holoprosencephaly, cebocephaly and cyclopia as distinctive features and microcephaly, hypotelorism and hypoplastic nose as unique findings have been reported in iso(18q) (12,13). However, apart from thin corpus callosum,

Table I. Phenotypic features and cytogenetic analysis results of the case

	Case 1	Case 2	Case 3	Case 4	Case 5	Case 6
Chromosomal abnormality	del(18)(p11.2)	del(18)(q21.1)	del(18)(q21.3)	Subtelomeric del(18q)	del(18) (q22.1-q23)	i(18)(q10)
Cranial MRI	Thin corpus callosum, cortical atrophy and ventricular dilatation	Corpus callosum atrophy	Delayed myelination on cerebral white matter	Hypomyelinization on cerebral white matter and thin corpus callosum	Normal	Thin corpus callosum
Head	Low hair line, round face, flared eyebrows, hypertelorism, strabismus, broad nasal bridge, prominent columella, teeth abnormalities, high palate, short neck	Microcephaly, brachycephaly, midface hypoplasia, hypertelorism, embryotoxon, low set ears, depresed and wide nasal bridge, long philtrum, micrognatia	Microcephaly, epicanthus, hypertelorism, bilaterally chorioretinal atrophy, low set and posterior rotated ears, depressed nasal bridge, anteverted nares, thin upper limb	Broad forehead coarse face, fascial hemangioma, upslanding palpebral fissures, hypertelorism, nistagmus, hypermetropia, depressed nasal bridge, micrognathia	Large mouth, thin upper lip, high-arched palate, peripapillary atrophy	Exophthalmos, ptosis, blue sclera, low set ears, sensorineural hearing loss, long philtrum, high arched palate, micrognathia
Cardiac	Normal	Secundum atrial septal defect	N/A	Normal	Mild mitral-tricuspid insufficiency and pulmonary stenosis	Ventricular septal defect
Growth and mental situation	Short stature, developmental delay	Intellectual disability	Developmental delay	Developmental delay	Intellectual disability	Growth retardation, intellectual disability
Extremity	Pes equinovarus	Overlapping toes	Tapered fingers, finger pads, unilateral simian line, rocker bottom feet and lymphedema on bilateral hands and foot	Proximal placement of thumb, long thin fingers and overriding toes	2-3 syndactyly of the toe	Fusiform fingers, coxa valga, bilateral delayed ossification of the proximal capital femoral epiphysis hallux valgus and pes equinovarus
Other features	Hypertrichosis, congenital hip dislocation	Generalized hypotonia and spastisity	Hearing loss, epilepsy	Hypospadias	-	Recurrent respiratory system infections, pectus excavatum

MRI: Magnetic resonance imaging

none of these were detected in our case. Contrary to this, exophthalmos, ptosis and blue sclera were noted.

Conclusion

Further case descriptions including the breakpoints of the structural anomalies of chromosome 18 will refine the clinical pictures and pathological mechanisms underlying these phenotypes. In this respect, it is hoped that our case series of chromosome 18 structural anomalies may contribute to the literature.

Ethics

Ethics Committee Approval: The study was approved by the Ethical Committee of the Ege University Faculty of Medicine (approval number: 20-3T/28, date: 04.03.2020).

Informed Consent: Written informed consent was obtained from all the patients or their parents/guardians.

Peer-review: Enternally peer-reviewed.

Authorship Contributions

Surgical and Medical Practices: F.Ö., Concept: Ö.Ç., Design: Ö.Ç., Data Collection or Processing: B.A., Analysis or Interpretation: T.A., Literature Search: T.A., F.Ö., Writing: E.I.

Conflict of Interest: None of the authors had conflict of interest.

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References

1. Hsu LYF. Prenatal diagnosis of chromosomal abnormalities through amniocentesis. In: Genetic disorders and the fetus, Milunsky A (Ed), 4th ed. Baltimore, The Johns Hopkins University Press 1998; 179.
2. Feenstra I, Vissers LELM, Orsel M, et al. Genotype–phenotype mapping of chromosome 18q deletions by high-resolution array CGH: An update of the phenotypic map. Am J Med Genet Part A 2007; 143:1858-67.
3. de Grouchy J. The 18p-, 18q- and 18r syndromes. Birth Defects 1969; 5:74-87.
4. Rosa RF, Rosa RC, Zen PR, Graziadio C, Paskulin GA. Trisomy 18: review of the clinical, etiologic, prognostic, and ethical aspects. Rev Paul Pediatr 2013; 31:111-20.
5. Online Mendelian Inheritance in Man, OMIM®. Johns Hopkins University, Baltimore, MD. MIM Number: {146390}: {07/09/2016}: World Wide Web URL: https://omim.org/
6. Turleau C. Monosomy 18p. Orphanet J Rare Dis 2008; 19;3-4.
7. Wester U, Bondeson ML, Edeby C, Anneren G. Clinical and molecular characterization of individuals with 18p deletion: a genotype-phenotype correlation. Am J Med Genet 2006; 140:1164-71.
8. Chen CP, Kuo YT, Lin SP, et al. Mosaic ring chromosome 18, ring chromosome 18 duplication/deletion and disomy 18: perinatal findings and molecular cytogenetic characterization by fluorescence in situ hybridization and array comparative genomic hybridization. Taiwan J Obstet Gynecol 2010; 49:327-32.
9. Dostal A, Nemeckova J, Gaillyova R. The 18q deletion syndrome and analysis of the critical region for orofacial cleft at 18q22.3. J Craniomaxillofac Surg 2009; 37:272-5.
10. Verrotti A, Carelli A, di Genova L, Striano P. Epilepsy and chromosome 18 abnormalities: A review. Seizur 2015; 32:78-83.
11. Maruani A, Huguet G, Beggiato A, et al. 11q24.2-25 Micro-Rearrangements in Autism Spectrum Disorders: Relation to Brain Structures. Am J Med Genet 2015; 167:3019-30.
12. Park JP, Moeschler JB. Isochromosome 18q revisited. Prenat Diagn 1997; 17:589-90.
13. Pal S, Siti MI, Ankathil R, Zilfalil BA. Two cases of isochromosome 18q syndrome. Singapore Med J 2007; 48:146-50.

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Original Article

Early Neonatal Outcomes in Premature Rupture of Membranes Beyond Twenty-eight Weeks of Gestation in a Tertiary Care Hospital of Coastal Karnataka

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ABSTRACT

Aim: Premature rupture of membranes (PROM) is a significant risk factor for various adverse neonatal outcomes such as prematurity, respiratory distress, birth asphyxia and early onset neonatal sepsis. Due to the public health relevance of this topic and its higher burden on health care services, this study was carried out to the identify risk factors and predictors of neonatal outcomes among babies born to mothers with PROM.

Materials and Methods: A 3-year retrospective record based descriptive study with 254 neonates delivered at a tertiary care hospital in Coastal Karnataka, India was carried out.

Results: The mean age of mothers was 28.57+/-4.3 years. Prematurity (39.3%) followed by hyperbilirubinemia (15.7%) and respiratory distress (12.2%) were the common complications seen, with a neonatal mortality rate of 2.3%. Antenatal complications (24.8%) and medical issues in the mother (13.7%) were the most common maternal risk factors associated with PROM. Although 59% cases delivered vaginally, Emergency Caesarean section was the mode of delivery in 97% of Caesarean cases. The median duration of latency was 590 minutes [interquartile (IQR) - 390-1,020 mins] with the highest median latency seen for 28-32 weeks of gestation which was 1,380 minutes (IQR: 672.5- 3,386.25 mins). Primiparity [Odds ratio (OR)- 1.99, 95% Confidence interval (CI)- 1.01-3.91, p=0.04] and preterm gestation (OR-2.12, 95% CI: 1.08-4.14, p=0.025) were factors associated with the increased latency period. A latency period >24 hours was found to be a significant factor associated with a poor Appearance, Pulse, Grimace, Activity and Respiration (APGAR) score (OR- 5.83, 95% CI- 2.85-11.93, p<0.001) and Neonatal Intensive Care Unit (NICU) admission (OR-5.98, 95% CI- 2.95-12.14, p<0.001).

Conclusion: PROM is associated with a significant risk of neonatal morbidity and mortality with the most common complications being prematurity and low birth weight. Prolonged PROM increases the risk of neonatal complications. Early recognition and prompt management prevents the delay in intervention and also reduces the risk of neonatal complications.

Keywords: Premature rupture of membranes, prematurity, neonatal outcomes, neonatal sepsis, neonatal morbidity

Introduction

According to a WHO report, 4 million neonates die annually with a global neonatal mortality rate of 23 per 1,000 live births. A million of these are due to neonatal infections. Neonatal sepsis is encountered in 1-10 per 1,000 live births in developed countries and is believed to be three times higher in developing countries (1). Premature rupture of membranes (PROM) is responsible for 5.2% of neonatal infections (2).

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PROM or pre-labor rupture of membranes refers to the loss of integrity of membranes before the onset of labor, resulting in leakage of amniotic fluid and the establishment of communication between the amniotic cavity and the endocervical canal and vagina. It is a matter of major concern to all obstetricians as well as pediatricians (3).

PROM can present either at term (>37 weeks) or preterm (<37 weeks) (4). The majority (90%) of PROM occurs in women at term (5). Term PROM is seen in almost 8% pregnancies (6). Preterm premature rupture of membranes (PPROM) happens in 3-8% of all pregnancies and is responsible for one third of all preterm births (7). The latency period after PPROM is inversely related to the gestational age at rupture of membrane. Over 90% of term patients will be in labor within 24 hours of PROM (4,8,9) compared with less than 50% of preterm patients (8). Hence, at term, PROM is more of a physiological variation rather than a pathological event (10).

Prolonged PROM is seen in 10% of pregnancies and it is seen when time of delivery from rupture is delayed by more than 24 hours (11). Neonatal complications after PROM are inversely related to the gestational age at the time of rupture and at delivery (4). The fetal and neonatal complications of PPROM include infections and fetal distress due to umbilical cord compression, Respiratory Distress syndrome (RDS), necrotizing enterocolitis, intraventricular hemorrhage, sepsis and pulmonary hypoplasia, and an overall increase in the perinatal morbidity and mortality rate (4,8).

Prompt management in the mother along with early detection of sepsis and aggressive management in neonates significantly improves the neonatal outcome (1). The key to management depends on the accurate assessment of gestational age, likelihood of infection, duration of the latency period and the availability of neonatal intensive care facilities.

The increasing frequency of PROM being encountered in present day scenarios and the lack of sufficient studies in this region justifies the need to carry out this study to focus on the neonatal outcomes in babies born to mothers with PROM along with the factors affecting them.

Definitions used in our study and the selection of the study population:

1. "Premature rupture of membranes or pre-labor rupture of membranes (PROM/PLROM): spontaneous rupture of membranes any time beyond the 28th week of pregnancy but before the onset of labor" (4).

2. "Term premature rupture of membranes (Term PROM): Rupture of membranes after 37 completed weeks of gestation and before the onset of labor" (4).

3. "Preterm premature rupture of membranes (PPROM): Rupture of membranes after the age of viability and before 37 weeks of gestation" (4).

4. "Latency period: the period between initial leakage of fluid and the onset of labor and delivery" (12).

5. "Prolonged rupture of membranes is defined as the rupture of membranes lasting more than 24 hours before the onset of labor" (11).

Objectives of the Study

1. To determine the neonatal outcomes among babies born to mothers with premature rupture of membranes.

2. To identify the predictors affecting clinical outcomes among these neonates.

3. To compare risks of individual outcomes among neonates according to the latency periods from membrane rupture until the time of delivery.

Materials and Methods

A cross sectional, descriptive, 3-year retrospective, record based study was carried out in a tertiary care hospital in coastal Karnataka, India, after obtaining a waiver of consent from the institutional ethical clearance committee (approval number: FMMCIEC/CCM/13/2018) using a pre-tested questionnaire.

• Using the formula:

$$n \geq \frac{Z^2_{1-\alpha/2} \times p(1-p)}{d^2}$$

Assuming p=30% (13) to be the percentage of perinatal morbidity in babies born to PROM mothers with α=0.05 and 80% power and allowable error d=6%, we obtain a value for n of 225, assuming a non-response rate of 10%, n was rounded up to 250.

Inclusion Criteria

All confirmed cases of PROM which occurred at more than 28 weeks of gestation.

Exclusion Criteria

Neonates with congenital anomalies, multiple pregnancy, pre-eclampsia, eclampsia, polyhydramnios, intrauterine death, antepartum hemorrhage or gestational diabetes mellitus were considered as exclusion criteria.

Statistical Analysis

The data collected was entered into Microsoft Excel and analyzed using SPSS 21.0 (IBM, Inc, Chicago, Illinois, USA). Descriptive analysis was performed with mean and standard deviation, median and interquartile range and proportion. An odds ratio (OR) with 95% confidence intervals (CI) was used to summarize the analytic output, while the p value <0.05 was used to assess the statistical significance of an association.

Results

A total of 254 participants formed the final study group during the 3-year study period. The mean age of the mothers was 28.57+/-4.3 years. A total of 115 (45%) mothers were from rural areas. 43 (17%) mothers were from families below the poverty line. Three (1.18%) did not receive essential obstetric care. One hundred thirty-nine (55%) mothers were multigravida. Antenatal complications (24.8%) and maternal infections (13.7%) were the most common risk factors associated with PROM in our study as depicted in Table I. The median duration of latency from rupture to delivery was 590 minutes [interquartile (IQR) - 390-1,020 mins] with duration of latency being highest in the period 28-32 weeks at 1,380 minutes (IQR: 672.5-3,386.25 mins) and least in the term PROM cases at 510 minutes (IQR-345-852.5 mins). Hundred and fifty (59%) of deliveries were normal vaginal, and of the 104 (41%) caesarean sections, only 3 (2.8%) were elective.

The mean birth weight of babies was 2.63+/-0.6 kg. Ninety-five (37.4%) were low birth weight babies and 48 (18.8%) required resuscitation at birth. One hundred (39.3%) were premature, 76 (30%) required The Neonatal Intensive Care Unit (NICU) care. Hyperbilirubinemia (15.7%), respiratory distress (12.2%), and sepsis (6.3%) were the most common neonatal complications as seen in Table II. The mean duration of hospital stay was 6.82+/-4.8 days. There were 6 (2.3%) neonatal mortalities in our study.

A latency period of more than 24 hours was associated with a poor Appearance, Pulse, Grimace, Activity and Respiration (APGAR) score, (OR-5.83, p<0.001, highly significant) and NICU admission (OR- 5.98, p<0.001, highly significant) as seen in Tables III and IV. Preterm (OR-2.12, p=0.025, significant) and primigravida (OR-1.99, p=0.04, significant) had a higher chance of having longer latency

Table I. Maternal risk factors associated with premature rupture of membranes

No	Maternal risk factors	number (n)	Proportion (%)
1.	ANC complications	63	24.8
2.	Medical issues in the mother	35	13.7
3.	Maternal infection	21	8.3
4	Prior PROM	18	7
5	Abnormal USG	18	7
	Total	155	61

PROM: Premature rupture of membranes, ANC: Absolute neutrophil count, USG: Ultrasonography

Table II. Neonatal outcomes in premature rupture of membranes cases (n=254)

No	Neonatal outcomes	Number (n)	Proportion (%)
1.	Prematurity	100	39.3
2.	Low birth weight	95	37.4
3.	NICU admission	76	30
4.	Hyperbilirubinemia	40	15.7
5.	Respiratory distress	31	12.2
6.	Neonatal sepsis	16	6.3
7.	Birth asphyxia	6	2.3
8.	Necrotizing enterocolitis	6	2.3
9.	Meningitis	3	1.2
10.	Death	6	2.3

NICU: Neonatal intensive care unit

Table III. Association of latency with neonatal appearance, pulse, grimace, activity, and respiration score

Duration of latency	APGAR score		Total
	>8	<7	
>24 hrs	21 (50%)	21 (50%)	42
<24 hrs	181 (85%)	31 (15%)	212
	202 (80%)	52 (20%)	254

X^2 - 26.95, p- <0.001, HS. Odds ratio - 5.83, 95% CI- 2.85-11.93, APGAR: Appearance, pulse, grimace, activity, and respiration score, hrs: Hours

Table IV. Effect of latency period on the neonatal intensive care unit admission for various complications

Duration of latency	NICU admission		Total
	No	Yes	
>24 hrs	15 (36%)	27 (64%)	42
<24 hrs	163 (77%)	49 (23%)	212
	178 (70%)	76 (30%)	254

NICU: The neonatal intensive care unit, X^2 - 28.34, p- <0.001, HS. Odds ratio - 5.98, 95% CI- 2.95-12.14, hrs: Hours

Table V. Association of period of gestation with duration of latency

Period of gestation	Latency		Total
	<24 hrs	>24 hrs	
Pre term	77 (77%)	23 (23%)	100
Term	135 (88%)	19 (12%)	154
	212 (83%)	42 (17%)	254

X^2 - 4.99, p- 0.025, Sig. Odds ratio - 2.12, 95% CI- 1.08-4.14, hrs: Hours

Table VI. Duration of latency with parity

Parity	Latency		Total
	< 24 hrs	>24 hrs	
Primi	90 (78%)	25 (22%)	115
Multi	122 (88%)	17 (12%)	139
	212 (83%)	42 (17%)	254

X^2 - 4.12, p- 0.04, Sig. Odds ratio - 1.99, 95% CI- 1.01-3.91

Table VII. Association of parity with birth weight of the baby

Parity	Birth weight		Total
	Normal	LBW	
Multi	75 (54%)	64 (46%)	139
Primi	84 (73%)	31 (27%)	115
	159 (63%)	95 (37%)	254

LBW: Low birth weight, X^2 - 9.79, p- 0.0012, Sig. Odds ratio - 2.31, 95% CI- 1.36-3.92

Table VIII. Association of period of gestation at premature rupture of membranes with birth weight of the baby

Period of gestation	Birth weight		Total
	Normal	LBW	
Pre term	23 (23%)	77 (77%)	100
Term	136 (88%)	18 (12%)	154
	159 (63%)	95 (37%)	254

LBW: Low birth weight, X^2 - 110.46, p- <0.001, HS. Odds ratio - 25.29, 95% CI- 12.85-49.7

as seen in Tables V and VI. The risk of having low birth weight babies was higher among multigravida (OR-2.31, p=0.0012, significant) and preterm gestation (OR-25.29, p<0.001, highly significant) as seen in Tables VII and VIII. Of the 100 preterm deliveries, 54 mothers received antenatal corticosteroids, of which 13 babies (24%) developed respiratory distress and 3 (5.5%) had birth asphyxia.

Discussion

Our study included 254 mothers with PROM studied retrospectively for the outcomes in their newborns and those factors predicting these outcomes.

Prematurity (39.3%) and low birth weight (37%) were the most common adverse neonatal outcomes seen in our study, which was in disagreement with a study done by Boskabadi H et al. (14) in Iran, where 67% were premature. In a study conducted by Ramesh TV et al. (15), 38% of neonates born to mothers with PROM were premature and 37% had RDS. Riyami NA et al. (16) in their study concluded RDS to be the most common neonatal complication (79%) followed by sepsis (50%). These differences might be due to varied management practices and the time from onset of rupture of the membranes to delivery.

60% of the mothers in our study group delivered vaginally, which is similar to two other recent studies on PROM (15,17).

Idrisa A et al. (18) in their study carried out in Nigeria stressed the importance of the use of intravenous steroids and antibiotics in PROM and concluded that they help to reduce complications and bring about favorable outcomes. Our study revealed that treatment of PROM cases with steroids and antibiotics with or without tocolytics did not show any significant difference in terms of APGAR score or the need for resuscitation in the absence of maternal infection. In our study population, the proportion of babies who developed RDS, whose mothers had received a full course of antenatal corticosteroids (24%) was almost the same as those who had not received antenatal corticosteroids (26%), thereby demeaning the importance of the administration of antenatal corticosteroids in preterm labor and this was found to be contradictory to the usual standards of care.

Our study showed that the chances of having a poor APGAR score at birth and requiring NICU admission were significantly higher when the latency period from rupture of membranes until delivery was more than 24 hours.

A study conducted by Jain N et al. (19) in Jaipur showed 92% of PROM cases occur between the 32nd and 36th weeks of gestation and also that the latency period tends to be more prolonged in lower gestational ages.

A study conducted on the outcomes of PROM in a tertiary care center in West Bengal by Chakraborty B et al. (20) revealed neonatal mortality in the very preterm group (<34 weeks) to be 10% as against 5.8% in preterms (34-37 weeks) and nearly 3% among term pregnancies (>37 weeks) indicating that gestational age is a major determinant of neonatal survival.

Results of a retrospective Cohort study conducted by Riyami NA et al. (16) in Oman showed a 16% neonatal mortality rate and revealed neonatal survival was

significantly associated with gestational age at delivery and not gestational age at the time of rupture.

Neonatal mortality was 2.3% in our study which was quite similar to a study performed by Boskabadi H et al. (14).

Study Limitations

The small sample size and retrospective study design were perceived to be the two most important limitations in our study. A prospective study with a larger sample size would have been better methodologically.

Our study also did not capture those complications in the mother which could have been related with obstetric interventions that could have had a bearing on neonatal outcomes.

Also, there is a paucity of data on the ideal intervention time from membrane rupture to management which could reduce the chances of both prematurity as well as infections, and so could help obstetricians in deciding on the optimal time of management, thereby reducing maternal and neonatal complications.

Conclusion

PROM is associated with an increased risk of prematurity and neonatal infections. The longer the duration from membrane rupture to delivery, the more the risk of neonatal complications. Preterm PROM is associated with an increased duration of the latency period. Early recognition and prompt management can reduce delays in intervention and also reduce risks of neonatal complications.

Ethics

Ethics Committee Approval: After obtaining a waiver of consent from the institutional ethical clearance committee (approval number: FMMCIEC/CCM/13/2018) using a pre-tested questionnaire.

Informed Consent: Informed consent was obtained.

Peer-review: Externally peer-reviewed.

Authorship Contributions

Concept: S.S., R.A., Design: R.A., Data Collection or Processing: S.S., Analysis or Interpretation: S.S., Literature Search: R.A., Writing: S.S.

Conflict of Interest: No conflict of interest was declared by the authors.

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References

1. Alam MM, Saleem AF, Shaikh AS, Munir O, Qadir M. Neonatal sepsis following prolonged rupture of membranes in a tertiary care hospital in Karachi, Pakistan. J Infect Dev Ctries 2014;8:67-73.
2. Ocviyanti D, Wahono WT. Risk factors for neonatal sepsis in pregnant women with premature rupture of the membrane. Journal of Pregnancy 2018:4823404.
3. Larranaga AC, Campo MG, Perez RAF, Ezcurdia GM. Dinoprostone vaginal slow-release system (Propess) compared to expectant management in the active treatment of premature rupture of the membranes at term: impact on maternal and fetal outcomes. Acta Obstet Gynecol Scand 2008; 87:195-200.
4. Dutta DC, Konar H (ed.). DC Dutta's Textbook of Obstetrics including Perinatology and Contraception. 8th ed. Jaypee Brothers Medical Publishers (P) Ltd (New Delhi); 2015:369-70.
5. Zamzami TYY. Prelabor rupture of membranes at term in low-risk women: induce or wait? Arch Gynecol Obstet 2006;273:278-82.
6. Cunningham FG, Leveno KJ, Bloom SL, Williams Obstetrics. 24th ed. McGraw Hill Education 2014;pp.448-9,839-49.
7. Sharma SK, Dey M. Maternal and Neonatal outcomes in cases of premature rupture of membranes beyond 34 weeks of gestation. Int J Reprod Contracept Obstet Gynecol 2017; 6: 1302-5.
8. Elder MG, Lamont RF, Romero R. Preterm labor. Churchill Livingstone Inc. (New York) 1997; 153-6.
9. Arias F. High risk pregnancy and delivery. 1st ed. Jaypee Brothers (New Delhi); 1990: Ch 4. pp.63.
10. Ozden S, Delikara MN, Avci A, Fiçicioglu C. Intravaginal misoprostol vs. expectant management in premature rupture of membranes with low Bishop scores at term. Int J Gynaecol Obstet Off Organ Int Fed Gynaecol Obstet 2002; 77:109-15.
11. Nagaria T, Diwan C, Jaiswal J. A study on feto-maternal outcome in patients with premature rupture of membranes. Int J Reprod Contracept Obstet Gynecol 2016; 5:4123-27.
12. Gleason CA, Devaskar SU. Avery's diseases of the newborn. 9th ed. Philadelphia: Elsevier Saunders 2012; 144-45,391-92, 540-656.
13. Jaiswal AA, Hariharan C, Dewani DKC. Study of maternal and fetal outcomes in premature rupture of membranes in central rural India. Int J Reprod Contracept Obstet Gynecol 2017; 6:1409-12.
14. Boskabadi H, Maamouri G, Mafinejad S. Neonatal complications related with prolonged rupture of membranes. Maced J Med Sci 2011; 4:93-8.
15. Ramesh TV, Panigrahi B, Pranaya P, Bindu PH. Outcome of neonates born to mothers with premature rupture of membranes. Int J Contemp Pediatr 2018; 5:1190-4.
16. Riyami NA, Shezawi FA, Ruheli IA, Dughaishi TA, Khabori MA. Perinatal outcome in pregnancies with extreme preterm premature rupture of membranes (mid-trimester PROM). Sultan Qaboos University Med J 2013; 13:51-6.

17. Kayiga H, Lester F, Amuge PM, Byamugisha J, Autry AM. Impact of mode of delivery on pregnancy outcomes in women with premature rupture of membranes after 28 weeks of gestation in a low-resource setting: A prospective cohort study. PLoSONE 2018; 13:e0190388.

18. Idrisa A, Pius S, Bukar M. Maternal and neonatal outcomes in premature rupture of membranes at university of Maiduguri teaching hospital, Maiduguri, North-Eastern Nigeria. Trop J Obstet Gynaecol 2019; 36:15-20.

19. Jain N, Reena P, Banerjee KP, Lata R, Gupta D. A study of perinatal outcome in premature rupture of membrane. Sch J App Med Sci 2017; 5:1391-5.

20. Chakraborty B, Mandal T, Chakraborty S. Outcome of prelabor rupture of membranes in a tertiary care centre in West Bengal. Indian Journal of Clinical Practice 2013; 24.

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Original Article

Blood Pressure Percentiles in Turkish Children and Adolescents

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ABSTRACT

Aim: Pediatric hypertension, a public health concern, is now commonly known worldwide to be an early risk factor for cardiovascular and renal morbidity and mortality. Early detection of hypertension is of the utmost importance to help reduce serious complications. Several distributions of country-specific blood pressure (BP) percentiles have been established worldwide. The aim of this study is to determine BP percentiles in healthy Turkish children aged 2 to 18 years.

Materials and Methods: In this cross-sectional study, BP was measured in 4,984 randomly selected children and adolescents aged 2-17 years. The 50th, 90th and 95th percentile of BP percentiles were determined for gender, age and height with the use a polynomial regression model. BP percentiles at median height were compared with the US Fourth Report references.

Results: The normative values of systolic blood pressure (SBP) and diastolic blood pressure (DBP) increased with age for both genders and varied by gender. At median height, the age-specific differences at the 90th percentile of SBP tended to be higher in boys than in girls at all ages. DBP values in girls were higher than in boys until the age of 9 years, after which boys demonstrated higher values compared to girls.

Conclusion: The age and height specific reference BP values determined in this study is a novel reference for Turkish children and adolescents. Turkish BP values are lower than existing US reference values.

Keywords: Blood pressure percentiles, children, height Z-score

Introduction

Pediatric hypertension, a public health concern, is now commonly known worldwide to be an early risk factor for cardiovascular and renal morbidity and mortality. Children with higher blood pressure (BP) are more likely to become hypertensive adults (1). Measuring BP is a part of physical examination in pediatric clinical practice and its significance had not been understood until recently. Since early detection of hypertension is of the utmost importance to help reduce various complications, BP assessment is now considered as an essential part of routine physical examination above 3 years of age (2). Elevated BP in children and adolescents is usually defined based on the distribution of BP in a reference population. The BP percentiles used in adults to define hypertension (>140/90 mmHg) is not applicable in the pediatric age group because BP is affected by age, gender and height in children (3).

BP percentile curves were first published in 1987 and described age specific distributions of systolic blood pressure (SBP) and diastolic blood pressure (DBP) for

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an age range between 5 and 17 years, with corrections for height and weight (4). An updated Report from the task force, published in 1996, provided additional details in infants and children (5). In 2004, the Fourth Report added further information including data for overweight and obese children and adapted data to growth charts previously developed by the Centers for Disease Control and Prevention (6). The inclusion of overweight and/or obese children in the normative BP values might lead to values as high as those that are used to define higher than normal BP in adults being considered as normal BP for children. The reference values of the Fourth Report are widely used in the US and European countries. In the Fourth Report, normal BP was defined as SBP and DBP values <90th percentile (on the basis of age, gender and height percentiles). For the preadolescent, prehypertension was defined as SBP and DBP ≥90th percentile and <95th percentile. Hypertension was defined as SBP and DBP ≥95th percentile (6). However, definitions of BP categories and stages have been updated in the new guideline of American Academy of Pediatrics for high BP in children and adolescents (7).

The BP values in children show diversity according to countries and, therefore many countries have begun to publish their own reference tables based on their population (8-14). The pooled BP reference values of six European studies have shown relatively high BP in comparison to US children (15).

A study conducted in Italy reported that the normal BP values in Italian children and adolescents were lower than US children and children in other European countries (8). The height-specific BP reference values for non-overweight Chinese children are lower than US reference values (16).

The BP reference values in Turkish children were conducted nearly 15 years ago (17). As secular trends of growing children will affect the normative values of BP, BP reference values should be updated. The aim of this study is to determine BP percentiles in healthy Turkish children aged 2 to 18 years.

Materials and Methods

This cross-sectional study was performed in 10 schools and nurseries (4 nurseries, 4 elementary schools and 2 high schools) in the selected urban location of İzmir in Turkey with a population of 73,908 individuals aged 2 to17 years between 2012-2013. The population in this region has low and/or fair socio-economic status. A stratified random cluster sampling method was used to select the children. The minimum sample size was calculated as 3,456 children. A total of 5,417 children were enrolled, with a response rate of 92% (4,984 children). The children were healthy with no acute or chronic diseases. All measurements were performed by physicians and trained nurses. Weight to the nearest 0.1 kg and height to the nearest 0.1 cm were measured using a Calibrated Electronic scale (SECA, Birmingham, United Kingdom) and a Stadiometer (Harpender stadiometer; Holtain Ltd, Crymych, United Kingdom). BP was measured with an oscillometric device using the right arm at the level of the heart and choosing a proper cuff size, which had to cover 80%-100% of the arm circumference and width of approximately 40% of the arm length. After at least 5 minutes of rest in the sitting position, three readings of BP for each child were taken with an interval of 2 minutes between readings. Korotkoff phase 1 and Korotkoff phase 5 were used for defining SBP and DBP (12).

The average of the three measurements was used for the analysis. Body Mass index was calculated as the ratio of weight (kg) by height squared (m^2). We used the US Fourth Report as the source for all threshold values (6).

The study was approved by the Ethical Committee of Ege University and by the provincial education directorate. Informed written consent was obtained from all parents and from those adolescents aged 13 years and older.

Statistical Analysis

The polynomial regression model was applied to estimate BP percentiles in relation to gender, age and height by the equation via R version 3.0.2.

$$BP_i = \sum_{j=1}^{4} \beta_j (age_i - 10)^j + \sum_{k=1}^{4} \gamma_k (Zheight_i)^k + \sum_{k=1}^{4} \gamma_k (Zweight_i)^k + e_i$$

A fourth-degree polynomial model was used to predict adjusted BP as a function of age and height Z-score (Zht) for both sexes separately. In the second stage, BP percentiles were constructed after excluding overweight children (>90th percentile) because of the possible influence of excess weight on BP distribution, and BP nomogram were refined using the normative database of non-overweight children using the equation.

$$BP_i = \sum_{j=1}^{4} \beta_j (age_i - 10)^j + \sum_{k=1}^{4} \gamma_k (Zheight_i)^k + e_i$$

Results

The study population consisted of 2,498 (50.1%) boys and 2,486 (49.1%) girls. We found that the values of SBP

and DBP increased with age for both genders and varied by gender. At median height, the age-specific differences in the 90th percentile of SBP tended to be higher in boys than in girls at all ages. The differences of SBP ranged from 0 to 3 mmHg until the age of 13 years and ranged from 2 to 7 mmHg for individuals >13 years old. However, the DBP percentile in boys was higher than in girls by up to 2-4 mmHg in the age group of 2-3 years, after which girls demonstrated higher values by up to 1-3 mmHg compared to boys between the ages of 4-8 years. DBP percentiles were higher in boys after 8 years old by up to 1-65 mmHg .

Table I and Table II shows the corresponding age- and height-specific SBP and DBP percentile values in boys and girls.

Figure 1 and 2 shows the 90th percentile of SBP and DBP in boys and in girls by age and percentile of height (height Z-score).

Discussion

The present study provides normative age and height-specific SBP and DBP values in Turkish children in the age range 2-17 years. We used the same statistical method as the Fourth Report, and we created BP percentiles based on the reference values of the US references. The advantage of this model is that although the distribution of height varies greatly with age, the distribution of Zht does not. Different statistical methods are used to determine BP percentiles in children (18,19).

We found that the SBP and DBP levels of the 90th percentiles in Turkish children and adolescents are lower than the US Fourth Report BP references. At median height, the age specific differences in the 90th percentiles for SBP in boys and girls were lower by up to 6-13 mmHg and 6-11 mmHg, respectively, and for DBP by up to 1-8 mmHg and 3-7 mmHg, respectively compared with the US references. The present study also included overweight children, as did the Fourth Report. However, the percentage of the overweight children is low. We found that the BP reference values were not influenced by the prevalence of overweight children.

In a study carried out in eight European countries including children (overweight and non-overweight) aged 2 to 10.9 years, SBP and DBP percentiles in boys and girls were higher than our study population for the same age group (12).

In a national study from Turkey in children from birth to 18 years carried out in 1999, the mean SBP and DBP values showed similar values with the results reported in the study of the second task force with small difference (17). The growth charts for boys and girls were updated in 2006 (20). Therefore, new BP curves for both genders in Turkish children should be determined.

According to data on BP from seven large nationally representative cross-sectional surveys in children aged 6-17 years of age in China, India, Iran, Korea, Poland, Tunisia, and USA published by Xi et al. (14), SBP and DBP reference values in boys and girls from a similar age group were higher than those the present study. The difference between BP percentiles may be due, in part, to the fact that Xi et al. (14) study excluded overweight/obese children while our study included overweight children. In addition, different statistical models were used for these two studies. The authors found similar BP percentiles to the revised US Fourth Report.

In German children, the normal-weight percentiles are nearly identical with the overall growth charts. However, at the 90th percentile, the authors found among 17-year-old adolescents 1/1 mmHg higher values in overall than in normal-weight males and females corresponding with 1/1 mmHg in male and 1/3 mmHg in females US adolescents (21). The authors found very small differences between normal-weight German and US children. This suggests that separate growth charts for normal-weight youths are not necessary. The comparison of the overall percentiles from the United States, Poland and Germany demonstrates very similar values (21,22).

A study conducted in Tehran by Ataei et al. (23) compared the 95th percentile of BP values of surveys from seven countries including Turkey. The SBP rose progressively with age in both genders, with the rise being steeper among boys after the age of 13. The DBP curves show slight differences between the two genders. British and Saudi Arabian children present the highest SBP levels for both genders compared to other countries with minor differences compared to each other until the age of 13, where their curves start to diverge and the data from the UK remains higher. Up to the age of six, Iran has the lowest BP levels among these countries for both genders. Saudi Arabia has the highest levels in almost all ages for both genders, while the Iranian DBP curve presents the lowest DBP levels. British DBP levels present with a mostly horizontal line until it becomes the lowest after the age of 13 years.

Raj et al. (24) reported that the BP normative values in Indian children aged 5-16 years demonstrated a different pattern in comparison to the US data. BP percentiles of Indian schoolchildren have higher DBPs for both genders than the Fourth Report reference. For SBP, girls showed

Table I. The percentiles of systolic and siastolic blood pressure in boys by age and percentile of height

Age (year)	H*	0.05 p	0.25 p	0.50 p	0.75 p	0.95 p	0.05 p	0.25 p	0.50 p	0.75 p	0.95 p
	BP**										
2	0.50	79	85	85	89	92	53	57	58	59	65
	0.90	82	88	90	92	97	56	59	60	62	69
	0.95	85	89	91	93	98	56	60	61	63	70
3	0.50	80	87	89	90	91	52	56	57	58	63
	0.90	85	89	91	93	97	53	57	58	59	67
	0.95	85	89	92	93	98	54	57	58	60	68
4	0.50	83	89	91	93	93	52	56	57	58	63
	0.90	86	91	93	94	99	53	57	57	59	66
	0.95	87	91	93	95	100	53	57	58	59	67
5	0.50	86	92	94	95	96	53	57	58	59	64
	0.90	89	93	95	97	101	54	57	58	60	67
	0.95	89	93	95	97	102	54	58	58	60	68
6	0.50	89	95	97	98	99	55	59	60	61	66
	0.90	92	96	98	99	104	55	59	60	62	69
	0.95	92	96	98	100	104	55	59	60	62	69
7	0.50	92	98	100	101	102	57	61	62	63	68
	0.90	94	98	100	102	106	57	61	62	64	71
	0.95	94	98	100	102	107	57	61	62	64	71
8	0.50	94	101	103	104	105	59	63	64	65	70
	0.90	97	101	103	105	109	60	64	64	66	73
	0.95	97	101	103	105	110	60	64	64	66	74
9	0.50	96	103	105	106	107	61	66	66	68	72
	0.90	99	103	105	107	111	62	66	66	68	75
	0.95	99	103	105	107	112	62	66	66	68	76
10	0.50	98	105	107	108	109	63	67	68	69	74
	0.90	101	105	107	109	113	63	68	68	70	77
	0.95	101	105	107	109	114	64	68	68	70	78
11	0.50	99	106	108	109	110	65	69	69	71	76
	0.90	102	106	108	110	115	65	69	70	71	78
	0.95	102	106	109	110	115	65	69	70	72	79
12	0.50	100	107	109	110	111	66	70	70	72	77
	0.90	104	108	110	111	116	66	70	71	73	80
	0.95	104	108	110	112	117	66	70	71	73	80
13	0.50	101	108	110	111	112	66	71	71	73	78
	0.90	105	109	111	113	117	67	71	72	74	81
	0.95	105	109	111	113	118	68	72	72	74	82
14	0.50	102	109	111	112	113	67	71	72	73	78
	0.90	106	110	112	114	119	69	73	73	75	82
	0.95	107	111	113	115	120	69	73	74	76	83
15	0.50	103	110	112	113	114	68	72	73	74	79
	0.90	108	113	115	116	121	70	74	75	77	84
	0.95	109	113	115	117	122	71	75	75	77	85
16	0.50	105	112	114	115	116	70	74	75	76	81
	0.90	112	116	118	120	124	73	77	77	79	86
	0.95	113	117	119	121	125	73	78	78	80	87
17	0.50	108	115	117	118	119	72	77	77	79	83
	0.90	116	121	123	124	129	76	81	81	83	90
	0.95	118	122	124	126	131	77	82	82	84	91

H*: Height of 5th, 25th, 50th, 75th and 95th percentiles, BP**: Blood pressure

Table II. The percentiles of systolic and diastolic blood pressure in girls by age and percentile of height

		SBP					DBP				
Age (year)	**H*** **BP****	**0.05 p**	**0.25 p**	**0.50 p**	**0.75 p**	**0.95 p**	**0.05 p**	**0.25 p**	**0.50 p**	**0.75 p**	**0.95 p**
2	0.50	81	82	84	87	91	50	51	53	55	58
	0.90	83	86	87	89	95	52	54	56	58	62
	0.95	84	87	88	90	96	53	55	57	59	63
3	0.50	83	84	87	89	93	52	54	56	58	60
	0.90	85	87	89	90	96	54	55	57	60	63
	0.95	85	88	89	91	97	54	56	58	60	64
4	0.50	86	87	89	92	96	54	56	58	60	63
	0.90	87	89	91	92	98	55	57	59	61	65
	0.95	87	90	91	93	99	55	57	59	62	65
5	0.50	89	90	92	95	99	56	58	59	62	64
	0.90	89	92	93	95	101	56	58	60	63	66
	0.95	89	92	93	95	101	57	58	60	63	67
6	0.50	92	93	95	98	102	57	59	61	63	66
	0.90	92	95	96	97	104	58	59	61	64	67
	0.95	92	95	96	98	104	58	60	62	64	68
7	0.50	95	96	98	101	105	59	60	62	64	67
	0.90	95	97	99	100	106	59	61	63	65	68
	0.95	95	97	99	100	107	59	61	63	65	69
8	0.50	97	99	101	104	107	60	61	63	65	68
	0.90	97	100	101	103	109	60	62	64	66	70
	0.95	97	100	101	103	109	60	62	64	66	70
9	0.50	99	101	103	106	110	61	62	64	66	69
	0.90	99	102	103	105	111	61	63	65	67	70
	0.95	99	102	103	105	111	61	63	65	67	71
10	0.50	101	103	105	108	111	62	63	65	67	70
	0.90	101	104	105	107	113	62	63	65	68	71
	0.95	101	104	105	107	113	62	63	66	68	72
11	0.50	103	104	106	109	113	62	64	66	68	71
	0.90	103	105	107	108	114	63	64	66	69	72
	0.95	103	106	107	108	115	63	64	66	69	73
12	0.50	103	105	107	110	114	63	65	66	69	71
	0.90	104	107	108	109	116	63	65	67	69	73
	0.95	104	107	108	110	116	64	65	67	70	73
13	0.50	104	106	108	110	114	64	65	67	69	72
	0.90	105	108	109	110	117	64	66	68	70	74
	0.95	105	108	109	111	117	65	66	68	71	75
14	0.50	105	106	108	111	115	64	66	68	70	73
	0.90	106	109	110	111	118	65	67	69	72	75
	0.95	106	109	111	112	118	66	68	70	72	76
15	0.50	105	106	109	111	115	65	66	68	70	73
	0.90	107	110	111	113	119	67	69	71	73	77
	0.95	108	111	112	114	120	68	69	71	74	78
16	0.50	106	107	109	112	116	66	67	69	71	74
	0.90	109	112	113	115	121	69	71	73	75	78
	0.95	110	113	114	116	122	70	72	74	76	80
17	0.50	107	108	110	113	117	67	68	70	72	75
	0.90	112	114	116	117	123	71	73	75	77	81
	0.95	113	116	117	119	127	73	74	77	79	83

H*: Height of 5th, 25th, 50th, 75th and 95th percentiles, BP**: Blood pressure, SBP: Systolic blood pressure, DBP: Diastolic blood pressure

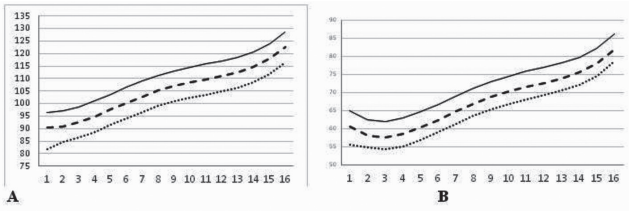

Figure 1. 90th percentile of blood pressure in boys by age and percentile of height (height z score)
A. Systolic blood presure; **B.** Diastolic blood presure

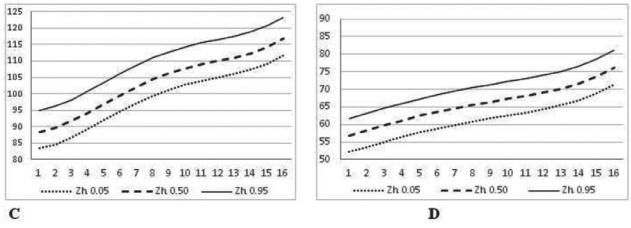

Figure 2. 90th percentile of blood pressure in girls by age and percentile of height (height z-score)
C. Systolic blood presure; **D.** Diastolic blood presure

higher values than the Fourth Report reference, while for boys, the difference appears to be minimal.

