The Relationship of Families' Environmental Behaviors with Child Health: A Cross-Sectional Study

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ABSTRACT

Objective: The study aimed to determine the effects of human activities related to environmental sustainability on child health. **Materials and Methods:** This descriptive, cross-sectional study was conducted with parents across the country who have children and live in the same household. Data were collected using a Family Information Form and an Environmental Behavior Scale (EBS). Parents from various regions nationwide were included in the study. Data were analyzed at a 95% confidence interval. **Results:** The study was completed with 616 mothers, with an average age of 35.7 years. It was determined that most families resided in developed and highly urbanized regions. Children were reported to be ill one to four times per year, most commonly with acute respiratory system diseases. The families' mean EBS score was 66.2, indicating an above-average level of environmental behavior. A significant difference was found between Environmental Behavior Scale scores and the region of residence. **Conclusion:** It is suggested that the incidence of acute or chronic diseases decreases among children who grow up in environmentally friendly settings, allowing for a healthier interaction between people and the planet. Human activities must be aligned with environmental harmony not only to protect human health but also to ensure a sustainable ecosystem overall.

Keywords: Behavior, Child, Environment, Environmental Behavior, Lifestyle, Sustainable Health.

Ailelerin Çevreye Yönelik Davranışlarının Çocuk Sağlığı ile İlişkisi: Kesitsel Bir Çalışma

ÖZ

Amaç: Çalışmada, çevresel sürdürülebilirlik içerisinde yer alan insan faaliyetlerinin, çocuk sağlığı üzerindeki etkilerinin belirlenmesi amaçlandı. **Gereç ve Yöntem:** Bu tanımlayıcı ve kesitsel çalışma, ülke genelinde çocuk sahibi olan ve onlarla aynı evde yaşayan ebeveynler üzerinde yürütüldü. Bu çalışmada veriler aile bilgi formu ve çevresel davranış ölçeği kullanılarak toplandı. Veriler %95 güven aralığı ile değerlendirildi. **Bulgular:** Çalışma yaş ortalaması 35,7 olan 616 anne ile tamamlandı. Ailelerin çoğunun kentleşmenin yoğun olduğu ülkenin gelişmiş bölgelerinde yaşadığı belirlendi. Çocukların yılda en fazla 1-4 kez hastalandıkları ve en çok solunum sistemi ile ilgili akut hastalıklar geçirdikleri tespit edildi. Ailelerin ölçek puan ortalamasının 66,2 olduğu ve ortalamanın üzerinde puan aldıkları belirlenirken, ölçek puanı ile yaşanılan bölge arasında anlamlı bir fark bulundu. **Sonuç:** Çevre dostu bir ortamda büyüyen çocuklarda akut veya kronik hastalıkların görülme sıklığının azalacağı, böylece dünyanın ve insanların sağlıklı bir şekilde etkileşime girmeye devam edeceği düşünülmektedir. Sadece insan sağlığı için değil, genel olarak sürdürülebilir bir çevre için de insan faaliyetlerinin çevre ile uyum içinde olması gerekmektedir.

Anahtar Kelimeler: Davranış, Çocuk, Çevre, Çevresel Davranış, Yaşam Tarzı, Sürdürülebilir Sağlık.

