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ORIGINAL ARTICLE

Exposure to and use of mobile devices in children aged 1–60 months

Ahmet Osman Kılıç[1] · Eyup Sari[1] · Husniye Yucel[1] · Melahat Melek Oğuz[1] · Emine Polat[1] · Esma Altinel Acoglu[1] · Saliha Senel[1,2]

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Abstract

The present study was conducted to determine young children's (aged 1–60 months) exposure to and use of mobile devices. The study included 422 parents of children aged 1–60 months admitted to pediatric outpatient clinics. A questionnaire was administered to the parents via face-to-face interview. Children's overall exposure to mobile devices was 75.6% ($n = 319$). Of the children, 24.4% ($n = 103$) had never used a mobile device. Among the children that had used a mobile device, 20.6% ($n = 66$) were aged between 1 and 12 months; 24.5% ($n = 78$) were aged between 13 and 24 months. The median age at the first time use of a mobile device was 12 months. The youngest child that used a mobile device was 6 months old. Tablets had a significant difference in the age at first use compared with other mobile media types ($P < 0.01$). Children's overall mobile device ownership was 30.7% (98/319) in frequency. There was a positive relationship between mobile device ownership and age ($p < 0.001$). The most commonly owned mobile device was a "tablet" at a frequency of 68.4% (67/98). The frequency of tablet ownership was inversely associated with household income ($P < 0.01$). Of the children that used mobile devices, 25.7% (82/319) used multiple mobile devices simultaneously. Among 422 children, 15.9% ($n = 67$) had a tablet in their room. The frequency of tablet use and ownership was inversely related to the mother's educational level ($P < 0.01$). The parents reported that 22.3% ($n = 71$) never received help while navigating the mobile device. The most frequent activity with mobile devices was watching videos (70.8%, $n = 226$). Of the parents, 59.6% (190/319) let their children use mobile devices while they are doing daily tasks or domestic chores. Of the parents, 91.5% ($n = 386$) reported not having been informed by a doctor about the effects of mobile devices on their children.

Conclusion: This study demonstrates a high prevalence of exposure to mobile devices in young children. The frequency of tablet use and ownership of offspring was inversely related with maternal educational level and household income.

What is Known:
- *Mobile phones and other similar mobile devices are now embedded in the daily lives of children.*
- *There are limited data about mobile media use in early childhood, and few guidelines on which clinicians can base their recommendations.*

What is New:
- *The exposure to mobile devices is high in young children aged 1–60 months.*
- *The frequency of tablet use and ownership of offspring was inversely related to household income and maternal educational level.*

Keywords Mobile · Media · Device · Tablet · Video · Phone · Media multitasking

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✉ Saliha Senel
drsaliha007@yahoo.com.tr

[1] Department of Pediatrics, Dr. Sami Ulus Maternity and Children's Health and Diseases Training and Research Hospital, Telsizler, 06080 Ankara, Turkey

[2] Department of Pediatrics, Yildirim Beyazit University, Ankara, Turkey

Abbreviations
AAP American Academy of Pediatrics
USA United States of America

Introduction

Mobile devices (mobile phones, + iPads/tablets, iPods, computers, etc.) play an increasingly important role in today's rapidly changing and developing the information technology sector. They are becoming the preferred media choice for

children because of their mobility, broad content, and interactivity [13]. Mobile devices are embedded in and dominate the daily lives of young children [5, 8, 19]. According to a report of Kabali et al. [13] conducted in an urban, low-income minority community in Philadelphia, 72% of children aged from 0 to 8 years used a mobile device in 2013, up from 38% in 2011. Even more dramatic was the increase in use by children under 2 years of age: 38% in 2013, up from 10% in 2011 [18]. Recent studies have shown associations between early childhood mobile media exposure and interference in well-being and caregiver-child relationships [5]. Excessive screen time is associated with poor sleep and risk factors for metabolic and cardiovascular diseases such as high blood pressure, obesity, low HDL cholesterol, insulin resistance, and reduced bone density [15]. An increased number of literature associates the excessive and addictive use of mobile media with interference in executive functioning such as task completion, impulse control, emotional regulation, and creative, flexible thinking [6, 13, 17, 18]. Internalizing and externalizing behavior, symptoms of depression, and suicide attempts are linked to screen time–induced poor sleep, the night use of digital devices, and mobile phone dependency. ADHD-related behavior has been connected to sleep problems, overall screen time, and violent and fast-paced content. Early and prolonged exposure to violent content is also linked to the risk of antisocial behavior and decreased prosocial behavior [12]. However, mobile media use by children could have positive effects with the right content and with the presence of parental interaction. Watching a moderate amount of high-quality programming, like "Sesame Street," has been shown to improve cognitive and social outcomes and literacy in children aged 3 to 5. Using well-designed educational apps reinforces learning among preschool and early elementary-aged children [5, 6, 19]. Media can also teach empathy, racial and ethnic tolerance, and a whole variety of interpersonal skills [12].