A reference sample of Chinese children aged 7-17 years from the Chinese Health and National Survey 1991-2009 was compared with the Fourth Report references. The 50th, 90th and 95th percentiles of SBP in boys and girls were on average 9-10 mmHg lower than their American counterparts; however, there were no clear differences in DBP percentiles. These results are consistent with the BP percentiles of our study (16). Whereas a national study obtained by the 2010 National Health Survey in children between 7-17 years of age from China reported that the 50th, 90th, 95th and 99th percentiles of BP in boys and girls aged 7 to 13 years were consistent with the US reference (25).

Polish preschool children's 90th and 95th SBP and DBP percentiles were lower than those in the US and German BP references. Differences in the 95th SBP percentiles ranged by age from -5 to 0 mmHg and from -2 to -1 mmHg, in boys and girls, respectively, whereas the difference at the same percentile of DBP ranged from -7 to -1 mmHg and from -5 to -1 mmHg in boys and girls, respectively. However, the 90th percentiles of SBP and DBP in Polish preschool children were higher than those for our children (22).

The comparison of data regarding BP percentiles in children from similar studies may be possibly limited by the different BP readings obtained from different automated devices, BP measurement numbers and different statistical methods used. BP normative values can also show differences depending on whether or not overweight children are included in the study. Furthermore, different patterns of BP percentiles in children and adolescents in different countries may be due to the influence of diverse socio-economic, cultural and nutritional factors in comparison to the US references.

Study Limitations

The present study has several limitations. Firstly, the reference values are based on BP measurements measured during a single session and not on multiple estimates from at least 3 separate sessions. Secondly, environmental factors were not included because life style data were not available for all subjects who took part in this study. Finally, comparable data from rural areas were not available. Therefore, the generalization of our results is limited.

Conclusion

We found that the values of SBP and DBP increased with age for both genders and varied by gender. The SBP and DBP levels of the 90th percentiles in Turkish children and adolescents are lower than the US BP references. In contrast to the US Fourth Report references, the reference values of the present study are not influenced by the prevalence of overweight children. National BP reference values of Turkish children and adolescents will be useful for international comparisons of national normative BP values and for evaluating the prevalence of elevated BP in children.

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Ethics

Ethics Committee Approval: The study was approved by the Ethical Committee of Ege University and by the provincial education directorate (approval number: 11.12.2013, date: 12.01.2012).

Informed Consent: Informed written consent was obtained from all parents and from those adolescents aged 13 years and older.

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Authorship Contributions

Concept: A.K., P.K., T.K., Design: A.K., P.K., T.K., Data Collection or Processing: P.K., S.Ö., Analysis or Interpretation: A.K., P.K., S.Ö., T.K., Literature Search: A.K., P.K., S.Ö., T.K., Writing: T.K.

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References

1. Bao W, Threefoot SA, Srinivasan SR, Berenson GS. Essential hypertension predicted by tracking of elevated blood pressure from childhood to adulthood: the Bogalusa Heart Study. Am J Hypertens 1995; 8:657-65.
2. Somu S, Sundaram B, Kamalanathan A. Early detection of hypertension in general practice. Arch Dis Child 2003; 88:302.
3. Rosner B, Prineas RJ, Loggie JM, Daniels SR. Blood pressure nomograms for children and adolescents, by height, sex, and age, in the United States. J Pediatr 1993; 123:871-86.
4. Report of the Second Task Force on Blood Pressure Control in Children-1987. Task Force on Blood Pressure Control in Children. National Heart, Lung, and Blood Institute, Bethesda, Maryland. Pediatrics 1987; 79:1-25.
5. Update on the 1987 Task Force Report on High Blood Pressure in Children and Adolescents: a working group report from the National High Blood Pressure Education Program. National High Blood Pressure Education Program Working Group on Hypertension Control in Children and Adolescents. Pediatrics 1996; 9:649-58.
6. The fourth report on the diagnosis, evaluation and treatment of high blood pressure in children and adolescents. Pediatrics 2004; 114(2 Suppl):555-76.
7. Flynn JT, Kaelber DC, Baker-Smith CM, et al. Clinical practice guideline for screening and management of high blood pressure in children and adolescents. Pediatrics 2017; 140:20171904.
8. Menghetti E, Virdis R, Strambi M, et al. Blood pressure in childhood and adolescence: the Italian normal standards. Study Group on Hypertension of the Italian Society of Pediatrics. J Hypertens 1999; 17:1363-72.
9. Wühl E, Witte K, Soergel M, Mehls O, Schaefer F, German Working Group on Pediatric Hypertension. Distribution of 24-h ambulatory blood pressure in children: normalized reference values and role of body dimensions. J Hypertens 2002; 20:1995-2007.
10. Ayatollahi T, Zare M. Blood pressure standards for shiraz (southern Iran) school children in relation to height. Iran J Pediatr 2012; 22:223-30.
11. Wang Z, Ma J, Dong B, Song Y, Hu PJ, Zhang B. Comparison of blood pressure levels among four age groups of Chinese children matched by height. J Human Hypertens 2012; 26:437-42.
12. Barba G, Buck C, Bammann K, et al. Blood pressure reference values for European non-overweight school children: the IDEFICS study. Int J Obes (Lond.) 2014; 38(Suppl 2):48-56.
13. Jiang X, Cao Z, Shen L, et al. Blood pressure tables for Chinese adolescents: justification for incorporation of important influencing factors of height, age and sex in the tables. BMC Pediatr 2014; 14:10.
14. Xi B, Zong X, Kelishadi R, et al. Establishing international blood pressure references among non overweight children and adolescents aged 6 to 17 years. Circulation 2016; 133:398-408.
15. de Man SA, Andre JL, Bachmann HJ, et al. Blood pressure in childhood: pooled findings of six European studies. J Hypertens 1991; 9:109-14.
16. Yan W, Liu F, Li X, et al. Blood pressure percentiles by age and height for non-overweight Chinese children and adolescents: analysis of the China Health and Nutrition Surveys 1991-2009. BMC Pediatr 2013; 13:195.
17. Tümer N, Yalcinkaya F, Ince E, et al. Blood pressure nomograms for children and adolescent in Turkey. Pediatr Nephrol 1999; 13:438-43.
18. Rosner B, Cook N, Portman R, Daniels S, Falkner B. Determination of blood pressure percentiles in normal-weightchildren: some methodological issues. Am J Epidemiol 2008; 167:653-66.
19. Cole TJ, Green PJ. Smoothing reference centile curves: the LMS method and penalized likelihood. Stat Med 1992; 11:1305-19.
20. Neyzi O, Furman A, Bundak R, Gunoz H, Darendeliler F, Bas F. Growth references for Turkish children aged 6-18 years. Acta Paediatr 2006; 95:1635-41.
21. Schwandt P, Scholze JE, Bertsch T, Liepold E, Haas GM. Blood pressure percentiles in 22,051 German children and adolescents: the PEEP Family Heart Study. Am J Hypertension 2015; 28:672-9.
22. Krzyzaniak A, Krzywinska-Wiewiorowska M, Stawinska-Witoszynska B, et al. Blood pressure references for Polish children and adolescents. Eur J Pediatr 2009; 168:1335-42.
23. Ataei N, Baikpour M, Hosseini M, et al. Blood pressure nomogram for children and adolescents by age and body mass index in Tehran Iran. Iran J Public Health 2017; 46:368-79.
24. Raj M, Sundaram R, Paul M, Kumar K. Blood pressure distribution in Indian children. Indian Pediatr 2010; 47:477-85.
25. Dong Y, Ma J, Song Y, et al. National blood pressure reference for Chinese han children and adolescents aged 7 to 17 years. Hypertension 2017; 70:897-906.

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Original Article

The Impact of e-Health Literacy on Health Promotion Behaviors of High School Students

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ABSTRACT

Aim: The aim of this study was to investigate the effects of e-health literacy on health promotion behaviors on high school students.

Materials and Methods: This descriptive, cross-sectional and relational study was conducted between May-June 2019 in a high school chosen by a random sampling method from the high schools of Narlıdere District of İzmir Province. Data were collected using a descriptive information form, the e-Health Literacy scale in Adolescents and the Adolescent Health Promotion scale. The data collected from the study was analyzed using numbers, percentages, average, Pearson correlation analysis and regression analysis in SPSS 22.0.

Results: 57.1% of the students included in this study were male and their mean age was 16.52±0.92 years. It was found that 47% of the students were studying in the 10th grade. Of the students' mothers, 42.1% were primary school graduates, while 29.2% of the fathers were primary school graduates. It was determined that 95% of the students used the internet, 69.4% accessed the internet via mobile phone and 65.3% did not take health promotion lessons at school. It was also seen that there was a positive moderate relationship between the e-health literacy and mean Health Promotion scale scores of the high school students, and that 17% of the factors affecting adolescent health promotion behaviors were explained by the total e-health literacy mean scores ($r=0.416$; $p<0.001$).

Conclusion: It was found that there was a statistically significant relationship between e-health literacy and the health promotion behaviors of the students, but it was found that the total score means of health promotion behaviors were not at the desired level. Starting from an early period, it is recommended to conduct interventional studies aimed at increasing health promotion behaviors in children and adolescents.

Keywords: Health promotion behaviors, e-health literacy, student

Introduction

The concept of children's health, which is one of the most important indicators of development in a country, lets individuals acquire positive health behaviors through interventions in childhood and youth and lets them help protect their health from many diseases and disabilities risks throughout their lives (1,2). Today's health system is important in terms of adopting practices to protect and improve the health of children. These practices include getting information about health services, making correct and effective decisions about their own health, and taking individual responsibility for their health. Factors such as complex diagnostic processes, constantly evolving and changing technology, cultural differences, limited literacy levels, and age-related physical and cognitive changes may affect children's self-care, self-efficacy, use of services and communication with healthcare teams. In all these processes, the health literacy of individuals stands out as an important factor in seeking and understanding health

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related information and communicating with health information and service providers (3). Researchers found an association between limited health literacy and an increase in the rate of preventable hospital visits and admissions (4).

Health literacy is the sum of the cognitive and social skills related to access, understanding, and use of health information in maintaining and promoting health (5,6). In 2000, "Healthy People 2010" identified the presence of limited health literacy as a public health problem and aimed at setting national goals for its improvement. In 2004, IOM (Institute of Medicine) reported findings that health literacy is critical to improving the health of individuals and the nation (7).

Adolescents maintain the health behaviors and habits they acquire during their adolescent years throughout their life (8). Supporting adolescents' health literacy needs is a crucial step in order for them to adopt a healthy lifestyle in the present and in the future. Also, today's adolescents are known to be prospective, independent health care system users, and young adults who are health literate may contribute to a generation-level reduction of poor health outcomes known to be associated with low health literacy among adults (9). In a study examining the health literacy of adolescents, 200 adolescents were studied in Australia and cigarette and alcohol consumption was found to be higher in adolescents with low health literacy levels (10). In another study which was conducted with 350 adolescents in the USA, it was found that children with low health literacy presented negative behaviors such as carrying weapons and bullying their peers (11). Sharif and Blank (12) reported that, following a child's age, gender and eating habits, a low health literacy level is one of the factors determining Body Mass index.

The development of the concept of e-health literacy has greatly contributed to the field of adolescent health literacy (13). E-health literacy contributes to an adolescent's ability to search, find, understand, evaluate and use health information obtained from electronic sources and use the acquired knowledge to address any health problem (14). Today, the internet is regarded as one of the key and important sources used to access health related information (15). Gray et al. (16) reported that despite the fact that adolescents frequently use information technologies, they experience difficulty in understanding and using online health information. In addition, it has been reported that little is known about the attitudes and perceptional patterns of this group of individuals who use the internet quite frequently concerning their e-health literacy. What's more, it has also been reported that they only feel the need to browse the internet for important health issues and that the consequences of misleading and low quality information on the internet might lead to significant problems (17,18).

The promotion of health literacy at an early age directly affects health literacy in later life as adolescents carry the knowledge and attitudes acquired during this period to adulthood (19). When the literature is examined, no studies examining the effects of e-health literacy on the health promotion behaviors of high school students were found. As a result of this gap in the field, the effect of e-health literacy on health promotion behaviors of high school students was investigated in this study.

Materials and Methods

This research uses a descriptive, cross-sectional and relational model. This study was conducted with a total of 219 students ranging from 14-18 years of age between May 2019 and June 2019 in a high school chosen by a simple random sampling method among the high schools affiliated to Narlıdere District National Education of İzmir Provincial Directorate of National Education. The sample was determined by a random draw from seven high schools in the Narlıdere region of İzmir, Turkey. Power analysis was performed according to the results of regression analysis. G-Power software was used for power analysis, and the sample size was calculated as 132 students based on the following parameters: a power of 80% (type II error rate was accepted as 0.20), a confidence interval of 95% (type I error rate was accepted as 0.05) and an effect size of 0.85 (Özdamar K. Modern Bilimsel Araştırma Yöntemleri, Kaan Kitabevi, Eskişehir, 2003)(20).

Data Collection

The data of this study were collected by using the descriptive information form, E-health literacy scale in Adolescents and Adolescent Health Promotion scale (AHPS) by using a questionnaire method.

Measures

Descriptive Information Form

The descriptive information form is composed of questions about the socio-demographic characteristics of the adolescents such as age, gender, educational status of parents, income status etc.

E-Health Literacy Scale

This was developed by Norman and Skinner in 2006 to identify traditional literacy, health literacy, information

retrieval, scientific research, media literacy, and computer literacy (21). This scale consists of two items related to internet use and eight items that measure internet attitude. The Cronbach's alpha value of the original scale was found to be 0.88. Scale items were determined as follows by a 5-point Likert-type scaling method: "1= strongly disagree, 2= disagree, 3= undecided, 4= agree, 5= strongly agree". The lowest score is 8 and the highest score is 40. A high score obtained from the scale shows that e-health literacy is high (20). The Cronbach alpha value of the scale, which was adapted by Coşkun and Bebiş (22) was found to be 0.78. The explained variance ratio of the Turkish scale is 67.54%. The item total score correlation of the scale was found to be between 0.43-0.57. The Turkish version of the e-health literacy scale in adolescents was determined to be a valid and Reliable scale (22). The Cronbach alpha reliability coefficient was found for the total scale to be 0.78 in this study.

The Adolescent Health Promotion Scale

This scale was developed by Chen et al. (23) to assess the health promotion behavior level of adolescents. This scale consists of 40 items and six sub-scales. The sub-scales are categorized as nutrition behaviors (6 items), social support (7 items), health responsibility (8 items), life appreciation (8 items), exercise (4 items) and stress management (6 items). The scale items are rated in the form of a Likert type scaling as 1= never, 2= sometimes, 3= usually, 4= frequently, 5= always. The sum of the subscale scores of the sub-scale is obtained by summing the scores of the items, and the total score of the scale is obtained by summing all the subscale scores. The lowest and highest scores that can be obtained from the scale vary between 40 and 200. A high score indicates that health promotion behaviors are positive (23). The validity and reliability studies of the scale were conducted by Temel et al. (24) and Ortabag et al. (25) and it was found that it can be used as a valid and Reliable scale (Cronbach alpha was 0.93 and 0.92 respectively) for the Turkish population in both studies. In this study, the Cronbach alpha reliability coefficient for the total scale was 0.91.

Statistical Analysis

SPSS 22.0 program was used for statistical analysis of the data. The Shapiro-Wilk Normality test was used to determine if the data complied with a normal distribution. Number, percentage, mean and standard deviation were used as descriptive analysis. The relationship between e-health literacy and health promotion behaviors of students was evaluated by Pearson correlation analysis and the effect of e-health literacy on health promotion behaviors was evaluated by simple regression analysis.

Results

Of the participants, 57.1% of the students were male and the mean age of the students was 16.52±0.92 years (minimum: 14; maximum: 18). It was found that 47% of the students studied in the 10th grade. Among the participants' parents, 42.1% of mothers were primary school graduates, while 29.2% of fathers were high school graduates. It was found that 95% of them used the internet, 69.4% accessed the internet via mobile phone and 65.3% did not take health promotion lessons at school (Table I).

Table I. Socio-demographic characteristics of the participants

The mean score of the high school students participating in the study from the E-health Literacy scale was 28.64±4.50. The Health promotion behaviors total score of the students was 127.20±24.99. Students were seen to have received the highest mean score from the AHPS Health Responsibility Sub-scale (32.41±7.49) while the lowest mean score was from the AHPS Nutrition Sub-scale (11.64±3.78) (Table II).

Table II. Mean and total scale scores of high school students

When the relationship between the total mean score of the AHPS and the e-health literacy scale of high school students was investigated, it was determined that there was a moderate positive relationship between adolescent health promotion and e-health literacy ($r=0.416$; $p<0.001$) (Table III).

Table III. The relationship between high school students' adolescent health promotion sub-scales and e-health literacy scale total score means

It was determined that there was a weak positive relationship between adolescent health promotion sub-scales and e-health literacy ($r=0.416$; $p<0.001$) (Table IV).

Table IV. The relationship between high school students' adolescent health promotion scale of sub-scale and e-health literacy scale total score means

According to simple regression analysis, it was found that there was a positive moderate relationship between e-health literacy and the mean scores of the adolescent health scale ($\beta=0.416$, $p<0.001$) in high school students and 17% ($F=45,353$, $p<0.001$) of the factors affecting adolescent

health promotion behaviors were found to be explained by the mean total scores of e-health literacy.

The regression analysis indicated that e-health literacy explained 17% of the increase in the adolescent health scale and increased the adolescent health scale by more than 0.416 (β=0.416) (Table V).

Table I. Socio-semographic characteristics of the participants

Socio-demographic data	**Mean**	
Age	16.52±.92	
	n	**%**
Gender		
Female	94	42.9
Male	125	57.1
Class (Grade)		
9th grade	39	17.8
10th grade	103	47.0
11th grade	49	22.4
12th grade	28	12.8
Mother's education level		
Not literate	21	9.6
Primary school	90	42.1
Middle School	56	25.6
High school	44	20.1
University	8	3.7
Father's education level		
Not literate	17	7.8
Primary school	64	29.2
Middle school	56	25.6
High school	64	29.2
University	18	8.2
Internet use status		
User	208	95.0
Non-user	11	5.0
Internet access way		
Computer at home	58	26.5
Computer at school	7	3.2
Mobile phone	152	69.4
Internet cafe	2	0.9
Status of health promotion lesson		
Received	76	34.7
Not Received	143	65.3
Total	219	100.0

Table V. The effect of e-health literacy of high school students on adolescent health promotion

The regression analysis indicated that e-health literacy explained 9% of the increase in the health responsibility subscale, 12% of the increase in the life appreciation subscale, 12% of the increase in the social support subscale, 7% of the increase in the nutritional behavior subscale, 1% of the increase in the exercise subscale and 11% in the stress management subscale.

Also, e-health literacy increased the health responsibility subscale by more than 0.303 (β=0.303), the life appreciation subscale by more than 0.346 (β=0.346), the social support subscale by more than 0.347 (β=0.347), the nutritional behavior subscale by more than 0.270 (β=0.270), the

Table II. Mean and total scale scores of high school students

Scale total score/sub dimension scores	**X ± SD**	**Min-max**	**Number of X/ items**
E-health literacy scale	28.64±4.50	16-40	3.58
Adolescent Health Promotion scale total score	127.20± 4.99	56-190	3.18
Adolescent Health Promotion scale health responsibility sub-dimension	32.41±7.49	14-50	4.05
Adolescent Health Promotion scale self-realization sub dimension	27.53±7.33	8-40	3.44
Adolescent Health Promotion scale social support sub-dimension	21.64±5.73	8-35	3.09
Adolescent Health Promotion scale nutrition sub dimension	15.54±4.10	6-25	2.59
Adolescent Health Promotion scale exercise sub-size	11.64±3.78	4-20	2.91
Adolescent Health Promotion scale stress management sub-dimension	18.41±5.22	4-30	3.06

SD: Standard deviation, min: Minimum, max: Maximum

Table III. The relationship between high school students' adolescent health promotion scale and E-health literacy scale total score means

	1	**2**
1. Promoting adolescent health	1.00*	-
2. E-health literacy	0.416*	1.0*

*: p<0.001

Table IV. The relationship between high school students' adolescent health promotion scale of sub-scale and e-health literacy scale total score means

	1	2	3	4	5	6	7
e-Health literacy	1.0*						
Nutrition behaviors	0.270*	1.0*					
Social support	0.347*		1.0*				
Health responsibility	0.303*			1.0*			
Life appreciation	0.346*				1.0*		
Exercise	0.122*					1.0*	
Stress management	0.338*						1.0*

*p<0.001

Table V. The effect of e-health literacy of high school students on adolescent health promotion

-	**Model 1**
-	β
Adolescent Health Promotion scale	0.416*
R^2	0.17
F	45,353
p	<0.001

*: p<.0001, β: Beta , R^2: Adjusted R^2, F: Variance

exercise subscale by more than 0.122 (β=0.270) and the stress management subscale by more than 0.338 (β=0.270) (p<0.001).

Discussion

As a result of this study conducted to investigate the effect of e-health literacy on the health promotion behaviors of high school students, it was concluded that e-health literacy has an effect on health promotion behaviors. The scores from the e-health literacy scale of the students participating in the study were slightly above the intermediate level with scores of 28.64±4.50. Coşkun and Bebiş's (22) study (27.4±4.6) concurs with the results of this study. By employing the E-health Literacy scale in the American College of Health with 422 students, Britt et al. (26) determined that that the health literacy level of the students was good. In another study conducted with 556 students in Taiwan, E-health Literacy was examined and the students' health literacy level was found to be good (27). In addition, Sukys et al. (28) found that the level of e-health literacy in adolescents was low. It is seen that adolescents use the internet as a source of information about health.

The health promotion behaviors total score of the participants was 127.20±24.99 out of 200. Accordingly, it can be said that adolescents' health promotion behaviors are moderate. Some studies have shown that health promotion behaviors in adolescents are strongly associated with future health outcomes (29,30). When compared with other studies using the same scale, this result remains lower than the results found by Bebiş et al. (31) (132.05±24.60) and Temel et al. (24) (mean 140.69±20.10) among high school students. Similarly, the total score obtained from the scale was 129 in a study by Chen et al. (23). This situation suggests that students do not receive adequate health education or cannot reflect their education in their behaviors.

It was found that high school students received the highest score from the health responsibility subscale of the AHPS. Temel et al. (24) revealed that 8th grade students (n=358) received the highest score from the health responsibility subscale. In the literature, it was found that adolescents received the highest score from the life appreciation subscale in the AHPS (22,25,31-33). The reason for the difference is thought to be due to the socio-cultural level of the adolescents and their families.

Students received the lowest score from the AHPS in the exercise subscale in our study. Unlike the findings of our study; in some studies, stress management of adolescents (22,24), and in some studies (33,34), the level of health responsibility was found to be the lowest. Similar to the findings in our study, it was found in the literature that there were many studies in which the participants received the lowest scores in the exercise subscale (25,32,35). It was determined that they led a sedentary life watching TV or playing computer games (36). It can be seen that they have difficulty in allocating time to exercise due to having to study for the university entrance exam and that they still cannot adequately perceive the importance of exercise.

It was found that there was a positive moderate relationship between e-health literacy and mean health promotion scale scores of high school students, and that 17% of the factors affecting adolescent health promotion behaviors were explained by the total e-health literacy mean scores. A systematic review of 17 studies on health literacy and health promotion behaviors of adolescents shows that there is a significant relationship between the health literacy and the health behaviors of adolescents (37). In his study with 1.601 adolescents in 6 different cities of Taiwan, Chang (19) found that adolescents with low health literacy had low health promotion behaviors. In a study conducted in Israel, health literacy skills were not the only determinants of health behavior adoption, although they help access appropriate sources of information which is

critical to the adoption of health behaviors (38). On the other hand, it was found in a study by Park et al. (39) that high school students with low health literacy had unhealthy diets, and were more likely to be overweight than their peers, and substance abuse was higher among them. In the literature, there is no information about what percentage of health promotion behaviors is accounted for by e-health literacy. However, health promotion behaviors are affected by many factors such as age, gender, family structure and education. Knowing the 17% effect of e-health literacy on health promotion behaviors is an important result that can contribute to the literature to act as a guide for future interventional studies.

Study Limitation

Collection of data from only one high school is the limitation of this study.

Conclusion

As a result of this study, a significant relationship was found between e-health literacy and health promotion behaviors. In this sense, public health nurses, school nurses, and health educators in schools should assess the concept and take the e-health literacy of adolescents into account while designing a health education program. In addition, school nurses should develop their e-health literacy skills to facilitate adolescents' health-promoting activities. There is a need for a systematic approach to the promotion of health literacy and a well-developed curriculum to implement this program. It is recommended that issues related to health promotion should be further integrated into the curriculum or a separate health promotion course should be added. Interventional studies that investigate the relationship between health promotion behaviors and e-health literacy are also recommended.

Ethics

Ethics Committee Approval: Before starting the study, written permission was obtained from the Non-Interventional Research Ethics Committee of Dokuz Eylül University (approval number: 2019/09-28 date: 10.04.2019) and from the institution where the research was conducted. In order to conduct the research, written permission was also obtained from İzmir Provincial Directorate of National Education.

Informed Consent: Written consent was obtained from the parents of the students included in the study. In addition, permission was obtained from the authors who adapted the scales used in this study into Turkish.

Peer-review: Externally and internally peer-reviewed.

Authorship Contributions

Surgical and Medical Practices: K.P.G., Concept: K.P.G., Design: K.P.G., Data Collection or Processing: K.P.G., D.A., Analysis or Interpretation: K.P.G., D.A., Literature Search: K.P.G., D.A., Writing: K.P.G., D.A.

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References

1. Australian Commission On Safety And Quality In Health Care. Consumers, The Health System And Health Literacy. Taking Action To İmprove SafetyAnd Quality. Consultation Paper: Sydney; 2013.
2. Birru MS, Monaco VM, Charles L, et al. Internet Usage By Low-Literacy Adults Seeking Health İnformation: An Observational Analysis. Journal of Medical Internet Research 2004; 6:25-27.
3. Çınar S, Ay A, Boztepe H. Child Health and Health Literacy. Sağlıkta Performans ve Kalite Dergisi 2018; 14:25-39.
4. Ghaddar SF, Valerio MA, Garcia CM, Hansen L. Adolescent health literacy: the importance of credible sources for online health information. Journal of School health 2012; 82:28-36.
5. Berkman ND, Davis TC, McCormack L. Health literacy: what is it? Journal of Health Communication 2010; 15(Suppl 2):9-19.
6. Aras Z, Temel AB. Evaluation of Validity and Reliability of the Turkish Version of Health Literacy Scale. Florence Nightingale Journal of Nursing 2017; 25:85-94.
7. Healthy People 2010. Available at: https://www.cdc.gov/nchs/healthy_people/hp2010.htm
8. Newacheck PW, Wong ST, Galbraith AA, Hung Y. Adolescent health care expenditures: a descriptive profile. Journal of Adolescent Health 2003; 32:3-11.
9. DeWalt DA, Pignone MP. Health literacy and health outcomes:overview of the literature. In: Schwartzberg JG, VanGeest JB,Wang CC (eds). Understanding Health Literacy: Implications forMedicine and Public Health. Chicago: AMA Press 2005; 205-27.
10. Kickbusch I, Pelikan JM, Apfel F, Tsouros A. Health Literacy. WHO Regional Office for Europe: Copenhagen, 2013.
11. Kickbusch I. Health Literacy: Empowering Children to Make Healthy Choices. Virtually Healthy 2006.
12. Sharif I, Blank AE. Relationship between child health literacy and body mass index in overweight children. Patient Education and Counseling 2010; 79:43-8.
13. Kickbusch I, Gordon J, Kropf D, O'Toole L. Learning for Well-Being. A Policy Priority for Children and Youth in Europe. A Process for Change. Paris, Learning for Well-Being Child Health and Health Literacy Consortium of Foundations in Europe 2012; 137-69.
14. Kickbusch IS. Health Literacy: Addressing the Health and Education Divide. Health Promotion International 2001; 16:289-97.

15. Kirsch I. The International Adult Literacy Survey (IALS): Understanding What Was Measured. Princeton, NJ: Educational Testing Services 2001; 1-61.

16. Gray NJ, Klein JD, Noyce PR, Sesselberg TS, Cantrill JA. The Internet: a window on adolescent health literacy. Journal of Adolescent Health 2005; 37:243.

17. Skinner H, Biscope S, Poland B. Quality of internet access: barrier behind internet use statistics. Soc Sci Med 2003; 57:875-80.

18. Skinner H, Biscope S, Poland B, Goldberg E. How adolescents use technology for health information: implications for health professionals from focus group studies. J Med Internet Res 2003; 5:1-32.

19. Chang LC. Health literacy, self-reported status and health promoting behaviours for adolescents in Taiwan. Journal of Clinical Nursing 2011; 20:190-6.

20. Özdamar K. Modern Scientific Research Methods. Eskişehir, Kaan Publication, 2003.

21. Norman C, Skinner HA. eHEALS: the eHealth literacy scale. Journal of Medical Internet Research 2006; 8:27.

22. Coşkun S, Bebiş H. Psychometric evaluation of a Turkısh version of the e-health literacy scale (e-heals) in adolescent. Gulhane Medıcal Journal 2015; 57:378-84.

23. Chen MY, Wang EK, Yang RJ, Liou YM. Adolescent health promotion scale: development and psychometric testing. Public Health Nursing 2003; 20:104-10.

24. Temel Bayık A, Başalan İz F, Yıldız S, Yetim D. The Reliability and Validity of Adolescent Health Promotion Scale in Turkish Community. Journal of Current Pediatrics 2012; 10:12-22.

25. Ortabag T, Ozdemir S, Bakir B, Tosun N. Health promotion and risk behaviors among adolescents in Turkey. Journal of School Nursing 2011; 27:304-15.

26. Britt RK, Collins W, Wilson K, Linnemeier G, Englebert AE. Health Literacy and Health Behaviors Affecting Modern College Students: A Pilot Study of Issues Identified by the American College Health Association. J Med Internet Res 2017; 19:392.

27. Yang SC, Luo YF, Chiang CH. The Associations Among Individual Factors, e-Health Literacy, and Health-Promoting Lifestyles Among College Students. J Med Internet Res 2017; 19:15.

28. Sukys S, Cesnatiene VJ, Ossowsky ZM. Is Health Education at University Associated with Students' Health Literacy? Evidence from Cross Sectional Study Applying HLS-EU-Q. BioMed Research International 2017; 8516843.

29. Kelder SH, Perry CL, Klepp KI, Lytle LL. Longitudinal tracking of adolescent smoking, physical activity and food choice behaviors. American Journal of Public Health 1994; 84:1121-26.

30. Lam TH, Chan BH, Chan SK, Leung GM, Ho SY, Chan WM. A prospective study of stage of change for general health promotion action and health-related lifestyle practices among Chinese adults. Social Science Medicine 2006; 63:1846-56.

31. Bebiş H, Akpunar D, Özdemir S, Kılıç S. Assessment of health promotion behavior of adolescents in a high school. Gulhane Medıcal Journal 2015; 57:129-35.

32. Dağdeviren Z, Şimşek Z. Health Promotion Behaviors and Related Factors of High School Students in Şanlıurfa. TAF Preventive Medicine Bulletin 2013; 12:135-42.

33. Musavian AS, Pasha A, Rahebi SM, Roushan ZA, Ghanbari A. Health promoting behaviors among adolescents: A cross-sectional study. Nursing and Midwifery Studies 2014; 3:14560.

34. Karaaslan MM. Çelebioğlu A. Determination of healthy lifestyle behaviors of high school students. Journal of Human Sciences 2018; 15:1355-61.

35. Geçkil E, Dündar Ö. Turkish adolescent health risk behaviors and self-esteem. Social Behavior and Personality 2011; 39:219-28.

36. Aghamolaei T, Tavafian SS. Health Behaviors of a Sample of Adolescents in Bandar Abbas, Iran. Int J High Risk Behav Addict 2013; 2:34-8.

37. Fleary SA, Joseph P, Pappagianopoulos JE. Adolescent health literacy and health behaviors: a systematic review. Journal of Adolescence 2018; 62:116-27.

38. Levin-Zamir D, Baron-Epel OB, Cohen V, Elhayany A. The association of health literacy with health behavior, socioeconomic indicators, and self-assessed health from a national adult survey in Israel. Journal of Health Communication 2016; 21:61-8.

39. Park A, Eckert TL, Zaso MJ, et al. Associations between health literacy and health behaviors among urban high school students. Journal of School Health 2017; 87:885-93.

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Original Article

A Turkish Version of Children's Emotional Manifestation Scale: Reliability and Validity Assessment

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ABSTRACT

Aim: This study aims to determine the reliability and validity of the Turkish version of the Children's Emotional Manifestation scale (T-CEMS).

Materials and Methods: The sample of this methodological-type study consisted of 62 children between the ages of 7 and 12 years who presented at the clinic for day surgery.

Results: The Content Validity index of the scale is 0.96, and thus, the scale is statistically significant. Internal consistency was found to be between 0.95 and 0.96 using Cronbach's alpha reliability coefficient. These results show that inter-rater reliability is sufficient.

Conclusion: T-CEMS is valid and reliable for measuring the emotional reactions of children before stressful medical processes or during the preoperative period.

Keywords: Stressful medical procedures, pediatrics, emotional stress, reliability and validity, nurse

Introduction

Stressful medical procedures are invasive procedures that children often face in their hospitalization process. Procedures like blood tests (1), intramuscular injection (2), intravenous catheterization (3,4) immunization (5), nasogastric tube insertion (6) and urethral catheter insertion (7) are stressful medical procedures for children that can be commonly encountered in hospital admissions.

Behavioral reactions of those children hospitalized relating to diagnosis and treatment procedures are reported to occur due to some fears such as fear of getting body damage, pain, body image deterioration, wrong treatment, disability and death (8).

It is also stated that behavioral distress signs during stressful medical procedures in children include crying, hiccups, physical resistance, verbal resistance, asking for emotional support, rigidity in the muscles, expressing pain, despair, aggressive behaviors and seeking escape (9).

Some other behavioral reactions of children relating to diagnosis and treatment were identified as the request for protection and crying to arouse pity for themselves (10).

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All invasive medical procedures, especially surgical procedures, result in emotionally negative behavior changes and increased anxiety (11-19).

Surgical procedures are a potentially threatening experience for children, regardless of whether they are minor operations in an ambulatory surgery unit (15) or major surgeries at a larger hospital (20,21).

Children who are anxious in the preoperative period exhibit negative emotional behavior during anesthesia induction and after surgery. Severe anxiety affects some physiological states such as pulse, blood pressure (15,22) and respiration (23) as well as the psychological state. It also deters the child from dealing with medical treatment, causes negative behaviors associated with health care and affects postoperative recovery negatively (12,24,25).

In the literature, it is stated that those medical interventions causing intense stress levels are more likely to be recalled in children's future lives (26,27).

In order to protect children from these negative influences, nurses must meet the emotional needs of the child and keep them informed before each procedure. This situation helps reduce the child's stress and leads to more effective treatment (28).

Studies indicate that negative physiological and psychological changes seen in children during stressful medical procedures can be reduced by appropriate interventions (3,5-7,9,16,19,22,28-31).

To the best of our knowledge, no objective measurement tool was used to assess the effect of nursing interventions to reduce the anxiety of Turkish children during stressful medical procedures. In this regard, the Children's Emotional Manifestation scale (T-CEMS) that has been adapted to be used in the Turkish context may be a simple and objective measurement tool to evaluate the effectiveness of intervention studies to reduce negative emotional behaviors and anxiety. The aim of this research is to determine the validity and reliability of the Turkish version of T-CEMS developed to measure the emotional responses of children during stressful medical procedures.

Materials and Methods

Design, Sample and Setting

The present study employed a methodological design and was conducted at a state hospital in the Aegean Region in western Turkey. The population of the study consisted of children aged between 7 and 12 years old who were admitted to hospital for ambulatory surgery. Those children admitted to hospital for ambulatory surgery for circumcision, hernia repair, undescended testis or minor ENT operations (tonsillectomy, adenoidectomy, tube insertion) were included in this study which was conducted in the Pediatric Surgery Service, Otorhinolaryngology Service, General Surgery Service, Urology Service or Operating Room.

The sample size of the study was determined based on the idea that the sample size in the validity and reliability studies of methodological researches should be at least 5 and at most 10 times the number of scale items (32). Since the scale to be used in the study included 5 items, it was decided to enroll at least 50 children into the study as the sample and eventually a total of 62 children constituted the sample group of this study.

Instruments

Demographic Information Form

Demographic Information Form designed to describe the children consists of three questions including age, gender and type of ambulatory surgery.

Turkish version of the Children's Emotional Manifestation Scale (T-CEMS)

T-CEMS was developed by Li and Lopez (22) in 2005 with the aim of measuring the emotional responses of children during stressful medical procedures. This scale, which allows for direct observation of behaviors, consists of 5 different behavior categories including "Facial expression", "Vocalization", "Activity", "Interaction" and "Level of cooperation". Each category consists of 5 different observable behaviors graded by level and intensity. Scale scoring is performed by reviewing the explanations of the behaviors in each category and selecting the numerical value that represents the observed behavior best. Each category is scored between 1 and 5. The total point is obtained by calculating all the points given for each category and it ranges between 5 and 25. A higher scale score indicates the manifestation of more negative emotional behaviors. The observable behaviors in each category of the scale are explained in detail with a guideline for the raters using this scale to carry out the evaluation properly in an objective manner. When the reliability analysis of the scale was considered, it was found that the inter-rater reliability coefficient was 0.96, the internal consistency coefficient was 0.92, and inter-item correlation ranged from 0.41 to 0.92.

As a result of this study, it was determined that there is sufficient inter-rater reliability, high internal consistency reliability, good content validity and excellent convergent validity (22).

Turkish Version of State-Trait Anxiety Inventory for Children

The State-Trait Anxiety Inventory for Children was developed by Spielberger and Edwards (33) in 1973 with 4th and 6th grade children, and its validity and reliability analysis for Turkish was conducted by Özusta (34) in 1995 with 615 children aged between 9-12 years. In this study, the State Anxiety scale, a sub-scale of State-Trait Anxiety Inventory for Children, which is composed of 20 items was used with the aim of evaluating emotions such as tension, strain, anxiety and nervousness. The Cronbach alpha coefficient of the State Anxiety scale was 0.82. At least 20 and at most 60 points can be obtained from this scale. A high total score indicates a high level of anxiety.

Physiological Measurement Form

The Physiological Measurement Form consists of children's physiological measurements including heart rate, mean arterial pressure (MAP) and breathing rate. Physiological measurements were based on heart rates (60-95 beats/min), MAP (100-120/60-75 mmHg) and breathing rates (14-22 breaths/min) (35).

Data Collection

The researcher ensured that those children admitted to the service for ambulatory surgery who met the study criteria filled in the Demographic Information Form and the Turkish version of the State Anxiety Inventory for Children (T-CSAS). Then the researcher went on to the operating room to collect data.

The MAP, breathing rate and heart rate of the children transferred to the operating room were measured when they were transferred to the operating table before the anesthesia induction, and recorded by the researcher. The emotional behavior of the children during anesthesia induction was observed by the same researcher and two nurses at the same time. The nurses had been trained on the use of the scales beforehand. They were experienced in the field of pediatric operating room nursing. The nurses observing the children evaluated their observations on the T-CEMS.

Ethical Considerations

Permissions for the adaptation of T-CEMS into Turkish, the use of the Turkish version and the use of T-CSAS were obtained from the authors via email. Legal permission was obtained from the State Hospital where the study was carried out and approval was obtained from the non-interventional Clinical Research Ethics Committee of the relevant university. The parents of the children aged between 7 and 12 admitted to ambulatory surgery who were included in the study as the sample were informed about the study and their consent was obtained in a written form. This study was granted permission by the Ethical Board of non-interventional Clinical Research Ethics Committee of the Pamukkale University (approval number: 16/5.12.2017).

Statistical Analysis

The data obtained from the study were analyzed using the SPSS version 21 software package. The significance level was 0.05, and it was stated that there was a significant difference in the case of $p<0.05$ and no significant difference in the case of $p>0.05$. The data demographic information of the children are presented using descriptive statistics.

In the analysis of the data, language validity, content validity and the construct validity studies were performed. For construct validity, the correlation between T-CEMS total score and MAP, heart rate, breathing rate and T-CSAS total scores were calculated using the Spearman Correlation Coefficient. In the reliability studies, the intra-class correlation coefficient was calculated for inter-rater reliability, and also inter-item correlations and item-total correlations were determined. Within the scope of the reliability studies, Cronbach Alpha coefficient was calculated in order to evaluate the internal consistency of the T-CEMS.

Results

Demographic Characteristic of the Children

The demographic characteristics of the children included in the study are given in Table I.

Validity

Language Validity and Content Validity

In the validity study of the scale, language validity was performed first. The scale was translated from English to Turkish by a pediatrician who knows an advanced level of English, a nursing academician and a translator. After these three translations were combined and finalized by the researchers and a single translation text was created, it was retranslated from Turkish back to English by an academician, adept in both languages, who had never seen the scale before. Upon the comparison of the scale that was retranslated from Turkish back to English with the original English scale, the finalized version of Turkish scale was developed.

For the content validity, 12 experts consisting of 7 nursing academicians in the field of pediatric nursing, one pediatric

surgeon and 4 pediatricians were asked for their opinions. In order to evaluate the appropriateness of the scale items, the experts were asked to score the items between 1 and 3 using a 3-point scoring system (1= required, 3= unnecessary). According to the Lawshe technique, expert opinions are graded as (a) "essential", (b) "useful but not essential", (c) "not necessary". The content validity ratio was found to be 0.56 and Content Validity index-(CVI) was calculated as 0.96 in our study. As CVI>CVR is the case, the content validity of the entire scale developed was statistically significant (36).

Construct Validity

When the correlation between T-CEMS total score and MAP, heart rate, breathing rate and T-CSAS total scores were examined, there was a moderately significant positive relationship between T-CEMS and T-CSAS (r=0.26, p=0.05). There was a moderately significant positive correlation between T-CEMS and heart rates (r=0.41, p=0.01). If r=0.00 - 0.24, correlation strength is weak; if r=0.25 - 0.49, it is moderate; if r=0.50 - 0.74, it is strong; and if r=0.75 - 1.00, it is very strong (37). No relationship was found between T-CEMS and MAP and breathing rates (Table II).

Table I. Sample characteristics (n=62)

Sample characteristics	**n (%)**
Gender	
Female	10 (16.1)
Male	52 (83.9)
Age (years)	
7	24 (38.7)
8	14 (22.6)
9	12 (19.4)
10	4 (6.5)
11	7 (11.3)
12	1 (1.6)
8.34±1.43; median 8 (7-12)	
Type of surgery performed	
Circumcision	40 (64.5)
Adenoidectomy	4 (6.5)
Myringotomy tube insertion	1 (1.6)
Tonsillectomy	2 (3.2)
Adenoidectomy & Tonsillectomy	8 (12.9)
Adenoidectomy, tonsillectomy & Myringotomy tube insertion	2 (3.2)
Adenoidectomy & Myringotomy tube insertion	3 (4.8)
Orchidopexy	1 (1.6)
Adenoidectomy & Circumcision	1 (1.6)

n: Number

Reliability

Intra-class correlation coefficients for observer 1 and observer 2 ranged from 0.94 to 0.99 (p<0.05). Intra-class correlation coefficients for observer 1 and observer 3 were between 0.94 and 0.97 (p<0.05). Intra-class correlation coefficients for observer 2 and observer 3 were between 0.96 and 0.98 (p<0.05) (Table III).

It was seen that inter-item correlation coefficients of T-CEMS ranged from 0.73 to 0.93 (Table IV).

