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ENFEKSİYON NEDENİYLE HASTANEYE BAŞVURAN OKUL ÖNCESİ ÇOCUKLARDA BESLENME DURUMU VE İLİŞKİLİ FAKTÖRLERİN DEĞERLENDİRİLMESİ (1)

EVALUATION OF NUTRITIONAL STATUS AND RELATED FACTORS IN PRESCHOOL CHILDREN ADMITTED TO HOSPITAL DUE TO INFECTION

Betül KOÇAK[1], Hande ÖNGÜN YILMAZ[2]

[1] Atlas University, Faculty of Health Sciences, Nutrition and Dietetics Department, Istanbul / Turkey
[2] Istanbul Okan University, Faculty of Health Sciences, Nutrition and Dietetics Department, Istanbul / Turkey

ORCID ID: 0000-0003-3664-9066[1], 0000-0002-3497-567X[2]

Öz: Amaç: Bu çalışmada enfeksiyon nedeniyle hastaneye başvuran okul öncesi çocukların beslenme durumlarının değerlendirilmesi ve enfeksiyon sıklığı ile büyüme ve gelişme arasındaki ilişkinin belirlenmesi amaçlanmıştır. **Yöntem:** Tanımlayıcı kesitsel tipteki bu araştırma, İstanbul'daki bir hastaneye enfeksiyon nedeniyle başvuran 3-6 yaş arası toplam 110 çocuk ile gerçekleştirilmiştir. Araştırmanın verileri, çocuğun yaşı, cinsiyeti, sağlık durumu, enfeksiyon sıklığı, temizlik alışkanlıkları, antropometrik ölçümleri ve besin tüketim sıklığı ile ilgili soruların yer aldığı bir anket formu aracılığıyla yüz yüze görüşme tekniği ile toplanmıştır. **Bulgular:** Beden kütle indeksi (BKİ) Z skorlarına göre çocukların %8,1'i çok zayıf, %9,1'i zayıf, %44,5'i normal, %21,8'i fazla kilolu ve %16,4'ü obezdir. Çocukların %36,4'ü yılda 1-3 kez enfeksiyon geçirirken, %63,6'sı yılda 4 ve daha fazla kez enfeksiyon geçirmektedir. Sık sık odaları temizlenen çocuklarda enfeksiyon sıklığı daha fazladır ($p<0.05$). D vitamini dışında çocukların günlük enerji ve besin ögeleri tüketimi ile enfeksiyon sıklığı arasında ilişki bulunmamıştır ($p>0.05$). Daha az D vitamini tüketen çocuklar yılda 4 veya daha fazla enfeksiyon geçirmektedir ($p<0.05$). **Sonuç:** Çocukluk çağında sık görülen enfeksiyon hastalıkları büyüme ve gelişmeyi etkilemektedir. Enfeksiyon ve yetersiz beslenme arasındaki ikili ilişki nedeniyle sık enfeksiyon geçiren çocukların beslenme durumu ve büyüme gelişmeleri yakından takip edilmelidir.

Anahtar Kelimeler: Çocuk Beslenmesi, Enfeksiyonlar, Büyüme ve Gelişme, Beslenme Durumu

Abstract: Aim: In this study, it was aimed to evaluate the nutritional status of preschool children who were admitted to the hospital due to infection, and to determine the relationship between the frequency of infection and their growth and development. **Method**: This descriptive cross-sectional study was conducted with a total of 110 children aged between 3 and 6 years who applied due to infection to a hospital in Istanbul. Data collection was made with face to face interviews with a questionnaire form including questions about the child's age, gender, health status, infection frequency, cleaning habits, anthropometric measurements, and food consumption frequency. **Results:** According to body mass index (BMI) Z scores, 8.1% of the children were severely thin, 9.1% thin, 44.5% normal, 21.8% overweight, and 16.4% obese. While 36.4% of the children having infection 1-3 times a year, 63.6% having infection 4 and more times a year. Children whose rooms were cleaned frequently had more infections ($p<0.05$). There was no relationship between the children's daily energy and nutrient consumption and the infection frequency ($p>0.05$) except vitamin D. Children who consumed less vitamin D had 4 or more infections yearly ($p<0.05$). **Conclusion:** Frequent infectious diseases during childhood affect growth and development. Due to the bilateral relationship between infection and malnutrition, the nutritional status and growth developments of children with frequent infections should be followed closely.