There are a few guidelines about mobile media use and screen time in early childhood on which clinicians can base their recommendations. For years, the American Academy of Pediatrics (AAP) has discouraged any screen time for children under the age of 2 [21]. AAP has revised its longstanding recommendations regarding the amount of screen time children should have per day. AAP recommends avoiding any screen media except for video chatting for children younger than 18 months. AAP recommends that children between 18 and 24 months only be exposed to high-quality programming, and children aged between 2 and 5 years be limited to 1 h of screen time involving high-quality programs in the presence of a parent. Parents of children aged 6 and older should place consistent limits on the time spent using media and types of media and make sure that it does not take the place of adequate sleep, physical activity, or other healthy behavior. The revised guidelines also recommend that parents designate media-free times spent together as a family as well as media-free zones within the home [19].

Australian physical activity and screen-based recommendations for children include at least 3 h (in a single block or spread throughout the day) and a maximum of 1 h of screen time in children aged 0–5 years and at least 60 min of moderate to vigorous physical activity every day and a maximum of 2-h screen-based activity for entertainment/non-educational purposes a day in both children aged between 5 and 12 years and those aged from 12 to 18 years [3]. Bozzola et al. [-5].recommends that no media device be used with children under 2 years of age, during meals, at least for 1 h before bedtime, in case of fast-paced programs, apps with distracting or violent content, and that children be kept quiet in public places.

The objective of the present study was to examine young children's (aged 1–60 months) exposure and the use of mobile devices. To the best of our knowledge, the present study is the first in terms of the age group in our country and one of the rare studies in the literature to examine the use of mobile devices in children aged 1–60 months.

Materials and methods

A descriptive study of an eligible sample of parents of children aged 1–60 months admitted to pediatric outpatient clinics at Dr. Sami Ulus Maternity and Children's Health and Diseases Training and Research Hospital between June 1, 2016, and August 1. 2016, was performed. Parents of children cared for at home and admitted to outpatient clinics because of well-child or sick visits were invited to participate in the study. Parents of children with physical and developmental disabilities and neurological and psychological disorders were excluded from the study. Four hundred twenty-two eligible parents (either the mother or the father) of 422 children agreed to be in the study, and none were excluded. No financial assistance was provided to participants. An institutional review board of Dr. Sami Ulus Maternity and Children's Health and Diseases Training and Research Hospital approved the study and written informed consent was obtained from the parents. A self-completion questionnaire with items adapted from previous studies [13, 20] was administered to parents via face-to-face interview (Table 1). The instrument was determined to have validity by a senior faculty (SS) but was not tested for reliability. Interviews were recorded by one of the authors (AOK) and there was no enumerator.

The participants were asked open-ended, yes/no, and multiple-choice questions about (1) demographic variables, (2) features of children's media exposure, (3) circumstances in which parents let their children use mobile media device, and (4) miscellaneous questions about parents' own mobile media use.

Demographic variables included the age and gender of children, parental age, educational status, and household monthly income. The male-female composition of interviewed parents was not recorded. Monthly income was

Table 1 Main titles of questionnaire

What is your child's age?
What is your child's gender?
Monthly household income (Turkish liras)?
Maternal educational level
Paternal educational level
Do you let your child use mobile media device?
Almost, sometimes, rare, never
How old was your child when she/he first used mobile devices?
Do you have mobile device/devices at home?
Which mobile devices have you got?
Smartphone, computer, tablet
Which type of cellphone have you got?
Does your child have mobile media device/devices in his/her own room?
Which mobile device is in his/her room?
Smartphone, computer, tablet
Does your child have own mobile media device?
Which mobile device does your child own?
Smartphone, computer, tablet
In which activities children participated on mobile media devices?
Watching TV, playing games, watching videos, reading books, using apps
Under which circumstances do you let your child use mobile media device?
Housekeeping, home visits, public places, parents own media use
Does your child need any help to navigate the mobile device?
Almost, sometimes, rare, never
Does your child like to use multiple media devices simultaneously?
Almost, sometimes, rare, never
How many apps have you downloaded on your mobile device?
How many apps did you download for your child's development, and education
How do mobile media devices affect family time and interaction
Increase, decrease, no change
Did a pediatrician give knowledge about the effects of mobile media devices on children?