For observer 1, item-total correlations were found to be between 0.83 and 0.91. For observer 2, they ranged from 0.84 to 0.94, while for observer 3, it was determined to be between 0.85 and 0.92. The item-total score correlation values of T-CEMS ranged from 0.83 to 0.94 (Table V).

The Cronbach's Alpha values of the scale were found to be 0.96 for observer 1; 0.97, for observer 2 and 0.96 for observer 3.

Table II. Correlation of turkish version of the children's emotional manifestation scale and four components

	T-CEMS	**T-CSAS**	**Heart rates**	**MAP**	**Breathe rates**
T-CEMS	1.00	-	-	-	-
T-CSAS	0.26*	1.00	-	-	-
Heart rates	0.41**	0.19	1.00	-	-
MAP	0.19	0.20	0.21	1.00	-
Breathe rates	0.21	0.21	0.29*	0.07	1.00

T-CEMS: Turkish version of the children's emotional manifestation scale, T-CSAS: Turkish version of state-trait anxiety ınventory for children, MAP: Mean arterial pressure, *Correlation is significant at the 0.05 level, **Correlation is significant at the 0.01 level

Table III. Intra-class correlation coefficients for turkish version of the children's emotional manifestation scale

	Observer 1 and Observer 2	**Observer 1 and Observer 3**	**Observer 2 and Observer 3**
Items	ICC	ICC	ICC
Facial expression	0.94*	0.95*	0.96*
Vocalization	0.97*	0.96*	0.98*
Activity	0.99*	0.97*	0.97*
Interaction	0.95*	0.94*	0.96*
Level of cooperation	0.98*	0.97*	0.97*

*p<0.0001, ICC: Intensive coronary care

Table IV. Inter-item correlations for the Turkish version of the children's emotional manifestation scale

	Facial expression			Vocalization			Activity			Interaction			Level of cooperation		
	Observer 1	Observer 2	Observer 3	Observer 1	Observer 2	Observer 3	Observer 1	Observer 2	Observer 3	Observer 1	Observer 2	Observer 3	Observer 1	Observer 2	Observer 3
Facial expression	1.00	1.00	1.00	-	-	-	-	-	-	-	-	-	-	-	-
Vocalization	0.81	0.80	0.81	1.00	1.00	1.00	-	-	-	-	-	-	-	-	-
Activity	0.79	0.81	0.78	0.86	0.89	0.85	1.00	1.00	1.00	-	-	-	-	-	-
Interaction	0.73	0.78	0.79	0.76	0.87	0.84	0.85	0.92	0.85	1.00	1.00	1.00	-	-	-
Level of cooperation	0.75	0.78	0.79	0.79	0.81	0.81	0.82	0.86	0.79	0.93	0.91	0.91	1.00	1.00	1.00

Table V. Item-total correlations for the Turkish version of the children's emotional manifestation scale

	Observer 1		Observer 2		Observer 3	
	Corrected item-total correlation	Cronbach's Alpha	Corrected item-total correlation	Cronbach's Alpha	Corrected item-total correlation	Cronbach's Alpha
Facial expression	0.83	0.94	0.84	0.96	0.85	0.95
Vocalization	0.87	0.93	0.90	0.95	0.90	0.94
Activity	0.91	0.93	0.94	0.94	0.88	0.94
Interaction	0.88	0.93	0.94	0.94	0.92	0.93
Level of cooperation	0.89	0.93	0.89	0.95	0.89	0.94

Discussion

In this study, the validity and reliability analyses of T-CEMS were performed to ensure its adaptation to Turkish society.

The content validity of T-CEMS is statistically significant in our study.

Content validity requires the measurement tool to measure all of the qualities it claims to measure, or to make a good measurement based on a good sample and make a valid measurement through each item it includes (38). The CVI of CEMS was also found to be 0.96 (22). The CVI values of T-CEMS and CEMS are the same.

As for the construct validity, while there was a moderately significant positive relationship between T-CEMS and T-CSAS, a moderately significant positive relationship was found between T-CEMS and heart rate and no relationship was found between T-CEMS and MAP or breathing rate.

Li and Lopez (22) stated that there was a considerably significant relationship between CEMS and heart rate (r=0.61, n=82, p=0.01). According to these results, CEMS and T-CEMS correlation analysis results are similar in terms of the direction and significance of the relationship.

No relationship was found between T-CEMS and MAP. Li and Lopez (22) revealed that they found a positive correlation with CEMS and MAP (r=0.43, n=82, p=0.01).

Li and Lopez (15) reported that they found a positive correlation between CEMS and MAP in a cross-sectional study they conducted to evaluate the effect of surgery on the emotional manifestation of 106 children aged between 7 and 12 years who were admitted to hospital for ambulatory surgery (r=0.39, p=0.01).Their findings were not similar to the findings of this study. It is thought that the reason of this difference may be due to the different number of samples.

The intra-class correlation coefficients calculated within the scope of the reliability analysis were 0.96 for the CEMS (22). The intra-class correlation coefficients of T-CEMS and CEMS were found to be very close to each other. The independent inter-rater reliability of T-CEMS is sufficient.

It was determined from the inter-item correlation analysis of T-CEMS that there was a highly significant and positive correlation. The inter-item correlation of CEMS developed by Li and Lopez (22) was reported to range between 0.41 and 0.92. T-CEMS and CEMS inter-item correlation values are very close to each other.

The item-total score correlation values of T-CEMS ranged from 0.83 to 0.94 while the item-total score correlation values of CEMS developed by Li and Lopez (22) ranged from 0.51 to 0.90. In the evaluation of item-total score correlations, it is stated that the items which are generally above 0.30 distinguish individuals to a good degree, those that are between 0.20 and 0.30 should be tested if they are considered to be necessary, and those items less than 0.20 should not be included in the test (32,38,39). The item-total score analysis of both scales shows that it is over 0.30 and it distinguishes individuals to a good degree. The results of item-total score correlation values of CEMS and T-CEMS were found to be consistent.

It is recommended to calculate the Cronbach's alpha coefficient to indicate internal consistency which is a part of reliability studies (40). The Cronbach's Alpha values of the scale were 0.96 for observer 1, 0.97 for observer 2 and 0.96 for observer 3. These values demonstrate that the scale is highly reliable. The Cronbach's Alpha coefficient, which was calculated by Li and Lopez (22) to evaluate the internal consistency of CEMS was 0.92. According to these results, it can be seen that the reliability values of the CEMS and T-CEMS, the adapted Turkish version of the original scale, are quite high and similar. As a result, T-CEMS is found to be valid and reliable for Turkish society.

As T-CSAS used in the study was developed and adapted for children aged between 7-12 years, a younger age group could not be included in the study. Due to the limited number of ambulatory surgery cases in the study setting, different and comprehensive types of ambulatory surgery could not be included. Another limitation in our study is that it was conducted in a single center.

T-CEMS is a valid and reliable scale for measuring the emotional responses of children during stressful medical procedures. It was determined that the items in the scale could measure the emotional manifestation to a high degree. T-CEMS, which has been adapted into Turkish, can be used as a simple and objective measurement tool to evaluate the effectiveness of intervention studies to reduce negative emotional behaviors and anxiety. In this way, the child will be supported in terms of coping mechanisms and so he/she will be less affected both physically and emotionally.

Study Limitations

As the T-CSAS used in the study was developed and adapted for children between 7 and 12 years old, a younger age group could not be included in the present study. In addition, due to the limited number of ambulatory surgery cases in the study setting, different and comprehensive types of ambulatory surgery could not be included. Another limitation of our study is that it was conducted at a single center.

Conclusions

Stressful medical procedures cause emotionally negative behavioral changes in children. Nurses play a crucial role in protecting children from these negative effects caused by stressful medical procedures. Hospitalized children may have behavioral reactions related to their fears surrounding medical procedures, such as sustaining bodily damage, feeling pain, a deteriorating body image, receiving the wrong treatment or becoming disabled. The T-CEMS is an objective measurement tool that can be used to evaluate the effects of nursing interventions designed to reduce the negative emotional manifestations of children during stressful medical procedures. Using this scale, healthcare professionals can evaluate the effectiveness of interventions performed to minimize anxiety during stressful medical procedures and ultimately to reduce negative emotional behaviors in children.

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Ethics

Ethics Committee Approval: This study was granted permission by the Ethical Board of non-interventional Clinical Research Ethics Committee of the Pamukkale University (approval number: 16/5.12.2017).

Informed Consent: Their consent was obtained in a written form.

Peer-review: Enternally and internally peer-reviewed.

Authorship Contributions

Surgical and Medical Practices: S.M.I., B.Ç., Concept: S.M.I., B.Ç., Design: S.M.I., B.Ç., Data Collection or Processing: S.M.I., B.Ç., Analysis or Interpretation: S.M.I., B.Ç., Literature Search: S.M.I., B.Ç., Writing: S.M.I., B.Ç.

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References

1. Aydin D, Şahiner NC. Effects of music therapy and distraction cards on pain relief during phlebotomy in children. ANR 2017; 33:164-8.
2. Hasanpour M, Tootoonchi M, Aein F, Yadegarfar G. The effects of two non-pharmacologic pain management methods for intramuscular injection pain in children. Acute Pain 2006;8:7-12.
3. Augustine AA, Umarani J. Effect of music therapy in reducing invasive procedural pain- a quasi experimental study. IJRSR 2013; 553-6.
4. Buratti CV, Angelino F, Sansoni J, Fabriani L, Mauro L, Latina R. Distraction as a technique to control pain in pediatric patients during venipuncture. A narrative review of literature. Prof Inferm 2015; 68.
5. Taddio A, Appleton M, Bortolussi R, et al. Reducing the pain of childhood vaccination: an evidence-based clinical practice guideline. Can Med. Assoc J 2010; 182:E843-55.
6. Kuo YW, Yen M, Fetzer, Lee JD. Reducing the pain of nasogastric tube intubation with nebulized and atomized lidocaine: a systematic review and meta-analysis. J Pain Symptom 2010; 40:613-20.
7. Mularoni PP, Cohen LL, De Guzman M, Mennuti-Washburn J, Greenwald M, Simon HK. A randomized clinical trial of lidocaine gel for reducing infant distress during urethral catheterization. Pediatr. Emerg. Care 2009; 25:439-43.
8. Coyne, I. Children's experiences of hospitalization. J Child Health Care 2006; 10:326-36.
9. Caprilli S, Anastasi F, Grotto RPL, Abeti MS, Messeri A. Interactive music as a treatment for pain and stress in children during venipuncture: arandomized prospective study. J Dev Behav Pediatr 2007; 28:399-403.
10. Forsner M, Jansson L, Söderberg A. Afraid of medical care: school-aged children's narratives about medical fear. J Pediatr Nurs 2009; 24:519-28.
11. Felder-Puig, R, Maksys A, Noestlinger C, et al. Using a children's book to prepare children and parents for elective ENT surgery: results of a randomized clinical trial. Int J Pediatr Otorhinolaryngol 2003; 67:35-41.
12. Li HCW, Lam HYA. Paediatric day surgery: impact on Hong Kong Chinese children and their parents. J Clin Nurs 2003;12:882-7.
13. Vagnoli L, Caprilli S, Robiglio A, Messeri A. Clown doctors as a treatment for preoperative anxiety in children: a randomized, prospective study. J Pediatr 2005; 116:e563-7.
14. Brewer S, Gleditsch SL, Syblik D, Tietjens ME, Vacik HW. Pediatric anxiety: child life intervention in day surgery. JPN 2006;21:13-22.
15. Li HCW, Lopez V. Assessing children's emotional responses to surgery: a multidimensional approach. J Adv Nurs 2006; 53:543-50.
16. Li HCW, Lopez V, Lee, TLI. Psychoeducational preparation of children for surgery: The importance of parental involvement. J Patient Saf 2007; 65:34-4.
17. Rice M, Glasper A, Keeton D, Spargo P. The effect of a preoperative education programme on perioperative anxiety in children: an observational study. Paediatr Anaesth 2008; 18:426-30.
18. Weber FS. The influence of playful activities on children's anxiety during the preoperative period at the outpatient surgical center. J Pediatr 2010; 86:209-14.
19. Wolyniez I, Rimon A, Scolnik D, et al. The effect of a medical clown on pain during intravenous access in the pediatric emergency department: a randomized prospective pilot study. Clin Pediatr 2013; 52:1168-72.
20. Robb SL, Nichols RJ, Rutan RL, Bishop BL, Parker JC. The effects of music assisted relaxation on preoperative anxiety. J Music Ther 1995; 32:2-21.
21. Kalogianni A, Almpani P, Vastardis L, Baltopoulos G, Charitos C, Brokalaki H. Can nurse-led preoperative education reduce anxiety and postoperative complications of patients undergoing cardiac surgery? Eur J Cardiovasc Nurs 2016; 5:447-58.
22. Li HCW, Lopez V. Children's Emotional Manifestation Scale: development and testing. J Clin Nurs 2005; 14:223-9.
23. Kaempf G, Amodei METC. Effect of music on anxiety: a research study. AORN 1998; 50:112-114-8.
24. Chieng YJS, Chan WCS, Liam JLW, Klainin-Yobas P, Wang W, He HG. Exploring influencing factors of postoperative pain in school-age children undergoing elective surgery. J Spec Pediatr Nurs 2013; 18:243-52.
25. He HG, Zhu L, Chan SWC, Liam JLW, Li HCW, Ko SS, Wang W. Therapeutic play intervention on children's perioperative anxiety, negative emotional manifestation and postoperative pain: a randomized controlled trial. J Adv Nurs 2015; 71:1032-43.
26. Brown DA, Salmon K, Pipe ME, Rutter M, Craw S, Taylor B. Children's recall of medical experiences: the impact of stress1. Child Abuse & Negl 1999; 23:209-16.
27. Peterson C. A decade later: adolescents' memory for medical emergencies. Appl Cogn Psychol 2015; 29:826-34.
28. Ipp M, Cohen E, Goldbach M, Macarthur C. Pain response to MMR vaccination in 4-6 year old children. Can J Clin Pharmacol 2006; 13:e296-99.
29. Bagnasco A, Pezzi E, Rosa F, Fornonil L, Sasso L. Distraction techniques in children during venipuncture: an Italian experience. J Prev Med Hyg 2012; 53.
30. Şahiner NC, İnal S, Akbay AS. The effect of combined stimulation of external cold and vibration during immunization on pain and anxiety levels in children. Journal of J Perianesth Nurs 2015; 30:228-35.
31. Şahiner NC, Bal MD. The effects of three different distraction methods on pain and anxiety in children. J Child Health Care 2016; 20:277-85.

32. Tavşancıl E. Tutumların ölçülmesi ve spss ile veri analizi. (Measurement of attitudes and data analysis with spss). (5th ed.). Ankara, Nobel Yayıncılık 2014.

33. Spielberger CD, Edwards CD. STAIC preliminary manual for the state-trait anxiety inventory for children (" How I feel questionnaire"). Consulting Psychologists Press 1973.

34. Özusta HS. Çocuklar için durumluk-surekli kaygı envanteri uyarlama, geçerlik ve güvenirlik çalışması (Turkish standardization, reliability and validity of state trait anxiety inventory for children). Türk Psikoloji Dergisi 1995; 10:32-44.

35. Hartman ME, Cheifetz IM. Pediatric emergencies and resuscitation. Nelson textbook of pediatrics. Eds: Kliegman R, Nelson WE, & Emerson W. 2011; 19th.USA: Elsevier, 280.

36. Lawshe CH. A quantitative approach to content validity 1. J. Pers. Psychol 1975; 28:563-75.

37. Aksakoğlu G. Sağlıkta araştırma teknikleri ve analiz yöntemleri (Health research methods and methods of analysis). İzmir, Turkey: D.E.Ü. Rektörlük Matbaası, 2001.

38. Esin MN. Veri toplama yöntem ve araçları, Veri toplama araçlarının güvenirlik ve geçerliği (Data collection methods and tools, reliability and validity of data collection tools). In: Eds: Erdoğan, S., Nahcivan, N., Esin, M.N. Hemşirelikte Araştırma, Süreç, Uygulama ve Kritik (Research, Process, Practice and Critical in Nursing). İstanbul, Nobel Tıp Kitapevleri 2015; 216-32.

39. Büyüköztürk S. Sosyal bilimler için veri analizi el kitabi [Data analysis handbook for social sciences] (24th ed.). Ankara, Turkey: Pegem Akademi 2018.

40. Nunnally JC, Bernstein IH. Psychometric theory (McGraw-Hill Series in Psychology) (Vol. 3). New York, McGraw-Hill.1994.

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Original Article

Perceptions and Factors Affecting Patient Safety Culture of Employees in Pediatric Services

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ABSTRACT

Aim: In this study, some factors affecting the patient safety culture and perceptions of health care workers working in pediatric clinics were examined.

Materials and Methods: This descriptive type of research was conducted with a total of 461 health care workers.

Results: 36.2% of these healthcare workers were aged 26-35 and 54.8% were working as nurses. The hospital health workers patient safety culture survey showed that they reached an overall score of 51% in the hospital survey. Employees received the highest positive response from "in-unit teamwork" sub-dimension with 71.55% and the lowest positive response from "non-punitive response to error" sub-dimension with 28.06%. It was determined that the majority of healthcare workers working in pediatric services knew the concept of patient safety and implemented patient safety initiatives while providing care.

Conclusion: As a result, it is recommended that the patient safety culture levels of the employees should be continuously evaluated between the institution and the employees.

Keywords: Patient safety, pediatric health team, safety culture

Introduction

Quality-oriented arrangements, performance-based payments and open reporting have contributed to focusing on quality and safety criteria in health care (1). Improving safety culture in health care is a fundamental component of preventing errors and improving overall health care quality (2). In patient safety culture, the important thing for the members of the organization is how to do the work carried out, communication between departments, and the values of how structures and systems are demonstrated in the norms of behaviour that support patient safety (3). The culture of an organization is reflected in its motivation to learn from reporting, analysis and medical errors (4). The evaluation of safety culture in hospitals is the first step in identifying their safety culture (5).

Patient safety has become a high priority in health care systems in the world over the past two decades and is an important issue in pediatric healthcare services (6,7). In the United States, after cancer and heart disease, medical errors are reported to be the third most important cause of death. 5.7 million children under 19 years of age have been examined and children (including those under one year, especially newborns younger than one month) are shown to be the most vulnerable group affected by patient safety incidents (8). The majority of preventable patient safety incidents not only affect the child and their family but also

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increase the length of hospital stay and hospital costs (9,10).

The effectiveness of patient safety in children increases with the knowledge of physical and developmental features specific to developmental periods. Developmental periods bring with them active and risky behaviours in pediatrics. In addition, due to the lack of predictable developmental characteristics of children, the risk of failure of health workers increases (11).

Research on patient safety culture in pediatric clinics in our country has not been available. The formation of patient safety culture requires data on this subject be collected first. In this context, this research is a preliminary study to determine the understanding of health care workers' safety culture working practices in pediatric clinics.

Research questions:

1. What are the levels of safety culture in general and in sub-groups of health workers working in pediatrics services?

2. Is there any difference in the perception of safety culture in terms of the individual characteristics of health workers working in pediatric services?

3. Is there any difference in the perception of the safety culture in terms of the working characteristics of health workers working in pediatric services?

Materials and Methods

Study Design

This descriptive study was conducted to examine the perceptions and factors affecting patient safety culture of healthcare workers working in the pediatric clinics of two children's hospitals.

Statistical Analysis

Data were collected from 253 nurses, 50 physicians and 158 other health workers (n=461). A survey method was used as the data collection tool in this research. The "Hospital Survey on Patient Safety Culture (HSoPSC)" and "Personal Information Form" were included in the survey form in order to measure the perceptions of health workers working in pediatrics services concerning patient safety culture. Statistical analysis was performed using a statistical package program.

Ethical Considerations

The approval of Uludağ University Faculty of Medicine Clinical Research Ethics Committee (52588837-000/421) concerning the subject, purpose and method of the research were obtained, and the study was launched upon obtaining permission for clinical practice from the hospitals included in the research. Individual permission from the participants was acquired via an informed consent form during the study.

Results

Of all the health workers participating in the survey, 64.9% were married, 36.2% were in the age range of 26-35 years, 54.8% were nurses, 34.27% were doctors, with the rest being healthcare workers. According to the study characteristics, 61.4% of the participants worked 40-49 hours a week, and 65.5% of the pediatric service workers had been working in these services for 1-5 years, while 33.2% had a work experience of 16 years or more. 88.5% of volunteers participating in this research were able to communicate directly with children and their families. 45.6% of the participants were in the pediatric service, 24.3% in pediatric intensive care, 8.5% were working in pediatric surgical services, while 21.7% were employed in other units (adult and child mixed services, pharmacy, laboratory, radiology, etc).

The 'patient safety of pediatric service personnel hospital survey' positive response averages are given in Table I.

As far as the health workers' patient safety culture is concerned, the hospital survey's overall score of 51.00% was recorded. The lowest positive response was for the "non-punitive response to error" with 28.06% of the total responses, while "teamwork within units" had the highest

Table I. The health workers hospital survey on patient safety culture positive response average

Hospital survey on patient safety culture sub-dimensions	Positive answer (%)
1. Overall perceptions of patient safety	62.35
2. Frequency of events reported	40.13
3. Teamwork across units	47.05
4. Handoffs and transitions	52.97
5. Supervisor/manager expectations and actions promoting patient safety	46.70
6. Organizational learning - continuous ımprovement	51.50
7. Teamwork within units	71.55
8. Communication openness	49.76
9. Feedback and communication about error	42.30
10. Non-punitive response to error	28.06
11. Staffing	31.00
12. Hospital management support for patient safety	47.43
Overall score	51.00

positive response with 71.55%. The results of Mann-Whitney U test showed significant differences between groups, and were utilized in order to determine whether the subscale positive response scores pointed to a significant difference in marital status (12). It was found that the scores of single health care workers were significantly higher in the sub-dimensions of "communication openness", "feedback and communication about error" and "handoffs and transitions". Those health workers who were married were shown to have higher average scores in the "staffing" sub-dimension.

The results of the Kruskal-Wallis test, which was conducted in order to determine whether the positive response scores differ significantly depending on the age of the patients in terms of "overall perceptions of patient safety", "teamwork across hospital units", "handoffs and transitions", "supervisor/manager expectations and actions promoting safety", "communication openness", and "hospital management support for patient safety" are presented in Table II. According to the results of this study, the difference between the groups was statistically significant.

Those healthcare workers aged 25 or less were found to have a significantly higher positive response average score than those between the ages of 26-35 in the "communication openness" and "organizational learning-continuous improvement" sub-dimensions.

The scores of the sub-dimensions "handoffs and transitions" and "teamwork across hospital units" of the nurses participating in the study are higher than the scores of all other participants. This may be because nurses think the team is important when working with the child and family. As a result of the post-hoc test conducted to determine which sub-fields differ between the groups in terms of the weekly working hours, health workers who do not exceed 40 hours a week had a significantly higher positive answer score than those putting in an average of 50 working

Table II. Hospital survey on patient safety culture distribution of subscales scores according to some individual characteristics

Hospital survey on patient safety culture sub-dimensions	**Marital status**	**Age**		**Job**	
	Married (n=299)	**26-35 age (n=167)**	**Nurse (n=253)**	**Doctor (n=50)**	**Other* (n=158)**
Individual features	**Median (min:max) Mean ± SD**				
1. Overall perceptions of patient safety	75 (0:100) 64.29±32.03	75 (0:100) 56.14±32.17	75 (0:100) 67.19±31.58	50 (0:100) 49.0±34.61	75 (0:100) 65.68±29.22
2. Frequency of events reported	33.3 (0:100) 41.13±44.01	33.3 (0:100) 41.71±44.47	33.3 (0:100) 42.94±44.14	0 (0:100) 6.66±38.68	33.3 (0:100) 46.63±43.54
3. Teamwork across units	50 (0:100) 47.07±35.44	25 (0:100) 40.56±32.19	50 (0:100) 46.24±36.26	25 (0:100) 38.0±33.97	50 (0:100) 55.38±32.82
4. Handoffs and transitions	50 (0:100) 52.75±34.49	50 (0:100) 47.46±33.34	75 (0:100) 58.2±32.11	50 (0:100) 8.0±37.74	50 (0:100) 52.69±36.19
5. Supervisor/manager expectations and actions promoting patient safety	50 (0:100) 46.73±34.99	25 (0:100) 42.66±34.52	50 (0:100) 46.24±36.26	50 (0:100) 37.5±32.83	50 (0:100) 52.21±34.02
6. Organizational learning-continuous improvement	66.7 (0:100) 56.18±35.11	66.7 (0:100) 50.69±34.88	66.7 (0:100) 58.5±35.44	33.3 (0:100) 41.33±34.71	66.7 (0:100) 56.75±34.59
7. Teamwork within units	75 (0:100) 71.41±34.05	75 (0:100) 67.66±35.6	100 (0:100) 74.3±32.29	75 (0:100) 71.05±33.12	75 (0:100) 70.88±33.01
8. Communication openness	33.3 (0:100) 47.26±33.6	33.3 (0:100) 47.9±33.45	66.7 (0:100) 53.75±32.81	33.3 (0:100) 42.66±36.91	66.7 (0:100) 51.27±34.62
9. Feedback and communication about error	66.7 (0:100) 58.19±36.48	66.7 (0:100) 57.68±37.03	66.7 (0:100) 65.54±35.1	66.7 (0:100) 52.66±39.32	66.7 (0:100) 60.55±36.06
10. Non-punitive response to error	33.3 (0:100) 29.65±32.74	0 (0:100) 25.14±31.78	33.3 (0:100) 31.21±32.33	0 (0:100) 15.32±27.1	33.3 (0:100) 30.59±34.07
11. Staffing	25 (0:100) 34.03±21.62	25 (0:75) 29.79±21.59	25 (0:75) 29.74±19.6	25 (0:75) 25.5±21.12	25 (0:75) 37.34±21.44
12. Hospital management support for patient safety	33.3 (0:100) 47.88±51.43	33.3 (0:100) 42.71±38.01	33.3 (0:100) 47.23±38.56	33.3 (0:100) 32.66±37.18	66.7 (0:100) 57.39±39.44

*: As other health workers, auxiliary health personnel working in the units were handled, SD: Standard deviation, min: Minimum, max: Maximum

hours a week in the sub-dimensions of "overall perceptions of patient safety", "supervisor/manager expectations and actions promoting patient safety", "communication openness", "non-punitive response to error", "feedback and communication about error", "staffing" and "hospital management support for patient safety" (Table III).

"Teamwork across units", "handoffs and transitions", "supervisor/manager expectations and actions promoting patient safety" and "staffing" also showed a statistically significant difference between groups determined on the basis of work experience of all the health workers. In particular, health workers with 16 years or less work experience registered higher scores in the sub-dimensions of "teamwork across units", "handoffs and transitions" and "staffing" (13).

Health workers working in other units responded more positively to "organizational learning-continuous improvement" than those working in the pediatric service and pediatric intensive care units, and the difference between these groups proved to be statistically significant. The positive scores received by healthcare professionals working in non-pediatric departments from the "hospital management support for patient safety" sub-dimension are significantly higher than those received by pediatric workers.

The study participants expressed their views on the presence or absence of patient safety in the hospital/institution where they work (Table IV). According to this, the median positive percentages of the sub-dimensions of "overall perceptions of patient safety", "teamwork across units", "handoffs and transitions", "organizational learning-continuous improvement", "teamwork within units", "communication openness", "feedback and communication about error", "non-punitive response to error", "staffing"

Table III. The comparison of hospital survey on patient safety culture subscale scores compared to weekly working hours

Hospital survey on patient safety culture sub-dimensions	**Weekly working hours**			
	It has not exceeded 40 hours (n=84)	**40-49 hours (n=283)**	**More than 50 hours (n=94)**	**p**
Individual features	**Median (min:max) Mean ± SD**			**-**
1. Overall perceptions of patient safety	75 (0:100) 70.23±30.67	75 (0:100) 65.81±31.14	50 (0:100) 56.91±31.56	**0.012***
2. Frequency of events reported	33.3 (0:100) 43.65±42.97	33.3 (0:100) 44.28±44.22	0 (0:100) 35.81±42.4	0.274
3. Teamwork across units	50 (0:100) 55.65±36.68	50 (0:100) 46.37±34.88	50 (0:100) 48.4±34.54	0.112
4. Handoffs and transitions	75 (0:100) 59.52±34.47	50 (0:100) 54.77±34.19	50 (0:100) 52.65±34.48	0.374
5. Supervisor/manager expectations and actions promoting patient safety	75 (0:100) 59.22±36.56	50 (0:100) 47.52±34.18	50 (0:100) 41.22±33.54	**0.002***
6. Organizational learning - continuous improvement	66.7 (0:100) 61.11±32.66	66.7 (0:100) 56.65±35.48	66.7 (0:100) 49.65±36.83	0.111
7. Teamwork within units	100 (0:100) 78.27±31.94	75 (0:100) 71.2±33.17	75 (0:100) 72.87±32.92	0.139
8. Communication openness	66.7 (0:100) 55.95±36.65	66.7 (0:100) 53.94±32.31	33.3 (0:100) 41.13±34.72	**0.004***
9. Feedback and communication about error	66.7 (0:100) 67.85±32.91	66.7 (0:100) 62.77±35.8	66.7 (0:100) 53.9±38.21	**0.040***
10. Non-punitive response to error	33.3 (0:100) 39.67±33.33	33.3 (0:100) 29.91±33.34	0 (0:100) 18.08±26.62	**0.000***
11. Staffing	50 (0:75) 38.69±19.56	20 (0:100) 32.07±20.49	25 (0:75) 25.26±20.89	**0.000***
12. Hospital management support for patient safety	66.7 (0:100) 58.73±39.95	66.7 (0:100) 49.47±38.63	33.3 (0:100) 39.53±39.11	**0.005***

*: p<0.05 Kruskal-Wallis test, SD: Standard deviation, min: Minimum, max: Maximum

and "hospital management support for patient safety" were determined differently among to participant.

Discussion

In this study, the perception of patient safety culture of health workers working in pediatric services and some factors affecting them were examined. When the percentage of positive answers by the health workers given in the "HSoPSC" items and the percentages of sub-dimensions were examined, the scale overall score was determined to be 51.0% according to the findings obtained. As a result of this research, the percentage of patient safety culture perceptions of healthcare professionals working in pediatric wards was evaluated as medium level. Studies with a higher percentage of this percentage have been reached in the literature. Chen and Li (14) reported 64% of their work in Taiwan, Sorra et al. (15) stated that employees' perception of patient safety culture was 75%.

Health workers' responses to the "HSoPSC" were found to have the highest positive response rate of 71.55% in the "teamwork across units" sub-dimension in this study. This result is similar to some studies conducted before (16-19). In one study conducted in Taiwan, teamwork was reported to be 78% and teamwork among the units was reported to be 57% (13). In the study of Pronovost et al. (20), nurse managers (90%), physicians (76%) and nurses (71%) reported positive relationships with their teammates. In another study, nurses reported that they were not worried about teamwork in their departments, but were worried about working with other units and that the cooperation between them was not good (21). According to these results, it can be said that health workers attach importance to teamwork in units, but still need to be supported. Teamwork is an important element in providing quality patient care and improving patient safety. Common values,

Table IV. Employees' views on sub-dimensions of patient safety culture in their institutions

Hospital survey on patient safety culture sub-dimensions **Individual features**	**Patient safety in the institution**				
	There is not		**There is**		
	n	**Median (min:max) Mean ± SD**	**n**	**Median (min:max) Mean ± SD**	**p**
1. Overall perceptions of patient safety	30	50 (0:100) 53.33±31.98	98	75 (0:100) 72.28±28.16	**0.004***
2. Frequency of events reported	30	0 (0:100) 37.78±45.26	96	33.33 (0:100) 46,18±43,63	0.322
3. Teamwork across units	30	25 (0:100) 34.17±33.79	97	75 (0:100) 65.21±34.42	**0.001***
4. Handoffs and transitions	30	50 (0:100) 45.83±33.53	97	75 (0:100) 72.68±28.66	**0.001***
5. Supervisor/manager expectations and actions promoting patient safety	29	50 (0:100) 47.41±35.57	96	50 (0:100) 49.48±34.98	0.783*
6. Organizational learning - continuous ımprovement	30	33.33 (0:100) 45.56±34.45	98	66.67 (0:100) 65.82±35.20	**0.006***
7. Teamwork within units	30	75 (0:100) 69.17±35.16	98	100 (0:100) 83.50±25.44	**0.032***
8. Communication openness	30	66.67 (0:100) 47.78±33.54	97	66.67 (0:100) 63.23±34.52	**0.030***
9. Feedback and communication about error	30	66.67 (0:100) 56.67±32.93	97	100 (0:100) 70.79±35.44	**0.027***
10. Non-punitive response to error	30	0 (0:100) 18.89±27.24	98	33.33 (0:100) 32.14±32.48	**0.035***
11. Staffing	30	25 (0:50) 21.67±17.04	98	25 (0:75) 32.40±19.18	**0.006***
12. Hospital management support for patient safety	30	0 (0:100) 31.11±37.07	97	66.67 (0:100) 63.75±37.19	0.001*

*: p<0.05 Mann-Whitney U test, the number of units to the no idea group (n=2) is not included in the table because the unit count is insufficient for statistical comparison, SD: Standard deviation, min: Minimum, max: Maximum

attitudes and beliefs at the highest level of the institution should be at the same level in all units in order to create an effective safety culture. In addition, in order to create an effective safety culture, employees should be able to communicate frequently and confidently with those outside their own units.

The lowest positive response percentage of pediatric workers participating in this study was found to be "non-punitive response to error" at 28.06%. The non-punitive response dimension to error appears to be generally inadequate. A low score from this sub-dimension may result from employees thinking that they can meet with more punitive responses to the mistakes made.With respect to other studies, Sorra et al. (15), Chen and Li (14) and Sorra et al. (22) found that employees' non-punitive response to error were 37%, 44% and 45%, respectively. Research conducted by Scherer and Fitzpatrick (23) found that 63.0% of physicians and nurses expressed anxiety about being penalized when they made mistakes. This rate is lower in studies conducted in the United States, China and Saudi Arabia (17-19), but were found to be higher in a study in Norway (16). These results show that a response approach which is not punitive to an error varies according to the institution, and is not generally adequate. It can contribute to taking certain measures by improving the non-punitive missions of hospitals for healthcare workers, and encouraging the improvement of error reporting.

It was determined that the average scores of positive responses in the "communication openness", "feedback and communication about error" and "handoffs and transitions" subscales of single health-care workers were higher than married health-care workers. The married health-care workers were found to have higher mean scores in the "staffing" sub-dimension. It can be said that single health workers working in pediatric services find communication and exchange especially valuable. Single employees are considered to have this point of view because they are younger. Married employees are thought to have been assessed because of their concerns about taking time from their marriage. Abdou and Saber (24) worked with nurses to perceive a patient safety culture. As a result of the study, they reached that marital status was not effective in the sub-dimensions of the security culture scale used.

In the research findings, it is thought that the sufficient employment of qualified health personnel is not provided considering that the health workers we have identified are working 40-49 hours per week or more than 50 hours. In the health-care services, nurses constitute the largest group in proportion to other health workers. A lack of nurses, especially the absence of well-trained and experienced nurses, leads to an increase in undesirable incidents. In terms of patient care, a lack of staff, individuals who do not work with equal sacrifice, and excessive work-loads are among the reasons for showing less positive scores. In a joint study in China, Taiwan and the United States, the effect of nurse working hours on patient safety culture was investigated. In all three countries, there was a correlation between the decrease in the degree of patient safety culture and the increase in the number of reported incidents (25). Rogers et al. (26) showed in their study that the rate of error increased among nurses working more than 12 hours a day and more than 40 hours a week. Since the education and training process of health care personnel requires more time and economic costs, and the number of employees assigned to this task is not sufficient to meet its needs, it is thought that the current health care workers have to continue their working lives while working overtime hours.

Nordin (27) studied patient safety with healthcare professionals with 10 years or more work experience. As a result, they stated that the working hour was effective in the "overall perception of patient safety" sub-dimension similar to our study. However, there is no similarity in the average positive response percentage of "frequency of reported events", "staffing", "hospital management support for patient safety" and "teamwork across units" sub-dimensions between our study and Nordin's study (27). Unlike our study, Abdou and Saber (24) did not find a statistically significant difference between working time and safety culture in the study of perception of the patient's safety culture. The sensitivity of experienced healthcare professionals who have been in the hospital work for a long time should be considered by hospital management. Alharbi et al. (28) stated that the patient's safety culture was higher among pharmacists than nurses.

The average of the positive responses of the employees in the pediatric service and pediatric intensive care units from the "organizational learning - continuous improvement" and "hospital management support for patient safety" sub-dimensions are low. It is thought that employees in both units have more work load, so there is not enough time for continuous improvement. In addition, it is thought that employees in these units face more cases of patient safety, and especially more often need to receive support from management. For these reasons, we can say that there is no support structure in the institutions in the development of patient safety culture in the hospital.

Aiken et al. (29) found that low level patient safety in the units in which nurses work affects their job satisfaction and their considerations to quit. Some studies in other countries have shown that this rate varies between 26.3 and 72% (16-19). In a study involving different health professional groups, for the majority of nurses in five hospitals in Belgium, the participants stated that executive support was very inadequate.

Study Limitations

In contrast, in another study, employees found the support of the management to be quite adequate in terms of patient safety (23). It is expected that an institution's patient safety culture will not differ according to the departments studied. It is hoped that the safety culture, which includes factors such as giving importance to patient safety, evaluating patient safety, providing financial resources, evaluating risks and reporting, does not differ from one institution or even from department to department, and should be fulfilled in every department.

Conclusion

These results show that pediatric health care professionals who work in patient safety culture at the desired level of perception adopt a positive line of professional conduct in health care. This study also demonstrates that this type of professional conduct could permeate to the whole group in which they serve, and the following recommendations can be made to that end:

• to develop processes that facilitate the planning, reporting, analysis and learning of the problems of patient safety in hospitals,

• to provide staff-specific training with a view to create an adequate number of experienced and competent employees,

• to increase the encouragement and support for staff in patient safety issues faced by the administrators,

• for managers to take into consideration patient safety regulations in favour of health workers, attaching special importance to working hours.

Ethics

Ethics Committee Approval: The approval of Uludağ University Faculty of Medicine Clinical Research Ethics Committee (52588837-000/421) concerning the subject, purpose and method of the research were obtained, and the study was launched upon obtaining permission for clinical practice from the hospitals included in the research.

Informed Consent: Individual permission from the participants was acquired via an informed consent form during the study.

Peer-review: Externally peer-reviewed.

Authorship Contributions

Surgical and Medical Practices: Y.K., G.M., Concept: Y.K., G.M., Design: Y.K., G.M., Data Collection or Processing: Y.K., G.M., Analysis or Interpretation: Y.K., G.M., Literature Search: Y.K., G.M., Writing: Y.K., G.M.

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References

1. Kumar B. Patient safety and quality metrics in pediatric hospital medicine. Pediatr Clin North Am 2016; 63:283-91.
2. Berman L, Rangel S, Goldin A, et al. Safety culture among pediatric surgeons: a national survey of attitudes and perceptions of patient safety. J Pediatr Surg 2018; 53:381-95.
3. Singer S, Lin S, Falwell A, Gaba D, Baker L. Relationship of safety climate and safety performance in hospitals. Health Serv Res 2009; 44:399-421.
4. Kohn LT, Corrigan J, Donaldson MS. To err is human: building a safer health system. Institute of Medicine (US) Committee on Quality of Health Care in America [Internet] 2000, 2019.
5. Hellings J, Schrooten W, Klazinga N, Vleugels A. Challenging patient safety culture: survey results. Int J Health Care Qual Assur 2007; 20:620-32.
6. Mi Cho S, Choi J. Patient safety culture associated with patient safety competencies among registered nurses. J Nurs Scholarsh 2018; 50:549-57.
7. Lacey S, Smith JB, Cox K. Pediatric safety and quality. In R. Hughes (Ed.), Patient safety and quality: An evidence-based handbook for nurses. Rockville MD: Agency for Healthcare; 2008; 411-40.
8. Valentini RP. Patient safety and quality improvement: what the pediatric trainee needs to know. Prog Pediatr Cardiol 2017; 44:47-53.
9. Abu-El-Noor NI, Hamdan MA, Abu-El-Noor MK, Radwan AKS, Alshaer AA. Safety culture in neonatal intensive care units in the Gaza Strip, Palestine: A need for policy change. J Pediatr Nurs 2017; 33:76-82.
10. Haerkens M, Jenkins DH, Van der Hoeven JG. Crew resource management in the ICU: the need for culture change. Ann Intesive Care 2012; 2:39.
11. Özkan A. Adaptation of patient safety measures to perinatal clinics and implementation guidelines. Doctoral thesis. Istanbul: Marmara University, Health Science Institues; 2012.
12. Nieva VF, Sorra J. Safety culture assessment: a tool for improving patient safety in health care organizations. Qual Saf Health Care 2003; 12:17-23.

13. Bodur S, Filiz E. A survey on patient safety culture in primary healthcare services in Turkey. Int J Qual Health Care 2009; 21:348-55.

14. Chen C, Li H. Measuring patient safety culture in taiwan using the hospital survey on patient safety culture (HSOPSC). BMC Health Serv Res 2010; 10:152.

15. Sorra J, Famolaro T, Dyer N, Nelson D, Khanna K. Patient Safety. Hospital Survey on patient safety culture: 2008 comparative database report. United States: AHRQ Publication 2008.

16. Balas MC, Scott LD, Rogers AE. The Prevalence and nature of errors and near errors reported by hospital staff nurses. Appl Nurs Res 2004; 17:224-30.

17. Elliott M, Liu Y. The nine rights of medication administration: an overview. Br J Nurs 2010; 19:300-5.

18. Snyder SR, Favoretto AM, Derzon JH, et al. Effectiveness of barcoding for reducing patient specimen and laboratory testing identification errors: a laboratory medicine best practices systematic review and meta- analysis. Clin Biochem 2012; 45:988-98.

19. Wakefield A, Attree M, Braidman I, Carlisle C, Johnson M, Cooke H. Patient Safety: Do Nursing and Medical Curricula Address This Theme? Nurse Educ Today 2005; 25:333-40.

20. Pronovost PJ, Weast B, Holzmueller CG, et al. Evaluation of the culture of safety: survey of clinicians and managers in an academic medical center. Qual Saf Health Care 2003; 12:405-10.

21. Kim J, An K, Kim MK, Yoon SH. Nurses' perception of error reporting and patient safety culturein Korea, J Nurs Res 2007; 29:827.

22. Wagner C, Smits M, Sorra J, Huang CC. Assessing Patient Safety Culture in Hospitals Across Countries. Int J Qual Health Care 2013; 25:213-21.

23. Scherer D, Fitzpatrick J. Perceptions of Patient Safety Culture Among Physicians and RNs in the Perioperative Area. AORN Journal 2008; 87:163-75.

24. Abdou HA, Saber KM. A Baseline assessment of patient safety culture among nurses at student university hospital. World Journal of Medical Sciences 2011; 6:17-26.

25. Wu Y, Fujita S, Seto K, et al. The impact of nurse working hours on patient safety culture: a cross-national survey including Japan, the United States and Chinese Taiwan using the Hospital Survey on Patient Safety Culture. BMC Health Serv Res 2013; 13:394.

26. Rogers AE, Hwang WT, Scott LD. The working hours of hospital staff nurses and patient safety. Health Aff 2004; 23:202-12.

27. Nordin A. Patient safety culture in hospital settings-measurements, health care staff perceptions and suggestions for ımprovement. Karlstad University Studies. Doctoral thesis [Internet] 2015, 2019.

28. Alharbi W, Cleland J, Morrison Z. Assesment of patient safety culture in an adult oncology department in Saudi Arabia. Oman Med J 2018; 33:200-8.