Keywords: Child Nutrition, Infections, Growth and Development, Nutritional Status

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(1) Sorumlu Yazar, Corresponding Author: Hande ÖNGÜN YILMAZ "Dr. Öğr. Üye., Assist. Prof", Istanbul Okan University, Faculty of Health Sciences, Nutrition and Dietetics Department, Istanbul / Turkey, dythandeongun@gmail.com, *Geliş Tarihi / Received: 29.12.2020, Kabul Tarihi / Accepted: 28.03.2021, Makalenin Türü: Type of Article: (Araştırma – Uygulama; Research-Application) Çıkar Çatışması, Yok – Conflict of Interest, No, (Etik Kurul Raporu ve Kurum İzin Bilgisi- Ethical Board Report and Institutiunal Approval, Var/Yes (Bezmialem Vakıf Üniversitesi Girişimsel Olmayan Araştırmalar Etik Kurulu Tarih:13.06.2017, Karar: 11/175)*

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INTRODUCTION

The normal growth of a child is one of the indicators of health. Growth is a process determined by genetic factors but affected by environmental factors such as nutrition and infections. Monitoring growth is important in terms of determining deviations from the normal, revealing the causes, and taking necessary measures (Atıcı et al., 2007:1-5; Çınar et al., 2007: 294-302).

The relationship between child nutrition and infection is known to be bilateral. The frequent disease can cause malnutrition and increase the infection risk by worsening nutritional status (Dewey and Mayers, 2011: 129-142). Although there is no distinctive symptom due to infection, physiological conditions associated with infections may impair growth. These physiological conditions are reduced appetite, decreased absorption of nutrients, increasing nutrient losses, and not using the nutrients for growth (Goto et al., 2009: 1509-1516).

Since the loss of appetite in infectious diseases is a common problem, weight loss can be seen in children during the disease period. Frequent repetition of these disease periods may result in weight loss in children and retention in growth and development; on the other hand, children who do not eat a regular and balanced diet are more susceptible to diseases (Humphrey, 2009: 1032-1035). Due to the use of energy and nutrients in the immune response during the infection, its usage in growth-development remains in the background. Therefore, there can be a mechanism depending on the growth adaptation declining during infections (Dewey and Mayers, 2011: 129-142).

Recurrent infections are associated with lower growth and stunting in children live in developing countries (Guerrant et al., 2008: 487-505). This is supported by previous findings that demonstrated temporal links between slowed growth and repeated infections, and more recent cohorts evaluated for growth related to clinically relevant diarrheal and respiratory infections. The presence of systemic inflammation during infection may play a role in growth suppression, as similar linear growth deficits have been noted in other conditions with high levels of systemic inflammation, such as Crohn's disease or juvenile idiopathic arthritis, in both poor growth is associated with high levels of inflammatory markers, low levels of important growth factors such as insulin-like growth factor (IGF)-1, and poor responsiveness of the growth plate (De Boer., et al., 2017: 248-253).

During infection, cytokines at high levels can lead to increased blood leptin concentration and reduced appetite (Somech et al., 2007: 76-78). Since the loss of appetite in infectious

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diseases is a common problem, weight loss can be seen in children during the disease period. Frequent repetition of these disease periods may result in weight loss in children and retention in growth and development; on the other hand, children who do not eat a regular and balanced diet are more susceptible to diseases (Humphrey, 2009: 1032-1035). Due to the use of energy and nutrients in the immune response during the infection, its usage in growth-development remains in the background. Therefore, regressive growth during infections may be a mechanism of adaptation (Dewey and Mayers, 2011: 129-142).

Activation of the immune system reduces the levels of certain nutrients in circulation. These nutrients are vitamin A, zinc, and iron. With the increase of iron involvement in the liver, the transportation of iron to other tissues is limited. This is probably part of an adaptive response to the protection of important nutrients from foreign pathogens. However, this adaptive response may cause nutrients to remain inadequate to support growth, even if taken sufficiently during the disease (Hautvast et al., 2000: 296-301; Dewey and Mayers, 2011: 129-142).

In this study, it was aimed to evaluate the nutritional status of preschool children who were admitted to the hospital due to infection, and to determine the relationship between the frequency of infection and their growth and development.

MATERIALS and METHODS

This descriptive cross-sectional study was conducted with a total of 110 children (54 girls and 56 boys) aged between 3 and 6 years who applied due to infection to the Department of Paediatrics, Eyup Sultan Additional Service Building in Bezmialem Vakif University Faculty of Medicine in İstanbul between 1 and 30 July 2017.

In order to conduct the study, the ethics committee approval from the non-invasive clinical trials ethics committee in Bezmialem Foundation University (Date:13.06.2017, Decision number:11/175), and permission from the health application and research center in Bezmialem Foundation University were obtained. The study was conducted with the children whose parents agreed to participate in the study voluntarily. The parents of the children who participated in the study completed the informed consent form.