categorized as below or above the national poverty threshold (1777 Turkish liras/TL). Mobile devices were divided into three categories (cellphones, tablets, and computers). Features of children's mobile media exposure and use were determined by questioning the frequency of mobile device use; the age at which children first used mobile devices; the need of any help to navigate the mobile device, mobile device ownership, mobile media device/devices in the child's own room, in which activities children participated in mobile media devices; and the simultaneous use of multiple media devices. "The use of mobile phones" was limited only for screen time. Voice calls were not counted.

The age at which children first used mobile devices was determined by the parents' answers to the question "How old was your child when she/he first experienced activity on a mobile device or first 'use' of mobile device?" The frequency of mobile device use was determined by the question "Do you let your child use the mobile device?" Response options were "always, sometimes, rarely, and never."

The activities in which children participated on mobile media devices were determined by the question "Which activities does your child interest on a mobile device?" Response options were watching videos, playing games, watching TV, reading a book, and accessing applications.

Circumstances in which parents let their children use mobile media devices were determined by the parents' answers to the question "When do you let your child use the mobile device?" Response options were "during daily tasks, while visiting others' homes, and to keep children calm when parents were out of the home or using their own mobile devices."

Children's ability with mobile media devices was assessed by parental responses to the question "Does your child need help to navigate the mobile device?" Response options were "always, sometimes, rarely, and never." Multitasking was only related to mobile devices (cell phones, tablets, and computers). It did not include other forms of screen devices.

Parental personal mobile device use and their supervision of their child's mobile devices were determined by asking the following questions. "How many apps have you downloaded for your child's development, and education?", "Has a pediatrician given knowledge about the effects of mobile media devices on children?", and "How do mobile media devices affect family time and interaction?" Response options were "increased, decreased, and no change."

Data were analyzed using SPSS Statistics for Windows version 20 (IBM Corp, Armonk, NY). Quantitative data are expressed as mean ± SD and median (range), and categorical data are shown as frequency and percentage. Categorical variables were compared using the chi-square test. The level of statistical significance was set at $P < 0.05$.

Results

The questionnaire was administered to 422 parents (either the mother or the father). Of the children, 50.2% were female (n = 212) and 49.8% were male ($n = 210$). The mean age of the children was 27.6 ± 0.86 months. 39.8% of the mothers and 33.4% of the fathers were primary school graduates. Of the parents, 50.5% ($n = 213$) had a monthly income below the national poverty threshold. Monthly income levels were found to be positively correlated with increased parental educational level ($p < 0.05$). Of the parents, 90% used smartphones and 10% non-smart phones (dumb phones). The parental demographic findings are shown in Table 2.

Children's overall exposure to mobile devices was 75.6% ($n = 319$). Of the children, 24.4% ($n = 103$) had never used a mobile device. Among the children that had used a mobile

Table 2 Sociodemographic data

	(*n*)	(%)
Sex/gender of children		
Female	212	50.2 (212/422)
Male	210	49.8 (210/422)
Age of children (month)		
1–12	121	28.7 (121/422)
13–24	111	26.3 (111/422)
25–36	65	15.4 (65/422)
37–48	74	17.5 (74/422)
49–60	51	12.1 (51/422)
Maternal educational level		
Illiterate	6	1.4 (5/422)
Primary school	168	39.8 (168/422)
High school	156	37 (156/422)
Education of high school	75	17.8 (75/422)
University, Master's degree, or PhD	17	4 (17/422)
Paternal educational level		
İlliterate	5	1.2 (5/422)
Primary school	136	32.2 (136/422)
High school	173	41 (173/422)
Education of high school	86	20.4 (86/422)
University, Master's degree or PhD	22	5.2 (22/422)
Monthly income		
Below the national poverty threshold	213	50.5 (213/422)
Above the national poverty threshold	209	49.5 (209/422)
• 1777–5000 TL	156	36,9 (156/422)
• > 5000 TL	53	12,6 (53/422)