INTRODUCTION

In the light of scientific advancements that have evolved from the past to the present, technological progress has also contributed to child health protection, as in all other fields (Alptekin, 2019; Atak Abukan, 2021). Technological and scientific developments not only help preserve ecological balance and ensure a cleaner environment but also positively influence children's health (Langmaid et al., 2021; Yanar Ates & Yilmaz, 2020). People, in their efforts to achieve and maintain a higher quality of life, also contribute to these changes and advancements. As a result of these developments, there has been a decline in mortality rates among children under five years of age, including infant, neonatal, and post-neonatal mortality, which are among the key health and development indicators (Turkey Demographic and Health Research [TNSA], 2019). Maintaining environmental balance depends on preserving ecological equilibrium (Langmaid et al., 2021). When this harmony is disrupted—whether by natural imbalance or external intervention—environmental systems that normally function perfectly begin to deteriorate (Timur & Yilmaz, 2013). The concept of environmental sustainability emerged from this reality, emphasizing that sustainability can only be achieved through the protection of the environment and the natural order (Yanar Ates & Yilmaz, 2020; Graham & White, 2019). Human activity plays a crucial role in maintaining or disturbing this natural order. Human behavior is vital to the environment and can be positively or negatively influenced by the conditions in which people live (Langmaid et al., 2021; Ozabaci & Yesilkaya, 2016). Due to population growth and inefficient use of resources, inequalities in their distribution and utilization have increased, causing the natural order of the world to deteriorate progressively (Langmaid et al., 2021; Deveci et al., 2019; Gascon et al., 2016). As a result, conditions such as malnutrition, poverty, and pandemics have emerged, all of which harm human health—particularly that of children (Buse et al., 2018; Wang et al., 2021). It is well known that children, who are still in the growth and development period, are more vulnerable to these negative conditions.

Ecological theory explains the interconnection between the ecosystem, organisms, and the environment. Furthermore, both the negative and positive factors affecting the physical, cognitive, and psychosocial development of a child exist in balance within a complex ecological system (Ozabaci & Yesilkaya, 2016). When this balance is disrupted, healthy growth and development become compromised (World Health Organization [WHO], 2021), and childhood mortality and morbidity rates may increase (Gascon et al., 2016). People must understand how ecological systems function, how to maintain balance, and how human activities impact the environment, and they must develop positive attitudes and sustainable behaviors (Langmaid et al., 2021; Buse et al., 2018; Wang et al., 2021). To improve environmental performance, identifying human activities and their impacts on nature is essential (Sattler & Del Bena Davis, 2008; Thompson & Schwarts Barcott, 2017). Protecting both the environment and human health requires early recognition of environmental problems and associated risk factors. A multidisciplinary approach is necessary to protect children from environmental hazards and diseases. Therefore, families must be educated about ecological balance, the factors that disrupt it, and how these disruptions affect children's health. This study aims to determine the effects of human activities related to environmental sustainability on children's health.

MATERIALS AND METHODS

Study type

This descriptive and cross-sectional study was conducted with families who had children aged 0–18 years between April 1, 2021, and January 1, 2022.

Study group

The population of the study included families from all regions of Turkey, and the sample size was determined to include 602 families, based on the G*Power analysis with an effect size of 0.50, a Type I error of 0.05, and a 95% confidence interval. The study included all individuals who completed the online questionnaire within the specified period. As a result, 616 families who met the inclusion criteria and read and approved the online informed consent form were included. The inclusion criteria were: having at least one child, having a child aged 0–18 years, and living in the same household with the child.

Data collection tools

Data were collected using the "Data Collection Form" prepared by the researchers and the "Environmental Behavior Scale (EBS)." The Environmental Behavior Scale was originally developed in English by Goldman et al. (2006), and its Turkish validity and reliability were established by Timur and Yilmaz (2012) (Timur & Yilmaz, 2013; LeClair et al., 2020). The Data Collection Form included an introductory section (27 items) with demographic and family-related information and a second section containing the scale items. The EBS consists of 20 items, six subdimensions (Resource conservation activities for personal economic benefit, environmentally friendly consumer behavior, nature-related leisure activities, recycling efforts, responsible citizenship, and environmental activism) and a five-point Likert scale. Each item is scored from 1 (never) to 5 (always). The minimum possible score is 20, and the maximum is 100. A higher score indicates more positive environmental behavior. The original study reported a Cronbach's alpha of 0.85, and in this study, the reliability coefficient was calculated as 0.81, demonstrating a high level of internal consistency.

Procedures

Because it was challenging to conduct face-to-face interviews with families across the country, data were collected via online messaging applications. For this reason, the snowball sampling method was used to reach the participating mothers. The questionnaire and scale were prepared electronically and distributed through a text messaging application.