Data collection was made with face to face interviews with a questionnaire form created by the researchers. The questionnaire includes questions about the child's age, gender, health status, infection frequency, cleaning habits, anthropometric measurements, and food consumption frequency. The nutrient quantities obtained from the food consumption frequen-

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cy questionnaire were entered into the BeBİS 7.2 (Nutrition Information System) program after determining the daily consumption of the child about that nutrient. According to the information received from the parent of the child, the frequency and amount of consumption of the specified foods were obtained.

Height measurement was made using a standard tape measure. TANİTA MC 780 was used for weight measurement, body analysis was not taken but only body weight was measured. By using the WHO AnthroPlus v1.0.4 program, height, weight, age data, and weight-for-age, height-for-age, and BMI-for-age were calculated as Z scores.

Statistical Analysis

All statistical analyses were performed using IBM SPSS for Windows version 21.0 (SPSS, Chicago, IL, USA). Kolmogorov-Smirnov test was used to assess the assumption of normality. In the evaluation for the study data, Pearson chi-square test, Fisher's exact test, Independent samples t-test was used along with comparative-descriptive statistical methods (mean, standard deviation, frequency, percentages). The statistical significance level was accepted as 0.05.

RESULTS

In this study, 49.1% (n=54) of the children were girls and 50.9% (n=56) were boys. Of all children, 32.7% (n=36) were three years old, 19.1% (n=21) were four years old, 29.1% (n=32) were five years old and 19.1% (n=21) were six years old. Only 15.5% (n=17) of children had chronic diseases, allergic asthma was the most common with 41.2% (n=7). Amongst 27.3% (n=30) children who had allergies, 33.4% (n=10) had allergies to house dust. Details about the descriptive features of the children are given in Table 1

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(TRADEMARK)
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Table 1. Descriptive Features of Children (n=110)

Variables		n	%
Gender	Girl	54	49.1
	Boy	56	50.9
Age (year)	3	36	32.7
	4	21	19.1
	5	32	29.1
	6	21	19.1
Chronic illness	Yes	17	15.5
	No	93	84.5
Chronic diseases (n = 17)	Allergic asthma	7	41.2
	Asthma	6	35.3
	Allergy	2	11.8
	Gastritis	1	5.9
	Bronchitis	1	5.9
Regular medication use	Yes	11	10.0
	No	99	90.0
Allergy condition	Yes	30	27.3
	No	80	72.7
Allergy type (n=30)	House dust allergy	10	33.4
	Food allergy	7	23.4
	Seasonal allergy	4	13.3
	Penicillin allergy	1	3.3
	Other (undetected)	8	26.6

Weight, height, and BMI Z score values of children are given in Table 2. When examining the weight-for-age Z scores, it was determined that 64.5% (n=71) of the children's Z-Score was zero, 4.5% (n=5) of the children were less than -2, none of the children were less than -3. When examining the height-for-age Z scores, it was found that 49.1% (n=54) of the children's Z-Score was zero, 7.3% (n=8) were less than -2, 4.5% (n=5) of the children were less than -3. When the BMI-for-age Z scores were examined, it was de-

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termined that 44.5% (n=49) of the children's Z-Score was zero, 3.6% (n=4) were less than -2, 4.5% (n=5) were less than -3, while 9.1% (n=10) were higher than +2, and 7.3% (n=8) were higher than +3.

Table 2. Weight, Height and BMI Z-Score Values of Children for Age (n=110)

Z-Score	Weight for age		Height for age		BMI for age	
	n	%	n	%	n	%
<-3	-	-	5	4.5	5	4.5
<-2	5	4.5	8	7.3	4	3.6
<-1	7	6.4	13	11.8	10	9.1
0	71	64.5	54	49.1	49	44.5
>1	15	13.6	12	10.9	24	21.8
>2	8	7.3	12	10.9	10	9.1
>3	4	3.6	6	5.5	8	7.3

The mean breastfeeding duration of the mothers was found as 16.82±9.92 (med:18/ min-max:0-48) months, and the time for mothers to start supplementary nutrients was an average of 6.845±4.010 (med:6/ min-max:1-36) months.

While 36.4% (n=40) of the children having infection 1-3 times a year, 63.6% (n=70) having infection 4 and more times a year. It was determined that the difference between the infection frequencies by gender was not statistically significant (p>0.05). The difference between the children's age and the infection frequency was also statistically insignificant (p>0.05).