29. Aiken LH, Sermeus W, Sloane MD. Patient safety, satisfaction, and quality of hospital care: cross sectional surveys of nurses and patients in 12 countries in europe and the United States. BMJ 2012; 344:1717.

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Original Article

The Effect of a Nurse Education Program on Infiltration and Extravasation in Pediatric Patients at a University Hospital

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ABSTRACT

Aim: Prevention of infiltration/extravasation (I/E) in pediatric patients is important. This study has examined the effect of an education program, which aims to prevent and manage pediatric I/E, on I/E rates in pediatric patients.

Materials and Methods: This is a semi-experimental study with a single group pre-test/post-test design. A sample of 79 nursing staff and 289 IV catheters of 150 pediatric patients was investigated. Pediatric I/E training was given to the nurses and the effectiveness of the training program and I/E rates before and after the training were evaluated.

Results: Compared to the pre-education phase, there was a significant increase in the mean scores of the nurses' knowledge in the post-education phase (t: 7,328; p<0.001). The education program was implemented based on the probability rate that was calculated by the researchers; this enabled a 12-fold reduction of pediatric I/E (odds ratio: 12,214, 95% confidence interval).

Conclusion: This study has led to an improvement in nursing care, an improvement in the quality of patient care and has helped progress toward increased patient safety.

Keywords: Child, infiltration, extravasation, nurse education program, clinical education program

Introduction

Infiltration/extravasation (I/E) are the two most common complications related to intravenous (IV) interventions (1,2). I involves leaking of the non-vesicant fluid into the tissue and E is the leakage of the vesicant medication or fluid into the tissue (1,3,4). Tripi et al. (5) found I in 13% of catheters. Wilkins and Emmerson (6) found a 0.38% level of E in their study. Temizsoy et al. (7) noted that the I rate was 32% and the E rate was 6%. Atay et al. (8) found that I/E occurred in 45.6% of newborns. Gerçeker et al. (9) stated that the I rate was 2.9% and the E rate was 2.3% in Turkey.

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I/E of fluids or medication is usually caused by the misplacement of the catheter or an increase in the permeability of the vein (10). Small and fragile vein structures, reduced peripheric circulation, capillary deficiency, and flexible tissues under the skin increase the risk of developing I/E in children (11).

Minor I's recover spontaneously within a short period. However, major I/E's in children lead to a loss of skin and tissue; disruption of comfort due to pain, infection, and malformation; muscle and tendon necrosis that requires plastic surgery or amputation; extended hospitalization; reductions in the satisfaction of patients and their families and importantly a decrease in the safety of patients; and an increase in morbidity and hospital costs (1,2,12,13).

The role of the nurse is vital in reducing IV intervention complications and ensuring patient safety by applying their knowledge and skills to IV interventions (2,14). Nurses are expected to diagnose early on in the procedure the symptoms and findings related to I/E and to act rapidly and effectively to reduce possible damage in tissues (14). The most important nursing intervention in I/E is prevention. Previous studies have emphasized that the risk of I/E development is reduced through training nurses and more frequent observation of the I/E area (2). In studies conducted in different countries, it has been determined that the education given to nurses about pediatric I/E is effective (2,13,15). At the same time, it is emphasized that it is important to repeat these trainings regularly and to develop education programs, education protocols and algorithms (9,15). This study examined the effect of an education program that aimed to prevent and manage pediatric I/E on the subsequent I/E rates in pediatric patients.

Materials and Methods

This is a quasi-experimental study in a single group with a pre-test/post-test design. The study data were collected between February 2016 and September 2016. The researchers decided to launch the pediatric I/E education program based on the results of a previous study "I/E in Pediatric Patients: A Prevalence Study in a Children's Hospital" (9). The current education program was initiated with the preparation of an education program about the prevention and management of pediatric I/E. The researchers had planned to give this education program to all nurses in the hospital where the study was carried out; however, only 79 nurses (66%) participated in the study. The researchers collected the relevant data from the pediatric patients on their I/E rate by monitoring 289 IV catheters in 150 patients during 1,221 patient days. The study sample included patients aged 18 years or younger (including newborns) who had IV catheters and were inpatients during monitoring. A power analysis was conducted based on the I/E rate determined. It showed that 270 catheters were needed to detect a 0.20 effect size using 0.80 power and a 0.05 significance level (16). This study was completed in six months. We included 289 catheters in the study, taking into account a 5% loss of sample.

Data Collection

A preliminary study was the basis of this study. In the previous study, the rates of I/E were high and faulty practices were performed (9). For this reason, we planned this pediatric I/E education program. The erroneous applications of I/E observed in the previous study, which directed the researcher to conduct the present study, proved the need to develop an urgent intervention in the prevention and management of pediatric I/E. These previous observations were the foundation of the pediatric I/E education program and the pediatric I/E education program was prepared subsequently. The pediatric I/E education program stage of the study was performed in February and March 2016. The pediatric I/E education program was delivered in five sessions so that most of the nurses in the relevant hospital could participate. However, the researchers managed to reach only 66% of the population. The effectiveness of the education program was evaluated using the "Pediatric I/E Prevention and Management Information Form" before and after the education program. The researchers also hung posters in the service areas of the hospitals about the education program content as a reminder to ensure the continuity of the knowledge provided to the participants. The researchers also anticipated that the posters would help the non-participant nurses as well to become more informed about the subject. Afterward, the researchers conducted a data collection stage focusing on the pediatric I/E rates and management after the education program.

In the framework of the study, all infants and children in all services and units of the pediatric hospital who were inpatients were monitored by the researchers. Before the study, all the researchers were trained about pediatric I/E, the education program, the forms and scales to be used. I was observed in only one patient after the training. Therefore, the harmony between the researchers was not examined. To collect data, the researchers used the IV Insertion Site in the Pediatric Patient Evaluation Form

and the IV Insertion Site in the Pediatric Patients with I/E Evaluation Form, starting from the patient's admission to the hospital and the implantation of the catheter. Those patients who had IV catheters were monitored after an evaluation of their demographic characteristics, catheter insertion point, the purpose for the catheter, and intake of fluids and medication. The researchers conducted a regular daily follow-up of the patients, and evaluated them for the development of I/E in their catheters, the reason for removing the catheter if it was removed, and the presence of a new catheter. If there was I/E, the researchers determined its location; the fluid or medicine that was infiltrated or extravasated; the speed of its flow; the days passed after the implementation of the catheter until the I/E development as well as the period until its recognition; and any interventions/initiations. The researchers photographed the relevant area in those patients who developed I/E and determined its level with the assistance of the scales. The I/E rate was determined by calculating the number of I/Es divided by the total number of patient days (I/E number/ catheter days x 1,000).

Pediatric infiltration and extravasation education program: The presentations in the pediatric I/E education program were prepared with the guidance of evidence-based studies as well as algorithms in the current literature (1,16,17). The education program content included descriptions of pediatric I/E, risk factors and symptoms of I/E, the medications and fluid lists that have a greater risk for I/E development (high risk, moderate risk, low risk), scales of I/E, nursing initiations addressing the prevention and management of I/E, special antidotes, and subjects concerning wound care. The presentation was prepared based on the current literature including related topics and the subject was given as a lecture. In addition, the algorithm was prepared and printed as a poster. These posters were posted in the treatment rooms in children's clinics. Expert opinions were obtained from seven experts from the pediatric nursing department about the training content. The training content was reviewed and finalized accordingly.

Data Collection Tools

Introductory Form for Nurses: This form includes questions about the nurses' age, their education level, the clinics they worked in, their professional experience, previous education programs on I/E, and any previous encounters with I/E.

Pediatric Infiltration and Extravasation (PINE) Prevention and Management Information Form: This is a 20-question form with the options "True, False and Don't Know", which was created to determine the nurses' knowledge levels before and after the education program. In the form, eight questions (questions 2, 6, 7, 8, 12, 14, 18, and 20) should be responded to as "False" and 12 questions should be responded to as "True". The possible scores on the scale range from 0 to 20. The questions in the form asked for descriptions of I/E, the fluids and medications that cause I/E, the interventions to prevent them, and the nursing interventions to be carried out after I/E development. The content validity of the form was ensured by consulting the opinions of seven experts. They were also asked to score each item from 1 to 4 (1 = Very Unsuitable, 4 = Completely Suitable). The Content Validity Index was used to evaluate expert opinions (18). The content validity index was 0.88. This form is valid in Turkish. The form was reviewed and finalized accordingly.

The IV Insertion Site in the Pediatric Patient Evaluation Form: This form developed by researchers includes questions about age, gender, disease diagnosis, total patient days, date of IV catheter insertion day, IV fluid and medication therapy flowing through the IV catheter, IV insertion site and date and reason for removing the IV catheter. This form was used in the previous study (9).

The IV Insertion Site in Pediatric Patients with the I/E Evaluation Form: This form includes questions about the IV catheter insertion day and when I/E occurred, the localization of I/E, the time when the I/E was noticed (time that passed since the I/E started), the infiltrated or extravasated IV fluid(s) and the medication therapy(s), and the applied interventions for I/E by the bedside nurses. This form was developed by the researchers and used in the previous study (9).

The Infusion Nurses Society Infiltration Scale: The scale which evaluates the I site was developed by The Infusion Nurses Society. It contains ratings on a scale from 0 to 4 as follows: Grade 0 = No symptoms; Grade 1 = Skin blanched, edema <1 inch (2.54 cm); Grade 2 = Skin blanched, edema 1 to 6 inches (2.54 to 15.24 cm); Grade 3 = Skin blanched, gross edema >6 inches (15.24 cm), mild to moderate pain; Grade 4 = Skin blanched, bruised, swollen, gross edema >6 inches (15.24 cm) moderate to severe pain. The interrater reliability of the I scale was statistically significant ($k=0.393$, $p<0.001$) (9,19,20).

Extravasation Scale [National Cancer Institute Common Terminology Criteria for Adverse Events version 4.0 (NCI-TCAE) Classification]: This classification was made based on the NCI-CTCAE (21). It evaluates the E site by rating it on a scale from 0 to 5 (Grade 1 = No symptoms; Grade 2 = Erythema with associated symptoms (e.g., edema, pain, induration, phlebitis); Grade 3 = Ulceration or necrosis; severe tissue damage; operative intervention indicated; Grade 4 = Life-threatening consequences; urgent intervention indicated; Grade 5 = Death) (9,21).

Statistical Analysis

The analysis of the study data was done using SPSS 16.0 software. The characteristics of the nurses were evaluated in numbers and percentages based on the information derived from the forms. The pre-test and post-test mean scores on the PINE Prevention and Management Information Form were evaluated using Fisher's exact test. The individual evaluation of the scale items before and after the education program was carried out using the McNemar test and Paired t-test. The study also calculated the I/E number for the total number of patient days to produce the I/E rate (I/E rate / patient days x 1,000 days). The number of I/Es in the previous study was compared to the findings in the pediatric I/E education program using a chi-square test. The researchers also calculated the odds ratio between the incidences in the previous study and this education program (9).

Results

Participant Characteristics: The average age of the nurses in this study was 29.89±7.69 years [minimum (min): 21, maximum (max): 50)]. Of the nurses, 49.4% had encountered I/E before, whereas 89.9% had never received any education program on I/E and 55.7% did not evaluate I/E as a medical error. Of the patients; 20% were 1 to 20 months old, and 20% were aged 6 to12 years; 57.3% were females; 24.7% were in the general pediatrics service, and 50.7% were monitored with one catheter (Table I). Before the education program, the knowledge mean score of the nurses was 9.41±3.22 (min: 0, max: 17), and 12.13±1.58 (min: 8, max: 16) after the education program. The increase in the knowledge level stimulated by the education was statistically significant (t: 7,328; p<0.001) (Figure 1).

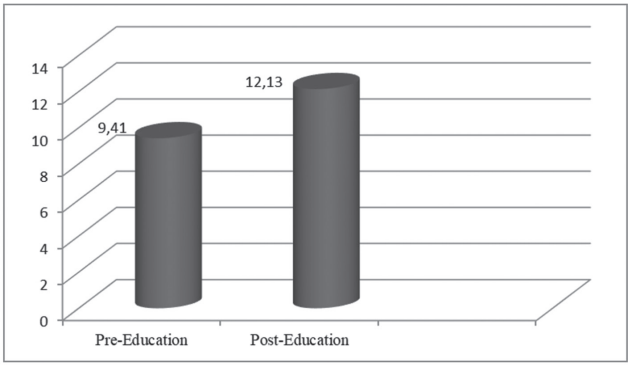

Figure 1. The knowledge level of nurses

IV Infiltration and Extravasation Rates: In 48.8% of the patients, the catheter was removed due to a blockage (Table II). In the PINE education program, the number of catheter days was 1,221, and the I/E rate in 289 IV catheter initiations was 0.8. A statistically significant difference was found between the I/E numbers in the previous study and in

Table I. Characteristics of nurses and patients

Nurse characteristics		**n**	**%**
Age		29.89±7.69 (min: 21, max: 50)	
Years of study in child wards/ units	0-1 year 1-5 year 6-10 year 11-15 year ≥16 year	29 23 14 5 8	36.7 29.1 17.7 6.3 10.1
Wards/ units	PICU+NICU Oncology/Hematology General Pediatric Other Clinics (Neurology, Nephrology, Cardiology, Respiratory)	12 28 18 23	12.7 35.4 22.8 29.1
Total		79	100
Patient Characteristics		**n**	**%**
Age	Neonatal Infant (1-12 months) 1-3 years 3-6 years 6-12 years 12 years and older	22 30 18 31 30 19	14.7 20.0 12.0 20.7 20.0 12.7
Gender	Male Female	86 64	57.3 42.7
Patients' ward/unit	NICU PICU Neurology Nephrology Cardiology Respiratory General Pediatric Oncology/Hematology	18 15 20 10 10 18 37 22	12 10 13.4 6.6 6.6 12 24.7 14.7
Total		150	100

NICU: Neonatal intensive care unit, PICU: Pediatric intensive care unit, min: Minimum, max: Maximum, n: Number of patients

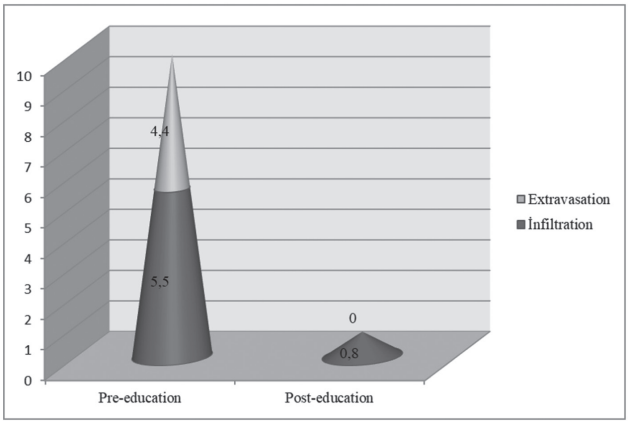

Figure 2. Extravasation and infiltration rates

Table II. Catheter characteristics

Catheter Characteristics		Post-education
		n (%)
The site of the peripheral IV line	Left Right	172 (59.5) 117 (40.5)
Inserted in peripheral vein	Dorsal metacarpal Brachial Vena marginalis medialis Cephalic Cephal Radial Vena temporalis Femoral Antecubital	146 (50.5) 79 (27.3) 10 (3.5) 15 (5.2) 18 (6.2) 3 (1.0) 9 (3.1) 1 (0.3) 8 (2.8)
The reason for catheter removal	Obstruction The end of treatment Dislocation Infiltration/Extravasation	141 (48.8) 112 (38.8) 35 (12.1) 1 (0.3)
Total		289 (100)

this education program (χ^2: 9,234; p=0.002) (Table III, Figure 2). The education program was implemented based on the probability rate that was calculated by the researchers; this enabled a reduction of pediatric I/E by 12-fold (odds ratio: 12.214, 95% confidence interval).

After the education program, there was a Grade 2 I in only one patient. That I developed in a two-month-old male patient who was being monitored in the general pediatrics service with a diagnosis of urinary tract infection in the right dorsal metacarpal vein and receiving a 5% Dextrose+0.9% NaCl fluid treatment during the second day of the catheter. The I was recognized 15 minutes after its development. Subsequently, the fluid treatment was ceased, physiological saline solution washing was applied after a fluid aspiration, and the extremity was elevated.

Table III. Infiltration and extravasation incidence rate between pre-education and post-education

Variables	Pre-education	Post-education	
Total catheter days	908	1,221	
Number of intravenous catheter insertions	297	289	
Number of infiltrations and extravasations			
• Number of infiltrations • Number of extravasations	5 4	1 0	X^2:
Infiltration and extravasation incidence rate •Infiltration incidence rate •Extravasation incidence rate	9.9 5.5 4.4	0.8 0.8 0	9,234 p: 0.002
Odds ratio	12.214	95% confidence interval	
		Lower	Upper
		1,545	96,576

Discussion

Several researchers have emphasized that the education of nurses is one of the most effective ways to prevent I/E in hospitalized children (2,13,16,22). In the present education program, the nurses improved their knowledge about pediatric I/E management and increased their rates of correct response to most of the statements. Similarly, the study by Taylor (2) evaluated the efficiency of education on evidence-based studies of the prevention of I and found that there was a significant difference in the knowledge scores before and after the education, proving that the education increased the information level of the participants. Tofani et al. (13) stressed that compulsory education given to nurses using a touch-look-compare method to reduce pediatric I/E rates led to an improvement in team communication and systematic recovery. Another relevant study stated that algorithms developed to prevent pediatric E's contributed to the prevision of nursing care and helped rapid and effective intervention in E incidents (16).

A review of the relevant literature indicated that there has been an increased number of studies in recent years on the effectiveness of the initiation of education in pediatric I: the I/E rates examined in these studies were high, and there was an obvious reduction in these I/E rates thanks to these initiations or the education provided to the nurses (2,13,23,24). In this education program, the rates of pediatric I/E were reduced 12-fold. In the study by Taylor (2), the rate of I in 1,000 patient days was 20.00 before the education, 11.83 after the education, and 8.93 at the end of the education program. In the study by Paquette et al. (11), 42 patients had

documented E and the incidence of E was 0.04% for every patient day. Tofani et al. (13) evaluated the PIV initiation area using a touch-look-compare method at the beginning of every hour and found that the I/E rate was reduced from 4.2 to 1.8 per 1,000 patient-days. The present study is based on that study and similar studies for the development of PINE education programs; it led to an important reduction in the I/E rate as in those other studies.

In the present study, the interventions applied to the patients with I/E before the study were not sufficient, and none of the patients had an antidote (9). After the study, only one patient received a correct I intervention. There was no administration of hyaluronidase to any of the patients either before or after the education. In the study by Paquette et al. (11), 50% of the subjects with E were treated using the correct antidote. In that study, 81% of the participants needed an antidote; however, only 33% of them were provided with that treatment.

In this study, catheter obstruction was the leading cause of catheter removal. The relevant literature also indicates that catheter obstruction is one of the most common catheter-related complications; it is key in order to maintain IV usage to give bolus flushing fluid to the patient and to make a safe determination (17).

Study Limitations

The present study aimed to prevent and manage pediatric I/E. This study also developed nursing practices and reduced rates of I/E. Some limitations of the study need to be taken into consideration. First, only 66% of the nurses working in the hospital where the study was carried out participated in the study. Another limitation of this study was that the patients were only monitored for six months after the education about I/E. These factors limit the generalization of the study results.

Conclusion

Pediatric I/E is common among children who are inpatients in health institutions because of acute and/or chronic health problems. This study has shown that a pediatric I/E education program improved nurses' knowledge about I/E management, and reduced I/E rates as well. This situation led to an improvement in nursing care and the quality of patient care and helped progress toward increased patient safety. It is recommended that prevention of I/E should become standard practice, institutional policy should be regulated to ensure appropriate treatment and care after injury has occurred and that in-service education to ensure that the information received about I/E should be up to date and lasting and all health personnel should be aware of this issue.

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Ethics

Ethics Committee Approval: Scientific Ethics Committee of a Faculty of Nursing approved this study (IRB number: 2015-93, approval date: 31.08.2015) and Children's Hospital, where the research was carried out.

Informed Consent: Children and their families were informed about the study and written informed consent was obtained. Also the nurses who participate in pediatric infiltration and extravasation education program have given written consent.

Peer-review: Enternally peer-reviewed.

Authorship Contributions

Surgical and Medical Practices: A.K., G.Ö.G., F.Y., Concept: A.K., G.Ö.G., F.Y., Design: A.K., G.Ö.G., F.Y., Data Collection or Processing: E.B., Ş.B.Y., H.N.Ç.Ö., A.Kar., D.Z., S.A.S., M.G., Analysis or Interpretation: A.K., G.Ö.G., F.Y., Literature Search: A.K., G.Ö.G., F.Y., Writing: A.K., D.Z.B.

Conflict of Interest: None of the authors had conflict of interest.

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References

1. Doellman D, Hadaway L, Bowe-Geddes LA, et al. Infiltration and extravasation: update on prevention and management. Journal of Infusion Nursing 2009; 32:203-11.
2. Taylor JT. Implementing an evidence-based practice project in the prevention of peripheral intravenous site infiltrations in children. Journal of Infusion Nursing 2015; 38:430-5.
3. Amjad I, Murphy T, Nylander-Housholder L, Ranft A. A new approach to management of intravenous infiltration in pediatric patients: pathophysiology, classification, and treatment. Journal of Infusion Nursing 2011; 34:242-9.
4. Yan YM, Gong M, Chen JL, et al. Incidence, risk factors and treatment outcomes of drug extravasation in pediatric patients in China. Turk J Pediatr 2017; 59:1621-168.
5. Tripi PA, Thomas S, Clebone A, Goldfinger MM, Tobias JD. Peripheral intravenous catheter problems in infants and children presenting for anesthesia and surgery. Middle East Journal of Anaesthesiol 2016; 23:411-4.
6. Wilkins CE, Emmerson AJB. Extravasation injuries on regional neonatal units. Archives of Disease in Childhood. Fetal and Neonatal Edition 2004; 89:274-5.

7. Temizsoy E, Eriş Ö, Karakoç A, Cangur Ş, Karatekin G, Ovalı F. Pediatrik Periferal İntravenöz İnfiltrasyon Ölçeğinin Türkçe Geçerlilik Güvenirliği ve Yenidoğana Uyarlanması. Journal of Pediatric Research 2017; 4:232-8.

8. Atay S, Şen S, Çukurlu D. Incidence of infiltration/extravasation in newborns using peripheral venous catheter and affecting factors. Revista da Escola de Enfermagem da USP 2018; 52:03360.

9. Gerçeker GÖ, Kahraman A, Yardımcı F, et al. Infiltration and extravasation in pediatric patients: a prevalence study in a children's hospital. Journal of Vascular Access 2018; 19:266-271.

10. Gopalakrishnan PN, Goel N, Banerjee S. Saline irrigation for the management of skin extravasation injury in neonates. Cochrane Database Systematic Reviews 2012; 15:CD008404.

11. Paquette V, McGloin R, Northway T, DeZorzi P, Singh A, Carr R. Describing intravenous extravasation in children (DIVE study). The Canadian Journal of Hospital Pharmacy 2011; 64:340-5.

12. Kuensting LL. Treatment of intravenous infiltration in a neonate. Journal of Pediatric Health Care 2010; 24:184-8.

13. Tofani BF, Rineair SA, Gosdin CH, et al. Quality improvement project to reduce infiltration and extravasation events in a pediatric hospital. Journal Pediatric Nursing 2012; 27:682-9.

14. Dougherty L. IV therapy: recognizing the differences between infiltration and extravasation. British Journal of Nursing (Mark Allen Publishing) 2008; 17:898-901.

15. Martin CD, Thompson DR. Study Sample Size Calculation. Design and Analysis of Clinical Nursing Reseach Studies. London, Routledge, 2000.

16. Chanes DC, da Luz Gonçalves Pedreira M, de Gutiérrez MGR. Antineoplastic agents extravasation from peripheral intravenous line in children: a simple strategy for a safer nursing care. European Journal of Oncology Nursing 2012; 16:17-25.

17. Hetzler RA, Wilson M, Hill EK, Hollenback C. Securing pediatric peripheral iv catheters-application of an evidence-based practice model. Journal of Pediatric Nursing 2011; 26:143-8.

18. Polit D, Beck C. The content validity index: are you sure you know what's being reported? critique and recommendations. Research in Nursing Health 2006; 29:489-97.

19. Groll D, Davies B, Mac Donald J, Nelson S, Virani T. Evaluation of the psychometric properties of the phlebitis and infiltration scales for the assessment of complications of peripheral vascular access devices. Journal of Infusion Nursing 2010; 33:385-90.

20. Infusion Nurses Society. Infusion nursing standards of practice. Journal of Infusion Nursing 2006; 29(1 Suppl):S1-92.

21. National Cancer Institute. Common Terminology Criteria for Adverse Events (CTCAE) Common Terminology Criteria for Adverse Events v4.0 (CTCAE). Retrieved June 20, 2016,

22. Panghal A, Naranje KM, Singh A, Pandita A, Gupta G. Reducing infiltration rates of peripheral intravenous cannula: A quality improvement initiative in a neonatal intensive care unit of tertiary care hospital in Northern India. Indian J Child Health 2019; 6:205-8.

23. Major TW, Huey TK. Decreasing IV infiltrates in the pediatric patient-system-based improvement project. Pediatric Nursing 2016; 42:14-20.

24. Park SM, Jeong IS, Kim KL, Park KJ, Jung MJ, Jun SS. The effect of intravenous infiltration management program for hospitalized children. Journal of Pediatric Nursing 2016; 31:172-8.

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Original Article

Psychometric Properties of a Turkish Version of the Nomophobia Scale for the Nine-Eighteen Age Group

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ABSTRACT

Aim: As a situational phobia, nomophobia is the fear experienced in the absence of a cell phone. Nomophobia leads to situations that negatively affect children's health. The aim of this study is to conduct validity and reliability studies for the Turkish version of the Nomophobia scale.

Materials and Methods: The study was conducted with volunteer students from three secondary schools and two high schools whose parents' approval was acquired. Expert opinions, a pilot study, and a calculation of validity and reliability stages were applied. For data analysis, the Shapiro-Wilk normality test, Content Validity index, Pearson correlation analysis, Cronbach's alpha coefficient, confirmatory factor analysis, explanatory factor analysis, and t-tests were used.

Results: This study included 818 voluntary child participants. Of the participants, 56.7% were girls. In all, 91.5% of the participating children were connected to the Internet on their mobile phones, and 67.2% had their own computer. The age range of participants was 9-18 years, and their average age was 14.1±2.32 years. The scale accounts for 57.8% of the total variance. Cronbach's alpha for the whole scale was identified as 0.90. As a result of confirmatory factor analysis, the factor coefficient was over 0.30, and the fit indices were over 0.90.

Conclusion: The Turkish version of the NMP-Q is reliable and valid for the 9-18 age group.

Keywords: Nomophobia, mobile phones, children, Turkey

Introduction

Mobile phones have become a technology that almost everyone owns. According to data from the Household Use of Information Technologies Research conducted in Turkey, 96.8% of households have mobile phones (1). The frequency of cell phone usage, in a similar way to adults, is gradually increasing among children. The increased duration of time spent by children with information and communication technologies results in new risks and opportunities. In particular, the use of mobile phones is becoming increasingly popular not only for communication but also for facilitating access to the Internet and social networks (2). Children in Turkey generally start using cell phones at about the age of nine (3). Due to the popularity of mobile phones, many problems have emerged due to their excessive use (4).

A major problem observed among mobile phone users is nomophobia (5,6). Derived as an acronym from the English expression "no mobile phone phobia," nomophobia is defined as the fear of being without a mobile phone. The tempting environment provided by mobile phones takes the place of cell phones, and becoming used to this environment constitutes the reason for such fears (6).

Symptoms of nomophobia include having a mobile phone kept on continuously, excessive use, a feeling of

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anxiety when one's phone is out of network coverage, constantly checking messages or missed calls, Ghost Vibration syndrome, and a habit of continuously looking at one's mobile phone screen (7,8).

In particular, nomophobia is common among adolescents who start using technology at an early age. This group have been called "Generation Z," "Digital Natives," or the "Net Generation" (9,10). For Generation Z, technology is "an indispensable part of them" (11). Issues such as abstraction from life, shunning social relationships, a reduced attention span, increased irritation, and reduced sleep quality and tolerance are notable (12,13). However, no tools were available to define factors negatively affecting adolescents' health concerning this issue. Valid and reliable measurement tools are needed to determine the current situation, to develop active programs accordingly, and to measure the effectiveness of these initiatives. For this reason, the objective of this study was to adapt the Nomophobia scale developed for young adults aged 9-18 into Turkish and to conduct validity and reliability analyses for it.

Materials and Methods

Research Type

This research was a methodological, descriptive, and cross-sectional study intended to conduct validity and reliability studies on the Turkish version of the Nomophobia scale for children aged 9-18.

Research Population and Sample

This study was conducted in three secondary schools and two high schools between January 2018 and March 2018. In validity and reliability studies, while determining the number of samples, the literature refers to the rule of 5s, 10s, and 100s. It is emphasized that for a researcher to conduct factor analysis, he should survey at least five people per item (14). For scale development studies, the literature has reported that a sample size of less than 100 people is insufficient, medium if 200 people, good if 300 people, very good if 500 people, and perfect if 1,000 people are sampled (15). A total of 818 children who volunteered to participate and who filled out the form completely were included in the study.

Sample Inclusion Criteria Included the Following:

- Children in the age range of 9-18 years
- Ownership of a mobile phone
- Verbal and written consent received from both the child and parent respectively.

Data Collection Tools and Characteristics

Data in the study was collected using the sociodemographic data collection form and the Nomophobia scale.

Sociodemographic Data Collection Form: Sociodemographic features such as "age, gender, grade, status of having their own computer, status of having a cell phone of their own" among the children were included on this form.

Nomophobia Scale: The scale was developed by Yildirim and Correia (16) to measure university students' nomophobic behaviors, and its validity-reliability study for Turkish university students was conducted by (17). The scale consists of 20 items discussing four aspects of nomophobia, as well as four sub-dimensions, including six items addressing "inability to communicate" (10^{th}, 11^{th}, 12^{th}, 13^{th}, 14^{th}, and 15^{th} items), five items addressing "losing adherence" (16^{th}, 17^{th}, 18^{th}, 19^{th}, and 20^{th} items), four items addressing "inability to access information" (1^{st}, 2^{nd}, 3^{rd}, and 4^{th} items), and five items addressing "giving up convenience" (5^{th}, 6^{th}, 7^{th}, 8^{th}, and 9^{th} items). The lowest score that can be obtained from the scale is 20, and the highest score is 140. A score of 20 points shows an absence of nomophobia; 21-60 points show mild nomophobia; 60-100 points show moderate nomophobia; and 100-140 points show the presence of severe of nomophobia. All items were graded using a 7-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree). Original scale reliability coefficients (α) were found as follows: 0.90 for "unable to communicate," 0.74 for "losing adherence," 0.94 for "unable to access information," 0.91 for "giving up convenience," and 0.92 as the reliability coefficient of the overall scale. According to results of the confirmatory factor analysis, it was found that $\chi 2$= 2.86, Root Mean Square Error of Approximation (RMSEA)= 0.08, Comparative Fit index (CFI)= 0.92.

Due to problems caused by nomophobia, it has become a subject of interest in the literature. The Nomophobia Scale was also adapted for Spanish (18), Persian (19), and Italian (20) culture.

The original scale sample was applied to university students with a mean age of 20 years. Its Turkish version was applied to individuals aged 17-34 years with an average age of 20.02±1.65, its Spanish version was applied to individuals aged 13-19 years with an average age of 15.41±1.22, its Persian version was applied to individuals aged 13-19 years, and its Italian version was applied to individuals with an average age of 27.91±8.63 years (6,17,19-21).

Research Steps

Expert Opinion Stage: To determine the scales' scope of validity, researchers have suggested referring to at least three expert opinions (14,22). The opinions of a total of eight experts, including two psychologists, four academic members of pediatric nursing departments, and two academic members of psychiatry nursing departments were collected using scales. The scale form was given to experts, and they were requested to submit scores between 1 (not appropriate) and 4 (completely appropriate) to assess the compliance of scale items. Points were assessed using the scope of Validity index. According to these expert opinions, the items are understandable, and there is no need for wording or grammatical changes.

Preliminary Stage: It was suggested, after receiving expert opinions, to apply the scale to a sample consisting of 10-20 people not included in the sample but bearing similar characteristics to those participants who would be part of the main sample population (14,22). The draft was revised using expert opinions and was given to 10 non-participants who complied with the sample characteristics. As no negative feedback was received relating to the clarity of the items; it was decided to apply the scale to the larger group.

Reliability Analysis: To analyze the total score for the scale and its sub-dimensions, Pearson correlation analysis was used, and by considering a correlation value of 0.20, nonconforming items were removed from the scale (14,22). Cronbach's alpha coefficient was calculated to determine internal consistency for the scale and its sub-dimensions (14,22).

Validity Analysis: Descriptive factor analysis was applied to determine the item-factor relationship, and confirmatory factor analysis was conducted to calculate whether items and sub-dimensions explain the scale's original structure (14,22). It was planned to remove items with factor loads below 0.30.

Statistical Analysis

For data analysis, the Shapiro-Wilk normality test was applied to determine the percentage and average for descriptive statistics and whether data were distributed normally. The Content Validity index was applied for the compliance analysis of the expert opinions. Pearson correlation analysis was applied for the item-total score analysis of the scale and its sub-dimensions. Cronbach's alpha coefficient was applied to determine the internal consistency of the scale and its sub-dimensions and exploratory factor analysis (EFA) was applied to determine item-factor relationships. Confirmatory factor analysis was conducted to determine whether items and sub-dimensions explained the original structure of the scale. A t-test was applied for comparison of similar groups. Pearson correlation analysis was applied to determine the relationships among factors of the scale; t-test and Pearson correlation analysis were conducted in invariance-dependent groups based on time. Pearson correlation analysis was conducted to assess the relationships among score averages of the scale and Visual Analog scale. In the data assessment, the margin of error was considered to be p=0.05.

Research Ethics

Written consent was received from parents and verbal permission was received from the children. Permission to use the scale was obtained via e-mail.

Results

Overall, 7.9% of the children (n=64) attended the fifth grade; 18% (n=144) attended the sixth grade; 9.7% (n=79) attended the seventh grade; 12.3% (n=100) attended the eighth grade; 16.1% (n=131) attended the ninth grade; 10.9% (n=89) attended the tenth grade; 15.5% (n=126) attended the eleventh grade; and 9.5% (n=77) attended the twelfth grade. Additionally, 56.7% of the children were female, and 43.3% were male. Most of the children (91.5%) connected to the internet via their mobile phones, and 67.2% had their own computers. The age of the participants ranged from 9-18 years, and their average age was 14.1±2.32 years.

Content Validity

The Content Validity index as per item (I-CVI) was 0.99-1.00, and the Content Validity index on the scale (S-CVI) basis was 0.99.

Explanatory Factor Analysis

As a result of EFA, Kaiser-Meyer-Olkin (KMO) was identified as 0.928, and the Bartlett test yielded a result χ^2= 6,631.247. As a result of EFA, it was determined that the scale consisted of four sub-dimensions. The scale accounts for 57.8% of the total variance. The 'inability to communicate' sub-dimension accounted for 37.1% of the total variance, the 'losing online connection' sub-dimension accounted for 9.1%, the 'loss of comfort' sub-dimension accounted for 6.5%, and the 'inability to access information' sub-dimension accounted for 5.1%.

It was determined that the factor loads of items included in the 'inability to communicate' sub-dimension ranged from 0.60 to 0.83; the factor loads of items in 'losing online

connection' ranged from 0.58 to 0.71; the factor loads of items in the 'loss of comfort' sub-dimension ranged from 0.40 to 0.75; and the factor loads of items in the 'inability to access information' sub-dimension ranged from 0.58 to 0.81 (Table I).

Confirmatory Factor Analysis

As a result of applying confirmatory factor analysis (CFA), fit indices were identified as follows: X2= 662.30, df= 162, χ^2/df= 4.08, RMSEA= 0.061, GFI= 0.93, IFI= 0.97, NFI= 0.97, NNFI= 0.97, CFI= 0.97, RFI= 0.96, and AGFI= 0.90. It was determined that the factor loads of items in the 'inability to access information' sub-dimension ranged from 0.67 to 0.81; the factor loads of items in the 'loss of comfort' sub-dimension ranged from 0.60 to 0.75; the factor loads of items in the 'inability to communicate' sub-dimension ranged from 0.74 to 0.83; and the factor loads of item in the 'losing online connection' sub-dimension ranged from 0.66 to 0.77 (Figure 1).

Table I. Explanatory factor analysis

Items	Sub-dimensions			
	Inability to Communicate	**Losing Online Connection**	**Demising Comfort**	**Inability to Access Information**
m11	0.83			
m13	0.80			
m10	0.71			
m15	0.69			
m14	0.63			
m12	0.60			
m16		0.71		
m18		0.70		
m17		0.67		
m19		0.65		
m20		0.58		
m5			0.75	
m6			0.66	
m7			0.60	
m9			0.55	
m8			0.40	
m2/ sqm				0.81
m1				0.77
m4				0.61
m3				0.58

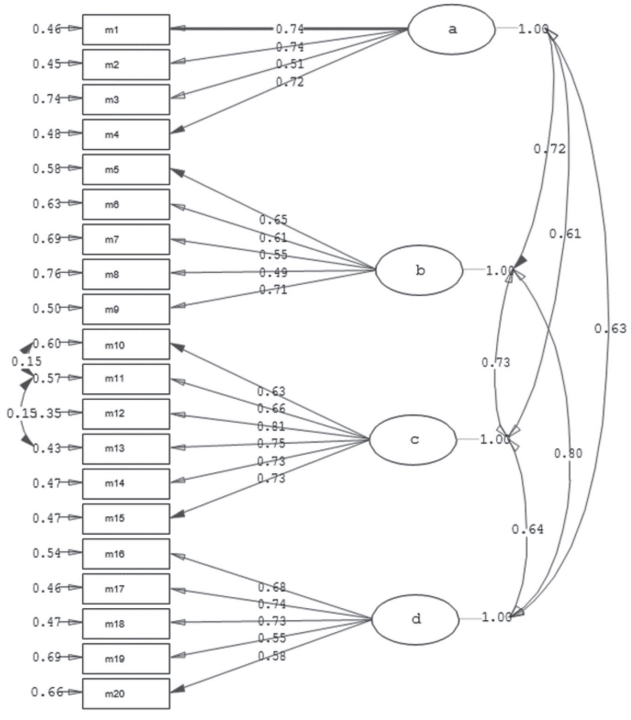
Reliability Analysis

Cronbach's alpha for the whole scale was identified as 0.90. Cronbach's alpha for the lower dimensions was 0.76 for the 'inability to access information' sub-dimension, 0.74 for the 'loss of comfort' sub-dimension, 0.87 for the 'inability to communicate' sub-dimension, and 0.78 for the 'losing online connection' sub-dimension. As a result of the two split-half analysis scale, the Cronbach's alpha value for the first half was identified as 0.83, and the Cronbach's alpha value for the second half was identified as 0.86. Spearman-Brown and Guttman split-half coefficients were both identified as 0.85 (Table II).

Table II. Reliability analysis of scale and sub-scale scores (n=818)

Subscale	Cronbach α	M ± SD	Min-Max
Inability to access information	0.76	13.27±6.17	4-28
Loss of comfort	0.74	16.40±7.59	5-35
Inability to communicate	0.87	21.99±10.09	6-42
Losing online connection	0.78	11.91±6.85	5-35
Total	0.90	63.69±24.96	20-140

M: Mean, SD: Standard deviation, Min: Minimum, Max: Maximum, n: Number



Chi-Square=6622.30, df=162, p-value=0.0000, RMSEA=0.061

Figure 1. Confirmatory Factor Analysis of Nomophobia scale for 9-18 age children

The total score of scale items and their correlations were determined to vary between 0.46 and 0.73. It was found that item-subscale correlations varied between 0.44 and 0.59 for the 'inability to access information' sub-dimension, between 0.48 and 0.60 for the 'loss of comfort' sub-dimension, and between 0.52 and 0.71 for the 'inability to communicate' sub-dimension (Table III).

Table III. Characteristics of items in scale scores (n=818)

Subscales	Items	Item-total score correlations (r)*	Item-subscale score correlations (r)*
Inability to access information	1	0.53	0.52
	2	0.51	0.49
	3	0.43	0.44
	4	0.59	0.59
Loss of comfort	5	0.54	0.54
	6	0.53	0.55
	7	0.46	0.48
	8	0.47	0.49
	9	0.61	0.60
Inability to communicate	10	0.55	0.55
	11	0.51	0.52
	12	0.73	0.71
	13	0.60	0.59
	14	0.61	0.61
	15	0.61	0.59
Losing online connection	16	0.54	0.54
	17	0.56	0.55
	18	0.55	0.55
	19	0.46	0.47
	20	0.52	0.55

*Significant at <0.001 level

Discussion

When the Content Validity index was applied, content validity indices were above 0.80 on an item and scale basis. There was a high level of compliance among the experts that items for this age range sufficiently represented the desired field (23,24). These results supported the content validity of the scale.

Construct Validity of the Scale

In the literature, to conduct factor analysis, the Bartlett Sphericity test value must be statistically significant, and the KMO value must be at least 0.60 (23,24). For this study, the Bartlett's sphericity test value was less than $p<0.05$, and the KMO value was higher than 0.60. These results show that the data are sufficient and appropriate for factor analysis (23-26). The results of this study show similarity with the original scale (6), the Spanish version (18), and the Italian version (20). In the EFA applied, an Eigenvalue of 1 or above was accepted for determining the factor number (26,27). The scale consisted of four sub-dimensions. These sub-dimensions accounted for 57.7% of the total variance. The original scale accounted for 69.6% of the total variance (6), the Spanish version accounted for 66.4% of the total variance (21), and the Italian version accounted for 65.9% of the total variance (20). In this study, the fact that the total variance obtained in this study was over 50% and closer to the total variance obtained in the original and other language versions reveals that the scale, which was developed for an older age group, was also a valid measurement tool for the 9 to 18-year-old age group. These results also support the content validity of the scale. In the literature, it is emphasized that, while deciding under which factor the items will be placed, the factor load should be at least 0.30 or above; meaning that items below this rate should be excluded from the scale (23-26). In this study, it was determined that items in all sub-dimensions had factor loads higher than 0.40, similar to factor loads in the original scale and scales in other languages (Table III) (16,18,20,28). These results showed that the scale had a powerful factor structure.

As a result of CFA, factor loads of the four sub-dimensions varied between 0.60 and 0.83 (Figure 1). The fact that all factor loads were greater than 0.30, fit indices were greater than 0.90, RMSEA was less than 0.080, and χ^2/df was less shows that items in each dimension defined their factors sufficiently. The results of this study were similar with the confirmatory factor analysis results in the Turkish adult and Spanish versions of the scale (17,18). The fact that these research results were found to be close to the adult group supports the structural validity of the scale and also shows that the scale can effectively assess nomophobia in the 9 to 18-year-old age group.

The EFA and CFA results in this study support the structural validity of the scale and reveal that the scale is a valid tool.

Reliability Analysis of Scale

Internal Consistency Analysis of the Scale and Its Sub-dimensions When the Cronbach's alpha coefficient

varies between 0.60 and 0.80, it shows that a scale is quite reliable; and when it varies between 0.80 and 1.00, it shows that a scale is highly reliable (29,30). In these research results, it was determined that the Cronbach's alpha for the whole scale was 0.90, and Cronbach's alpha values for the four sub-dimensions were all above 0.70 (Table I). The Cronbach's alpha value in the original scale was 0.95 (6), 0.92 in the Turkish adult version (17), and 0.95 in the Italian version (20). Internal consistency values obtained in this study showed similarity with those found in the original versions and versions in other languages. These study results have shown that the scale is a measurement tool that can be used safely with the 9 to 18-year-old age group. In the split-half method used in this study, the Cronbach's alpha values for both sections were over 0.80, and there was a strong and significant relationship between the halves. These results provide important evidence supporting the reliability of the scale.