Statistical analysis

Data were analyzed using the Statistical Package for the Social Sciences (SPSS), Version 25 (IBM Corp.). For continuous variables, mean, median, minimum, maximum, and standard deviation were calculated. For categorical variables, numbers and percentages were presented. Depending on data distribution, the following tests were used: Chi-square (χ^2), Fisher's exact Chi-square, One-way ANOVA (F-test), and Kruskal–Wallis (KW) tests. Statistical significance was set at $p < 0.05$ with a 95% confidence interval.

Ethical considerations

Ethical approval was obtained from the local ethics committee before the study began (Approval number: 2021/21). Written consent was obtained from all participants. When the online questionnaire was opened, participants first viewed the informed consent text, and the questions became visible only after participants selected the "I confirm" option, indicating voluntary participation. This study complied with the principles of the Declaration of Helsinki.

RESULTS

The study was completed with 616 mothers. The distribution of findings related to the mothers, families, and children is presented in Table 1.

It was found that 46.9% of the children lived in the Marmara Region, 11.7% in the Mediterranean Region, and 51.5% in city centers. It was determined that 61.2% of the families owned their homes, 82.8% lived in apartments, and approximately half had access to a garden. In addition, 33% of the participants lived near a factory or industrial area, 30% near a stream or lake, and 69.5% had access to a primary health care facility. Most families used bottled water for drinking, and 77.6% reported that they purchased fruits and vegetables from local markets.

Table 1. Distribution of characteristics related to family and child (n=616).

Features	Mean±Sd		Min-Max (med)	
Mother age (years)	35.7±8.1		16-77 (35)	
Number of children	1.7±0.9		1-9 (2)	
			n	**%**
Mother's working status	**Working**		339	55.0
	Not working		277	45.0
Mother's educational status	**Illiteracy**		2	0.3
	Literate		12	1.9
	Elementary /Primary /Secondary School		118	19.2
	High School /College		135	21.9
	University		300	48.7
	Graduate		49	8.0
Family income status	**Bad**		134	21.8
	Middle		117	19.0
	Good		365	59.3
Frequency of children getting sick	**Once a month**		60	9.7
	Variable		29	4.7
	Every season		150	24.4
	Rarely		13	2.1
	Once a year		311	50.5
	He did not get sick.		53	8.6
Presence of nutritional problems in the child	**Yes**		121	19.6
	No		495	80.4
Presence of growth development problems in the child	**Yes**		20	3.2
	No		596	96.8

Table 1. (continues) Distribution of characteristics related to family and child (n=616).

		n	%
Diseases suffered by the child in the last year*	**Allergy**	146	11.5
	Diarrhea	100	7.9
	Bronchitis	26	2.1
	Pneumonia	11	0.9
	Constipation	84	6.6
	Flu/Cold	234	18.5
	Cold	357	28.2
	Fall/Multiplication	116	9.2
	Cutting/Wounding	28	2.2
	Infection	68	5.4
	Weakness	29	2.3
	Kidney Disease	7	0.6
	Urinary tract infection	56	4.4
The presence of chronic disease in your child	**Yes**	21	3.4
	No	595	96.6
TOTAL		**616**	**100**

Sd: Standard deviation; min: minimum; max: maximum; med: median; n: number; %: percentage.
*Participants selected more than one option.

When family and environmental characteristics were compared with the presence of feeding problems in children, it was found that the mother's education level (KW=3.921; p=0.048) and employment status (χ^2=6.401; p=0.011) were significantly associated with the occurrence of nutritional problems. However, the housing characteristics and living area did not affect the presence of feeding problems (p>0.05). The comparison of children's illness frequency and family or environmental characteristics is presented in Table 2.

Table 2. Comparison of the frequency of children's illnesses with characteristics related to the family and environment.