The comparison of the children's weight, height, and BMI for age Z scores with their yearly infection frequency was investigated. It was determined that there was no relationship between the weight, height, and BMI for age Z score groups with infection frequency. The difference between the groups was statistically insignificant (p>0.05). Also, average breastfeeding time did not have an effect on infection frequency.

A comparison of some hygiene behaviors and infection frequency of children was given in Table 3. When the relationship between the child's habits of handwashing and the infection frequency was examined, according to the children's hygiene habits (hand and face washing in the morning, hand washing before and after the meal, when they come home and after using the toilet), those who

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had low handwashing habits had infection 4 and more times a year and even though children with bad hygiene habits have a tendency to get more infection diseases per year, the difference between the groups was statistically insignificant (p>0.05).

It was determined that out of children whose parents did once or less room cleaning in a week, 84.2% had infection 1-3 times a year and 15.8% had infection 4 and more times a year; on the other hand, out of children whose parents did room cleaning 2-3 times a week, 59.3% had infection 1-3 times a year and 40.7% had infection four and more times a year. The difference between the groups was statistically significant (p<0.05) (Table 3).

Table 3. Comparison of Some Hygiene Behaviors and the Frequency of Infection (n = 110)

Hygiene behaviors		1-3 times a year		4 times a year and more		p
		n	%	n	%	
The child's hand washing habit	Hand-face wash in the morning	61	62.2	37	37.8	0,298[1]
	Before dinner	52	65.0	28	35.0	0,393[1]
	After dinner	61	64.2	34	35.8	0,482[1]
	Come home from the outside	66	64.1	37	35.9	0,500[1]
	After using toilet	66	62.9	39	37.1	0,399[1]
Room cleaning frequency	Once a week or less	16	84.2	3	15.8	0,033[2*]
	2-3 per week	54	59.3	37	40.7	

[1]Pearson Chi-square test [2]Fisher exact test [*]p <0.05

Comparison between children's energy and nutrient consumption and the frequency of infection was given in Table 4. When the relationship between the children's daily energy and nutrient consumption and the infection frequency was examined, according to the children's energy, macronutrients, vitamins, and minerals the difference between the groups was statistically insignificant (p>0.05) except vitamin D. Children who consumed less vitamin D had 4 or more infections yearly. While children with 0.97±0.56 µg mean vitamin D consumption had 1-3 infections yearly, children with 0.73±0.43 µg vitamin D consumption had 4 or more infections yearly (p<0.05). It should not be forgotten that vitamin D consumed from food is not efficient in serum vitamin D levels and it would be deceiving to judge diet intake instead of serum levels.

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Table 4. Comparison Between Children's Energy and Nutrient Consumption and the Frequency of Infection (n = 110)

Nutrient	1-3 times a year		4 times a year and more		t	P
	Mean	SD	Mean	SD		
Energy (kcal)	1595.64	418.51	1593.17	389.01	0.031	0.976
CHO (g)	146.44	53.61	135.47	45.07	1.091	0.277
Protein (g)	54.30	15.95	57.14	18.01	-0.858	0.393
Fat (%)	36.87	8.44	38.72	11.6	-0.957	0.734
SFA† (%)	14.79	7.35	14.66	7.46	0.091	0.928
PUFA‡ (%)	9.29	4.38	8.26	3.45	1.274	0.205
MUFA§ (%)	12.81	9.56	15.79	11.01	-1.484	0.141
Cholesterol (mg)	428.77	95.60	427.47	105.27	0.066	0.948
Fiber (g)	12.33	6.12	11.63	5.23	0.600	0.549
Vitamin A (µg)	606.11	166.18	617.15	127.74	-0.363	0.717
Vitamin B1 (mg)	0.83	0.39	0.82	0.38	0.162	0.871
Vitamin B2 (mg)	1.98	0.85	1.86	0.81	0.735	0.464
Niacin (mg)	5.90	1.76	5.36	1.63	1.589	0.115
Vitamin B6 (mg)	0.97	0.44	0.99	0.43	-0.172	0.864
Folic acid (µg)	195.26	67.37	183.67	69.39	0.859	0.393
Vitamin B12 (µg)	2.35	1.22	2.52	1.41	-0.672	0.503
Vitamin C (mg)	62.66	15.83	58.02	12.27	1.596	0.113
Vitamin D (µg)	0.97	0.56	0.73	0.43	2.370	0.020*
Vitamin E (mg)	15.08	5.80	14.88	5.34	0.180	0.858
Vitamin K (µg)	133.78	446.16	129.69	49.89	0.434	0.665
Na (mg)	2124.18	857.95	2045.30	811.67	0.473	0.637
K (mg)	2881.44	839.28	2885.62	881.80	-0.025	0.980
Ca (mg)	1401.54	709.57	1242.42	650.28	1.166	0.246
P (mg)	1619.87	525.91	1540.65	555.57	0.745	0.458
Mg (mg)	262.87	109.42	281.62	120.95	-0.832	0.407