Item-total Score Analysis of Scale and Sub-dimensions

Item-total score and item sub-dimension total score correlations should be greater than 0.20, and preferably as close to 1 as possible, and positive (14). In this study, the item correlations with scale total scores and subscale total scores were above 0.40 (Table II). The item-total score and item-subscale total score correlations in the original scale and versions in other languages were above 0.40 and show similarity with this study's results (16,18,20,28). These results show that each item is highly interrelated with all scales and subscales. This suggests the field to be measured, the scale sufficiently measures nomophobia for the 9 to 18-year-old age group, and the item reliability of scale and sub-dimensions is high.

Conclusion

Consequently, it was determined that the scale had prominent levels of reliability and validity in assessing the level of nomophobia in the 9 to 18-year-old age group. In this study, an objective measurement tool was found to assess the levels of nomophobia among individuals in the 9 to 18-year-old age group. Problems in mobile phone usage behaviors may interrupt adolescents' daily lives and adversely affect their physical and mental health. The increase in nomophobia among adolescents was negatively predicted by cell phone addiction and attention levels (31). In addition, as adolescents' levels of nomophobia increase, depression, a decrease in social relations, and low academic achievement are observed (31,32). Self-esteem, extraversion, conscientiousness, and emotional stability are identified as important determinants of nomophobia (33). Using this scale, students' nomophobia levels can be determined, and the mechanics of nomophobia can be defined more clearly with further studies. This study may be a guide for determining risk groups, planning preventive studies that focus on these groups, and assessing the effectiveness of these planned initiatives.

Notes

Compliance with Ethical Standards

Ethical Approval

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or the national research committee and the 1964 Helsinki declaration and its later amendments or comparable ethical standards. Informed consent was obtained from all individual participants included in the study.

Ethics

Ethics Committee Approval: All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or the national research committee and the 1964 Helsinki declaration and its later amendments or comparable ethical standards. Informed consent was obtained from all individual participants included in the study.

Informed Consent: Written consent was received from parents and verbal permission was received from the children. Permission to use the scale was obtained via e-mail.

Peer-review: Enternally and internally peer-reviewed.

Authorship Contributions

Surgical and Medical Practices: E.Z.Ö., Concept: E.Z.Ö., Design: M.B., Data Collection or Processing: M.B., Analysis or Interpretation: E.Z.Ö., Literature Search: E.Z.Ö., Writing: E.Z.Ö.

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References

1. Turkish Statistical Institute. Household Information Technology Usage Survey 2016- 2018. Retrieved from: http://www.tuik.gov.tr/ Access Date: December 18,2018.

2. Salehan M, Negahban A. Social networking on smartphones: When mobile phones become addictive. Comput Human Behav 2013; 29:2632-9.
3. Turkish Statistical Institute. 06-15 Age Group Use of Information Technologies in Children and Media 2013 2018. Retrieved from: http://www.tuik.gov.tr/ Access Date: December 18,2018.
4. Choi JS, Park SM, Roh MS, et al. Dysfunctional inhibitory control and impulsivity in Internet addiction. Psychiatry Res 2014; 215:424-8.
5. King ALS, Valença AM, Silva AC, Baczynski T, Carhalvo MR, Nardi AE. Nomophobia: Dependency on virtual environments or social phobia? Comput Human Behav 2013; 29:140-4.
6. Yildirim C, Correia AP. Exploring the dimensions of nomophobia: Development and validation of a self-reported questionnaire. Comput Human Behav 2015; 49:130-7.
7. Bragazzi NL, Del Puente G. A proposal for including nomophobia in the new DSM-V. Psychol Res Behav Manag 2014; 7:155-60.
8. Mura G, Topcu-Uzer Ç, Erdur-Baker Ö, Diamantini D. A Cross-Country Perspective on Cyber Bullying: Italian and Turkish Experience. Mersin Univ J Educ Fac 2017; 13:80-93.
9. Cirilli E, Nicolini P. Digital skills and profile of each generation: a review. Int J Dev Educ Psychol Rev INFAD Psicol 2019; 3:487-94.
10. Garrick B, Pendergast D, Geelan D. Through the Lens of Generational Theory. In: Theorising Personalised Education, 6th ed. Singapore, Springer Publication 2017; 47-60.
11. Bennett S, Maton K, Kervin L. The 'digital natives' debate: A critical review of the evidence. Br J Educ Technol 2008; 39:775-86.
12. Velički D, Dumančić M, Topolovčan T. The Net Generation, the Internet, and Political Communication and Participation. Croat J Educ 2017; 19:237-66.
13. Sahin S, Ozdemir K, Unsal A, Temiz N. Evaluation of mobile phone addiction level and sleep quality in university students. Pakistan J Med Sci 2013; 29:913-8.
14. Sencan H. Validity and Reliability in Social and Behavioral Measurements, 1st ed. Ankara, Seckin Publishing 2005; 355-407.
15. Misirli ZA, Akbulut Y. Development of a Scale to Explore Technology Literacy Skills of Turkish 8th Graders. Contemp Educ Technol 2013; 4:249-62.
16. Yildirim C, Correia AP. Exploring the dimensions of nomophobia: Development and validation of a self-reported questionnaire. Comput Human Behav 2015; 49:130-7.
17. Yildirim C, Sumuer E, Adnan M, Yildirim S. A growing fear: Prevalence of nomophobia among Turkish college students. Inf Dev 2016; 32:1322-31.
18. González-Cabrera J, León-Mejía A, Pérez-Sancho C, Calvete E. Adaptation of the Nomophobia Questionnaire (NMP-Q) to Spanish in a sample of adolescents. Actas Esp Psiquiatr 2017; 45:137-44.
19. Lin CY, Griffiths MD, Pakpour AH. Psychometric evaluation of Persian Nomophobia Questionnaire: Differential item functioning and measurement invariance across gender. J Behav Addict 2018; 1-9.
20. Adawi M, Bragazzi NL, Argumosa Villar L, et al. Translation and Validation of the Nomophobia Questionnaire in the Italian Language: Exploratory Factor Analysis. JMIR Mhealth Uhealth 2018; 22:24-31.
21. Gutiérrez Puertas L, Márquez Hernández VV, Aguilera Manrique G. Adaptation and Validation of the Spanish Version of the Nomophobia Questionnaire in Nursing Studies. CIN Comput Informatics Nurs 2016; 34:470-5.
22. Simsek OF. Introduction to Structural Equation Modeling, LISREL Fundamental Principles and Practices, 3rd ed. Ankara, Ekinoks Press 2007; 4-22.
23. DeVellis R. Scale development: Theory and Applications, North California, 3rd ed. Sage Publication, 2012; 205-385.
24. Johnson B, Christensen L. Educational Research: Quantitative, Qualitative, and Mixed Approaches, 3rd ed. California, Sage Publication 2007; 664-780.
25. Terwee C, Bot S, Boer MR, et al. Quality criteria were proposed for measurement properties of health status questionnaires. J Clin Epidemiol 2007; 60:34-42.
26. Hayran M. Basic Istatistics for Health Surveys, 1st ed. Ankara, Art Ofset Publication 2011; 358-416.
27. Tabachnick BG, Fidell LS. Using Multivariative Statistics, 2nd ed. Boston, Pearson Publication 2013; 623-78.
28. Lin CY, Griffiths MD, Pakpour AH. Psychometric evaluation of Persian Nomophobia Questionnaire: Differential item functioning and measurement invariance across gender. J Behav Addict 2018; 7:100-8.
29. Nunnally JC, Bernstein IH. Psychometric theory, 3rd ed. New York, McGraw-Hill 1994; 153-514.
30. Rattray J, Jones MC. Essential elements of questionnaire design and development. J Clin Nurs 2007; 16:234-43.
31. Seo DG, Park Y, Kim MK, Park J. Mobile phone dependency and its impacts on adolescents' social and academic behaviors. Comput Human Behav 2016; 63:282-92.
32. Gezgin DM, Cakir O, Yildirim S. The Relationship between Levels of Nomophobia Prevalence and Internet Addiction among High School Students: The Factors Influencing Nomophobia. Int J Res Educ Sci 2018; 4:215-25.
33. Argumosa Villar L, Boada Grau J, Vigil Colet A. Exploratory investigation of theoretical predictors of nomophobia using the Mobile Phone Involvement Questionnaire (MPIQ). J Adolesc 2017; 56:127-35.

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Original Article

Turkish Adaptation and Reliability and Validity Study of Parent Attitudes About Childhood Vaccines Survey

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ABSTRACT

Aim: Since the discovery of vaccines, opposing views have emerged and spread to the present day. Despite being based on different beliefs in different societies, anti-vaccination has become a rapidly growing social movement worldwide. Resistance to vaccination was included among health hazards at a global level by the World Health Organization in 2019. In a review of the literature, some studies conducted on vaccine rejection, vaccine hesitations and vaccine acceptance were found in different countries, but no studies in which vaccine hesitation was examined had been conducted in Turkey. The main reason was considered to be the lack of a vaccine attitude scale adapted into the Turkish language.

The aim of this study was to carry out a vaccination attitudes scale validity and reliability test on a scale which had been proven in foreign empirical studies and been translated into the Turkish language and to publish the scale in the field literature to be used in future vaccination attitudes studies in Turkey.

Materials and Methods: This study is a methodological study. The Parent Attitudes about Childhood Vaccines (PACV) scale was translated into Turkish by three experts who were competent in both English and Turkish, then it was translated back into English again. As a result of the comparison made, several changes were made to the Turkish scale. A pilot application was used and its results were evaluated. Confirming the results of the pilot application, the scale was applied to 225 parents. The reliability of the analyzed data was tested via Cronbach's alpha.

Results: The reliability of the data was determined to be 0.84, and the scale was considered reliable. Confirmatory factor analysis for the adapted scale was carried out, and the adaptation of the scale into Turkish was completed.

Conclusion: The Turkish version of the PACV scale is a valid and reliable scale for evaluating vaccine attitudes including vaccine rejection, vaccine hesitations and vaccine acceptance.

Keywords: Anti-vaccination movement, vaccination refusal, reliability and validity, questionnaires

Introduction

Vaccination is one of the most effective methods to protect against infectious diseases and maintain health. Starting from infancy, vaccination is an important factor for healthy growth and development. Despite its effectiveness and safety proven by scientific studies, anti-vaccination opinions have become widespread in society nowadays (1). Although the growth of the anti-vaccination as a social movement all around the world is fed with some common beliefs, the development of anti-vaccination attitudes in parents can happen as a result of different dynamics (2). Today, the 'Strategic Advisory Group of Experts' (SAGE)

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meetings are held by the World Health Organization with regard to these rapidly growing anti-vaccine movements (3). In a report prepared by SAGE, the reasons for anti-vaccination are mainly grouped under three titles. These were classified as contextual effects, individual and group effects, and also specific subjects related to vaccine/vaccination (4). The causes of anti-vaccination trends are shown in Table I.

With the proliferation of anti-vaccination movements, adherence to vaccination schedules and immunization rates have begun to decline in many countries and the number of cases of some infectious diseases, which were close to elimination, have increased. The main obstacle to the implementation of vaccination programs is regarded as the fact that some families have doubts or direct resistance to the vaccination calendar (5).

Hagood and Herlihy (6) defined the classification of parents experiencing anxiety about vaccination into three groups. The first group is vaccine rejectors (VRJ) who strongly reject vaccination. The second group include vaccine resistants who are more willing to assess the safety and efficacy of vaccines than VRJ although they still refuse vaccination. The third parent group is made of people who have some hesitancy about some vaccines and are generally concerned about vaccinations.

Although anti-vaccination is the main concept which is emphasized in maintaining social immunity, recently vaccination hesitancy, which is the invisible part of the iceberg, has been more controversial (7). According to Dubé et al. (8), the concept of "vaccine hesitation", which was introduced in response to an inability to consider attitudes and behaviors towards vaccination as just "acceptance" or "rejection", defines doubts about vaccination resulting in delays in vaccination schedules and rejection although it is provided as a service. Since the concept covers individuals who reject vaccination and those who have doubts, it offers a more holistic approach.

In studies conducted so far, it has been determined that some important reasons for hesitation against vaccinations include concerns about the safety of vaccinations, perception that vaccinations are not beneficial, fear of injections or insecurities about the implementation of vaccination programs and towards the pharmaceutical industry (9-11). In a study conducted in Turkey, similar results were obtained, and it was determined that parents' hesitations about vaccines included concerns about the contents of vaccines and the side effects of vaccinations, the inability to obtain adequate information about vaccines, religious beliefs, mistrust of the pharmaceutical industry and the probable relations of interest between the industry and authorities (12).

It is important to determine those people who are hesitant about vaccination primarily in the planning of interventions concerning vaccine hesitation. Although SAGE

Table I. The causes of anti-vaccination

Contextual effects	Individual and group effects	Vaccine and vaccination specific issues
a. Communication and media environment	a. Personal, family and/or community members' experiences related to vaccines including pain	a. Risk/benefit (epidemiological and scientific evidence)
b. Effective leaders, vaccination program guardians and anti-vaccination or vaccination lobbies	b. Attitudes towards beliefs, health and protection	b. Applying a new vaccine or a new formulation or a new recommendation for an existing vaccine
c. Historical influences	c. Knowledge/awareness	c. Management mode
d. Religion/culture/gender/socioeconomic	d. Health system and providers-trust and personal experience	d. Design of vaccination program/delivery method (e.g. routine program or mass vaccination campaign)
e. Politics/policies	e. Risk/benefit (perceived, intuitive)	e. Reliability and/or supply of vaccine and/or vaccination equipment
f. Geographical barriers	f. Immunization as a social norm/not required/harmful	f. Vaccination program
g. Perception of the pharmaceutical industry	-	g. Costs
-	-	h. The strength of advice and/or knowledge base and/or attitude of healthcare professionals

has prepared several different types of questions to measure vaccine hesitation (13), a uniform and Global scale has not been prepared for this purpose. Many different surveys and questionnaires have been used in cross-section studies in different countries to measure parental attitudes towards vaccination (14-19). Many of these questionnaires have focused on a limited number of factors affecting vaccine hesitation, and the reliability and validity of these scales have not been tested. In this context, the Parent Attitudes about Childhood Vaccines (PACV) scale, developed by Opel et al. (5,20) and tested for validity-reliability, is one of the first vaccination hesitation scales. Consequently, the scale has been used in different country-based studies such as in Spain, Canada, Malaysia, Italy, and Iraq (21-27).

In the literature review conducted, a Vaccine Hesitation scale study for a Turkish adaptation was not found. The purpose of this study is to adapt the PACV scale developed by Opel et al. (20) in 2011, which measures parents' hesitations towards childhood vaccination, into the Turkish language and to apply a validity/reliability study on this scale so that the above mentioned gap in the literature is eliminated.

Materials and Methods

This section describes the implementation processes of the adaptation of the scale and the analyses of its validity and reliability.

Data Collection Tool

During the development process of the PACV scale, a literature-assisted question pool was created, interviews were made with a focus group, expert opinions on scale items were obtained, and a preliminary test was conducted on a working group of parents. As a result of this process, an 18-item scale was created (5). The Developed scale was evaluated in terms of validity and reliability by applying it to the parents of children of 19 to 35-month-old children in another study. The final form of the scale consisted of 15 items in three sub-dimensions, namely, safety effectiveness, general attitudes and behavior (20). A validation study was conducted to determine the level of accuracy in terms of prediction of the PACV scale on parents' future vaccination behaviors. This study demonstrated the prediction validity and test-retest reliability of PACV (28).

Answers on scale questions were taken from three different response formats including closed-ended (Yes/No/I don't know), 5-item Likert type (Strongly Agree/Agree/Not Sure/Disagree/Strongly Disagree) and the scoring type (from 0 to 10). While using scoring scale items, hesitant responses were scored as 2, unstable responses were scored as 1, unhesitant responses were scored as 0, and points taken from each item were added without any weighting to determine the total score. A simple linear conversion table was used for the missing data. The lowest score that can be achieved in the scale is 0 and The highest score is 100 (100 points indicate high vaccination hesitation).

Translation Study

In this study, a "back translation" method was used as one of the scale translation techniques. Beaton et al. (29) suggested that the original scale should be translated by two independent translators and a third translator retranslates the translated scale back into its original language.

To adapt and use PACV, Opel, who is the original developer of the scale, was contacted by email and his written approval was obtained. The PACV scale was translated from English to Turkish by three people who are competent in both languages. Then, their translations were revised and edited by the researchers, and a common translation text was created. This translation of the scale in Turkish was then retranslated into English by a different translator. For PACV, the opinions of four academics in the health field were taken. Experts were asked to give each item a rating between 1 and 4 (1= Not Applicable, 4= Completely Appropriate) to evaluate the original version and translation of the scale and to assess language/expression suitability and content appropriateness. Based on these experts' assessments, no item was removed from the scale. The final version of the translation, which was created as a result of the experts' assessments, was prepared for use in the study by consulting a linguist who specializes in the Turkish language.

The scale was applied to 30 parents who had similar characteristics with the sample group but would not be included in the pilot study. After this stage, feedback was received from each parent in order to find which of the scale items were understandable and which were difficult to understand. Parents gave feedback mostly on the sixth item of the scale and expressed that this item was unclear or hard to understand. By considering the recommendations of the parents, the scale was given its final form.

Collection of Data

This study was conducted in the children's services and polyclinics of a private university hospital between January and February 2019. The criteria for inclusion in the study were determined as having a child under 6 years of age and an education level of being at least literate, and these

criteria were used in the selection of the sample. Written consent forms were taken from each participant. The scale forms were handed over to parents, and they were asked to deliver them after they finished answering these surveys. Completing the scale took the parents an average of 5 minutes.

Statistical Analysis

To adapt the PACV into the Turkish language, confirmatory factor analysis was conducted to determine accuracy of the three-dimensional structure developed previously by Opel et al. (20). Before the analysis, scale items with different ratings were scored between 0 and 2 points, as in the original, and factor analysis was performed through this scoring. The robust maximum likelihood estimation method was used based on the asymptotic covariance matrix when performing confirmatory factor analysis. Confirmatory factor analysis was carried out with the LISREL 8.80 program. Cronbach's alpha and McDonald's Omega reliability coefficients were calculated to determine the reliability of the measurements obtained. Jamovi (Version 0.9.5.12) (Computer Software) (https://www.jamovi.org) was used to calculate the reliability coefficient.

Ethics Committee Approval

Ethics Committee approval was given to the study at the 102nd meeting held by Istanbul Okan University Ethics Committee on 09.01.2019 (decision no: 11).

Results

The study group consisted of 242 parents with a mean age of 36.22 years, ranging from 20 to 56 years old. The descriptive characteristics of the participants are given in Table II.

Analyzing Table II, it can be seen that 90.1% of respondents (n=218) were mothers, and 9.9% of them (n=24) were fathers. It was determined that the ratio of parents who have a single child was 49.6% (n=120); the ratio of parents having two children was 42.1% (n=102); the ratio of parents having three children was 7% (n=17); and the ratio of parents having four or more children was 1.2% (n=3). It was determined that 12% of the participants (n=29) were 20 to 29 years old, and 87.6% of them (n=212) were 30 years old or older. Analyzing in terms of educational background, it was found that the majority of participants were holders of a bachelor's degree (n=117, 48.3%) or postgraduate degree (n=52, 21.5%) degree. 14.5% of the study group (n=35) consisted of participants whose income was less than their expenses; 26.4% (n=64) consisted of participants whose income was more than their expenses; and 58.7% of them (n=143) consisted of participants whose income was equal to their expenses.

In the confirmatory factor analysis conducted to examine the three sub-dimensions of the PACV scale, conformity of the model data was assessed by examining the conformity index values, factor load values and error variances. Conformity index values, factor load values [maximum (max)- minimum (min)] and error variance (max-min) values are presented in Table III; and the measurement model acquired as a result of this analysis is presented in Figure 1.

When Table III is examined, it is seen that the value is less than 3, thus, the model can be said to be very well adapted to the data. The comparative fit index value was found to be 0.97, and the Normed Fit index value was determined to be 0.95. The fact that these values were over 0.90 indicates that the model is perfectly adapted to the data. Since the goodness of fit index value was 0.71 and this value was under 0.90, it means that there was no adaptation

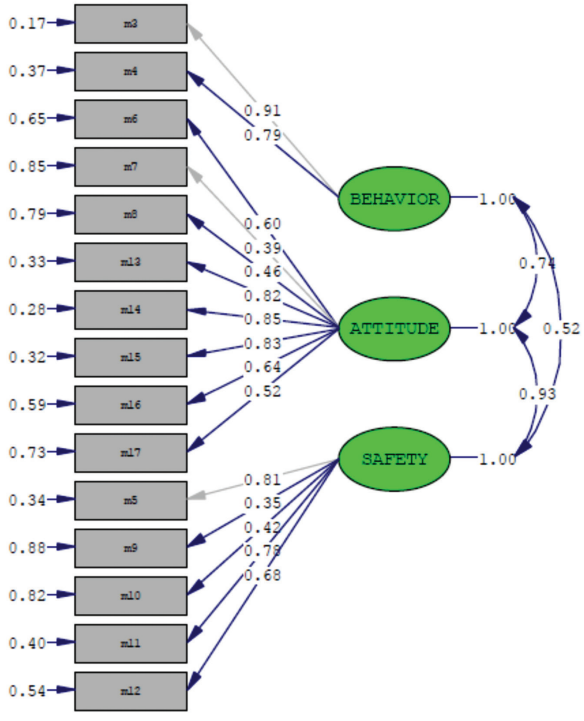
Table II. Descriptive statistics related to demographic characteristics of participants

		f	%			f	%
Parent	Mother	218	90.1	**Educational Background**	Primary school/Primary education	8	3.3
	Father	24	9.9		High school	35	14.5
Number of Children	1	120	49.6		Undergraduate	30	12.4
	2	102	42.1		Bachelor's degree	117	48.3
	3	17	7.0		Postgraduate	52	21.5
	4 and more	3	1.2	**Economic Situation**	My income is less than my expenses	35	14.5
Age	20-29 years	29	12.0		My income is more than my expenses	64	26.4
	30 years old and more	212	87.6		My income is equal to my expenses	143	58.7
	Have not specified	1	0.4		Have not specified	1	0.4

between the data and the model according to this index. The root mean error of approximation index is 0.080 for the model, and it is possible to say that the model showed adaptation to the data when it is evaluated according to this index. The general analysis of the adaptation indices shows that the three-dimensional model was adapted well to the data. Factor load values for items in each dimension varied between 0.35 and 0.91. Since the factor load values were over 0.30, it can be said that each item serves its purpose in its dimension.

Descriptive statistics and factor load values for answers given to each item in the PACV scale are presented in Table IV.

Cronbach's Alpha and McDonald's Omega Coefficients were used to examine the reliability of the scores acquired from PACV used within the scope of this study. These findings are presented in Table V.



Chi-Square=221.67, df=87, p-value=0.0000, RMSEA=0.080

Figure 1. Measurement model of parent attitudes about childhood vaccines scale

When examining Table V, it can be seen that the reliability values for the scores of the scales used in the study varied between 0.61 and 0.85. Based on the calculated confidence index values, it can be said that the scores obtained from the scale in general are reliable.

Discussion

The determination of hesitations about immunization and vaccination in the community is very important in planning necessary interventions. At the same time, measurement tools are also needed to determine the effectiveness of interventions.

In this study, the PACV scale was adapted into the Turkish language, applied to 242 parents, and its validity and reliability were determined. According to the results of our analysis, the 15 items on the original scale were preserved on the Turkish scale. According to the results of the factor analysis, it was determined that the Turkish scale was also in a three-factor structure as was the original scale. The Cronbach's alpha coefficients of the original scale had an internal consistency ranging from 0.74 to 0.84. The Cronbach's alpha reliability value of the Turkish scale was determined to be 0.84.

The determination of attitudes and hesitations towards vaccinations was not one of the main objectives of this study. However, this study yielded results regarding parents' attitudes towards childhood vaccinations. The absence of published data concerning parents' hesitations towards vaccinations in Turkey has made these results significant. 11.6% of the parents who participated in this study reported that they decided not to vaccinate their children without any exemptions. In a similar study conducted in North America, the parents' rate of declining one or more vaccines was found to be 15% (30). Another important conclusion revealed in this study is that 28.1% of parents describe themselves as hesitant about childhood vaccinations. In a study conducted in the United States, this rate was found

Table III. Confirmatory factor analysis results of parent attitudes about childhood vaccines scale

			p	CFI	GFI	NFI	RMSEA	Factor Load Values		Error Variances	
								max	min	max	min
Scale	221.67	2.55	0.000	0.97	0.71	0.95	0.080	0.91	0.35	0.88	0.17
Recommended Value		$\chi 2/df \leq 3$		≥0.90	≥0.90	≥0.90	≤0.080	≥0.30		≤0.90	

Max: Maximum, min: Minimum, $\chi 2$: Chi square index, CFI: Comparative fit index, GFI: Goodness of fit index, NFI: Normed fit index, RMSEA: Root mean square error of approximation

Table IV. Descriptive statistics and factor loads of parent attitudes about childhood vaccines scale

		n (%)	Factor Load Values		
			Safety & effectiveness	**General attitudes**	**Behavior**
3. Have you ever delayed having your child get a shot without any risks of illness or allergy?	Yes	14 (5.8)			0.91
	No	228 (94.2)			
	Don't know				
4. Have you ever delayed having your child get a shot (not including seasonal flu or swine flu (H1N1) shots) for reasons other than illness or allergy?	Yes	28 (11.6)			0.79
	No	213 (88.0)			
	Don't know	1 (0.4)			
5. How sure are you that following the recommended shot schedule is a good idea for your child?	0-5*	37 (15.3)	0.81		
	6-7	28 (11.6)			
	8-10	117 (73.1)			
6. Children get more shots than are good for them.	I agree	50 (20.7)		0.60	
	I Disagree	118 (48.8)			
	I'm not sure.	74 (30.6)			
7. I believe that many of the illnesses that shots prevent are severe.	I agree	196 (81.0)		0.39	
	I disagree	22 (9.1)			
	I'm not sure.	24 (9.9)			
8. It is better for my child to develop immunity by getting sick than to get a shot.	I agree	57 (23.6)		0.46	
	I disagree	124 (51.2)			
	I'm not sure.	61 (25.2)			
9. It is better for children to get fewer vaccines at the same time.	I agree	100 (41.3)	0.35		
	I disagree	52 (21.5)			
	I'm not sure.	90 (37.2)			
10. How concerned are you that your child might have a serious side effect from a shot?	I am worried	119 (49.2)	0.42		
	I am not worried	84 (34.7)			
	I'm not sure.	39 (16.1)			
11. How concerned are you that anyone of the childhood shots might not be safe?	I am worried	73 (30.2)	0.78		
	I am not worried	122 (50.4)			
	I'm not sure.	47 (19.4)			
12. How concerned are you that a shot might not prevent the disease?	I am worried	70 (28.9)	0.68		
	I am not worried	123 (50.8)			
	I'm not sure.	49 (20.2)			
13. If you had another infant today, would you want him/her to get all the recommended shots?	Yes	201 (83.1)		0.82	
	No	11 (4.5)			
	Don't know	30 (12.4)			

14. Overall, how hesitant about childhood shots would you consider yourself to be?	I am hesitant	68 (28.1)		0.85	
	I am not hesitant	148 (61.2)			
	I'm not sure.	26 (10.7)			
15. I trust the information I receive about shots.	I agree	170 (70.2)		0.83	
	I disagree	20 (8.3)			
	I'm not sure.	52 (21.5)			
16. I am able to openly discuss my concerns about shots with my child's doctor.	I agree	180 (74.4)		0.64	
	I disagree	32 (13.2)			
	I'm not sure.	30 (12.4)			
17. All things considered, how much do you trust your child's doctor?	0-5**	28 (11.6)		0.52	
	6-7	44 (18.2)			
	8-10	170 (70.2)			

*The response category is between 0 and 10 (From "0 = I am not entirely sure" to "10 = I totally agree")
**The response category is between 0 and 10 (From "0 = I don't trust" to "10 = I certainly trust")

Table V. Reliability of scale scores

	Number of items	Cronbach's alpha	McDonald's omega
Safety & effectiveness	5	0.70	0.72
General attitudes	8	0.77	0.79
Behavior	2	0.61	0.63
Total	15	0.84	0.85

to be 33%; in another study conducted in Italy, this rate was 34.7%; and in another study conducted in Iraq, it was found to be 20.9%. The change in the proportion of hesitation in different countries may arise due to the contextual or group effects based on cultural differences (4).

Study Limitations

The sample group of the study was formed by people of relatively higher levels of income and education. This situation should be considered as a limitation of this study in assessing vaccine hesitation rates in the general population. It is recommended to carry out studies in larger samples by paying attention to provincial, district and socio-demographic distributions. Furthermore, there is a need for studies in which the correlation is assessed with another measurement tool of vaccine hesitation.

Conclusion

The three-factor structure of the PACV scale was adapted into the Turkish language in a reliable and valid way. This adapted scale is suitable for the determination of vaccine hesitations. It will also be a proper tool to compare national results with international findings.

Ethics

Ethics Committee Approval: Ethics Committee approval was given to the study at the 102nd meeting held by Istanbul Okan University Ethics Committee on 09.01.2019 (decision no: 11).

Informed Consent: Written consent forms were taken from each participant.

Peer-review: Enternally peer-reviewed.

Authorship Contributions

Surgical and Medical Practices: D.A., Concept: M.A.B., Design: M.A.B., Data Collection or Processing: D.A., Analysis or Interpretation: E.D.H., Ö.G., Literature Search: D.A., Writing: D.A.

Conflict of Interest: None of the authors had conflict of interest.

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References

1. Dubé E, Vivion M, MacDonald NE. Vaccine hesitancy, vaccine refusal and the anti-vaccine movement: Influence, impact and implications. Expert Rev Vaccines 2015; 14:99-117.
2. Lane S, MacDonald NE, Marti M, Dumolard L. Vaccine hesitancy around the globe: Analysis of three years of WHO/UNICEF Joint Reporting Form data-2015-2017. Vaccine [Internet] 2018; 36:3861-7.
3. Domek GJ, O'Leary ST, Bull S, et al. Measuring vaccine hesitancy: Field testing the WHO SAGE Working Group on Vaccine Hesitancy survey tool in Guatemala. Vaccine [Internet] 2018; 36:5273-81.
4. World Health Organization (WHO). Report of the SAGE working group on vaccine hesitancy [Internet], 2014.
5. Opel DJ, Catz S, Wiese C, et al. Development of a survey to identify vaccine-hesitant parents. Hum Vaccin 2011; 7:419-25.

6. Hagood EA, Herlihy SM. Addressing heterogeneous parental concerns about vaccination with a multiple-source model: A parent and educator perspective. Hum Vaccines Immunother 2013; 9:1790-4.

7. Leach M, Fairhead J. Vaccine Anxieties Global Science, Child Health & Society. London: Earthscan 2007; 16-45.

8. Dubé E, Bettinger J, Fisher W, Naus M, Mahmud S, Hilderman T. Vaccine acceptance, hesitancy and refusal in Canada: Challenges and potential approaches. Canada Commun Dis Rep 2016; 42:246-51.

9. Dubé E, Laberge C, Guay M, Bramadat P RR& JAB. Vaccine hesitancy. Hum Vaccin Immunother 2013; 9:1763-73.

10. Larson HJ, Jarrett C, Eckersberger E, Smith DMD, Paterson P. Understanding vaccine hesitancy around vaccines and vaccination from a global perspective: A systematic review of published literature, 2007-2012. Vaccine [Internet] 2014; 32:2150-9.

11. Taddio A. Setting the stage for improved practices during vaccine injections: A knowledge synthesis of interventions for the management of pain and fear. Clin J Pain 2015; 31:1-2.

12. Çapanoğlu E. Sağlık çalışanı ve ebeveyn perspektifinden çocukluk çağı aşılarinin reddi niteliksel bir araştırma [dissertation]. Acıbadem Mehmet Ali Aydınlar Üniversitesi; 2018.

13. Jarrett C, Wilson R, Larson HJ, et al. Measuring vaccine hesitancy: The development of a survey tool. Vaccine 2015; 33:4165-75.

14. Allred NJ, Rickert DL, Santibanez TA, Santoli JM, Shaw KM. Parental vaccine safety concerns Results from the National Immunization Survey, 2001–2002. Am J Prev Med 2005; 28:221-4.

15. Freed GL, Clark SJ, Butchart AT, Singer DC, Davis MM. Parental Vaccine Safety Concerns in 2009. Pediatrics 2010; 125:654-9.

16. Luthy KE, Beckstrand RL, Callister LC. Parental hesitation in immunizing children in Utah. Public Health Nurs 2010; 27:25-31.

17. Bakhache P, Rodrigo C, Davie S, Ahuja A, Sudovar B, Rose M, et al. Health care providers' and parents' attitudes toward administration of new infant vaccines-a multinational survey. Eur J Pediatr 2012; 172:485-92.

18. My C, Danchin M, Willaby HW, Pemberton S, Leask J. Parental attitudes, beliefs, behaviours and concerns towards childhood vaccinations in Australia: A national online survey. Aust Fam Physician 2017; 46:145-51.

19. Greenberg J, Dubé E, Driedger M. Vaccine Hesitancy: In Search of the Risk Communication Comfort Zone. PLoS Curr [Internet] 2017; 9.

20. Opel DJ, Taylor JA, Mangione-Smith R, et al. Validity and reliability of a survey to identify vaccine-hesitant parents. Vaccine [Internet] 2011; 29:6598-605.

21. Roberts JR, Thompson D, Rogacki B, et al. Vaccine hesitancy among parents of adolescents and its association with vaccine uptake. Vaccine [Internet] 2015; 33:1748-55.

22. Correa A, Munoz FM, Kerr GB, et al. Development of a Spanish version of the parent attitudes about childhood vaccines survey. Hum Vaccin Immunother [Internet] 2019; 0:1-24.

23. Raof AM. Parental attitude and beliefs towards child vaccination: identifying vaccine hesitant groups in a family health center, Erbil city, Iraq. World Fam Med 2018; 16:17-26.

24. Mohd Azizi FS, Kew Y, Moy FM. Vaccine hesitancy among parents in a multi-ethnic country, Malaysia. Vaccine [Internet] 2017; 35:2955-61.

25. Strelitz B, Gritton J, Klein EJ, et al. Parental vaccine hesitancy and acceptance of seasonal influenza vaccine in the pediatric emergency department. Vaccine [Internet] 2015; 33:1802-7.

26. Napolitano F, D'Alessandro A, Angelillo IF. Investigating Italian parents' vaccine hesitancy: A cross-sectional survey. Hum Vaccines Immunother [Internet] 2018; 14:1558-65.

27. Dubé È, Farrands A, Lemaitre T, et al. Overview of knowledge, attitudes, beliefs, vaccine hesitancy and vaccine acceptance among mothers of infants in Quebec, Canada. Hum Vaccin Immunother [Internet] 2019; 15:113-20.

28. Opel DJ, Taylor JA, Zhou C, Catz S, Myaing M, Mangione-Smith R. The Relationship Between Parent Attitudes About Childhood Vaccines Survey Scores and Future Child Immunization Status: A Validation Study. JAMA Pediatr 2013; 167:1065-71.

29. Beaton DE, Bombardier C, Guillemin F, Ferraz MB. Guidelines for the Process of Cross-Cultural Adaptation of Self-Report Measures. Spine (Phila Pa 1976) [Internet] 2000; 25:3186-91.

30. Gilkey MB, McRee AL, Magnus BE, Reiter PL, Dempsey AF, Brewer NT. Vaccination confidence and parental refusal/delay of early childhood vaccines. PLoS One. 2016; 11:1-12.

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Original Article

The Influence of Maternal Factors on Children's Oral Health: Mothers' Age, Education Level, Toothbrushing Habit and Socioeconomic Status

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ABSTRACT

Aim: This study aimed to determine the influence of maternal factors on their children's oral health.

Materials and Methods: A total of 148 individuals aged between 5 and 14 years were included in this study. The children were randomly selected from their Dental Hospital Files. The oral hygiene habits and the examinations of the children and their mothers were evaluated. Clinical examination included decayed, missing or filled permanent teeth and decayed missed filled primary tooth indices. Statistical analyses were performed using Mann-Whitney, Kruskal-Wallis and Correlations test.

Results: The main finding of this study is that the mothers' socioeconomic status significantly affects their children's caries frequency. The caries incidence of those children whose mothers have high income was lower than those of children whose mothers have either moderate or low income. A relationship was found between the mothers' level of education and their children's toothbrushing habit. As the frequency of toothbrushing by the mothers increased, the frequency of toothbrushing by their children increased. It was found that as the mothers' age increased, the caries frequency of their children decreased.

Conclusion: A statistically significant result was found between the caries indices of children and the economic level of their mothers. A positive correlation between the mothers' level of education and the frequency of toothbrushing by their children was found.

Keywords: Caries, child, mother, socioeconomic status

Introduction

Caries is a public health problem, affecting both underdeveloped and industrialized nations (1). It is thought that caries are the most prevalent diseases in children and sugar is a significant factor in caries development together with poor oral hygiene (2). It was shown in one study about caries and their related factors in children that children who eat sweetened foods were more likely to have caries than children who do not have such nutritional habits (3). Other studies stated that the presence of caries was associated with a lower frequency of toothbrushing (4) and that children whose parents assisted them with toothbrushing had a better oral health status and lower caries scores (5). Furthermore, it was reported in another previous study that there was a relationship between the consumption of cariogenic foods and high caries risk (6). Adeniyi et al. (7) stated that maternal factors affected the oral health status of their children. It was also stated that mothers played an important role in reducing the risk of caries of their children. The findings of Shearer et al. (8) study put forward that

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mothers with poor oral health were likely to have children who also have poor oral health. Paglia stated that pediatric dentists should focus on the mother's education to prevent caries in their children (2). As a result of these findings, this study aimed to determine the influence of maternal factors on their children's oral health.

Materials and Methods

The dental examinations were carried out by one pedodontist using a dental mirror and explorer at a Pediatric Clinic at a Dental Hospital. A total of 148 individuals aged between 5 and 14 years and registered in the Dental Hospital files were included in this study. The children were randomly selected from the Dental Hospital Files. The files included the child's and parent's consent form, the child's age, gender, frequency of sugar intake, the mother's age, her education level, her toothbrushing habits and her socioeconomic status. The mothers' monthly income status was evaluated in three groups; low-income (0-200 €), moderate-income (201-600 €) and high-income (601 € and over). Clinical examination included decayed, missing or filled permanent teeth (DMFT) and decayed missed filled primary tooth (dmft) indices. Exfoliated teeth in primary and mixed dentition, unerupted teeth, and teeth extracted for other reasons apart from caries were not included in the indices. The inclusion criteria were children aged between 5-14 years. The exclusion criteria were the presence of a systemic disease or the inability to cooperate with the dental practitioner. Ethical approval for this study was given by the Ethics Committee of the University and Ministry of Health Provincial Health Directorate Dental Hospital Chief Physician (approval number: 2019/02)

Statistical Analyses

Statistical analyses were performed using Mann-Whitney, Kruskal-Wallis and Correlations test.

Results

The DMFT and dmft values of children are shown in Table I. The frequency of consuming sweets, the mother's age, her education level, tooth brushing habits, and monthly income are shown in Table II.

No statistically significant difference was found between boys and girls regarding the dmft index with the mixed dentition giving a p=0.717>0.05 and the DMFT index with permanent dentition giving a p=0.238>0.05 (Mann-Whitney U test).

Table I. Decayed missed filled teeth index for permanent dentition and dmft values of children

Gender	DMFT ± SD	DMFT ± SD
Girl	2.71±0.65	2.80±0.33
Boy	2.79±0.61	2.17±0.48
Total	2.74±2.49	2.61±2.36

DMFT: Decayed missed filled teeth index for permanent dentition, dmft: Decayed missed filled teeth index for primary dentition, SD: Standard deviation

Table II. The frequency of consuming sweets of children, monthly income, education level and ages of mothers, frequency of toothbrushing of children

Frequency of consuming sweets of children	**%**
Once a day	27.0
2-3 times a day	66.2
4 or more times a day	6.8
Monthly income	**%**
Low income	37.8
Moderate income	54.1
High income	8.1
Mother's education level	**%**
Primary- secondary school	68.3
High school	19.5
University	12.2
Mother's age	**%**
25-30	12.3
31-35	22.4
36-40	34.7
41-45	20.4
46-50	6.1
51-55	4.1
Frequency of toothbrushing of children	**%**
None	16.2
Irregular	83.8
1-2 times a day	0

Table III. Association between caries of the children (DMFT, dmft) and their mothers' monthly income

	Mother's monthly income			
Caries value	**Low income**	**Moderate income**	**High income**	**p**
DMFT	2.71±2.35	2.83±2.38	0.67±1.63	0.06
dmft	3.31±2.52	2.20±2.56	3.00±2.00	0.46

DMFT: Decayed missed filled teeth index for permanent dentition, dmft: Decayed missed filled teeth index for primary dentition

It was shown that increasing DMFT scores in the children were associated with their frequency of consuming sweets (p=0.036<0.05) (Kruskal-Wallis test). However, no relationship was found between the dmft scores of children and their frequency of consuming sweets (p=0.179>0.05) (Kruskal-Wallis test).

No relationship was found between the DMFT of children and their parent's monthly income (p=0.461>0.05) (Kruskal-Wallis test) Table III. However, there was a relationship between the DMFT scores of the children and their parent's monthly income. The DMFT scores of those children whose parents had high income were lower than those of children whose parents had a moderate income (p=0.021<0.05) (Kruskal-Wallis test). Additionally, the DMFT values of those children whose parents had high income were lower than that of those children whose parents had low income (p=0.042<0.05) (Kruskal-Wallis test) Table III.

There was a relationship between the DMFT values of the children and the age of their mothers. As the age of the mothers increased, the DMFT values of their children decreased in the groups with the mothers' ages between 31-45 (p=0.014<0.05) (Correlations test). There was no relationship between the DMFT values of the children and the age of their mothers in the other age groups.

As the frequency of toothbrushing of the mothers increased, the frequency of toothbrushing of their children increased (p<0.05). There was no relationship between the frequency of the mothers' toothbrushing and the number of caries of their children (p>0.05) (Kruskal-Wallis test) Table IV.

As the mothers' level of education increased, the frequency of toothbrushing of their children increased (p<0.05) (Kruskal-Wallis test). There was no relationship between the mother's level of education and the number of caries of their children (p>0.05) (Mann-Whitney U test) Table V. There was no relationship between the mothers' level of education and the frequency of consuming sweets of their children (p=0.235>0.05) Table VI.

Table IV. Association between caries of the children (DMFT, dmft) and their their mothers' toothbrushing frequency

	Mother's toothbrushing frequency			
Caries value	**Irregular Mean ± SD**	**1x/day Mean ± SD**	**2x/day Mean ± SD**	**p**
DMFT	2.56±2.65	2.34±2.40	2.88±2.30	0.55
dmft	2.00±2.82	2.56±2.25	3.40±2.79	0.50

DMFT: Decayed missed filled teeth index for permanent dentition, dmft: Decayed missed filled teeth index for primary dentition, SD: Standard deviation

Discussion

It was stated that caries are associated with risk factors and sugar intake, while the mother's educational level and socioeconomic status are predictors (9,10). Santos et al. (11) stated that there was a relationship between the lower socioeconomic status of mothers and the higher prevalence of caries in their children. Tinanoff and Reisine (12) stated that children from low socioeconomic status are likely to have more early childhood caries during the preschool age. Pinto et al. (13) also announced that higher socioeconomic status was a protective factor against the occurrence of dental caries. That study presented all mothers had a similar educational level and similar low socioeconomic status. Mothers with high socioeconomic status were not included in this study. For this reason, it is difficult to assign that there was a relationship between low socioeconomic status and lower education level among the mothers. It was found that there was a relationship between the DMFT scores of the children and their mothers' monthly income in the present study. The main finding of this study is that the mothers' socioeconomic status significantly affects their children's caries incidence. The caries incidence of those children whose mothers have high income was lower than those of children whose mothers have either moderate or low income.