Variables		Frequency of children getting sick						Total	p
		Once a month	Variable	He did not get sick	Every season	Rarely	Once a year		
		n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	
Regions	**Central Anatolia**	4 (6.7)	6 (20.7)	2 (3.8)	15 (10)	2 (15.4)	2 (7.4)	52 (8.4)	****0.005**
	Eastern Anatolia	6 (10.0)	1 (3.4)	2 (3.8)	9 (6)	0 (0)	11 (3.5)	29 (4.7)	
	Southeastern Anatolia	12 (20)	4 (13.8)	1 (1.9)	18 (12)	0 (0)	14 (4.5)	49 (8)	
	Aegean	5 (8.3)	2 (6.9)	3 (5.7)	8 (5.3)	3 (23.1)	2 (6.8)	42 (6.8)	
	Mediterranean	7 (11.7)	1 (3.4)	7 (13.2)	22 (14.7)	0 (0)	35 (11.3)	72 (11.7)	
	Marmara	20 (33.3)	11 (37.9)	32 (60.4)	56 (37.3)	7 (53.8)	163 (52.4)	289 (46.9)	
	Black Sea	6 (10)	4 (13.8)	6 (11.3)	22 (14.7)	1 (7.7)	44 (14.1)	83 (13.5)	
Nutritional problem	**Yes**	19 (31.7)	6 (20.7)	4 (7.5)	27 (18)	3 (23.1)	60 (19.3)	119 (19.3)	****0.054**
	No	41 (68.3)	23 (79.3)	49 (92.5)	123 (82)	10 (76.9)	251 (80.7)	497 (80.7)	
Growth development problem	**Yes**	4 (6.7)	2 (6.9)	1 (1.9)	3 (2)	1 (7.7)	10 (3.2)	21 (3.4)	****0.412**
	No	56 (93.3)	27 (93.1)	52 (98.1)	147 (98)	12 (92.3)	301 (96.8)	595 (96.6)	
Chronic disease	**Yes**	2 (3.3)	3 (10.3)	0 (0)	11 (7.3)	0 (0)	5 (1.6)	21 (3.4)	****0.017**
	No	58 (96.7)	26 (89.7)	53 (100)	139 (62.7)	13 (100)	306 (98.4)	595 (96.6)	
Industrial zone presence near home	**Yes**	12 (20)	7 (24.1)	21 (39.6)	55 (36.7)	3 (23.1)	105 (33.8)	203 (33)	***0.143**
	No	48 (80)	22 (75.9)	32 (60.4)	95 (63.3)	10 (76.9)	206 (66.2)	413 (67)	

Table 2. (continues) Comparison of the frequency of children's illnesses with characteristics related to the family and environment.

Variables		Frequency of children getting sick						Total	p
		Once a month	Variable	He did not get sick	Every season	Rarely	Once a year		
		n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	
Stream/ lake presence near home	Yes	17 (28.3)	5 (17.2)	16 (30.2)	43 (28.7)	2 (15.4)	102 (32.8)	185 (30)	*0.424
	No	43 (71.7)	24 (82.8)	37 (69.8)	107 (71.3)	11 (84.6)	209 (67.2)	431 (70)	

n: number; %: percentage; *Chi square test; ** Kruskal Wallis test; Post Hoc Tamhane test; p<0.05

The mean total Environmental Behavior Scale (EBS) score was 66.25±10.7, which is above the average, and all subdimension mean scores were also above the average (Table 3). When the EBS total and subdimension scores were compared according to the region of residence, a statistically significant difference was found. Specifically, significant differences were identified for resource conservation activities for economic benefit (KW=23.219; p=0.000), environmentally conscious consumer behavior (KW=28.913; p=0.002), nature-related leisure activities (KW=21.419; p=0.002), and recycling efforts (KW=13.574; p=0.035). No significant difference was observed between the region of residence and the responsible citizenship or environmental activism subdimensions (p>0.05).