Table 3 Features of mobile media usage (*n* = 319)

Need help to navigate the mobile devices	*n*	%
Almost	123	38.5 (123/319)
Sometimes	69	21.6 (69/319)
Rare	56	17.6 (56/319)
Never	71	22.3 (71/319)
Activities with mobile devices*	*n*	**%**
Watching videos	226	70.8 (226/319)
Playing games	181	56.7 (181/319)
Using other applications	91	28.5 (91/319)
Watching TV	53	16.6 (53/319)
Reading books	4	1.2 (4/319)
Frequency of mobile media exposure	*n*	%
1–12 months	66	20.6 (66/319)
13–24 months	78	24.5 (78/319)
25–36 months	58	18.2 (58/319)
37–48 months	68	21.3 (68/319)
49–60 months	49	15.4 (49/319)
Frequency of mobile device ownership	*n*	%
1–12 months	7	2.2 (7/319)
13–24 months	11	3.44 (11/319)
25–36 months	21	6.6 (21/319)
37–48 months	35	10.9 (35/319)
49–60 months	24	7.52 (24/319)

*More than one option can be chosen

device 20.6% (*n* = 66) were aged between 1 and 12 months, 24.5% (*n* = 78) were aged between 13 and 24 months, 18.2% (*n* = 58) were aged 25–36 months, 21.3% (*n* = 68) were aged 37–48 months, and 15.4% (*n* = 49) were aged 49–60 months. The youngest child that used a mobile device was 6 months old. The median age at the first-time use of a mobile device was 12 months. Tablets had a significant difference in the age at first use compared with other mobile media types ($P < 0.01$).

Children's overall mobile device ownership was 30.7% (98/319) in frequency. There was a positive relationship between mobile device ownership and age ($P < 0.01$). The frequency of ownership of at least one mobile device was 2.2% (*n* = 7) in children aged 1–12 months, 3.44% (*n* = 11) in children aged 13–24 months, 6.6% (*n* = 21) in children aged 25–36 months, 10.9% (*n* = 35) in children aged 37–48 months, and 7.52% (*n* = 24) in children aged 49–60 months. The most commonly owned mobile device was a "tablet" at a frequency of 68.4% (67/98). Computer and smartphone ownership was at a frequency of 15.3% (*n* = 15) and 9.2% (*n* = 9), respectively. Of the 98 children, 1.6% (*n* = 7) had owned both a tablet and a computer (Table 3). The frequency of tablet ownership was inversely associated with household income ($P < 0.01$).

Of the children that used mobile devices, 25.7% (82/319) used multiple mobile devices simultaneously (media multitasking).

Among 422 children, 15.9% (*n* = 67) had a tablet in their room, 3.6% (*n* = 15) had a computer in their room, 2.1% (*n* = 9) had a cell phone in their room, and 1.7% (*n* = 7) had both a tablet and computer in their room. The frequency of tablet use and ownership was inversely related with their parental educational level ($P < 0.05$); this was strongly correlated with the mother's educational level ($P < 0.01$) (Table 3).

The parents reported that 38.6% (123/319) of children usually received help when using mobile devices, 21.6% (*n* = 69) sometimes received help, 17.6% (*n* = 56) rarely received help, and 22.3% (*n* = 71) never received help. The frequency of help needed to navigate the mobile device decreased as the child's age increased ($P < 0.01$) (Table 3). The most frequent activities that children used mobile devices for were watching videos (70.8%, *n* = 226), playing games (56.7%, *n* = 181), use of other applications (28.5%, *n* = 91), watching television (16.6%, *n* = 53), and reading books (1.2%, *n* = 4) (Table 4).

Of the parents, 59.6% (190/319) let their children use mobile devices while they (parents) are doing daily tasks or domestic chores (Table 4).

Table 4 Circumstances in which parents let their children use mobile media device

Activity	*n*	%
During daily tasks		
Almost	40	12.6 (40/319)
Sometimes	90	28.2 (90/319)
Rare	60	18.8 (60/319)
Never	129	40.4 (129/319)
During home visits		
Almost	17	5.2 (17/319)
Sometimes	45	14.1 (45/319)
Rare	30	9.4 (30/319)
Never	227	71.2 (227/319)
During house keeping		
Almost	34	10.7 (34/319)
Sometimes	76	23.8 (76/319)
Rare	43	13.5 (43/319)
Never	166	52 (166/319)
Public places		
Almost	13	4.1 (13/319)
Sometimes	43	13.5 (43/319)
Rare	35	10.9 (35/319)
Never	228	71.5 (228/319)
When their parents were out of the home or using smart devices		
Almost	6	1.9 (6/319)
Sometimes	25	7.8 (25/319)
Rare	27	8.5 (27/319)
Never	261	81.8 (261/319)

Of the 422 parents, 87.4% ($n = 369$) responded to the question about the effect of mobile media devices on family time and interaction as "decreased," 4.7% ($n = 20$) as "increased," and 7.8% (n=33) as "no change."