The second finding of this study is that there was a relationship between the mothers' level of education

Table V. Association between caries of the children (DMFT, dmft) and their mothers' education level

	Mother's education level			
Caries value	**Primary-secondary school**	**High school**	**University**	**p**
DMFT	2.60±2.37	2.77±2.42	2.44±2.55	0.93
dmft	3.00±2.65	2.20±1.92	-	0.61

DMFT: Decayed missed filled teeth index for permanent dentition, dmft: Decayed missed filled teeth index for primary dentition

Table VI. Association between frequency of consuming sweets of children and their mothers' education level

	Mother's education level			
Frequency of consuming sweets of children	**Primary-secondary school**	**High school**	**University**	**p**
Once a day	25%	15.4%	55.6%	0.23
2-3 times a day	69.2%	76.9%	33.3%	
4 or more times a day	5.8%	7.7%	11.1%	

and their children's toothbrushing habit. Goldenfum et al. (14) also stated that when there was a higher mother's educational level, the frequency of children's toothbrushing increased to three times a day. It was stated in another study that the mothers' higher level of oral health knowledge was associated with their children's twice-daily toothbrushing (15). In this study, it was also found that there was a positive correlation between the mothers' education level and their children's toothbrushing frequency. As the mothers' level of education increased, the frequency of their children's toothbrushing increased.

The third finding of this study is that there was no relationship between the mothers' level education and their children's caries incidence. Folayan et al. (16) also stated that the mothers' and their children's knowledge of caries preventive measures were not predictors of the presence of caries.

The fourth finding of this study is that there was no relationship between the mothers' level of education and their children's frequency of consuming sweets. It was stated that there was a correlation between the high prevalence of caries and sugar consumption (17). Goldenfum et al. (14) also stated that the frequency of sugar intake could be considered as risk indicators for caries in the child population. Another study also showed that an increase of the caries index was associated with sugar consumption in children (18). It was also shown in this study that an increase of the caries indices in children was associated with their frequency of consuming sweets. However, no relationship between the frequency of consuming sweets of children and their mothers' level of education was found in this study.

The fifth finding of this study is that there was no relationship between the frequency of the mothers' toothbrushing and the number of caries of their children. However, as the frequency of toothbrushing of the mothers increased, the frequency of toothbrushing of their children increased. Shearer et al. (8) also stated that the mothers' oral hygiene and habits could have an impact on their children's oral health and could be a risk indicator for poor oral health among the offspring later in their adulthood. Rahbari et al. (19) study revealed that there was also a significant relationship between the frequencies of the mother's toothbrushing and the frequency of their children's toothbrushing.

Study Limitations

The sixth finding of this study is that there was a relationship between the ages of the mothers and the caries indices of their children. As the age of the mothers increased, the caries values of their children decreased with those mothers whose ages were between 31-45 years in this study. Similar results were not found in those mothers younger than 31 years or older than 45 years. There were no similar results or implications to compare the results of this current conclusion with.

Conclusion

It was observed that the age, education level, toothbrushing habit and socioeconomic status of mothers have a significant effect on the oral health of their children. A mother's oral hygiene and brushing habits could affect her child's oral health. However, in this study, it was observed that the children's caries incidence was not affected by their mothers' habits.

Ethics

Ethics Committee Approval: Ethical approval for this study was given by the Ethics Committee of the University and Ministry of Health Provincial Health Directorate Dental Hospital Chief Physician (approval number: 2019/02).

Informed Consent: Consent was obtained from her parents.

Peer-review: Externally peer-reviewed.

Authorship Contributions

Surgical and Medical Practices: B.K., İ.U., Concept: B.K., İ.U., Design: B.K., İ.U., Data Collection: B.K., İ.U., Analysis and Interpretation: B.K., İ.U., Literature Search: B.K., İ.U., Writing: B.K., İ.U.

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References

1. Paglia L. Friuli S, Colombo S, Paglia M. The effect of added sugars on children's health outcomes:Obesity, Obstructive Sleep Apnea Syndrome (OSAS), Attention-Deficit/Hyperactivity Disorder (ADHD) and Chronic Diseases. European Journal of Paediatric Dentistry 2019; 20:127-32.
2. Paglia L. Oral prevention starts with the mother. European J of Paediatric Dent 2019; 20:173.
3. Alhabdan YA, Albeshr AG, Yenugadhati N, Jradi H. Prevalence of dental caries and associated factors among primary school children: a population-based cross-sectional study in Riyadh, Saudi Arabia. Environ Health Prev Med 2018; 23:60.
4. Silva JS, Silva FDSCM, Forte FDS, Sampaio FC. Caries prevalence and risk indicator among 2- to 6- year-old children at the clinic of preventive dentistry of the UFPB. Revista Odonto Ciência 2006; 21:17-21.

5. Pieper K, Drerrler S, Heinzel-Gutenbrunner M, Neuhäuser A, Krecker M, Wunderlich K, Jablonski-Momeni A. The influence of social status on pre-school children's eating habits, caries experience and caries prevention behaviour. Int J Public Health 2012; 57:207-15.

6. Peres MA de Oliveira Latorre Mdo R, Sheiham A, Peres KG, et al. Social and biological early life influences on severity of dental caries in children aged 6 years. Community Dent Oral Epidemiol 2005; 33:53-63.

7. Adeniyi OO, Ogunbodede EO, Jeboda SO, Folayan MO. Do maternal factors influence the dental health status of Nigerian preschool children. Int J Paediatr Dent 2009; 19:448-54.

8. Shearer DM, Thomson WM, Broadbent JM, Poulton R. Maternal oral health predicts their children's caries experience in adulthood. J Dent Res 2011; 90:672-7.

9. Corrêa-faria P, Paixão-gonçalves S, Paiva SM, Pordeus IA. Incidence of dental caries in primary dentition and risk factors: a longitudinal study. Braz Oral Res 2016; 30.

10. Lopes LM, Vazquez FL, Pereira AC, Romão DA. Indicators and risk factors of dental caries in children in Brazil - a literature review. RFO UPF 2014; 19.

11. Santos Junior V, Sousa RM, Oliveira MC, Caldas Junior AF, Rosenblatt A. Early childhood caries and its relationship with perinatal, socioeconomic and nutritional risks: a cross-sectional study. Oral Health 2014; 6:47.

12. Tinanoff, N, Reisine, S. Update on early childhood caries since the Surgeon General's Report. Acad Pediatr 2009; 9:396-403.

13. Pinto GDS, Azevedo MS, Goettems ML, Correa MB, Pinheiro RT, Demarco F. Are Maternal Factors Predictors for Early Childhood Caries? Results from a Cohort in Southern Brazil. Braz Dent J 2017; 28:391-7.

14. Goldenfum GM, Silva NC, Almeida LA, et al. Risk indicators of caries lesion activity in children. European Journal of Paediatric Dentistry 2019; 20:179-82.

15. Saied-Moallemi Z, Virtanen JI, Ghofranipour F, Murtomaa H. Influence of mothers' oral health knowledge and attitudes on their children's. European Archives of Paediatric Dentistry 2008; 9:79-83.

16. Folayan MO, Kolawole KA, Oyedele T, et al. Association between knowledge of caries preventive practices, preventive oral health habits of parents and children and caries experience in children resident in sub-urban Nigeria. BMC Oral Health 2014; 14:156.

17. Valentak LJ, Najzar-Fleger D, Rajic Z. Effect of Diet and Dietary Habits on Caries. Acta Stomatol Croat 1995; 29:41-6.

18. Elidrissi SM, Naidoo ES. Prevalence of dental caries and toothbrushing habits among preschool children in Khartoum State, Sudan. International Dental Journal 2016; 66:215-20.

19. Rahbari M, Gold J. Knowledge and behaviours regarding early childhood caries among low-income women in Florida: a pilot study. J Dent Hyg 2015; 89:132-8.

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Original Article

Knowledge, Attitudes and Practices of Pediatricians about Effects of Pediatric Drugs on Oral Health: A Survey Study

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ABSTRACT

Aim: Pediatricians may be able to play an important and effective role in providing forward guidance on children's oral health. When they make the right recommendations, the erosive, cariogenic and staining effects of medications are predicted to reduce. The objective of this research is to assess the knowledge, attitude and practices of pediatricians concerning the effects of medication use on oral health.

Materials and Methods: A cross-sectional, descriptive survey study was conducted on pediatricians in İstanbul, Turkey. Data were collected by distributing a questionnaire to pediatricians working in hospitals and private clinics. Differences between the proportions of categories were assessed using the chi-square tests. For the differences between two ordinal variables, rank sums nonparametric test Mann-Whitney U test was used for quantitative analysis.

Results: 54.3% of the responders informed patients about oral health after prescribing drugs. Only 27% of the pediatricians felt knowledgeable about informing parents about oral care after drug use. Only 17.7% of them agreed with the statement that their training about oral health during medical school/pediatrics is adequate.

Conclusion: There is a need to organize the curriculum relating to oral health in pediatrics education and to increase the level of knowledge of pediatricians through educational programmes.

Keywords: Oral health, pediatrician, dental caries, pediatric drug, tooth staining

Introduction

Liquid oral medicines are extensively recommended for children. Acids are added to medications as a buffering agent to maintain chemical stability to maintain tonicity and physiological compliance and also sugars are added to enhance the taste, consistency and compatibility of the medication (1,2). The high frequency of intake, low pH, high titratable acidity, high viscosity, bedtime consumption, salivary flow reduction and high sugar content affects the cariogenic and erosive potential of these medications (3,4). Iron supplements may lead to caries and dental erosion in addition to one of its main problems being tooth staining. Tooth staining is a major cause of concern among parents and can adversely affect the social interactions of preschool children (5). The ionic form of ferric sulfide has been suspected as it may interact with gingival cervical fluid and bacterial hydrogen sulfide to produce iron stains (6). Additionally, powdered or aerosol versions of inhaled medications are acidic and have erosive potential especially when used on a regular basis and over long period of time (7).

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Many recommendations have been made for minimizing tooth damage caused by medications. The patient should be advised to rinse the mouth immediately after taking the medicine (8). Immediate toothbrushing is not recommended because of the increased risk of abrasive wear on the softened/eroded surface and so it should be delayed for at least 20 min after an erosive attack and possibly up to 60 min (9).

Parents infrequently bring their children to visit a dentist to check dental diseases. Pediatricians are the main contributors of premier healthcare for children due to their frequent communication with families for check-up visits in the early years of a child's life. They can play an important and effective role in providing forward guidance on children's oral health (10). The American Academy of Pediatrics (AAP) places emphasis on the substantial role of pediatricians in oral health (10). When the right recommendations are made, the erosive, cariogenic and staining effects of medications are predicted to reduce.

Although there are some published articles researching the knowledge and attitudes of pediatricians towards pediatric medicines and their cariogenic and erosive potentials, there is no published data on pediatrists' knowledge and attitudes on suspension or inhaler form medications' effects and no data about their knowledge and attitudes of iron supplements' staining effects.

The objective of this research is to assess the knowledge, attitude and practices of pediatricians on the effects of medication use on oral health.

Materials and Methods

Ethics approval was obtained from the institutional ethics and research committee of the University of Health Sciences (12/18) (Approval number:18/103). Informed consent was taken from the people who participated in study.

A cross-sectional, descriptive survey study was conducted on pediatricians in Istanbul, Turkey. In order to estimate their knowledge, attitudes and practices on tooth decay, dental erosion and tooth staining relating to pediatric medications, a survey was carried out. Certain tools utilized in previous studies were adapted to this survey. We utilized material from previous studies that investigated the relationship between dental caries and dental erosion (3-5,7), and also tooth staining (6). A draft questionnaire was prepared and this was evaluated by one pediatrician, one pediatric dentist and one biostatistics specialist.

The questionnaire included items concerning demographics, most frequently prescribed medicaments and also knowledge, attitudes and practices about the effects of medication use on oral health. Pediatricians were asked about the erosive, dental caries and tooth staining effects of suspensions, inhalers and iron preparations. In addition; pediatricians were asked about their oral health recommendations after prescribing medications. In relation to some items on the questionnaire, there was the choice of marking a single answer, for instance 'true, false or not sure' or the options 'agree, disagree or not sure' for other items. There was also an open-ended question.

Random cluster sampling was used (Table I). An estimated 300 pediatricians were included in this study.

Data were collected by distributing the questionnaire to those pediatricians working in hospitals and private clinics. Initially, an informed consent form that explained the objectives of the study and ensured data confidentiality was completed. Following this, the surveys were distributed and gathered in on the same day (via the face-to-face method). Data were collected between January 1st and March 29th, 2019.

www.e-picos.com, New York was utilized for the statistical analysis of the collected data. Chi-square tests were used to examine the differences between proportions of categories. The number of daily patients and years

Table I. Random cluster sampling methodology of the work

Status	Real population size (private hospital)	Real population size (public hospital)	Estimated population size (private hospital)	Estimated population size (public hospital)	Actual population size (private hospital)	Actual population size (public hospital)
Research assistant	481		105		71	
Specialist	466	358	103	79		
Associate professor	16	14	4	3		
Professor	20	8	4	2		
Total	1363		300		300	

of practice were divided into 4 groups using median and quartiles (25-75). For the differences between two ordinal variables, rank sums non-parametric test Mann-Whitney U tests were used for quantitative analysis. P-value of less than 0.05 was accepted as a statistically significant difference. Qualitative data analysis was used for open-ended questions.

Results

Responder Characteristics

The 28 questions included on the questionnaire were answered by 300 pediatricians. The questionnaires were carried out by a hand delivery system to increase the response rate and reliability.

All responders were from İstanbul, TURKEY. The median age was 38 [IQR (30.46)] and 60.7% were female. The demographic characteristics of the responders are shown in Table II.

Knowledge

58% of pediatricians agreed that dental caries and 49.3% that dental erosion due to the use of suspension form drugs (antibiotics, analgesics) is expected. 44.3% of pediatricians agreed that dental caries and 39.7% that dental erosion due to the use of iron preparations is expected. Most (90%) pediatricians agreed that tooth staining due to iron preparations is expected. 41% of pediatricians agreed that dental caries and 55.3% that dental erosion due to the use of inhaler drugs is expected. Also 76.3% of them agreed that taking medication before going to bed at night may increase the risk of dental caries.

Attitudes and Practices

The majority of pediatricians (47%) agreed that the acidity of the drugs that they prescribe is important for them. Most of them (62.7%) agreed that the sugar content of the drugs that they prescribe is important for them. 70.3% of pediatricians recommended that their patients rinse their mouth after using suspension/inhaler drugs (Table III) (Figure 1).

54.3% of the responders inform patients about oral health after prescribing drugs (Figure 2). However, for those pediatricians who practice at a private hospital, the rate of informing patients about oral health after prescribing drugs was significantly higher (Z:-1.981) and at public hospitals is lower than the university hospitals and others ($p<0.05$) (Z:3.451). This rate was high for associate professors and professors (Z:-3.319) and low for research assistants. ($p<0.05$) (Z:3.574). In addition to this, this rate was lower for pediatrists who have been working for less than 3 years (Z:2.034) and significantly higher for those physicians who have been working for 9-17 years ($p<0.05$) (Z:-2.227).

Only 27% of pediatricians felt knowledgeable about informing parents about oral care after drug use. Pediatricians who have been practicing at a university hospital felt less knowledgeable (Z:-2.733), while pediatricians at public hospitals felt more knowledgeable ($p<0.05$) (Z:2.268). This rate was low for research assistants (Z:2.995) and high for associate professors/professors ($p<0.05$) (Z:-4.393). Also, this rate was significantly lower for pediatricians who have been working less than 3 years (Z:2.497) and significantly higher for those pediatricians who have been working for more than 17 years ($p<0.05$) (Z:-2.724). Moreover, this rate was lower for those pediatricians caring for 46 or more patients per day (Z:2.446) ($p<0.05$).

Additionally, only 17.7% of responders agreed with the statement that their training about oral health during medical school/pediatrics was sufficient (Table II) (Figure 3). However, pediatricians at a university hospital agreed that they received adequate training ($p<0.05$) (Z: -2.078). In addition, according to the year-based comparison, although the study period increases, the statement that their training about oral health during medical school/pediatrics was adequately was not rated significantly.

The majority of the pediatricians (68.7%) recommended that their patients brush their teeth after using a suspension/inhaler drug. 53% of them recommended

Table II. Overview of demographic characteristics

Demographics	**Mean (95% CI)**
Age	38.88 (24-65)
Years of practice	11 (1-37)
Daily number of patient	35.49 (3-150)
	Percentage (%)
Type of practice	
University	18.3
Public hospital	28.7
Private hospital	50
Other	3
Status type	
Research asisstant	23.7
Specialist	59.3
Assistant professor	8
Associate professor/Professor	9

CI: Confidence interval

brushing immediately after taking suspension/inhaler drugs. This immediately brushing recommendation rate was low for pediatricians at public hospitals (Z:-3.589) and high for pediatricians at private hospitals ($p<0.05$) (Z:2.503). This rate was high for research assistants (Z:-3.285) and low for associate professors/professors ($p<0.05$) (Z:3.291). However only 34.7% of responders advised brushing teeth 20 minutes after taking these types of drugs (Figure 3).

We asked the pediatricians the names of the most common analgesics, antibiotics, inhalers and iron preparations that they frequently prescribe. With respect to iron preparations, pediatricians prescribed Ferro Sanol (31%), Ferrum (27.7%) as the most common drug, and Sidefer (10.7%) as the second most common drug; with respect to antibiotics, they prescribed Augmentin (47%), Klamoks (23%) as the most common drug, and Macrol (10 %) as the second most common drug; with respect to analgesics, they prescribed Calpol (54.7%), Parol (19.3%) as the most common drug and Dolven (25.7%) as the second most common; with respect to inhaler preparations, they prescribed Ventolin (68%), Flixotide (15.3%) as the most common drug, and Pulmicort (13.3%) as the second most common.

Moreover; it was asked to the pediatricians 'What would be your approach when a parent complains about coloration/tooth decay/erosion which occurs after medication use?' 42% of the pediatricians replied that they would try to solve the problem by giving advice or take action such as change of medication, discontinuation of medication, better dental care and mouth rinsing. 57.5% of them answered that when they encountered such a problem, they would consult with a dentist or pediatric dentist. 0.5% of them answered that this problem is expected as a possible side effect and that they would state to the patient that it was normal. Especially, tooth staining was considered normal and there was no need to take any action.

The total recommendation scores of those pediatricians practicing at private hospitals are significantly higher compared to those working in public hospitals, university hospitals or others ($p<0.05$).

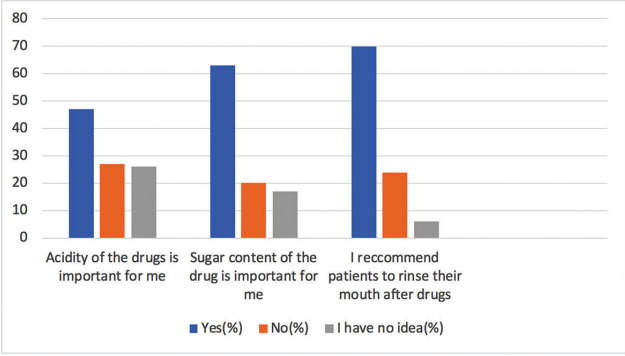

Figure 1. Attitudes of pediatricians

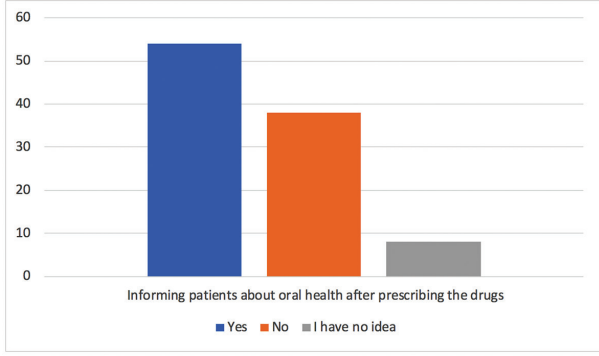

Figure 2. Informing patients about oral heath

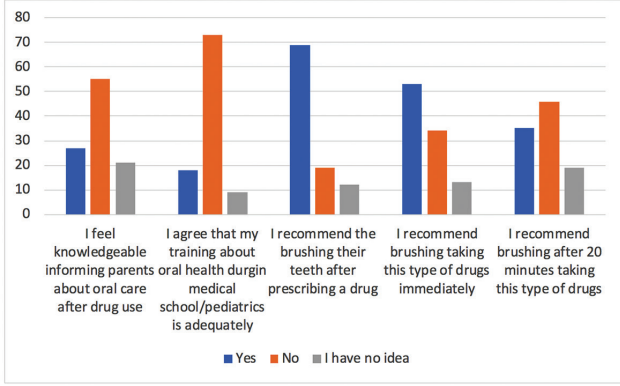

Figure 3. Practices of pediatricians

Table III. Attitudes and practices of the responders

	Agree (%)	Disagree (%)	Not sure (%)
The acidity of preparation I've prescribed is important for me.	141 (47)	81 (27)	78 (26)
The sugar content of preparation I've prescribed is important for me.	188 (62.7)	61 (20.3)	51 (17)
I reccommend my patients rinse their mouth after prescribing suspension/inhaler drug.	211 (70.3)	71 (23.7)	18 (6)
I inform my patients about oral health after prescribing drug.	163 (54.3)	113 (37.7)	24 (8)
I feel knowledgeable about informing parents oral heathcare after medication use.	81 (27)	165 (55)	54 (18)
I think my training about oral health during medical school/pediatrics is adequately.	53 (17.7)	219 (73)	28 (9.3)

Discussion

This is the first study to analyze data from a sample of pediatricians to assess their knowledge, attitude and practices concerning the effects of medication use on oral health.

Subjects related with oral health are included in only 33% of medical schools in many European countries' pediatrics training programmes (11). In contrast, in a US study, the vast majority of pediatricians received oral hygiene education in medical school (12). A high percentage of responders (73%) in the present study reported that their education about oral health during medical school/pediatrics was insufficient. When evaluating the findings of this study, we believe that the awareness of pediatricians about oral health should be improved. Inadequate training about oral health can be a challenge for pediatricians in the providing for children's oral health.

Most of the responders (90%) knew about the tooth staining effect of iron preparations, however, most of them were not aware of the relationship between pediatric suspension forms of drugs and caries formation (42%) or dental erosion (50.7%). Also, most of them were not aware of the relationship between inhaler drugs and caries formation (59%) or dental erosion (44.7%).

The European Academy of Pediatric Dentistry (EAPD) recommends no intake of sugar containing drinks or sweetened baby bottles especially at nighttime. This recommendation is based on 'common sense' due to the etiologic role of sugar in early childhood caries (13). Although there is no part about drugs in the recommendations, care should be taken not to take some drugs at night because of their content. 76.3% of the responders in the present study agreed that taking drugs at nighttime may increase the risk of dental caries.

After taking drugs, immediate toothbrushing is not recommended. It should be delayed for at least 20 minutes after an erosive attack and possibly up to 60 minutes because of the increased risk of abrasive wear on the softened/eroded surface (9). This study clearly indicates that the participants are not aware of this recommendation since only 34.7% of them advised brushing teeth 20 minutes after taking these types of drugs. 53% of them recommended brushing immediately after taking suspension/inhaler drugs. The recommendation rate for immediate brushing was lower for associate professors/professors ($p<0.05$). This result increases concerns about the quality of the educational content in medical schools concerning oral health and it is seen that awareness has been created through practical and academic experience.

Some pediatric drugs are highly recommended by the participants in the present study, the oral and dental effects of them are unknown so further studies are necessary with respect to the dental and oral effects of these drugs.

Only 27% of the study population feel knowledgeable about informing parents about oral healthcare after medication use, which is lower compared to a previous study (12) However, the rate for those pediatricians with more years of working experience was higher. In the study by Adamos et al. (11), it was seen that half (55%) of pediatricians with more than 10 years in practice felt confident about oral health in children, compared to 36% of the professionals with 5-10 years in practice and 31% of those with less than 5 years in practice ($p<0.05$). While the majority of the pediatricians did not feel sufficient, the rate of informing patients concerning oral health issues increased with the pediatricians level of experience. This indicates an ongoing lack of medical education related to oral health for pediatricians.

This study demonstrates that with respect to the rate of informing patients, practitioners at private hospital were higher. Also, associate professors/professors' rate was higher than research assistants. This rate of informing patients can be associated with the number of intensive patients.

54.3% of responders informed patients about oral health after prescribing drugs. The rate in private hospitals was higher. This rate is high for associate professors and professors and low for research assistants. In addition to this, the rate was lower for those pediatrists who had been working for less than 3 years and significantly higher for those physicians who had been working for 9-17 years. According to these results, an awareness about the effects of drugs on oral health develops through practical experience.

Conclusions

The results of this study provide information about need for oral health education programmes for pediatricians. Although most practitioners often encounter oral and dental effects of the drugs they recommend, they do not feel sufficiently knowledgeable to inform patients. There is a need to organize the curriculum related to oral health in pediatrics education and to increase the level of knowledge of pediatricians through educational programmes.

Ethics

Ethics Committee Approval: Ethics approval was obtained from the institutional ethics and research

committee of the University of Health Sciences (12/18) (approval number: 18/103).

Informed Consent: Informed consent was taken from the people who participated in study.

Peer-review: Externally peer-reviewed.

Authorship Contributions

Concept: Ş.T.K., Design: Ş.T.K., Data Collection or Processing: G.G.P., C.A., Analysis or Interpretation: E.A.K., Literature Search: Ş.T.K., Writing: Ş.T.K.

Conflict of Interest: No conflict of interest was declared by the authors.

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References

1. Maguire A, Baqir W, Nunn JH. Are sugars-free medicines more erosive than sugars-containing medicines? An in vitro study of paediatric medicines with prolonged oral clearance used regularly and long-term by children. Int J Paediatr Dent 2007; 17:231-8.
2. Kenny DJ, Somaya P. Sugar load of oral liquid medications on chronically ill children. J Can Dent Assoc 1989;55:43-6.
3. Duward C, Thou T. Dental caries and sugar containing liquid medicines for children in New Zealand NZ Dent J 1997;93:124-9.
4. Bigeard L. The role of medication and sugars in pediatric dental patients. Dent Clin North Am 2000; 44:443-56.
5. Kumar A, Kumar V, Singh J, Hooda A, Dutta S. Drug-induced discoloration of teeth: an updated review. Clin Pediatr (Phila) 2012; 51:181-5.
6. Addy M, Moran J. Mechanisms of stain formation on teeth, in particular associated with metal ions and antiseptics. Adv Dent Res 1995; 9:450-6.
7. Costa CC, Almeida ICS, Costa Filho LC. Erosive effect of an antihistamine-containing syrup on primary enamel and its reduction by fluoride dentifrice. Int J Paediatr Dent 2006; 16:174-180.
8. Kato MT, Sale-Peres SH, Buzalaf MA. Effect of iron on acid demineralisation of bovine enamel blocks by a soft drink. Arch Oral Biol 2007; 52:1109-11.
9. Attin T, Knofel S, Buchalia W, Tutuncu R. In situ evaluation of different remineralisation periods to decrease brushing abrasion of demineralised enamel. Caries Res 2001; 35:216-22.
10. Krol DM. Educating pediatricians on children's oral health: past, present and future. Pediatrics 2004; 13:487-93.
11. Adamos H, Zachi G, Stefano del TK, Michailidou, Diego VE, Rita C. Oral health training, knowledge, attitudes and practices of primary care paediatricians: a European survey. European Journal of Pediatrics 2018; 177:675-81.
12. Lewis CW, Grossman DC, Domoto PK, Deyo RA. The role of the pediatrician in the oral health of children: a national survey. Pediatrics 2000; 106:84.
13. Tinanoff N, Palmer CA. Dietary determinants of dental caries and dietary recommendations for preschool children. J Public Health Dent 2000; 60:197-206.

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Original Article

Psychometric Properties of the Turkish Version of the 'Nine to Eleven-Year-Olds' Attitudes Towards Breakfast Questionnaire

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ABSTRACT

Aim: This study has been carried out to evaluate the validity and reliability of the Turkish version of the '9 to 11-Year-Olds' Attitudes towards Breakfast Questionnaire.

Materials and Methods: This study was conducted with 646 children. Data were collected by a socio-demographic data form and the '9 to 11-Year-Olds' Attitudes towards Breakfast Questionnaire. Factor analysis, Cronbach's alpha, item-total correlation and contrasting group comparison were used in the evaluation of the data.

Results: The scale consists of 13 items and uni-dimensions which accounted for 32.45% of the total variance. All the factor loadings were found to be greater than 0.30 in both explanatory and confirmatory factor analysis. All of the fit indices were greater than 0.90 and root mean square error of approximation was less than 0.08. For the whole of the scale, Cronbach's alpha was found to be 0.82.

Conclusion: The '9 to 11-Year-Olds' Attitudes towards Breakfast Questionnaire is a valid and reliable measurement tool for the Turkish sample. By using this scale, researchers can identify students' attitudes towards breakfast, reduce negative behaviors, and develop programs to improve positive attitudes in children towards breakfast.

Keywords: Children, breakfast, attitude, questionnaire

Introduction

Adequate and balanced nutrition is very important for children's healthy growth, development and protection from diseases (1-3). The timely and regular consumption of essential nutrients required for new tissue production during the growth process is a special issue for children's health. For this reason, it is recommended that all children should eat regularly and consume different nutrients in all meals of the day for healthy growth and development (1-2). Of all the meals of the day, breakfast has a special place since it is the first meal of the day after a long sleep. A large part of the vitamins, minerals, proteins, and energy that the body needs is taken at breakfast (4). In addition, breakfast also has an important role in meeting the energy required for rapid growth and development in children and increasing their brain development and cognitive capacity (5). School children spend a large part of the day at school, their

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physical activities increase, and their energy requirements go up due to their involvement in an active learning process (4,5). In order to meet this energy need, meals should be consumed without exception. These benefits further increase the importance of breakfast, especially for school children. Regular breakfast habits play a significant and positive role in the academic achievement of school age children (6,7). Studies have emphasized that breakfast habits have a positive effect on adaptation to school, peer relationships, motivation, and willing participation in activities as well as academic achievement (6,7). Regular breakfast has also been shown to provide physiological benefits such as balancing blood glucose levels and also reducing the risk of obesity and high blood pressure (6-9). The omission or irregularity of breakfast affects the food consumed by children and causes them to acquire non-healthy eating habits (9-11). Children often eat fast food in environments such as school canteens as they cannot have breakfast at home due to reasons such as early schooling and late rising. In addition, children who attend schools with no breakfast program prefer fast food between their short breaks (12,13). This situation leads to many health problems in children such as a rapid increase in obesity, malnutrition, very low or excessive weight, inadequate physical activity, and sleep disorders (14-16). For this reason, it is extremely important to determine the attitudes of children towards breakfast. Increased obesity in recent years, changes in the nutritional habits of children, and the consumption of high-calorie foods with inadequate nutrients have further increased the importance of research on the eating attitudes of children (12-16). When the existing scales in the field are examined, it can be seen that they do an overall evaluation of children's eating habits rather than a meal-based evaluation. In our country, there are studies on eating habits, Body Mass indexes, and the obesity prevalence of school age children, but there is no valid and reliable measurement tool which evaluates meal-based breakfast habits. In addition, the school-age period is a special age group due to the transition to the adolescent period. Positive behaviors gained at these ages are maintained for a long time and negative behaviors can be intervened in this age period. For this reason, with the intention of filling a gap in the literature, this study was conducted to test the psychometric properties of the Turkish version of a scale which assesses the breakfast attitudes of 9 to 11-year-old children developed in 2007 by Tapper et al. (17) .

Materials and Methods

Research Design

This descriptive, comparative, correlational, and methodological study was carried out to test the reliability and validity of the Turkish version of the '9 to 11-Year-Olds' Attitudes towards Breakfast Questionnaire (ATBQ-T) which aims to determine the breakfast attitudes of children.

Study Time and Setting

Data were collected from three schools selected by a simple random sampling method among the primary and secondary schools of the Ministry of Education located in the central and western Anatolian region of Turkey. The data collection procedure was administered to the students by the researchers in a separate class hour for each class (each lesson took 40 minutes). Parental consent for the children to participate in the study was obtained.

Sampling and Sampling Characteristics

When sampling size is to be determined in studies, statistics experts suggest that at least 10 subjects per item should be involved in the factor analysis. (18). To do the validity and reliability study of the '9 to 11-Year-Olds' ATBQ-T', which has a total of 13 items, the sampling size was calculated to be 130 participants ensuring "10 participants per item". According to the Turkish National Education System, children aged between 9 and 11 are 4^{th}, 5^{th}, and 6^{th} graders in primary and secondary schools; therefore, the children in these grades were targeted to make up the sampling population. To determine the invariance of the questionnaire more clearly, 646 students from the 4^{th}, 5^{th}, and 6^{th} grades were involved in the study.

Inclusion and Exclusion Criteria

Children between the ages of 9 and 11 years, who voluntarily agreed to participate and who had a written consent from their parents were included in the study.

Data Collection Tools and Their Features

The data collection tools employed in the study were a socio-demographic data collection form designed by the researchers and the '9 to 11-Year-Olds' ATBQ-T' developed in 2008 by Tapper et al (17).

The Socio-demographic Data Collection Form: This form includes questions about the characteristics of the students (age, gender, grade, education status of the parents, family income status, whether having breakfast at home or not, and the content of breakfast (cheese, milk, eggs etc).

'9 to 11-Year-Olds' Attitudes towards Breakfast Questionnaire: This is a 5-point Likert-type measurement tool developed by Tapper et al. (17) in 2008 which consists of 13 items evaluating the breakfast attitudes of 9 to 11-year-old age group children. The questionnaire has a single factor structure and analyzes feelings, beliefs, and

behaviors related to breakfast. There is no cut-off point of the scale. High scores above the average of 13 items indicate more positive attitudes towards breakfast and lower scores show a negative attitude. The 1st, 12th and 13th items of the scale are reverse scored. As a result of the analyses, it was found that it accounted for 32.74% of the variance with its single factor structure. Factor loads ranged from 0.38 to 0.69. The Cronbach's alpha coefficient was 0.82.

Study Steps

Validity Analyses: Content and scope validity were used for the validity analyses.

Translation of the Scale: The scale was separately translated from English to Turkish by three linguists. Following this, the Turkish form of the scale was collaboratively formed by the researchers. The Turkish questionnaire was back-translated into English by a different English linguist (18-20).

Content Validity: Nine experts were referred to for an evaluation of the scale translated into Turkish in this study. They were asked to rate the translated version using scores ranging between 1 and 4 points. The items were revised taking their recommendations into consideration. The item-basis scope validity index (I-CVI) and the scale-basis scope Validity index (S-CVI) were calculated. In this analysis, 0.80 and above indicates agreement among experts. (18-22).

Pilot Study: To study a scale in terms of the language and comprehension of its statements, the scale should be applied to 20-30 people from a similar population (18-22). Following the translation studies, the scale was piloted to 20 individuals who were not involved in the real sampling but who had similar characteristics to subjects of the sampling.

Reliability of the Scale: The Cronbach's alpha, item-total and item-sub-scale score, floor/ceiling effects were used. Cronbach's alpha is desired to be above 0.70 (18-22). Item-total correlation is to be at least 0.20. The floor and ceiling effects are required to be below 15% (21).

Construct Validity: The construct validity was evaluated with exploratory factor analysis (EFA) and confirmatory factor analysis (CFA). The Kaiser-Meyer-Olkin (KMO) coefficient and Bartlett Sphericity test were calculated for EFA. To perform EFA, it is recommended that the KMO value be greater than 0.60 and the Barlett Sphericity test be $p<0.05$. In determining the factors, an eigenvalue was accepted to be 1 or higher. Statisticians emphasize that the factor value should be taken as 0.30. In the CFA, degree of freedom, Pearson chi-square, Goodness of Fit index (GFI), root-mean-square error of approximation (RMSEA), Comparative Fit index (CFI) and normal fit index (NFI) were analyzed as fit indexes. It is recommended that RMSEA should be below 0.080, df/χ^2 should be less than five, and the other indexes should be higher than 0.90 (23).

Statistical Analysis

The descriptive data were analyzed using number, percentages and means. The validity of the scale was analyzed using EFA and CFA. The reliability of the scale was evaluated by Cronbach's alpha coefficient and split-half analysis. The item-total score relationship was analyzed with Pearson correlation. T-test was used for contrast group comparison. Statistical significance was accepted as $p<0.05$.

Research Ethics

Written consent from the Non-Invasive Clinical Studies Board of University (IRB: 2018/28-07), Directorate for National Education and from the parents of the children involved were received, and verbal permission was received from the children.

Results

48.6% of the children (n=309) who participated in the study were female, and the mean age was 10.24+1.20 years (aged between 8 and 13). 53.0% (n=337) were 4th graders, 22.6% (n=144) were 5th graders, and 24.4% (n=155) were 6th graders. 43.4% (n=276) of the mothers were primary school graduates and 38.7% (n=246) of the fathers were primary school graduates. 26.6% of the children (n=169) had two siblings. While 86.9% of the children reported that they had breakfast on a regular basis, 13.1% stated that they did not have breakfast. Of the children who had breakfast, 81.5% (n=451) had breakfast at home and the rest had breakfast at school.

The fit between the opinions of the experts included in the study was found to be between 0.95-1.00 on item basis and 0.99 on a scale basis.

As a result of the EFA, KMO was found to be 0.855, the Bartlett test χ^2 value was 1954.896, and $p<0.01$. According to EFA, it was determined that the scale consists of one dimension. The scale accounted for 32.45% of the total variance. Factor loads ranged between 0.37 and 0.68 (Table I).

According to CFA, fit indexes were found to be follows: χ^2=185.970; df= 62, χ^2/df= 2.99; RMSEA= 0.056; GFI= 0.96; CFI= 0.94; incremental fit index= 0.94; NFI= 0.91; Trucker-Lewis index= 0.92; Relatve Fix index= 0.88. The factor loads

were found to range from 0.30 to 0.66 as shown by CFA (Table II, Figure 1).

The mean scale scores of those children who had breakfast in the morning was 52.57+9.11, whereas the mean scale score of those children who did not have breakfast was 43.27+11.69. The difference between the children's scores according to the status of having breakfast was significant (p<0.001, Table III).

Cronbach's alpha coefficient was found to be 0.82. According to analysis of split-half, the Cronbach's alpha values of the two halves were determined to be 0.72 and 0.70, respectively. The Spearmen-Brown, Guttman half and correlation between the two halves were found to be 0.78, 0.78 and 0.65, respectively. The floor/ceiling effects were found to be 0.0% and 7.1%, respectively (Table IV).

Hotelling's T2 test was conducted to examine the response bias. Hotelling's T2 was determined to be 481.459 and p<0.01. It was determined that there was no response bias on the scale.

The item-total correlation ranged between 0.37-0.66 (Table V).

Table I. Factor loadings for the one extracted factor after varimax rotation (n=636)

Items	Factor loadings	Explained variance %	Eigen value
1	0.37	32.45	4.219
2	0.68		
3	0.61		
4	0.63		
5	0.65		
6	0.58		
7	0.46		
8	0.53		
9	0.57		
10	0.67		
11	0.34		
12	0.36		
13	0.54		

n: Number

Discussion

In this study, it was found that the I-CVI and S-CVI were above 0.80 regarding the analysis of the fit between the experts, harmony between experts' opinions was found, and that the items represented the desired area sufficiently (18-23). These results supported the CVI of the scale.

KMO and Bartlett's χ^2 tests were employed to determine whether the sampling of the study was suitable for EFA. When Bartlett's test is significant, it indicates that the data are suitable for EFA and when KMO is greater than 0.60, it indicates that the sampling size is adequate for EFA. In this

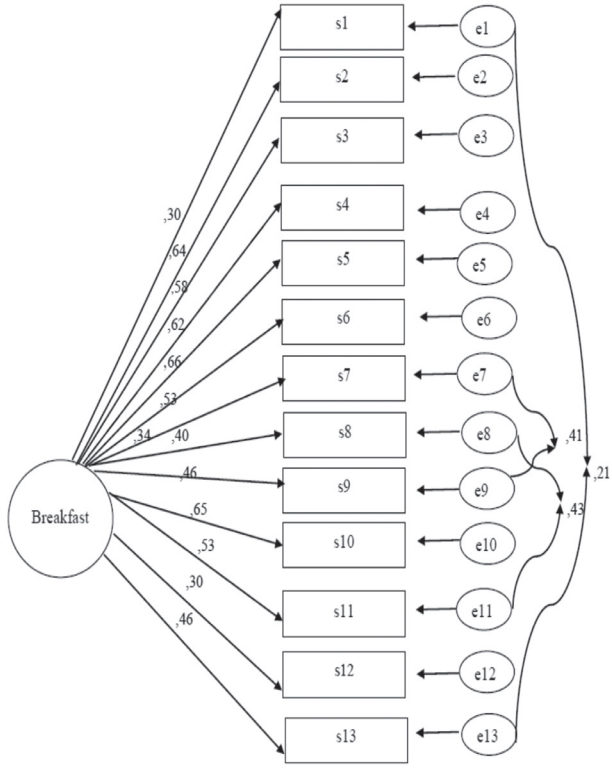

Figure 1. The Breakfast Attitudes Questionnaire

Table III. Comparison of mean scale scores according to the status of having breakfast (known group comparison (n=636)

Has breakfast	n	M + SD	t	p
Yes	553	52.57+9.11	6.933	0.000
No	83	43.27+11.69		

M: Mean, SD: Standard deviation, n: Number

Table II. Model fit indices of the breakfast attitudes questionnaire

	X^2	DF[a]	X^2/DF	RMSEA[b]	GFI[c]	CFI[d]	IFI[e]	RFI[f]	NFI[g]	TLI[h]
One factor model	185.970	62	2.99	0.056	0.96	0.94	0.94	0.88	0.91	0.92

a: Degree of freedom, b: Root mean square error of approximation, c: Goodness of fit index, d: Comparative fit index, e: Incremental fit index, f: Relative fit index, g: Normed fit index, TLI:Trucker-Lewis index

study, Bartlett's chi-square test was found to be significant and the KMO value was determined to be greater than 0.60, which indicated that the data in this study were suitable for factor analysis and the sample size was adequate (18-23).

It is emphasized in the literature that a variance of 30% or above explained in unidimensional scales is satisfactory (18-22). According to EFA, it was found that the scale was composed of one dimension and this one-dimensional scale accounted for 32.45% of the total variance. The original scale also consists of one dimension and it accounted for 32.74% of the total variance (17). The total variance calculated in this study was similar to the total variance calculated in the original scale (17). This finding showed that the construct of the Turkish version of the scale was similar to the original one. In this study, the factor loadings of the scale were found to range between 0.37-0.68. The factor loadings of the original scale range between 0.38-0.69 (17). In the field, it is emphasized that the factor load should be at least 0.30 (18-22). In this study, since the factor loadings of all the items in the scale were greater than 0.30 and they were similar to the ones in the original scale, the Turkish version could be said to maintain the original construct and have a good factor construct for Turkish sampling. The results of this study show that the Turkish form had good construct validity.

It is also emphasized in the literature that a CFA should be conducted in the examination of construct validity, especially if a cultural adaptation is being performed (18-23). The conformity of factor construct determined by EFA in this study was also evaluated by CFA. As a result of the CFA, it was found that the df/χ^2 was less than 5, RMSEA was below 0.08, the indices were higher than 0.90, and that the factor loads were higher than 0.30. As CFA findings were not presented in the original study (17), these study results could not be compared to those of the original scale. The fact that the fit indexes in the CFA used to determine the harmony of the construct determined by EFA to real life is above 0.90 in the literature, the RMSEA is below 0.08, df/χ^2 is less than 5, and that the factor loads are greater than 0.30 indicates that the scale confirmed its factor construct. The CFA results reveal that the CFA confirmed the single-factor construct, the items identified their own factor sufficiently and measured the target concept adequately (18-23).