When the total EBS scores were compared according to the place of residence, a statistically significant difference was found both in the total scale score (KW=19.992; p=0.000) and in the mean scores of all subdimensions (p<0.05). When the mean EBS scores were compared with the frequency of children's illnesses, no significant relationship was found for the total EBS score (p>0.05). However, there was a significant association for the Environmentally Sensitive Consumer subscale (F=2.358; p=0.039) and the Responsible Citizenship subscale (F=2.644; p=0.022). This significance was attributed to those who became ill once a month in the environmentally sensitive consumer subdimension and those who were ill more frequently in the responsible citizenship subdimension.

Table 3. Distribution of score averages of Environmental Behavior Scale and subscales.

Scale information	Mean±Sd	Min-max(med)
Scale total points	66.25±10.70	36-98 (66)
Resource protection activities for the economic benefit of the person	7.64±2.32	3-15 (8)
Environmentally conscious consumer	10.91±3.00	3-50 (11)
Leisure activities related to nature	14.98±2.43	4-20 (15)
Recycling efforts	10.69±2.51	3-1 (11)
Responsible citizenship	15.41±3.15	5-35 (15)
Environmental activism	6.60±1.70	92-10 (7)

Sd: Standard deviation; min: minimum; max: maximum; med: median

DISCUSSION

One of the most pressing issues of the twenty-first century is environmental problems (Karami et al., 2021). Environmental problems are not limited to any single country or society and therefore require universal solutions (Langmaid et al., 2021; Buse et al., 2018; WHO, 2021). The first step in developing and implementing effective solutions is to understand individuals' environmental behaviors and to correct negative behavioral patterns. In the present study, when the environmental behaviors of families in Turkey were analyzed using the Environmental Behavior Scale (EBS), it was found that their scores were above the average level. No other study using the EBS was found in Turkey or abroad; however,

when research utilizing different scales measuring environmental behavior is considered, similar trends appear. In a study conducted in Taiwan with 526 participants, environmental behavior scores were reported to be at a moderate level (Fang et al., 2018), while in China, participants demonstrated an average level of environmental behavior knowledge (Li et al., 2019). According to the 2018 Global Environmental Performance Index, the ten countries with the best environmental performance have shown that increased awareness contributes significantly to environmental protection (Karami et al., 2021). Based on these findings, it can be concluded that people generally possess environmental awareness, but this awareness is not always reflected in behavior.

Table 4. Comparison of Environmental Behavior Scale total and subscale scores according to child and family characteristics.

Variables		n	Environmental Behavior Scale						
			Total	1	2	3	4	5	6
Regions	**Central Anatolia**	52	**0.001**	**0.000**	**0.002**	**0.002**	**0.035**	0.071	0.671
	Eastern Anatolia	29							
	Southeastern Anatolia	49							
	Aegean	42							
	Mediterranean	72							
	Marmara	289							
	Black Sea	83							
Place of residence	**Province**	317	**0.000**	**0.003**	**0.005**	**0.024**	**0.006**	**0.004**	**0.023**
	District	273							
	Town	6							
	Village	20							
Family income status	**Bad**	133	**0.006**	**.000**	**00.003**	0.612	0.429	**0.006**	**0.002**
	Middle	365							
	Good	118							
Mother's educational status	**Illiteracy**	2	**0.002**	**0.000**	**0.000**	0.082	0.786	0.128	0.544
	Literate	12							
	Primary	117							
	High School/College	138							
	University	298							
	Graduate	49							
Frequency of children getting sick	**Once a month**	60	0.637	0.660	0.096	0.229	0.845	**0.035**	0.493
	Variable	29							
	Every season	150							
	Rarely	13							
	Once a year	311							
	He did not get sick.	53							
Nutritional problem	**Yes**	121	0.320	0.847	0.190	0.229	0.927	0.122	0.354
	No	495							

Scale subdimensions; 1: Resource protection activities for the economic benefit of the person; 2: Environmentally conscious consumer; 3: Leisure activities related to nature; 4: Recycling efforts; 5: Responsible citizenship; 6: Environmental activism
*Chi square test; *Kruskal Wallis test; **Mann Whitney-U test; Post Hoc Tamhane test; p<0.05