Of the parents, 91.5% ($n = 386$) reported not having been informed by a doctor about the effects of mobile devices on their children.

Discussion

In the present study, nearly half of the children began using mobile devices before 25 months of age and the median age at first-time mobile device use was 12 months. Furthermore, one child had access to a mobile device at the age of 6 months. Parents in the present study introduced mobile devices to their children at early ages. Kabali et al. [13] reported that 92% of children aged 6 months to 4 years had access to mobile devices in 2015 although it was 10% in 2011. Rideout et al. [20] reported mobile media use at a frequency of 38% among children aged ≤ 24 months in 2013 in the USA. A recent survey from Italy has described that 20% of children used a smartphone for the first time during their first year of life. Moreover, 80% of children from 3 to 5 years of age are able to use their parent's smartphone [5]. It was reported that by the age of 2 years, 37.4% of children used touchscreen devices in a study from Argentina [22]. In a study from France concerning a group of 197 children under 3 years of age, nearly half of the children had played with an interactive screen during the previous week and in 20 families, the child was sometimes or often permitted to play during meals [2]. These data show that the frequency of mobile device use increases even at a very young age despite intercommunal differences.

In the USA, the frequency of tablet use was 20% in 2013 [20] and 36.2% in 2015 [13]. The most popular device was a tablet, owned by two thirds of 4-year olds. Child ownership of mobile devices was not associated with child gender, ethnicity, or parental education. In the present study, 16% of children used and owned tablets. The differences between the frequencies of tablet use in the present study might be due to the differences in socioeconomic conditions and distinct types of parental mediation practices to which parents guide their children's media use. Mobile devices became involved in the daily lives of the Turkish community later than in Europe or the USA and they are less expensive in these countries. An important observation in the present study was that the frequency of children who were permitted to use and own tablets decreased as their parental and especially maternal educational status increased. This finding may indicate that supervision of children's access to mobile devices increased in the higher educational level.

Although the digital divide between higher and lower income families has been narrow, disparities still exist [2, 16, 18–20]. Tablet ownership was inversely related to household income levels in the present study.

The most owned device was a "tablet" in our study as in Kabali et al.'s report [13]. Among all the children, nearly one quarter had one or more devices in their room, a "tablet" being the most common. In a study with the parents of children aged 0–7 years in the Netherlands, only 16% of the parents reported that their child had one or more devices in their room, most often a TV set or a game device [16]. More media devices at home, in particular when they are placed in the child's bedroom, may make it more difficult for the parent to supervise these screens and effectively guide the child's media use.

Young children acquire competence in using touch screen devices very early. They are capable of using touchscreen devices effectively unlocking the device, sweeping the screen with a finger to access the next page, and understanding what the keys do [1]. In the present study, 41.3% of children below 2 years never or rarely received help to navigate the mobile devices, which we find troubling. The AAP and other researchers recommend not leaving children alone in front of a screen, but that they should be accompanied by a parent who can keep an eye on the content and intervene so as to avoid their children using mobile devices by themselves [5, 9, 11, 17–19].

In the present study, approximately one quarter of the children were reported to simultaneously use multiple mobile devices (media multitasking), whereas Kabali et al. [13] reported this as 33%. According to AAP, simultaneous use of multiple mobile devices by children is associated with a lack of attention and decreased participation in social activities, daily tasks, and school performance [21].