Another method used to determine construct validity is contrast group comparison. In this method, group means, which are likely to get different scores from the scale, are compared, and thus a difference is expected (18-23). In this study, the scale scores of those students who had breakfast and those who did not have breakfast were used to compare to the known group. In this study, the scores of those children who had breakfast were found to be significantly higher than those who did not have breakfast ($p<0.01$). These results reveal that the scale could distinguish between the groups that were expected to be different in terms of the characteristics that the scale intended to measure, which revealed that the scale had good construct validity. In the original study, it was determined that children who often skipped breakfast had more negative attitudes towards breakfast than those who skipped breakfast less frequently (17). These results were in line with those of the original scale.

Table V. Correlations of the item total score and sub-scale total score (n=636)

Items	Item-total score correlation*
1.	0.37
2	0.66
3	0.61
4	0.60
5	0.61
6	0.56
7	0.51
8	0.55
9	0.61
10	0.63
11	.063
12	0.42
13	0.53

*p<0.001

Table IV. The results for the reliability analysis of the scale (n=636)

Sub-scales	Cronbach α	First half cronbach α	Second half cronbach α	Spearman-brown	Guttman split-half	Correlation between the two halves	M ± SD (Min-Max)	Floor effect %	Ceiling effect %
Scale totals	0.82	0.72	0.70	0.78	0.78	0.65	51.36±9.98 (21-65)	0.0	7.1

M: Mean, SD: Standard deviation, n: Number, Min: Minimum, Max: Maximum

Cronbach's alpha is the most commonly recommended method to be used in determining reliability. In scales, it is desired that the Cronbach's alpha value is above 0.70 (18-22). In this study, the Cronbach's alpha coefficient of the scale was 0.82. The reliability coefficient of this study was over 0.80, which showed high reliability. In addition, the alpha value of the original scale was also 0.82 (17), therefore, the alpha values of the two studies were in line with each other. In the literature, another of the methods recommended to be used for reliability is the split-half. In this analysis, it is recommended that the alpha values of the two halves, the Spearman-Brown and Guttman split-half should be above 0.70 (18-22). In this study, it was found that the Cronbach's alpha of both halves, the Spearman-Brown and Guttman split-half were above 0.70 and there was a high relationship between the two halves. These results showed that each item was highly correlated with the scale, they determine that the topic is measured adequately, the scale measures the attitudes of the children towards breakfast satisfactorily, and that the reliability of the scale is high.

One of the critical factors affecting scales is response bias. Response bias occurs when the respondents do not base their answers on their own opinions but give responses in accordance with the society's or the researchers' expectations (18-22). In this study, the existence of response bias was analyzed by Hotelling's T2 analysis and it was determined that there was no response bias in the scale. This finding supported the conclusion that the scale had both reliability and validity.

In the literature, it is recommended that the floor/ceiling effect be evaluated in scales, and that the floor/ceiling effect should be below 20% (18-23). In this study, the floor/ceiling effect was found to be below 20%. The low floor/ceiling effect values in the study showed that the scale was reliable and it adequately measured the required construct to be measured (18-23).

It is recommended to perform item-total score analysis in psychometric studies. It shows the extent to which the items in the scale are correlated to the scale and whether it measures the desired feature (18-22). The correlation coefficient was calculated in this analysis. This value is expected to be positive and greater than 0.20 (18). In this study, item-total score correlation was found to be positive and greater than 0.20. In this study, it was determined that all items of the scale had a high level of correlation with the total score, that they measured the required qualification to a sufficient level and that the scale items had a high level of reliability.

Study Limitation

The limitation of this study was the use of a convenience sampling method. This may have affected the generalizability of the study.

Conclusion

In conclusion, it was determined that the Turkish scale has good validity and reliability. By using this scale, researchers can identify students' attitudes towards breakfast, reduce negative behaviors, and develop programs to improve positive attitudes in children towards breakfast. They can also carry out cross-cultural comparative studies using this scale.

Ethics

Ethics Committee Approval: Written consent from the non-invasive Clinical Studies Board of University (IRB: 2018/28-07), Directorate for National Education and from the parents of the children involved were received, and verbal permission was received from the children.

Informed Consent: Written consent from parents.

Peer-review: Enternally peer-reviewed.

Authorship Contributions

Surgical and Medical Practices: İ.B., D.D., Ş.D., D.A., A.A.K., Concept: İ.B., D.D., Ş.D., D.A., A.A.K., Data Collection or Processing: M.B., D.D., Ş.D., D.A., A.A.K., Analysis or Interpretation: M.B., Literature Search: M.B., Writing: İ.B.

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References

1. Afshin A, Micha R, Khatibzadeh S, et al. The impact of dietary habits and metabolic risk factors on cardiovascular and diabetes mortality in countries of the Middle East and North Africa in 2010: a comparative risk assessment analysis. BMJ Open 2015; 5:e006385.
2. Micha R, Peñalvo JL, Cudhea F, et al. Association between dietary factors and mortality from heart disease, stroke, and type 2 diabetes in the United States. JAMA 2017; 317:912-24.
3. Deshmukh-Taskar P, Nicklas TA, Radcliffe JD, O'Neil CE, Liu Y. The relationship of breakfast skipping and type of breakfast consumed with overweight/obesity, abdominal obesity, other cardiometabolic risk factors and the metabolic syndrome in young adults. The National Health and Nutrition Examination Survey (NHANES): 1999–2006. Public health nutrition 2013; 16:2073-82.
4. Coulthard JD, Palla L and Pot GK. Breakfast consumption and nutrient intakes in 4–18-year-olds: UK National Diet and

Nutrition Survey Rolling Programme (2008–2012). British Journal of Nutrition 2017; 118:280-290.

5. MacInerney EK, Swatzyna RJ, Roark AJ, et al. Breakfast choices influence brainwave activity: Single case study of a 12-year-old female. International Society of Neurofeedback and Research 2017; 4:56-62.
6. Edefonti V, Rosato V, Parpinel M, et al. The effect of breakfast composition and energy contribution on cognitive and academic performance: a systematic review. The American journal of clinical nutrition 2014; 100:626-56.
7. Ho CY, Huang YC, Lo YTC, Wahlqvist M, Lee MS. Breakfast is associated with the metabolic syndrome and school performance among Taiwanese children. Research in developmental disabilities 2015; 43:179-188.
8. Ptomey LT, Steger FL, Schubert MM, et al. Breakfast intake and composition is associated with superior academic achievement in elementary schoolchildren. Journal of the American College of Nutrition 2016; 35:326-33.
9. Littlecott HJ, Moore GF, Moore L, Lyons RA, Murphy S. Association between breakfast consumption and educational outcomes in 9–11-year-old children. Public health nutrition 2016; 19:1575-82.
10. Nurul-Fadhilah A, Teo PS, Huybrechts I, Foo LH. Infrequent breakfast consumption is associated with higher body adiposity and abdominal obesity in Malaysian school-aged adolescents. PloS one 2013; 8:e59297.
11. Sampasa-Kanyinga H, Hamilton HA. Eating breakfast regularly is related to higher school connectedness and academic performance in Canadian middle-and high-school students. Public health 2017; 145:120-3.
12. Tee ES, Nurliyana AR, Norimah AK, et al. Breakfast consumption among Malaysian primary and secondary school children and relationship with body weight status-Findings from the My Breakfast Study. Asia Pacific journal of clinical nutrition 2018; 27:421-32.
13. Orhan A, Çelik İ. İlköğretim okulu öğrencilerinin kahvaltı alışkanlıkları ve okul kantini ile ilişkilerinin belirlenmesi Akademik Gıda 2014; 12:51-6.
14. Smith KJ, Breslin MC, McNaughton SA, Gall SL, Blizzard L, Venn AJ. Skipping breakfast among Australian children and adolescents; findings from the 2011-12 National Nutrition and Physical Activity Survey. Australian and New Zealand journal of public health 2017; 41:572-8.
15. Blondin SA, Anzman-Frasca S, Djang HC, Economos CD. Breakfast consumption and adiposity among children and adolescents: an updated review of the literature. Pediatric obesity 2016; 11:333-348.
16. Savaşhan Ç, Erdal M, Sarı O, et al. İlkokul çağındaki çocuklarda obezite görülme sıklığı ve risk faktörleri. Türkiye Aile Hekimliği Dergisi 2015; 19:14-21.
17. Tapper K, Murphy S, Lynch R, et al. Development of a scale to measure 9–11-year-olds' attitudes towards breakfast. European journal of clinical nutrition 2008; 62:511.
18. Şencan H. Sosyal ve davranışsal ölçümlerde güvenilirlik ve geçerlilik (reliability and validity in social and behavioral measurement). 1.edition, Ankara: Seçkin Yayınevi 2005.
19. Polit DF, Beck CT and Owen SV. Is the CVI an acceptable indicator of content validity? Appraisal and recommendations. Res Nurs Health 2007; 30:459-67.
20. Rattray J and Jones MC Essential elements of questionnaire design and development. Journal of Clinical Nursing 2007;16:234-43.
21. Terwee CB, Bot SD, de Boer MR, et al. Quality criteria were proposed for measurement properties of health status questionnaires. J Clin Epidemiol 2007; 60:34-42.
22. DeVellis RF. Scale development, theory and Applications. 3rd ed. India, SAGE Publication Inc 2012:31-59.
23. Şimşek ÖF. Yapısal Eşitlik modellemesine giriş temel ilkeler ve LISREL Uygulamaları (Introduction to Structural Equation Modeling, LISREL Fundamental Principles and Practices). İstanbul: Ekinoks; 2010.

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Original Article

The Efficiency of the Triple P Program for Parents of Children with Type-1 Diabetes

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ABSTRACT

Aim: The aim of this study was to investigate the effect of the Triple P-Positive Parenting Training Program, which was applied to the parents of children and adolescents with a type 1 diabetes (T1D) diagnosis aged 3-12 years, on parental attitude, parental mental health, and child behaviour.

Materials and Methods: This research was conducted in a quasi-experimental manner. The sample of the research consisted of 32 parents who had children with a T1D diagnosis aged 3-12 years and who agreed to participate in the study. Data were collected using the Family Background Questionnaire, General Health Questionnaire, Strengths and Difficulties Questionnaire, Parental Attitude Research Instrument, Conflict Behaviour Questionnaire and Parent Satisfaction Questionnaire. The Group Triple P Programme was implemented with all groups for 8 weeks. Data were collected immediately after the programme. Data were evaluated by using multidirectional variance analysis, t- test and chi-square test.

Results: It was shown that the Group Triple P applied to the parents of those children with a T1D diagnosis positively affects the mental health of the parents, their parental attitudes and the problematic behaviour of their children and also that the parents had less conflict with their children and the children had less conflict with their parents.

Conclusion: It is suggested that further studies are carried out in different centres and cities with the Group Triple P Programme to widen the use of the Group Triple P Programme and also to plan future research where the Group Triple P programme and other programmes currently used in country can be compared.

Keywords: Group Triple P Programme, behavioural problems, parenting style, parental mental health, type 1 diabetes

Introduction

Developments in the fields of health and technology over the past 20 years have led to an increase in the number of children who have a chronic disease (1-4). Diabetes has become one of the most common chronic diseases among children as its incidence has increased (5). It is estimated that 70,000 children under the age of 15 years develop type 1 diabetes (T1D) each year (6). Moreover, in the United States, it is reported that 400-600 children are diagnosed with T1D annually.

T1D management is a time-consuming, complex, and difficult process. Diabetes requires continuous and careful treatment management throughout life (7). Effective diabetes management involves paying attention to diet and exercise, monitoring blood glucose levels during the day, injecting insulin or using an insulin pump, and being

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able to respond to urgent medical conditions (8). Parents are fully or primarily responsible for diabetes management in children depending on the child's age (9,10). The results obtained in studies suggest that the responsibility of diabetes management should be gradually transferred to children under the parents' supervision until these children or adolescents take the responsibility of primary treatment alone (3,11-13).

Parents have a very important role in their children's diabetes management; however, efficient T1D management requires the cooperation of both parents and children (12-14). Non-compliance to treatment may lead to negative short- and long-term consequences for a child's health and poor management of diabetes can cause serious health complications (9).

Parent-related and family-related factors affect the compliance to treatment and glycaemic control levels of children with T1D. The children of extremely indulgent families (9,15-17) and families with conflicts and authoritarian parents (9,13,18) have less child welfare, lower self-efficacy, increased depression, and increased behavioural problems (19). On the other hand, families with effective communication and democratic attitudes increase the compliance to treatment in their children and diabetes management is handled more successfully (9,15). As opposed to the disease-related factors that cannot be changed (for example, the age of disease onset and the severity of the disease), parenting can be changed and good parenting practices can be developed.

Studies have shown the effectiveness of interventions to reduce family conflicts and increase family communication and child welfare for children with diabetes (9,12,13).

Triple P-Positive Parenting Program is the most effective parent program in the world. It cooperates with families and society, reduces risk factors, supports protective factors, has a multidisciplinary approach, has high evidence standards, uses randomized controlled studies, and obtains long-term results. (9,20,21). The theoretical structure of the program is based on social learning principles and cognitive theory. The program aims to create a positive relationship between the child and the parents, to develop positive parenting skills, to support the child's talents and development, to enable the child to gain skills for the management of problematic behaviours, to teach effective communication skills to couples, and to reduce parental stress (21-24). Strong evidence regarding the efficiency of preventive and clinical interventions presented in various ways has been obtained in randomized controlled and meta-analysis studies conducted on the Triple P-Positive Parenting Program (25-29).

A limited number of studies on the Triple P-Positive Parenting Program have been conducted regarding the parents of children with a T1D diagnosis. In the randomized controlled study conducted by Westrupp et al. (30) with 76 parents, it was determined that the parents had better mental health, the problematic behaviours of children decreased, and there was no change in glycaemic control levels after the Triple P-Positive Parenting Program (30). In another study conducted by Doherty, Calam, and Sanders, it was found that family conflicts, especially disease-related ones, decreased after the Triple P-Positive Parenting Program applied to the parents of adolescents aged between 11-17 years with T1D (31).

According to the results obtained from these studies conducted with different samples in Turkey, it was determined that there was a need to carry out studies with the Triple P-Positive Parenting Program at different clinics and schools (32-35). When the studies conducted regarding the Triple P-Positive Parenting Program in Turkey so far were considered, it was seen that there was no study conducted based on families with diabetic children. Furthermore, the number of studies conducted in other countries is quite limited.

In our country, there is a need for the implementation of the Triple P-Positive Parenting Program that will meet the needs of parents and that will be easily accessed by every walk of life and to extend this program by making it functional.

The aim of this study was to investigate the effect of the Triple P-Positive Parenting Program, which was applied to the parents of children and adolescents aged 3-12 years with a T1D diagnosis, on parental attitude, parental mental health, and child behaviour.

Materials and Methods

A "Single Group Pre-test/Post-test Model", one of the quasi-experimental designs, was used to evaluate the effect of the Triple P-Positive Parenting Program, which was applied to the parents of children aged 3-12 years with a T1D diagnosis in a university hospital in Bursa, on parental attitude, parental mental health, and child behaviour.

The study was conducted together with Uludağ University Hospital Child and Adolescent Mental Health Clinic and Clinic of Paediatric Endocrinology. The training sessions were held between December 2014 and January 2015.

The sample of the research consisted of 32 parents who had children aged 3-12 years with a T1D diagnosis and who agreed to participate in the study after the necessary explanations were made without any sampling method.

The inclusion and exclusion criteria of the study were taken into account while selecting the parents. In this respect, the sample characteristics can be explained as follows:

• Parents of children with T1D

• Parents of children without mental retardation, autism, psychosis, schizophrenia, bipolar disorder, obsessive-compulsive disorder or diffused developmental disorder

• Parents living with their child (both mother and father or only the mother or father)

• Non-divorced parents, parents living together

• Parents who have not received any mental assistance for parenting education

• Parents who read the informed consent form and who wanted to participate in the study

Written permission for this study (decision number: 2013-14/19) was obtained from the Ethics Committee of Bursa Uludağ University Hospital. In the research, the parents were informed that the data obtained would be reported without giving a name to protect their privacy and that their names would be kept confidential.

Data Collection Tools

Socio-demographic Data Collection form: This form consists of 19 questions regarding the parents' families, education and occupation and information about the health status of the parent and child.

Parental Attitude Research Instrument: The scale was developed by Schaefer and Bell (1958) in order to determine the child-rearing attitudes of parents and adapted to Turkish by LeCompte et al. (36). The scale can be applied to parents, children, and adolescents. It consists of 60 items and 5 subdimensions. High scores indicate that the respondent supports the attitude expressed in the relevant subdimension. High scores obtained from other subdimensions except for democratic approach/ensuring equality indicates a negative parental attitude. When an evaluation was made in terms of psychometric characteristics, the scale was repeatedly applied to a group of 34 female students at three-week intervals for the test-retest reliability of the scale and the Spearman Correlation coefficients were found to be between 0.58 and 0.88. The scale was then applied to 179 mothers from three socio-economic levels, low, middle, and high. As a result of the analysis conducted, it was determined that each subdimension had a high internal consistency and that the half alpha internal consistency was 0.64. As a result of factor analysis, four factors were identified and a fifth factor was identified from the rest of the items. In the final form of the scale, the internal consistency of the subdimensions ranged between 0.59 (democratic approach/ensuring equality subdimension) and 0.90 (strict discipline subdimension). For the factor validity of the scale, the correlation between the mothers' socio-economic levels and 5 factors was examined. Accordingly, there was a negative correlation found between SEL and the extreme motherhood/overprotection and the strict discipline subdimensions and a positive correlation between SEL and the other factors (36).

Strengths and Difficulties Questionnaire: The Strengths and Difficulties Questionnaire (SDQ) was developed by Robert Goodman in 1997 and is used to screen mental problems in children and adolescents. The Turkish validity and reliability study of the scale was conducted by Güvenir et al. (37). This questionnaire includes a parent and teacher form for those aged 4-16 years and an adolescent form, which is filled out by the adolescent by him/herself, for those aged 11-16 years. The SDQ consists of 25 questions, some of them regarding positive and some of them regarding negative behaviour characteristics. These questions are divided into 5 sub-problem areas. These behavioural problems are as follows: Attention deficit and hyperactivity, emotional problems, peer problems, and social behaviours. As a result of the SDQ scoring, sub-scores specific to these problem areas can be obtained as well as the total score. The SDQ includes items that question psychiatric symptoms and the level of exposure to these symptoms. In this section, the respondent evaluates whether the adolescent has difficulty with their emotions, behaviours, attention, and relationships with others. If one's response indicates difficulty, the person reports whether this difficulty puts the child and adolescent into distress, whether it affects their daily life, whether it challenges people who live together, and how long the difficulties have existed (37).

General Health Questionnaire-12: The General Health Questionnaire is a questionnaire that is used as a primary screening test in social studies examining mental diseases. The 12-question General Health Questionnaire is extensively preferred since it is short, has high sensitivity and specificity in distinguishing cases and can be used in various socio-cultural environments (38). The Turkish validity and reliability study was conducted by Kilic (1996). The lowest score that

can be obtained from this scale is 0 and the highest score is 12. Higher scores indicate a higher risk of mental disease. A score of 2 points or more in the 12-item form of the general health questionnaire indicates a high possibility of having a psychiatric disorder. In the literature, the concepts of "distress", "well-being", and "mental health" are assessed using the general health questionnaire (38).

Conflict Behaviour Assessment Questionnaire: The questionnaire was developed by the researcher by reviewing the literature to investigate the conflict behaviours of the children towards their parents and of the parents towards their children (39). For the content validity of the form prepared, the opinions of 3 experts, one faculty member of psychiatry nursing and two child and adolescent psychiatry physicians, were obtained. The questionnaire was finalized considering their feedback. It consists of a parent form (20 items) and a child form (20 items for the mother, 20 items for the father). Each item has two options, "yes" and "no". Both options cause a score increase in some items. A high score indicates that many conflicts are experienced between the child and his/her parent in both directions and that they do not show appropriate behaviour during the conflict (39).

Satisfaction Questionnaire: This questionnaire was prepared by the researcher by reviewing the literature in order to determine the opinions and satisfaction levels of the parents after the Triple P-Positive Parenting Program (39). For the content validity of the form prepared, the opinions of 3 experts, one faculty member of psychiatry nursing and two child and adolescent psychiatry physicians, were obtained. The questionnaire was finalized considering the feedback from these expert opinions. It consists of 14 items, 11 closed-ended and 3 open-ended. The highest score that can be obtained from the questionnaire is 77 and the lowest score is 11. A high score indicates the parents' satisfaction with the Triple P-Positive Parenting Program (39).

HbA1C Level: HbA1C levels of the children with T1D were obtained from laboratory results before and after the Triple P-Positive Parenting Program.

Intervention Program

The Triple P-Positive Parenting Program provides specific information that helps parents who participate in the program to encourage the development of their children, reduce problematic behaviours, and reduce or eliminate risky situations that endanger the health of the child. The program, which is organized for the parents of children aged 0-12 years, consists of 8 sessions. First, four two-hour group sessions are held for groups of 10-12 parents. After these sessions, three 15-30 minute-phone calls are conducted with each parent and a final closing session is held (Session 8). Follow-up phone calls provide additional support to parents who implement what they have learned in the group sessions. The closing group session allows parents to assess their progress and share their achievements. Both parents (when conditions are appropriate) are encouraged to participate (21,22,24).

Statistical Analysis

The data were evaluated using the 22.00 SPSS package software. The significance level (Type 1 Error) was determined to be 0.05 in this study. The t-test was used to assess the effect of the intervention on dependent groups.

Results

The descriptive characteristics of the parents included in the research are given in Table I.

The parents scored 40.09 points from the Overprotection subdimension of the Parental Attitude Research Instrument (PARI) before the Triple P-Positive Parenting Program and 35.27 points after the program; 29.41 points from the Democratic Approach/Ensuring Equality subdimension before the training and 33.01 points after the training; 14.18 points from the Marriage Conflict subdimension before the training and 12.07 points after the training; 34.66 points from the Strict Discipline subdimension before the training and 30.86 after the training (Table II).

There was a statistically significant difference found between the pre- and post-training mean scores from the subdimensions of overprotection (t=5.62 p=0.000), Democratic Approach/Ensuring Equality (t=3.41 p=0.001), Marriage Conflict (t=2.98 p=0.000), Strict Discipline (t=4.24 p=0.000). On the other hand, from the Denial of Housewife Roles subdimension, the parents scored 28.79 before the training and 27.23 after the training. When the pre- and post-training mean scores from the Denial of Housewife Roles subdimension (t=-0.72 p=0.52) were compared, there was no statistically significant difference found (Table II).

The score obtained from the SDQ was 15.81 before the Triple P-Positive Parenting Program and 10.01 after the program. According to the result of the t-test which was conducted to evaluate whether there was a difference between the scores of the adolescents from the SDQ before and after the program, the difference between the two mean scores was found to be statistically significant (t=7.79 p=0.000) (Table III).

The score of the parents obtained from the general health questionnaire was 5.45 before the Triple P-Positive Parenting Program and 2.19 after the program. According to the result of the t-test which was conducted to evaluate whether there was a difference between the scores of the parents from the general health questionnaire before and after the program, the difference between the two mean scores was found to be statistically significant (t=5.54 p=0.000) (Table III).

The score of the parents obtained from the conflict behaviour questionnaire was X:13.18 before the Triple P-Positive Parenting Program and X:10.09 after the program. According to the result of the t-test which was conducted to evaluate whether there was a difference between the scores of the parents from the conflict behaviour questionnaire before and after the program, the difference between the two mean scores was found to be statistically significant (p<0.05) (Table III).

The score of the children obtained from the conflict behaviour questionnaire was X:14.10 before the Triple P-Positive Parenting Program and X:11.45 after the program. According to the result of the t-test which was conducted to evaluate whether there was a difference between the scores of the adolescents from the conflict behaviour

Table I. Descriptive characteristics of parents included in the research

Variables	Number	%
Age		
25-35 years	18	56.3
36-45 years	11	34.4
46-55 years	3	9.3
56-65 years	-	
Educational status		
Primary school graduate	4	12.5
Secondary school graduate	10	31.3
High school graduate	15	46.9
University graduate	3	9.3
Post-graduate	-	
Occupational status		
Housewife	8	25
Government employee	10	31.3
Retired	2	6.2
Worker	11	34.4
Unemployed	1	3.1
Health status of parents		
I received help in the last 6 months	21	65.6
I did not receive help in the last 6 months	11	34.4
Previous participation in a parenting training program		
Yes	0	0
No	32	100
TOTAL	32	100

Table II. Mean scores of parents from the parental attitude research instrument subdimensions before and after the program

Parental attitude research instrument subdimensions	Pre-test X ± SD	Post-test X ± SD	t	p
Overprotection	40.09±8.31	35.27±6.04	5.62	0.000
Democratic approach/ensuring equality	29.41±3.15	33.01±3.12	3.41	0.001
Denial of housewife roles	28.79±6.49	27.23±6.60	-0.72	0.52
Marriage conflict	14.18±3.67	12.07±3.77	2.98	0.000
Strict discipline	34.66±6.52	30.86±6.76	4.24	0.000

SD: Standard deviation

Table III. Mean scores of parents from the questionnaires before and after the program (n=32)

Questionnaires	Pre-test X ± SD	Post-test X ± SD	t	p
Strengths and difficulties questionnaire	15.81±5.90	10.01±2.53	7.79	0.000
General health questionnaire	5.45±3.18	2.19±2.63	5.54	0.000
Conflict questionnaire (parent)	13.18±3.92	10.09±2.27	5.80	0.000
Conflict questionnaire (adolescent)	14.10±2.95	11.45±1.88	8.25	0.000
Satisfaction questionnaire	-	73.80±2.87	-	-
HbA1C (mmole/mole)	8.17	7.92	-0.43	0.338

SD: Standard deviation

questionnaire before and after the program, the difference between the two mean scores was found to be statistically significant ($p<0.05$) (Table III).

The HbA1C value of the children was 8.17 before the Triple P-Positive Parenting Program and 7.92 after the program. When pre- and post-training HbA1C values were compared, no statistically significant difference was found ($t=-0.43$ $p=0.338$) (Table III).

The parents' level of satisfaction with the Triple P-Positive Parenting Program was 73.80 out of a total score of 77 (Table III).

Discussion

In this study, the Triple P-Positive Parenting Program applied to the parents of children with T1D led to a significant improvement in the parental attitudes and mental health levels of these parents, by reducing the problematic behaviours of children and by reducing family conflicts.

In this study, when the difference in the PARI score after the Triple P-Positive Parenting Program was evaluated, it was found that there was a significant decrease in the subdimensions of Overprotection, Democratic Approach/ Ensuring Equality, Marriage Conflict, and Strict Discipline. However, there was no difference was found in the Denial of Housewife Roles subdimension. This suggests that the Triple-P Positive Parenting Program may be beneficial to the attitudes of those parents of children with T1D diagnoses. Considering related studies, two studies that were conducted with the parents of children diagnosed with T1D are worthy of mention. In the randomized controlled study conducted by Westrupp et al. (30) in 2015 with 76 parents, it was found that there were significant changes in the Over Reactivity subdimension of the Parenting scale after the Triple P-Positive Parenting Program. In another study conducted by Doherty et al. (31), it was determined that there were positive differences in the attitudes of parents after the Triple P-Positive Parenting Program applied to those parents of adolescents aged 11-17 years with T1D. These results indicate that the Triple P-Positive Parenting Program reduces behavioural disorder (32), attention deficit and hyperactivity disorder (34), anxiety disorder (33), and dysfunctional parenting practices such as sending the child to a Montessori school (35) and also increases positive or democratic parental attitudes.

In our study, there was a significant decrease in the SDQ scores of children after the Triple P-Positive Parenting Program. This shows that the Triple-P Positive Parenting Program applied to the parents of children with T1D diagnosis reduces the emotional and behavioural problems of the children. This finding is similar to that in the study conducted by Westrupp et al. (30) in 2015 and Doherty et al. (31) in 2013 with the parents of children diagnosed with T1D. In both studies, the problematic behaviour of children and adolescents were found to decrease after the Triple-P Positive Parenting Program.

Our study findings show similarity with those obtained in other studies conducted on the Triple P Program with different samples and by using SDQ (32,40-44). In the study conducted by Arkan (32), which was the first study on the Triple P-Positive Parenting Program in Turkey, in the study conducted by Özyurt (33) with the parents of children diagnosed with anxiety disorder, in the randomized controlled study conducted by Martin and Sanders (41) in 2003, in the randomized controlled study conducted by Leung et al. (43) in 2003 with 69 parents, in the study conducted by Stallman and Ralph (45) in 2007, and in the study conducted by Sanders et al. (42), which was initiated as a large project in 2008 and conducted with 2,996 parents, it was found that the total score of the children and adolescents from the difficulty subdimension of SDQ decreased as was also the case in our study. When the findings of these studies and our study are evaluated together, it is suggested that the Triple P-Positive Parenting Program is an effective and successful parent program in reducing children's behavioural and sensory problems. Considering that the Triple-P Positive Parenting Program improves parents' self-efficacy, self-efficiency, and self-control characteristics, it is very important to shape the behaviours of parents and children together, strengthen the self-efficacy perceptions of parents, and develop the self-regulation skills of parents in the treatment of behavioural and emotional problems of children and adolescents (22,42,46).

Another important finding regarding parents was that their General Health Questionnaire score was lower after the Triple-P Positive Parenting Program. This result shows that the stress and anxiety levels of the parents decreased significantly after the program. Westruppet et al. (30) evaluated the stress, anxiety and depression levels of parents before and after the program separately and reported that the anxiety and stress levels of parents decreased noticeably. In the study conducted by Doherty et al. (31) in 2013, there was no statistically significant difference found in the stress levels of parents after the program. Contrary to the study conducted by Doherty et al. (31), regarding the studies conducted on the Triple P Program with different

samples in the world (47-49) and in Turkey (32-35), it is seen that the program reduces parents' stress, anxiety, and depression levels. It is clearly seen that the Triple-P Positive Parenting Program is more successful in reducing parents' stress, anxiety, and depression levels compared to other parent programs. This can be explained by the fact that the Triple P-Positive Parenting Program meets mostly parents' needs and strengthens parents more.

One important finding obtained in our study is that the program reduces the tendency to have conflict both in parents and children and reduces the level of family conflicts. This finding is similar to those in two studies conducted on the Triple P-Positive Parenting Program. In the studies conducted by Westrupp et al. (30) in 2015 and Doherty et al. (31) in 2013, the characteristics and quantity of family conflict were evaluated with the Diabetes Family Conflict scale. In both studies, it was revealed that there was a significant difference in the level of conflict after the program. Conflicts between the parents and the child affect the treatment management of the child with T1D negatively. Ending or reducing family conflicts is of great importance for successful treatment management. These results reveal that the Triple P-Positive Parenting Program is highly effective in reducing the parents' tendency to engage in conflict with each other and also in reducing family conflicts.

Another finding obtained in our study is that there was no significant difference in the HbA1C values of children before and after the Triple P-Positive Parenting Program. This result is similar to those obtained in the studies conducted by Westrupp et al. (30) in 2015 and Doherty et al. (31) in 2013. In both studies, it was found that there was no difference in the HbA1C values of children at the 3rd, 6th, and 12th month follow-ups after the program. Both in our study and in the studies conducted by Westrupp et al. (30) and Doherty et al. (31), there was a decrease in the HbA1C values of children; however, this decrease was not found to be statistically significant.

Study Limitations

This study is important since it is the first study conducted in Turkey in which the Triple P-Positive Parenting Program was applied to the parents of children diagnosed with T1D. However, besides the positive results revealed, there are some limitations of the study. The main limitation is the small sample size. Another limitation is the lack of a randomized controlled study design. In light of these preliminary results, future studies should be planned with a randomly selected control group in order to show the effectiveness of this parent program more strongly. In addition, if possible, another parent program should be applied to the control group in our country. The third most important limitation is that no follow-up process was planned in order to demonstrate the permanence of the positive and healing effect of the program. Future studies or a study with the current sample group should be planned with at least a 6-month or 1-year follow-up. This is important in terms of showing the long-term efficacy determined in the literature for the Turkish sample.

Conclusion

In conclusion, it was determined that the Triple P-Positive Parenting Program reduced the General Health Questionnaire and PARI scores of the parents and the SDQ and Conflict Behaviour Assessment Questionnaire scores of the children with T1D. In addition, the parents' level of satisfaction with the program was high. Due to the many factors affecting the HbA1C level, the decrease in the HbA1C value of the children was not at the desired level. These results show that the Triple P-Positive Parenting Program applied to the parents positively contributes to the mental health of the family. Therefore, it is recommended to plan new studies with a randomized controlled study design and a larger sample, in which prospective follow-up sessions are planned, to conduct research in which the results of the Triple P-Positive Parenting Program and currently applied programs in our country are compared, and to extend this program throughout the country.

Ethics

Ethics Committee Approval: The Ethics Committee approval of this study was received on 30.07.2013 from Bursa Uludağ University Hospital Clinical Research Ethics Committee (2013-14/19).

Informed Consent: Written, informed consent was obtained from all parents.

Peer-review: Externally peer-reviewed.

Authorship Contributions

Surgical and Medical Practices: B.A., A.P.V., Ş.E., E.E., Concept: B.A., A.P.V., Ş.E., E.E., Design: B.A., A.P.V., Ş.E., E.E., Data Collection or Processing: B.A., Analysis or Interpretation: B.A., Literature Search: B.A., A.P.V., Ş.E., E.E., Writing: B.A., A.P.V., Ş.E., E.E.

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References

1. Isaacs D, Sewell JR. Children with choronic conditions. The Medical Journal of Australia 2003; 179:235-6.
2. Vickers M, Parris M, Bailey J. Working mothers of children with choronic illness: Narratives of working and caring. Australian Journal of Early Childhood 2004; 29:39-44.
3. Lohan A, Morawska A, Mitchell A. A systematic review of parenting interventions for parents of children with type 1 diabetes. Child: Care, Health and Development 2015; 41:803-17.
4. Kish AM, Newcombe PA, Haslam DM. Working and caring for a child with chronic illness: A review of current literatüre. Child Care Health Dev 2018; 44:343-54.
5. Patterson CC, Dahlquist GG, Gyürüs E, Green A, Soltész G. Incidence trends for childhood type 1 diabetes in Europe during 1989-2003 and predicted new cases 2005-20: a multicentre prospective registration study. The Lancet 2009; 373:2027-33.
6. International Diabetes Federation. IDF Diabetes Atlas, 3rd edn. Brussels: International Diabetes Federation; 2006. Available at: http://www. diabetesatlas.org/resources/previous-editions. html. Accessed 1 July 2019.
7. Lohan A, Mitchell A, Filus A, Sofronof K, Morawska. Positive Parenting for healty living (Triple P) for parents of children with type 1 diabetes: protocol of a randomised controlled trial. BMC Pediatrics 2016; 16:1-13.
8. Lohan A, Morawska A, Mitchell A. Development and Validation of a Measure Assessing Child Diabetes Behavior: The Diabetes Behavior Checklist Comprehensive Child and Adolescent Nursing 2018; 41:111-27.
9. Lohan A, Morawska A, Mitchell A. Associations Between Parental Factors and Child Diabetes-Management–Related Behaviors. Journal of Developmental & Behavioral Pediatrics 2017; 38:330-8.
10. Canter K, Christofferson J, Scialla AM, Kazak AE. Technology-Focused Family Interventions in Pediatric Chronic Illness: A Systematic Review. Journal of Clinical Psychology in Medical Settings 2019; 26:68-87.
11. Markowitz JT, Garvey KC, Laffel LMB. Developmental changes in the roles of patients and families in type 1 diabetes management. Curr Diabetes Rev 2015; 11:231-8.
12. Hilliard ME, Tully C, Monaghan M, Wang J, Streisand R. Design and development of a stepped-care behavioral intervention to support parents of young children newly diagnosed with type 1 diabetes, Contemporary Clinical Trials 2017; 62:1-10.
13. Feldman MA, Anderson L, Shapiro JB, Jedraszko AM, Evans M, Weil LEG, Garza KP, Weissberg-Benchell J. Family-Based Interventions Targeting Improvements in Health and Family Outcomes of Children and Adolescents with Type 1 Diabetes: A Systematic Review, Current Diabetes Reports 2018; 18:15.
14. Palmer DL, Osborn P, King PS, et al. The structure of parental involvement and relations to disease management for youth with type 1 diabetes. J Pediatr Psychol 2011; 36:596-605.
15. Davis CL, Delamater AM, Shaw KH, et al. Parenting styles, regimen adherence, and glycemic control in 4- to 10-year-old children with diabetes. Journal of Pediatric Psychology 2001; 26:123-9.
16. Liakopouloua M, Alifierakia T, Katidenioua A, et al. Maternal expressed emotionandmetaboliccontrolofchildren and adolescents with diabetes mellitus. Psychotherapy and Psychosomatics 2001; 70:78-85.
17. Shorer M, David R, Schoenberg-Taz M, Levavi-Lavi I, Phillip M, Meyerovitch J. Role of parenting style in achieving metabolic control in adolescents with type 1 diabetes. Diabetes Care 2011; 34:1735-37.
18. Miller-Johnson S, Emery RE, Marvin RS, Clarke W, Lovinger R, Martin M. Parent-child relationships and the management of insulin-dependent diabetes mellitus. Journal of Consulting and Clinical Psychology 1994; 62:603.
19. Chisholm V, Atkinson L, Bayrami L, Noyes K, Payne A, Kelnar C. An exploratory study of positive and incongruent communication in young children with type 1 diabetes and their mothers. Child: Care, Health and Development 2012; 40:85-94.
20. Mullett J. Triple P Community Implementation Report. Victoria, BC: Action Research Consulting. Report prepared for the Vancouver Island Health Authority 2007.
21. Sanders MR. Development, evaluation, and multinational dissemination of the Triple P-Positive Parenting Program. Annu Rev Clin Psychol 2012; 8:345-79.
22. Sanders MR. Triple P-Positive Parenting Program: Towards an empirically validated multilevel parenting and family support strategy for the prevention of behavior and emotional problems in children. Clin Child Fam Psychol Rev 1999; 2:71-90.
23. Sanders MR. Guest editorial: the translation of an evidencebased parenting program into regular clinic services. Australian e-Journal for the Advancement of Mental Health 2003; 2.
24. Sanders MR. Triple P-positive parenting program as a public health approach to strengthening parenting. J Fam Psychol 2008; 22:506-17.
25. Sanders MR, Kirby JN, Tellegen CL, Day JJ. Towards a public health approach to parenting: A systematic review and meta-analysis of the Triple P-Positive Parenting Program. Clin Psychol Rev 2014; 32:337-57.
26. De Graaf I, Speetjens P, Smit F, de Wolff M, Tavecchio L. Effectiveness of the Triple P Positive Parenting Program on behavioral problems in children: a meta-analysis. Behav Modif 2008; 32:714-35.
27. De Graaf I, Speetjens P, Smit F, De Wolff M, Tavecchio L. Effectiveness of the triple P positive parenting program on parenting: a meta- analysis. Fam Relat 2008; 57:553-66.
28. Nowak C, Heinrichs NA. comprehensive meta-analysis of triple P-positive parenting program using hierarchical linear modeling: effectiveness and moderating variables. Clin Child Fam Psychol Rev 2008; 11:114-44.
29. Sanders MR, Turner KM, Markie-Dadds C. The development and dissemination of the Triple P-Positive Parenting Program: A multilevel, evidence-based system of parenting and family support. Prev Sci 2002; 3:173-89.
30. Westrupp EM, Northam E, Lee KJ, Scratch SE, Cameron F. Reducing and preventing internalizing and externalizing behavior problems in children with type 1 diabetes: a randomized controlled trial of the Triple P-Positive Parenting Program. Pediatric Diabetes 2015; 16:554-63.
31. Doherty FM, Calam R, Sanders MR. Positive parenting program (Triple P) for families of adolescents with type 1 diabetes: a

randomized controlled trial of self-directed teen triple P. J Pediatr Psychol 2013; 38:846-58.

32. Arkan B, Davranış Sorunları Olan Ergenlerin Ebeveynlerine Uygulanan Eğitimin Ebeveyn Tutumu, Ebeveyn Ruh Sağlığı ve Ergen Davranışına Etkisi Dokuz Eylül Üniversitesi Sağlık Bilimleri Enstitüsü Psikiyatri Hemşireliği Anabilim Dalı Doktora Tezi İzmir 2012.

33. Özyurt G. Triple P Olumlu Anne Babalık Eğitimi'nin Anksiyete Bozukluğu Olan 8-12 Yaş Arası Çocuklarda Ve Ebeveynlerinde Anksiyete Düzeyi Ve Ruh Sağlığı Üzerine Etkilerinin Araştırıldığı Randomize Kontrollü Bir Çalışma, Dokuz Eylül Üniversitesi Tıp Fakültesi Çocuk Ve Ergen Ruh Sağlığı Ve Hastalıkları Anabilim Dalı, Uzmanlık Tezi, İzmir, 2013

34. Öztürk Y. Triple P Olumlu Anne Babalık Eğitimi'nin Dikkat Eksikliği Ve Hiperaktivite Bozukluğu Olan 7-12 Yaş Arası Çocuklarda Dikkat Eksikliği Hiperaktivite Bozukluğu Belirtileri Üzerine Etkilerinin Araştırıldığı Randomize Kontrollü Bir Çalışma. Dokuz Eylül Üniversitesi Tıp Fakültesi Çocuk Ve Ergen Ruh Sağlığı Ve Hastalıkları Anabilim Dalı, Uzmanlık Tezi, İzmir, 2013.

35. Arkan B. Olumlu Annebabalık Eğitimi Programı'nın (Positive Parenting Program-Triple P) Ailenin Ruh Sağlığına Etkisi. Bursa Uludağ Üniversitesi Eğitim Fakültesi Dergisi 2019; 32:43-61.

36. Le Compte G, Le Compte A, Özer S. Üç Sosyoekonomik Düzeyde Ankaralı Annelerin Çocuk Yetiştirme Tutumları: Bir Ölçek Uyarlaması. Türk Psikoloji Dergisi 1978; 1:5-8.

37. Güvenir T, Özbek A, Baykara B, Arkar H, Şentürk B, İncekaş S. Güçler ve güçlükler anketi'nin (GGA) türkçe uyarlamasının psikometrik özellikleri. Çocuk ve Ergen Ruh Sağlığı Dergisi 2008; 15:65-74.

38. Kilic C. Genel Sağlık Anketi: geçerlik ve güvenirlik çalışması. Türk Psikiyatri Dergisi 1996; 7;3-11.

39. Sanders MR, Ralph A, Thompson R, Sofronoff K, Gardiner P, Bidwell K, Dwyer S. Every Family: A Public Health Approach to Promoting Children's Wellbeing. Brief Report. www.pfsc.uq.edu.au, 2005: Erişim Tarihi: 12. 01. 2008.

40. Sanders MR, Montgomery DT, Brechman-Toussaint ML. The Mass Media and The Prevention of Child Behavior Problems: The Evaluation of A Television Series To Promote Positive Outcomes For Parents And Their Children. Journal of Child Psychology and Psychiatry 2000; 41:939-48.

41. Martin AJ, Sanders MR. Balancing Work and Family: A Controlled Evaluation of the Triple P- Positive Parenting Program as a Work-Site Intervention. Child and Adolescent Mental Health 2003; 8:161-9.

42. Sanders MR, Ralph A, Sofronoff K, Gardiner P, Thompson R, Dwyer S, Bidwell K. Every Family: A Population Approach To Reducing Behavioral And Emotional Problems In Children Making The Transition To School. Journal of Primary Prevention 2008; 29:197-222.

43. Leung C, Sanders MR, Leung S, Mak R, Lau J. An Outcome Evaluation of The Implementation of The Triple P- Positive Parenting Program In Hong Kong. Family Process 2003; 42:531-44.