Environmental behavior awareness alone is not sufficient to prevent environmental degradation. Such behavior is influenced by factors including living area, region, economic status, and accessibility to resources. It is generally thought that harmony with the environment is stronger in rural areas compared with urban settings, in quiet towns and villages compared with crowded cities, in detached houses compared with apartments, and in locations with better access to essential resources such as water, food, and health services (Gundogdu et al., 2021). In the present study, it was observed that children living in urban areas experienced illness more frequently, although most participants lived in regions far from industrial zones, and their children did not experience serious health problems. The literature supports this finding, reporting that children in regions with high air and water pollution become ill more frequently (Wang et al., 2021; Sutcu et al., 2018). Acute diseases have been identified as a leading cause of frequent illness (Wang et al., 2021; Sutcu et al., 2018; Duron-James et al., 2020), and the data in this study are consistent with those findings.

In a study conducted with 200 children aged 9–12 years living in rural areas, it was found that the place of residence had a significant effect on children's connection to nature, with rural children displaying more environmentally friendly behaviors (Duron-James et al., 2020). Living in green areas has also been shown to positively influence cognitive and behavioral development in children. In a study involving 620 children, a relationship was found between urbanization, green space availability, and children's intelligence and behavior (Bijnens et al., 2020). Considering both the current study and existing literature, it can be concluded that familial and environmental factors, as well as the area of residence, play an essential role in children's health and environmental awareness.

Living in harmony with the environment can only be achieved through education and awareness (Timur & Yilmaz, 2013; Artun & Ozsevgec, 2015; Erkal et al., 2011). The data obtained in this study indicate that families with higher levels of education and socioeconomic status tend to have children with fewer health issues, better nutrition, and more positive environmental behaviors. These results were

supported by the EBS total and subdimension scores. The sociocultural and socioeconomic level of a family plays a critical role in the development of environmental awareness among children (Musaad et al., 2017; Scaglioni et al., 2018).

In one study, it was found that negative environmental behaviors displayed by parents negatively affected children's attitudes and actions (Appleyard et al., 2005). In another, environmental education programs for children significantly improved post-education environmental awareness scores compared with pre-education levels (Artun & Ozsevgec, 2015). Therefore, environmental education should begin within the family and be reinforced in schools. Public awareness campaigns should also be promoted through social and digital platforms.

Environmental awareness should not be limited to education systems but should also be embedded in state policies and legislation. Legal sanctions must be applied to ensure compliance and accountability for environmental violations. If environmental consciousness is instilled from childhood, individuals will develop lifelong habits that support sustainability and prevent environmentally harmful behaviors.

Limitations of the Study
The limitation of the study is the difficulties in accessing the online questionnaire to families without the internet this limitation.

CONCLUSION
In conclusion, the socioeconomic and educational levels of families were found to influence their environmental behaviors. It was determined that children living in regions with higher levels of urbanization experienced illness more frequently. The presence of chronic diseases also had an impact on the frequency of illness among children. This study suggests that to maximize the effectiveness of education for sustainable development, both environmental attitudes and environmental behaviors should be addressed simultaneously. Although it is not entirely possible to protect children from the effects of environmental pollution, these effects can be significantly reduced through preventive measures. With collaboration among multiple sectors, professional groups, and parents, the potential harm to children can be minimized. Health professionals have a critical role in informing the public and parents about necessary environmental health precautions. Continuous monitoring and evaluation of up-to-date information regarding the environment and child health are essential, and this topic should be integrated into educational programs. It is also recommended to conduct comparative studies emphasizing the importance of environmental sustainability and demonstrating its measurable impacts. In this way, sustainability strategies can be strengthened through evidence-based results, promoting a healthier environment for future generations.

Conflict of Interest
The authors declare no potential conflicts of interest with respect to the research, authorship and/or publication of this article.

Author Contributions
Conceptualization, formal analysis, validation: AŞ, **Methodology, validation, resources, data collection, Writing – review & editing**: AŞ, EÇ, SÖ, EÇ, SÖ, EB;

Ethical Approval
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