Another important finding of the present study is that children most frequently used mobile devices for watching videos. Kabali et al. [13] reported that 76% of children watched videos on mobile devices. Rideout et al. [20] observed that 47% of older children watched videos and 63% played games on mobile devices. It is likely that children of school age prefer playing games to watching videos on mobile devices, and that the passive activity of watching videos may be preferred to active gameplay among children aged < 6 years, as the motor capabilities in young children are not sufficiently developed for them to enjoy digital gameplay [19]. Playing with an interactive touchscreen device (smartphone or tablet) is preferable for children, especially for those younger than 2 years of age. Playing games with peers is fundamental to neurodevelopment [10]. As with watching television, the passive activity of watching videos on mobile devices may have a profoundly negative effect on brain development during the preschool period in which vital neurodevelopmental milestones need to be achieved [6, 14, 17, 18]. Children younger than 2 years need social interaction with caregivers to develop their cognitive, language, motor, and social-emotional skills. Infants and toddlers cannot learn from digital media as they do from interactions with a real-life adult. At this age, symbolic thinking, memory, and attentional controls are immature to transfer knowledge to their three-dimensional experience [4, 7, 17, 19].

In the present study, the most frequent reason that parents let their children use mobile devices was to keep them occupied while they (parents) were performing daily tasks or domestic chores as in a study by Kabali et al. [13] Parental inability to adequately supervise children while performing such tasks and chores can lead to exposure to unsuitable content that is not intended to be viewed as well as excessive duration of use. Especially very young children can be assumed to have limited media-literacy and are therefore more susceptible to negative media effects The consequences of these on the later development of children are unknown, especially if the parents are not present and available to provide explanations [2]. Parental use of mobile media devices together with their children (co-viewing), which may be a beneficial way of monitoring and preventing children from accessing unsuitable content [5, 19].

Most of the parents in the present study replied negatively to the questionnaire item, "Do you let your children use mobile devices while you are using mobile devices in order to prevent them from distracting you?," whereas a remarkable number of parents answered the same question positively in a study from the USA [13]. In a study from Italy, parents often use media as pacifiers, giving mobile devices to their child to keep them calm during the first (30%) and the second (70%) year of life [5]. In a French study, 44% said that they had sometimes or often loaned their own smartphone or tablet to their child to keep the child busy [2]. Our finding may be consistent with differences in parental mediation (guidance) of mobile devices. Parental mediation practices may vary widely according to demographic variables such as the parent's age, gender, education, or income level; the parent's own media use and skills, and family context variables, such as family size, marital status, and the number of media screens at home.

Media use decreases verbal and nonverbal interactions between parents and children which may damage parent-child interaction and have a negative impact on cognitive, language, and emotional development [5]. Most of the parents in the present study agreed about the distractive effect of mobile media devices on family time and interaction. The guidelines now emphasize that how kids use screens is just as important as how much they use them [19]. Media use by children and toddlers could have positive effects only with the right content and the presence of parental interaction [5, 19].

Pediatricians have an important role in warning about exposure to mobile media in childhood [5]. Pediatricians should explain to families both the benefits and side effects of mobile devices [9]. Of the parents in our study, above 90% reported not having been informed by a doctor about the effects of mobile devices on their children. It may be beneficial to improve physicians' awareness about mobile media use or the exposure of young children. Future studies are warranted to further establish the developmental and/or health-related consequences of mobile device use.

Limitations

It would have been better if the frequency of mobile device use had been defined in quantitative terms, or in categories defined in terms of hours, per day or per week of mobile/device use. The use of unvalidated tool might also be a potential limitation. Also, our study did not explore parental media use which plays a crucial role in shaping their children's media behavior. Nevertheless, the generous sample size and intriguing finding of an inverse association between maternal educational attainment and mobile device usage in offspring are the major strengths of this study of interest to clinicians and researchers alike.

The data from this study demonstrates a high prevalence of exposure to mobile devices in children below 60 months of age. The maternal educational level was inversely related to mobile device use in offspring. The frequency of tablet ownership was also inversely associated with household income. Based on these findings, the focus should be on families with a higher economic status and lower educational level.

Authors' Contributions Dr. Kilic and Prof. Senel conceptualized and designed the study, drafted the initial manuscript, and reviewed, and revised the manuscript. Drs Sari, Yucel, Oguz, Altinel Acoglu, and Polat designed the data collection instruments, collected data, carried out the initial analyses, and reviewed and revised the manuscript.

Prof. Senel conceptualized and designed the study, coordinated and supervised data collection, and critically reviewed the manuscript for important intellectual content.

All authors approved the final manuscript as submitted and agree to be accountable for all aspects of the work.

Compliance with ethical statements

Conflict of interest The authors declare that they have no conflict of interest.

Informed consent Written informed consent was obtained from all individual participants included in the study.

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