44. Turner KMT, Richards M, Sanders MR. Randomised clinical trial of a group parent education programme for Australian Indigenous families. J Paediatr Child Health 2007; 43:429-37.

45. Stallman HM, Ralph A. Reducing Risk Factors For Adolescent Behavioural And Emotional Problems: A Pilot Randomised Controlled Trial of A Self-Administered Parenting Intervention. Australian e-Journal for the Advancement of Mental Health 2007; 6:1-13.

46. Sanders MR, Markie-Dadds C, Turner KMT, Ralph A. Using the Triple P System of Intervention to Prevent Behavioural Problems in Children and Adolescents. Handbook of Interventions that Work with Children and Adolescents Prevention and Treatment. John Wiley & Sons Ltd 2004; 490-516.

47. Zubrick SR, Ward KA, Silburn SR, Lawrence D, Williams AA, Blair E, Robertson D, Sanders MR. Prevention of Child Behavior Problems Through Universal Implementation of A Group Behavioral Family Intervention. Prevention Science 2005; 6:287-304.

48. Leung C, Sanders MR, Ip F, Lau J. Implementation of Triple P - Positive Parenting Program In Hong Kong: Predictors of Program Completion And Clinical Outcomes. Journal of Children's Services 2006; 1:4-17.

49. Bodenmann G, Cina A, Ledermann T, Sanders MR, The Efficacy of The Triple P - Positive Parenting Programme In Improving Parenting And Child Behaviour: A Comparison With Two Other Treatment Conditions. Behaviour Research and Therapy 2008; 46:411-27.

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Original Article

The Prevalence of Sports-related Dental Injuries and the Rate of Awareness of Mouthguard Use among Child Athletes

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ABSTRACT

Aim: Sport activities are among the most important causes of dental injuries. The prevalence of dental injuries is higher in children and in contact sports and the use of mouthguards can reduce their incidence. The goal of this study was to determine the frequency and type of dental injuries in child athletes and their parents' awareness regarding the use of mouthguards.

Materials and Methods: A cross-sectional study was conducted on child athletes aged 7-13 years. The questionnaires were completed by their parents. The questionnaire included questions on demographic data, type and history of sport activity, history of sports-related dental injuries, type of dental injury, awareness on mouthguards, type of mouthguard used and problems during its use. Data analysis was done using descriptive statistics and chi-square test. The level of significance was set at $p<0.05$.

Results: Three hundred fifty six child athletes with a mean age of 10.72±2.08 years participated in the study. The prevalence of dental injuries during sport activity was 15.5% and was higher in boys (70.9%, 39 of 55) than in girls (29.09%, 16 of 55) ($p=0.008$). The most commonly affected age was 12 years (38.2%). The dental injuries rates were as follows: mobility (58%), crown fracture (36.4%) and avulsion (5.6%). The rate of awareness of the mouthguard was 48.6%, while the utilization rate was 23.9%.

Conclusion: According to our results, the rate of dental injuries among boys and full contact sport players are high and the most common dental injury is mobility. The age and prevalence of dental injuries in young athletes in our study is not higher than has been reported in other countries. The provision of proper mouthguards and regular use of them may possibly reduce the occurrence of dental injuries during sport activity.

Keywords: Sports-related dental injuries, child athletes, mouthguard

Introduction

Sport plays an important role in a child's health (1-3). Sport activities are among the most important etiologic factors of traumatic dental injuries (4,5). Given the daily advancements made in sport activities, the risk of dental injuries has risen among athletes (6). Sport activities contribute to one third of dental injuries (2). The rate of injury varies in different studies depending on the number, location, age and type of sport activity (7,8). Contact sports and children are more vulnerable to these injuries (2,6,9-11). The most commonly prone age to sport-related dental injuries are between 7 and 11 years of age (12-14). The reason behind the increased incidence of dental injuries in children is their inability to detect injurious situations (15). Traumatic dental injuries not only occur during games, but also during training and exercise. The severity and

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frequency of contact are among the main causes of these injuries (16). There is an increased risk of dental injuries in contact sports such as boxing, football, basketball and hockey (3,16-18). The aftermath of these injuries can be the loss of teeth; root resorption and/or ankylosis may even occur in cases that have been treated. Subsequently, the patient may constantly undergo procedures such as repair, root treatment, implant, and the use of prostheses (16,19). Dental injuries can have considerable social, psychological and economic impacts (2,6). Treatment of dental injuries leads to absence from work and school (20). Sport dentistry deals with the prevention and treatment of activity/sport-related dental injuries and oral diseases. This risk can be reduced by the use of a mouthguard (2,21-23). Mouthguards evenly distribute the force of the impact throughout the mouth and thus reduce the impact of injury (2,18). Usually, they are made of ethyl vinyl acetate, given its non-toxic nature, elasticity, minimum humidity absorption, and easy construction (2,24). When a mouthguard is not used, the risk of injury increases by 1.6-1.9 times. Multiple review studies have indicated that the use of a mouthguard reduces injury to both the soft and hard tissues (2). Although many studies have proven the positive and protective effect of mouthguard use, it is compulsory in only a few sports (such as: Boxing, martial arts, American football, ice hockey) (6,25,26). Furthermore, there is no specific description of the type of mouthguard that is to be used (27). To our knowledge, data on the frequency of dental injuries and awareness of mouthguard use among 7 to 13-year-old child athletes in Hamadan (a city in west of Iran) is scarce. For this reason, this study was conducted.

Materials and Methods

This cross-sectional study was conducted on 356 children aged 7 to 13 years old practicing in organized sport activity in Hamadan's sport centers. This study was approved by the Ethics Committee of the Hamadan University of medical science (IR.UMSHA.REC.1397.728) and was conducted for a period of approximately 5 months from May2018 to October 2018. Since the athletes were aged less than 16 years, their parents had to complete the questionnaires.

This study was conducted by the parents' of child athletes who agreed to participate in the study, and provided informed consent. Children who were involved in different types of sports (more than one) (n=26) and those who did not provide informed consent (n=17) were excluded from the study.

The questionnaire was based on studies conducted earlier (2,5,16,19,28), and confidentiality was guaranteed by keeping the participants' names anonymous. The questionnaire was comprised of three sections; the first part included questions on age, gender, type of sport activity and the duration of sport activity. The second part consisted of questions on sports dental injury and in cases of having a history of sports dental injuries; the time and type of injury, the time of arrival at a medical center, the type of medical center admitted to, returns to the clinic to examine the healing process (follow up) and the duration of follow-up visits. The third part included questions on the athletes' level of awareness regarding the mouthguard, mouthguard use, type of mouthguard used, difficulties faced during mouthguard use, presence or absence of a mouthguard at the time of injury, and the cause of injury if a mouthguard had been used.

Therefore, the types of sports were classified based on their extent of contact into the following groups: Non-contact groups: gymnastics; limited-contact sports: Volleyball, baseball; semi-contact sports: Karate, taekwondo; full-contact sports: Soccer, wrestling, boxing, judo (5,29-31). The time of treatment was classified into: Acute treatment; a few hours after the injury, sub-acute treatment; in the first 24 hours following injury, delayed treatment; more than 24 hours after injury, and no treatment (32).

Statistical Analysis

Statistical analysis was done with SPSS 21. Data were presented as numbers and percentage (%). Data analysis was done using descriptive statistics and chi-square test. The level of significance was set at $p<0.05$.

Results

In total, 356 child athletes (age 7-13years) comprising 194 boys (54.5%) and 162 girls (45.5%) were included in the study. The mean age of the participants in the study was 10.72±2.08 years.

The athlete's characteristics are shown in Table I.

Fifty-five (15.4%) child athletes sustained dental injuries, 39 (70.9%) were male, and 16 (29.09%) were female participants (p=0.008). The most commonly affected age was 12 years old (38.2%). The prevalence of different injuries in different sports included in order: Handball (16.4%); boxing (16.4%); wrestling (14.5%); baseball (12.7%); soccer (10.9%); judo (9.1%); volleyball (9.1%); taekwondo (5.5%); gymnastics (3.6%) and karate (1.8%).

Among the 55 children with dental injuries, 49 of 55 had a history of sport activity of 1 to 5 years. Forty-eight children (87.3%) sustained injuries during training, and 7

(12.7%) had sustained injuries during matches. Of these injured participants, (18%) had not sought any treatment, 27 (49%) had received acute treatment, 12 (22%) had received sub-acute treatment, and 6 (11%) had received delayed treatment. Twenty-nine (64.4%) had visited public medical centers and 16 (35.6%) had visited private dental clinics. The time of admission based on the type of injury is presented in Table II. Forty-six (83.6%) of the injured children had revisited the dentist for an evaluation of the treatment process, and 9 (16.4%) had no follow-up.

The types of dental injuries based on contact sports are presented in Table III. The most damage was seen in full-contact sports (67.27%), and the most common injury was mobility (83.3%).

There was a significant difference between the level of awareness regarding mouthguards and their utilization (p<0.001); 271 (76.1%) children did not use a mouthguard, and 85 (23.9%) did (Table IV).

Among the 271 children who did not use mouthguards, 45 (16.6%) had sustained dental injuries, while only 10 (11.8%) of those who used a mouthguard had sustained injuries. This difference was not statistically significant (p=0.281). The association between mouthguard use and experience of dental injuries is presented in Table V. The

Table I. Characteristics of participants with or without dental injury

Variable		Total	Dental injuries Non-injured n (%)	Injured n (%)	p
Gender	Boys Girls	194 (54.5) 162 (45.5)	155 (51.5) 146 (48.5)	39 (70.9) 16 (29.1)	0.005
Age (mean ± SD)	Boys Girls	10.73±2.18 10.71±1.95	11.59 (20.1) 10.63 (9.9)	10.51 (79.9) 10.72 (90.1)	0.008
Sport	Soccer Baseball Gymnastics Taekwondo Karate Wrestling Judo Handball Boxing Volleyball	43 (12.1) 31 (8.7) 34 (9.6) 31 (8.7) 34 (9.6) 39 (11.0) 28 (7.9) 41 (11.5) 39 (11.0) 36 (10.1)	37 (12.3) 24 (8.0) 32 (10.6) 28 (9.3) 33 (11.0) 31 (10.3) 23 (7.6) 32 (10.6) 30 (10.0) 31 (10.3)	6 (10.9) 7 (12.7) 2 (3.6) 3 (5.5) 1 (1.8) 8 (14.5) 5 (9.1) 9 (16.4) 9 (16.4) 5 (9.1)	-
Contact sport	Non-contact sport Limited-contact Semi-contact sport Full-contact sport	34 (9.6) 67 (18.8) 65 (18.3) 190 (53.4)	32 (10.6) 55 (18.3) 61 (20.3) 153 (50.8)	2 (3.6) 12 (21.8) 4 (7.3) 37 (67.3)	0.025
Experience (years)	>1 to <5 ≥5	325 (91.3) 31 (8.7)	276 (91.7) 25 (8.3)	49 (89.1) 6 (10.9)	-
Training days per week	<3 ≥3	153 (43.0) 203 (57.0)	135 (44.9) 166 (55.1)	18 (32.7) 37 (67.3)	0.063
Training hours per day	≤3 >3 to <5 ≥5	217 (61.0) 109 (30.6) 29 (8.1)	188 (62.7) 87 (29.0) 25 (8.3)	29 (52.7) 22 (40.0) 4 (7.3)	-
Total		356	301	55	-

SD: Standard deviation

Table II. Time of treatment and dental injury

Type of injury	Time of treatment			
	No treatment n (%)	**Acute treatment n (%)**	**Sub-acute treatment n (%)**	**Delayed treatment n (%)**
Crown fracture	5 (50.0)	7 (26)	4 (33.3)	4 (66.7)
Mobility	4 (40.0)	18 (66.6)	8 (66.7)	2 (33.3)
Avulsion	1 (10.0)	2 (7.4)	0 (0.0)	0 (0.0)

rate of using a mouthguard in sports where they are mandatory is presented in Figure 1. The association between the experience of dental injuries and mouthguard use in sports where they are mandatory is presented in Table VI.

The most common type of mouthguard used was the boil and bite type (67%); the next most common was the one prepared by the dentist (custom fabricated) (28.4%); 4.6% of the parents were unaware of the type of mouthguard their children used. The problems children had while using the mouthguard were as follows: difficulty breathing; pain and discomfort in the mouth; and lack of beauty. Of those children who had sustained injuries, 45 had not used a mouthguard and 10 had used one. In the parents' opinions, the reason behind the injury in spite of mouthguard use was its lack of suitability (58.8%) and the type used (41.2%).

Discussion

Sport causes dental and facial injuries, which can be prevented through adequate training and the use of protective tools (21). Based on this cross-sectional study, the prevalence of dental injury in this age group was 15.4%. Few studies have dealt with the prevalence of dental injuries in child athletes.

Farcasiu et al. (6) reported this figure to be 14.36% in children aged 10.24±1.97 years. Galic et al. (33) reported this prevalence to be 13.5% in children from four contact sports and aged 12.9±3.2 years. Tsuchiya et al. (5) reported a rate of 13.3% in children with a mean age of 11 years (33). The aforementioned studies' findings are close to ours. In a systematic review conducted by Azami-Aghdas et al. (34), the prevalence of dental injuries among children was reported to be 17.5%. Ozbay et al. (28) observed rate of injury in 12±1.6-year-old children was 19.3%, a figure higher than ours, which may be explained by examining the injury as a whole, the athletes' age and the type of sports played.

Between 6 to 12 years of age, the continuous development of power movements becomes dominant, and the period of development of delicate motor skills begins (35). Children are more prone to dental injuries between the ages of 7 and 11 (36). Furthermore, the risk of injury increases with age as the duration of exercise lengthens (37). In our study, the most commonly injured age was the age of 12 years (38.2%), which almost the same as those of studies conduct by Naidoo et al. (38), Ozbay et al. (11), and Kececi et al. (19), Naidoo et al. (38) also studied the occurrence of dental injuries in school-going children aged 11 to 13 years, and found that the most commonly affected age was 12 years. Ozbay et al. (11) made a similar observation. Kececi et al. (19) reported that the risk of injuries was greater at younger ages (<12 years).

In line with other studies, the prevalence of dental injuries was reported to be higher among boys than among girls (8,28,39,40). This may be attributed to several factors, such as, internal factors like biological differences, bodily strength, weight and psychological traits, and environmental factors, such as play management - including the coaching style (5).

In our study, most injuries were sustained during training (86.8%); Ozbay et al. (11) have also mentioned the occurrence of dental injuries during matches.

At younger ages, the density of the alveolar bone is lower, thus, luxation is common. Aging is associated with an increase in bone density. Moreover, the lower crown/root ratio raises the possibility of crown fractures (41). The most common dental injury in our study was mobility, which is due to the lower alveolar bone density and root immaturity. Rouhani et al. (16) examined dental injuries among young athletes (20 to 30 year-olds) and also observed that the most common dental injury was luxation; despite the difference in the age group, the finding was similar to ours. Galic, however, has reported avulsion as the most common injury (33). Kececi et al. (19) observed that crown fractures were the most common injury. Likewise, Farcasiu et al. (6) reported enamel fractures as the most frequently occurring

Table IV. Relation between awareness and use of a mouthguard

Awareness	Using mouthguard		p
	Yes, n (%)	No, n (%)	
Yes	74 (87.1)	99 (36.5)	0.001
No	11 (12.9%)	172 (63.5)	

Table III. Type of dental injury with respect to level of contact in sport

Type of injury	Total	Contact sport			
		Non-contact sport n (%)	Limited-contact sport n (%)	Semi-contact sport n (%)	Full-contact sport n (%)
Crown fracture	20 (36.4)	1 (5.6)	6 (33.3)	3 (16.7)	10 (27.0)
Mobility	32 (58)	1 (3.1)	5 (15.6)	1 (3.1)	25 (83.3)
Avulsion	3 (5.6)	0	1 (33.3	0	2 (6.7)

Table V. Relation between mouthguard use and dental injures			
Using mouthguard	**Dental injuries**		**p**
	Non injured, n (%)	**Injured, n (%)**	
Yes	75 (88.2)	10 (11.8)	0.281
No	226 (83.4)	45 (16.6)	

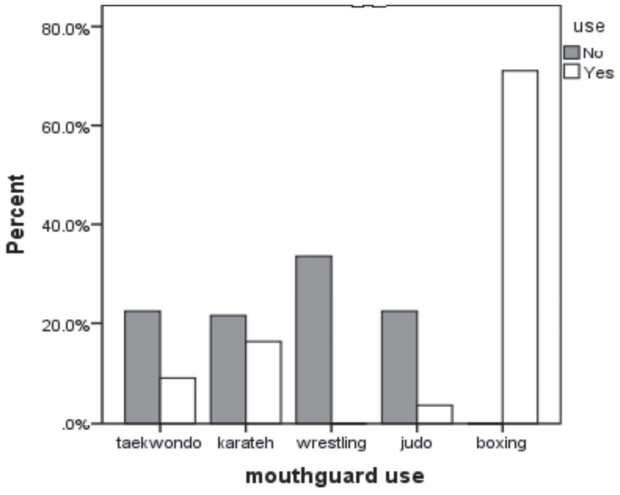

Figure 1. Rate of using mouthguards in sports where they are mandatory

Table VI. Relation between dental injuries and use of mouthguards in sports where they are mandatory and other sports				
Type of sport	**Dental injures**	**Using mouthguard**		**Total**
		No n (%)	**Yes n (%)**	
Boxing	No	0	30 (76.92)	39
	Yes	0	9 (23.07)	
Judo	No	22 (78.57)	1 (3.57)	28
	Yes	4 (14.28)	1 (3.57)	
Wrestling	No	31 (79.48)	0	39
	Yes	8 (20.51)	0	
Karate	No	24 (70.58)	9 (26.47)	34
	Yes	1 (2.94)	0	
Taekwondo	No	23 (74.19)	5 (16.12)	31
	Yes	3	0	
Other sports	No	126	30	185

dental injuries. These differences may be attributed to the type of dental system, bone density, type and extent of force applied, and type of sport.

The greater the velocity and contact, the greater the sport injury (2,6). In our study, dental injuries more frequently occurred in full-contact sports, a finding similar to those reached by Rouhani et al. (16) and Glendor (8) but contrary to Tsuchiya et al. (5) results, who did not find a significant association between the type of contact sport and the occurrence of injury. Raising awareness, the existence of rules mandating the use of mouthguards in high-risk sports and encouraging athletes to regularly use mouthguards can reduce the rate of injury.

Reducing the episodes and severity of sport-related dental injuries is the greatest goal of many sports; by using protective gear, we can achieve this goal to some extent. Unfortunately, mouthguard use is not mandatory in many high-risk sports including basketball and soccer (42). In our study, although 48.6% of parents were aware of mouthguards, only 42.8% of their children used them. This finding is similar to the results of the studies by Dursun et al. (42), Rouhani et al. (16) and Tiwari et al. (21), wherein the use of mouthguards was limited in spite of athletes being aware of them. Parents should be informed of the risks of dental injuries and their aftermaths and the advantages of using suitable mouthguards (2). Many studies have shown the protective effect of mouthguard use in reducing injury (28,42-45), the provision of proper mouthguards may possibly reduce the occurrence of TDI. However, there is still insufficient evidence that planned intervention is effective in reducing the prevalence or incidence of sports-related injuries to the mouth and face, and much remains to be elucidated regarding the attitude toward and effective use of protective equipment (46). Although the use of mouthguards had reduced injury, the difference was statistically insignificant when compared to the group that had not used mouthguards, which may be due to the type of mouthguard used, a lack of awareness regarding its replacement, structural changes and reduced efficacy over time, and the avoidance of its continuous use throughout sports such as during training. Sport coaches and dentists can play a positive role in raising awareness about and the use of mouthguards in athletes (21). Athletes need to be informed about the type of mouthguard, their replacement time, and the role of their thickness in preventing injury, as thickness plays a major role in protecting teeth and the surrounding tissues (47).

The participants of our study mostly used the boil and bite type of mouthguard, similar to O'Malley et al. (2) study, wherein two thirds of parents had reported their children using this type of mouthguard. These mouthguards are commonly used by children. Given the continuous oral changes in mix dentition ages, there is a possibility for remolding. Nevertheless, this type of mouthguard's fit may decline over time, which may limit its efficacy (26). Thus, custom mouthguards are used by 4% of children,

and policies should be regulated to make them available and raise awareness on their usage (2). Our participants experienced difficulties such as, difficulty breathing, feelings of pain and discomfort and lack of beauty, which were similar to the problems reported by Boffano et al. (48), Ranalli (49) and Duddy et al. (50). In addition to the aforementioned problems, they reported difficulty speaking and changes in the mouthguard during its utilization, all of which may be reduced by using the custom type (50,51).

Study Limitations

The limitation of our study was some parents' poor cooperation in the timely completion and handing over of the questionnaires. The use of electronic questionnaires can alleviate this problem to some extent.

Conclusion

According to our study, dental injuries were relatively high among boys and full contact sport players. The most commonly injured age and the prevalence of dental injuries in child athletes are similar to other studies conducted. Provision of proper mouthguards may reduce the occurrence of dental injuries during sport activity. Educational programs to increase awareness, improve knowledge, and promote the use of proper mouthguards with young athletes and their parents are needed.

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Ethics

Ethics Committee Approval: This study was approved by the Ethics Committee of the Hamadan University of medical science (IR.UMSHA.REC.1397.728).

Informed Consent: This study was conducted by the parents' of child athletes who agreed to participate in the study, and provided informed consent.

Peer-review: Externally peer-reviewed.

Authorship Contributions

Surgical and Medical Practices: F.M., M.F., S.T., Concept: F.M., M.F., S.T., Design: F.M., M.F., S.T., Data Collection or Processing: F.M., M.F., S.T., Analysis or Interpretation: F.M., M.F., S.T., Literature Search: F.M., M.F., S.T., Writing: S.T.

Conflict of Interest: No conflict of interest was declared by the authors.

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References

1. Goswami N, Gandhi A, Patel P, Dikshit R. An evaluation of knowledge, attitude and practices about prescribing fixed dose combinations among resident doctors. Perspectives in clinical research 2013; 4:130-5.
2. O'Malley M, Evans DS, Hewson A, Owens J. Mouthguard use and dental injury in sport: a questionnaire study of national school children in the west of Ireland. Journal of the Irish Dental Association 2012; 58:205-11.
3. Al-Arfaj I, Al-Shammari A, Al-Subai T, et al. The knowledge, attitude and practices of male sports participants to sports-related dental trauma in Khobar and Dammam, Saudi Arabia - A pilot survey. The Saudi dental journal 2016; 28:136-41.
4. Gassner R, Bösch R, Tuli T, Emshoff R. Prevalence of dental trauma in 6000 patients with facial injuries: implications for prevention. Oral Surgery, Oral Medicine, Oral Pathology, Oral Radiology, and Endodontology 1999; 87:27-33.
5. Tsuchiya S, Tsuchiya M, Momma H, et al. Factors associated with sports-related dental injuries among young athletes: a cross-sectional study in Miyagi prefecture. BMC oral health 2017; 17:168.
6. Farcaşiu C, Farcaşiu A-T, Munteanu A, Stanciu I, Luca R. Sports related dental trauma in mixed dentition in Bucharest. Romanian Journal of Oral Rehabilitation. 2012; 4:59.
7. Kumamoto D, Maeda Y. Global trends and epidemiology of sports injuries. J Pediatr Dent Care 2005; 11:15.
8. Glendor U. Aetiology and risk factors related to traumatic dental injuries–a review of the literature. Dental Traumatology 2009; 25:19-31.
9. Cortes MI, Marcenes W, Sheiham A. Impact of traumatic injuries to the permanent teeth on the oral health-related quality of life in 12-14-year-old children. Community dentistry and oral epidemiology 2002; 30:193-8.
10. Ferrari CH, De Medeiros JMF. Dental trauma and level of information: mouthguard use in different contact sports. Dental Traumatology 2002; 18:144-7.
11. Ozbay G, Bakkal M, Abbasoglu Z, Demirel S, Kargul B, Welbury R. Incidence and prevention of traumatic injuries in paediatric handball players in Istanbul, Turkey. European Archives of Paediatric Dentistry 2013; 14:41-5.
12. Tesini D, Soporowski N. Epidemiology of orofacial sports-related injuries. Dental clinics of North America 2000 ;44:1-18.
13. ADA Council on Access, Prevention and Interprofessional Relations; ADA Council on Scientific Affairs. Using mouthguards to reduce the incidence and severity of sports-related oral injuries. The Journal of the American Dental Association 2006; 137:1712-20.
14. Stewart GB, Shields BJ, Fields S, Dawn Comstock R, Smith GA. Consumer products and activities associated with dental injuries to children treated in United States emergency departments, 1990-2003. Dental traumatology 2009; 25:399-405.
15. Borssén E, Källestal C, Holm AK. Treatment time of traumatic dental injuries in a cohort of 16-year-olds in northern Sweden. Acta odontologica Scandinavica 2002; 60:265-70.
16. Rouhani A, Ghoddusi J, Rahmandost MR, Akbari M. Prevalence of traumatic dental injuries among contact sport practitioners

in Northeast of Iran in 2012. Journal of Dental Materials and Techniques 2016; 5:82-5.

17. Kumamoto D, Maeda Y. A literature review of sports-related orofacial trauma. General dentistry 2004; 52:270-80; quiz 81.
18. Ranalli DN. Prevention of sports-related traumatic dental injuries. Dental clinics of North America 2000; 44:35-51, v-vi.
19. Keçeci AD, Erogˇlu E, Baydar ML. Dental trauma incidence and mouthguard use in elite athletes in Turkey. Dental Traumatology. 2005; 21:76-9.
20. Adirim TA, Cheng TL. Overview of injuries in the young athlete. Sports medicine 2003; 33:75-81.
21. Tiwari V, Saxena V, Tiwari U, Singh A, Jain M, Goud S. Dental trauma and mouthguard awareness and use among contact and noncontact athletes in central India. Journal of oral science 2014; 56:239-43.
22. Tulunoglu I, Özbek M. Oral trauma, mouthguard awareness, and use in two contact sports in Turkey. Dental Traumatology 2006; 22:242-6.
23. Aljohani YR, Alfaifi KH, Redwan SK, Sabbahi DA, Zahran MH. Dental injuries in taekwondo athletes practicing in Saudi Arabia. Saudi medical journal 2017; 38:1143-7.
24. Westerman B, Stringfellow P, Eccleston J. Beneficial effects of air inclusions on the performance of ethylene vinyl acetate (EVA) mouthguard material. British journal of sports medicine 2002; 36:51-3.
25. Knapik JJ, Marshall SW, Lee RB, et al. Mouthguards in sport activities history, physical properties and injury prevention effectiveness. Sports medicine 2007; 37:117-44.
26. American Academy of Pediatric Denstistry Clinical Affairs Committee; American Academy of Pediatric Dentistry Council on Clinical Affairs. Policy on prevention of sports-related orofacial injuries. Pediatric dentistry 2005; 27(7 Suppl):45.
27. Mills SC. Mandatory mouthguard rules for high school athletes in the United States. General dentistry 2015; 63:35-40.
28. Ozbay G, Bakkal M, Abbasoglu Z, Demirel S, Kargul B, Welbury R. Incidence and prevention of traumatic injuries in paediatric handball players in Istanbul, Turkey. European archives of paediatric dentistry 2013; 14:41-5.
29. Mintah JK, Huddleston S, Doody SG. Justifications of aggressive behavior in contact and semicontact sports. Journal of Applied Social Psychology 1999; 29:597-605.
30. Gartland S, Malik M, Lovell M. Injury and injury rates in Muay Thai kick boxing. British journal of sports medicine 2001; 35:308-13.
31. Sohrabi F, Atashak S, Aliloo M. Psychological profile of athletes in contact and non-contact sports. Middle-East Journal of Scientific Research 2011; 9:638-44.
32. Andreasen J, Andreasen F, Skeie A, Hjørting-Hansen E, Schwartz O. Effect of treatment delay upon pulp and periodontal healing of traumatic dental injuries–a review article. Dental traumatology 2002; 18:116-28.
33. Galic T, Kuncic D, Pericic TP, et al. Knowledge and attitudes about sports-related dental injuries and mouthguard use in young athletes in four different contact sports-water polo, karate, taekwondo and handball. Dental traumatology 2018; 34:175-81.
34. Azami-Aghdash S, Azar FE, Azar FP, et al. Prevalence, etiology, and types of dental trauma in children and adolescents: systematic review and meta-analysis. Medical journal of the Islamic Republic of Iran 2015; 29:234.
35. Nowak AJ, Skotowski MC, Widmer R, Strate J, Cugini M. A practice based evaluation of a range of children's manual toothbrushes: safety and acceptance. Compendium of continuing education in dentistry 2002; 23(3 Suppl 2):17-24.
36. Newsome P, Tran D, Cooke M. The role of the mouthguard in the prevention of sports-related dental injuries: a review. International Journal of Paediatric Dentistry 2001; 11:396-404.
37. Muller-Bolla M, Lupi-Pegurier L, Pedeutour P, Bolla M. Orofacial trauma and rugby in France: epidemiological survey. Dental Traumatology 2003; 19:183-92.
38. Naidoo S, Sheiham A, Tsakos G. Traumatic dental injuries of permanent incisors in 11-to 13-year-old South African schoolchildren. Dental traumatology 2009; 25:224-8.
39. Goettems ML, Schuch HS, Hallal PC, Torriani DD, Demarco FF. Nutritional status and physical activity level as risk factor for traumatic dental injuries occurrence: a systematic review. Dental Traumatology 2014; 30:251-8.
40. Welch C, Thomson M, Kennedy R. ACC claims for sports-related dental trauma from 1999 to 2008: a retrospective analysis. New Zealand Dental Journal 2010; 106:137-42.
41. Järvinen S. Incisal overjet and traumatic injuries to upper permanent incisors: A retrospective study. Acta Odontologica Scandinavica 1978; 36:359-62.
42. Dursun E, Ilarslan YD, Ozgul O, Donmez G. Prevalence of dental trauma and mouthguard awareness among weekend warrior soccer players. J Oral Sci 2015; 57:191-4.
43. Tanaka Y, Maeda Y, Yang TC, Ando T, Tauchi Y, Miyanaga H. Prevention of orofacial injury via the use of mouthguards among young male rugby players. International journal of sports medicine 2015; 36:254-61.
44. Frontera RR, Zanin L, Ambrosano GMB, Flório FM. Orofacial trauma in Brazilian basketball players and level of information concerning trauma and mouthguards. Dental traumatology 2011; 27:208-16.
45. Yeşil Duymuş Z, Gungor H. Use of mouthguard rates among university athletes during sport activities in Erzurum, Turkey. Dental traumatology 2009; 25:318-22.
46. Billings RJ, Berkowitz RJ, Watson G. Teeth. Pediatrics 2004; 113(Supplement 3):1120-7.
47. Guevara PH, Hondrum SO, Reichl RB. A comparison of commercially available mouthguards and a custom mouthguard. Gen Dent 2001; 49:402-6.
48. Boffano P, Boffano M, Gallesio C, Roccia F, Cignetti R, Piana R. Rugby athletes' awareness and compliance in the use of mouthguards in the North West of Italy. Dental Traumatol 2012; 28:210-3.
49. Ranalli DN. Sports dentistry and dental traumatology. Dental Traumatology 2002; 18:231-6.
50. Duddy FA, Weissman J, Lee Sr RA, Paranjpe A, Johnson JD, Cohenca N. Influence of different types of mouthguards on strength and performance of collegiate athletes: a controlled-randomized trial. Dental traumatology 2012; 28:263-7.
51. Boffano P, Boffano M, Gallesio C, Roccia F, Cignetti R, Piana R. Rugby athletes' awareness and compliance in the use of mouthguards in the North West of Italy. Dental Traumatology 2012; 28:210-3.

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Case Report

Transfusion-related Acute Lung Injury: A Case Report

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ABSTRACT

Transfusion-related acute lung injury (TRALI) is a non-cardiac pulmonary edema presenting with severe dyspnea, hypoxia and bilateral diffuse infiltrates on chest X-ray. It usually occurs within the first 6 hours following the administration of plasma and plasma rich blood products. Herein, we present a patient who developed TRALI shortly after plasmapheresis due to Hemolytic Uremic syndrome and exhibited a dramatic response with early systemic steroid treatment.

Keywords: Transfusion-related acute lung injury, hemolytic uremic syndrome, respiratory distress, plasmapheresis, systemic steroid treatment

Introduction

Transfusion-related acute lung injury (TRALI) is characterized by tachypnea, tachycardia, cyanosis and dyspnea and it usually occurs within the first 6 hours following the administration of plasma or plasma-rich blood products. It is diagnosed by acute lung injury starting during or within 6 hours of transfusion, lack of lung damage before transfusion and the exclusion of other causes that may lead to this condition (1). The incidence has been reported as 1 per 5,000 transfusions. Although it may develop due to all blood products, it has been reported that the transfusion of platelet suspensions which have been kept in a blood bank for a long time or blood products containing more than 50 mL of plasma increase the risk (2). Within transfusion reactions, it is the fourth most common one and also it is the third most common cause of mortality (3). TRALI is rarely diagnosed because it is often not considered among the preliminary diagnoses by clinicians.

Case Report

A 7-year-old girl with a history of recurrent diarrhea with bloody mucus every 15 minutes (20 times a day), and therefore being treated with metronidazole, was referred to us because of fatigue, skin color paleness and impaired renal function tests, although her diarrhea complaint regressed on the 3rd day. When the patient arrived, there were no pathological findings except for a lethargic and pale appearance in physical examination. Blood tests revealed haemoglobin: 9.6 g/dL, Hematocrit: 28%, mean corpuscular volume: 76.7 fL, white blood cells: 10,680/mm^3, PL: 81,000/mm^3, urea: 161 mg/dL, creatinine: 4.9 mg/dL, urea nitrogen: 75 mg/dL, uric acid: 9.5 mg/dL, total serum bilirubin: 1 mg/dL, indirect bilirubin: 0.8 mg/

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dL, lactace dehydrogenase: 2,085 IU/L, albumin: 3.4 g/dL, total protein: 5.5 g/dL, alamine aminotransferase: 32 IU/L, aspartate aminotransferase: 104 IU/L. Serum electrolytes and venous blood gases were as follows; Na: 129 mEq/L, CL: 99 mEq/L, K: 4 mEq/L, Ca: 8 mg/dL, pH: 7.33, and HCO_3: 19.5 mmol/L, respectively. Direct Coombs test was negative. Urine analysis revealed the following: density: 1,024, pH: 5, protein (+++), blood (+++). With the thrombocytopenia, hemolytic anemia and renal failure triad, and also previous complaints of bloody diarrhea, low hemoglobin and platelet counts, and peripheral blood smear findings (35% spherocytes and schistocytes), Hemolytic Uremic syndrome (HUS) was diagnosed. The stool culture and shiga toxin producing *E. coli* were negative in the enteric bacterial panel. ADAMTS 13 activity level was detected to be normal at 94%. Plasmapheresis and hemodialysis were planned with the preliminary diagnosis of atypical HUS. Blood was sent for mutation analyzes for atypical HUS. On the second day of hospitalization, the patient underwent hemodialysis for 30 minutes. Pre-hemodialysis biochemistry revealed creatinine: 5.22 mg/dL, urea:166 mg/dL and uric acid: 8.8 mg/dL. After hemodialysis, they reduced as follows: creatinine: 4.27 mg/dL, urea: 110 mg/dL, uric acid: 5.2 mg/dL. One day later, plasmapheresis was performed with 4 units of fresh frozen plasma. There was no problem during plasmapheresis. However, one hour later, the patient developed respiratory distress, tachypnea, tachycardia and desaturation. The patient was provided with 6-10 L/min oxygen support. On physical examination, respiratory sounds were equal in both hemi thorax, but diminished bilaterally, rales-rhonchus was not detected, heart beats were rhythmic, and there were no murmur or other additional sounds and no edema-acid or hepatomegaly. Bilateral diffuse irregular reticulonodular infiltrates were detected on PA chest X-ray (Figure 1). Sudden respiratory failure after plasmapheresis was thought to be due to TRALI. Methylprednisolone (10 mg/kg/day) was administered intravenously for 2 days. During follow-up, respiratory distress regressed, oxygen necessity decreased and mechanical ventilation was not needed. Infiltrations regressed on PA chest X-ray (Figure 2). Monitoring with hemodialysis continued in the patient while respiratory distress regressed. Plasmapheresis was not repeated.

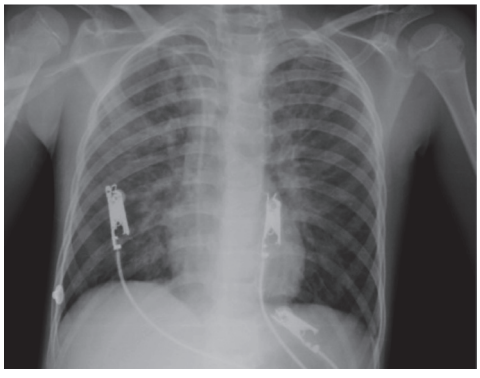

Figure 1. Chest X-Ray soon after plasmapheresis during respiratory distress

Discussion

Transfusion-related acute lung injury is a serious complication of blood products transfusion and is one of the most common causes of transfusion-related deaths. As clinicians do not consider this complication as a preliminary diagnosis, and therefore it is often not diagnosed, the actual frequency is not known but it is estimated to be 1 per 5,000 transfusions (4). Diagnosis is made by the development of acute lung injury during or within the first six hours of transfusion, the absence of acute lung injury prior to transfusion and the presence of risk factors that may lead to this condition (5).

TRALI is a non-cardiac pulmonary edema with severe dyspnea, hypoxia and bilateral diffuse infiltrations on chest X-ray. The mechanism of TRALI has not been clearly explained. According to the most accepted theory; the alloantibodies (anti-HLA class I and II, antineutrophil antibodies) from the donor activate the recipient's neutrophils, monocytes and tissue macrophages after the transfusion of plasma-containing blood products. Activation of granulocytes initiates capillary damage, increases permeability and the inflammatory process. Fluid filling occurs in the alveolar space due to diffuse alveolar capillary damage. The detection of anti-HLA or anti-neutrophil antibodies is helpful in diagnosis (6).

Another theory suggests that biologically active lipids such as phosphatidylcholine released by the breakdown of cellular components in stored blood are also effective in TRALI

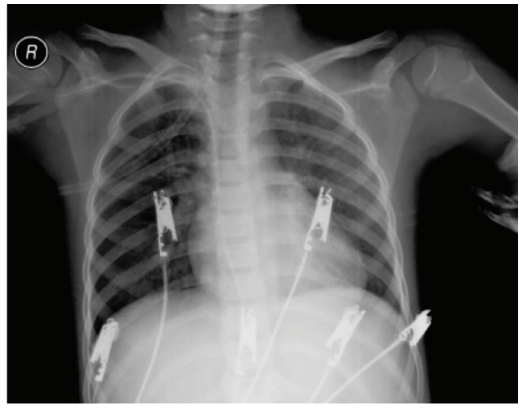

Figure 2. Chest X-ray taken 48 hours after plasmapheresis

formation and that such lipids binding to "platelet activating factor" receptors cause damage to the pulmonary bed (7).

In this case, there was no respiratory distress prior to plasmapheresis and there was no other reason to explain acute lung injury that developed immediately after the procedure. Causes of cardiogenic pulmonary edema such as transfusion associated circulatory overload (TACO), congestive heart failure and myocardial infarction should be ruled out in patients with a possible diagnosis of TRALI (8). TACO with findings such as transient volume increase with transfusion, dyspnea, increased respiratory rate, hypoxemia and jugular venous fullness is the most confused situation with TRALI (9). Clinical signs of dyspnea, cyanosis, orthopnea, severe headache, hypertension and newly developing congestive heart failure during or immediately after transfusion are suggestive of the possibility of TACO. In the first evaluation of the patient, the presence of fullness in the jugular vein, gallop rhythm, and S3 should be checked. In our patient, plasmapheresis was performed with 4 units of TDP, and after 1 hour, next to observed respiratory distress, physical examination did not reveal hypertension, heart beats were rhythmic, there was no murmur or additional sounds, no signs of rapidly-developing coronary failure such as edema-acid-hepatomegaly, and no pathology in her electrocardiography (ECG). Oxygen supplementation was started with a mask and 10 mg/kg/day methylprednisolone was given intravenously for 2 days. Due to the rapid recovery of clinical findings within 24-48 hours, the absence of ischemia on ECG or dynamic troponin changes or other cardiac causes, our case was diagnosed as TRALI.

Since there is no specific treatment for TRALI, the main component of patient management is symptomatic and supportive treatment. As soon as the diagnosis of TRALI is considered, transfusion should be terminated immediately. Oxygen and hemodynamic support should be given. Some patients may require mechanical ventilation. The key to the management of these patients is the treatment of hypoxemia. Fluid therapy is also important for hypovolemia and hypotension and vasopressor agent support may be required. Therefore, diuretics should be avoided. The advantages or disadvantages of steroids have not been clarified (10). However, we think that in our case, we received a dramatic response to steroid treatment which was initiated as soon as symptoms began. After supportive therapy in TRALI, 80% of patients had symptom regression within the first 96 hours while 20% required long-term supportive care. The mortality rate has been estimated to be 5-10%. In our case, radiological and clinical improvement was achieved within 48 hours with respiratory-hemodynamic support and systemic steroid treatment.

Conclusion

Transfusion-related acute lung injury should be kept in mind in cases of acute respiratory distress during or immediately after transfusion of blood products containing plasma and if the transfusion is still in progress, it should be terminated immediately.

Ethics

Informed Consent: Informed consent from patient's family was received.

Peer-review: Internally peer-reviewed.

Authorship Contributions

Concept: Y.Y., E.N.A.Ö., A.T.Y., P.E., H.G., A.Ç.P., Data Collection or Processing: Y.Y., E.N.A.Ö., A.T.Y., P.E., H.G., A.Ç.P., Analysis or Interpretation: Y.Y., E.N.A.Ö., A.T.Y., P.E., H.G., A.Ç.P., Literature Search: Y.Y., E.N.A.Ö., A.T.Y., P.E., H.G., A.Ç.P., Writing: Y.Y., A.T.Y., H.G., A.Ç.P.

Conflict of Interest: No conflict of interest was declared by the authors.

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References

1. Vlaar APJ, Juffermans NP. Transfusion-related acute lung injury: a clinical review. Lancet 2013; 382:984-94.
2. Goldman M, Webert KE, Arnold DM, et al. Proceedings of a consensus conference: Towards and understanding of TRALI. Transfus Med Rev 2005; 19:2-31.
3. Triulzi DJ. Transfusion-related acute lung injury: an update. Hematology Am Soc Hematol Educ Program 2006:497-501.
4. Popovsky MA, Davenport RD. Transfusionrelated acute lung injury: femme fatale? Transfusion 2001; 41:312-5.
5. Kleinman S, Caulfi eld T, Chan P, et al. Toward an understanding of transfusion-related acute lung injury: Statement of a consensus panel. Transfusion 2004; 44:1774-89.
6. Jawa RS, Anillo S, Kulaylat MN. Transfusion-related acute lung injury. J Intensive Care Med 2008; 23:109-21.
7. Silliman CC, Boshkov LK, Mehdizadehkashi Z et al. Transfusion-related acute lung injury: epidemiology and a prospective analysis of etiologic factors. Blood 2003; 101:454-62.
8. Benson A, Moss M, Silliman C. Transfusion-related acute lung injury (TRALI): a clinical review with emphasis on the critically ill. BJH 2009; 174:431-43.
9. Murphy EL, Kwaan N, Looney MR, et al. Risk factors and outcomes in transfusion-associated circulatory overload. Am J Med. 2013; 126:357.e29-38.
10. Silliman CC, Fung YL, BradLey Ball J, Khan SY. Transfusion related acute lung injury: Cur-rent concepts and misconceptions. Blood Rev 2009; 23:245-55.

2020 Referee Index

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2020 Subject Index

2020 Subject Index