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Fe (mg)	5.07	1.40	4.90	1.12	0.641	0.523
Zn (mg)	7.44	3.01	7.45	2.85	-0.009	0.993

†Saturated fatty acids ‡Polyunsaturated fatty acids §Monounsaturated fatty acids

*Independent samples t-test *p <0.05*

DISCUSSION

Frequent infections during childhood worsen the nutritional status and may cause malnutrition. The relationship between child nutrition and infection is known to be bilateral. The frequent infection diseases can cause malnutrition and increase the infection risk by worsening nutritional status (Dewey and Mayers, 2011: 129-142). The normal growth of a child is one of the important indicators that he is healthy. Growth is a process determined by genetic factors but affected by environmental factors such as nutrition and infections. Monitoring growth is important in terms of determining deviations from the normal, revealing the causes, and taking necessary measures (Atıcı et al., 2007:1-5; Çınar et al., 2007: 294-302). In this study, it was aimed to evaluate the nutritional status of preschool children who were admitted to the hospital due to infection, and to determine the relationship between the frequency of infection and their growth and development.

In the study comparing the relationship of infectious diseases with nutritional status during the preschool period, the children's weight-, height-, BMI-for-age Z score values were determined. It was concluded in the study according to BMI Z scores that 9.1% of the children were weak, and 8.1% were very weak. According to 2010, BMI Z scores data of the Turkey Nutrition and Health Survey (TNHS) (2014: 554-556) conducted in Turkey, 10.3% of the children under age 5 were weak, and 5.6% were very weak. The results of the study were similar to the results of the TNHS.

According to the World Health Organisation's data, malnutrition is a serious health problem in both underdeveloped and developing countries. Looking at different regions of the world, malnutrition affects about 20 million preschool children, especially in Africa and Southeast Asia. While the low-weight rate in preschool children was 25% in 1990 in the world, it decreased to 14.3% in 2014. While the rate of children with malnutrition was 32.4% in Asia and 35.5% in Africa in 1990, it decreased to 17.5% in Asia and 23.5% in Africa in 2014. Although there is a decrease in the rate of being low-weight, 162 million children under the age of 5 years in the world

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(2015/04315- 2015-GE-18972)

are struggling with inadequate food intake (Sibel et al., 2016: 210-225).

Obesity as well as malnutrition is seen as an important health problem in the world. It is reported that the obesity prevalence of children under 5 years between 2000-2013 increased from 11% to 19% in Africa and from 3% to 7% in Asia. If this increase continues, 70 million children under 5 years of age living in developing countries were expected to be overweight or obese in 2025. The researchers have stated that obesity especially in children under 5 years of age is a serious condition that needs to be followed (Sibel et al., 2016: 210-225). According to TNHS (2014: 554-556) BMI Z score data in Turkey, 17.9% of 0-5-year-old children are slightly obese and 8.5 are obese. It was determined as a result of the study that 21.8% of the children were overweight, and 16.4% were obese. It was found that the study results were higher than the TNHS's results and especially the rate of obese children was significantly higher.

It is known that breast milk can meet all the nutritional needs of the baby in the first six months (Atıcı et al., 2007: 1-5). It is known that breastfeeding should continue until the end of two years with appropriate supplementary nutrients started at the sixth month. However, in the study, the mean breastfeeding time was found as 16.818±9.917 (med:18/ min-max:0-48) months. This suggested that breastfeeding took place during the first six months, but it did not continue until 2 years of age. According to the data obtained from the study, there were also children who were not breastfed. If the mother and families are warned and trained against breastfeeding problems emerging after the delivery, many lactation deficiency problems can be prevented. In particular, it should be ensured that the baby receives the colostrum produced during the first few days after birth. Colostrum has immunological and developmental characteristics as well as nutritional value (Gün et al., 2009: 176-182). In a study conducted between the children completely breastfed and the children who were weaned and fed by formula, it was found that the children who were weaned had 14.2- and 3.6-times risk of death in diarrhea and respiratory tract infections, respectively (Ginde et al., 2009: 384-390). In another study, it was emphasized that breastfeeding should be continued until two years in order to benefit from the protective effect of breast milk in full capacity. Breast milk is effective up to two years of age to protect against the morbidity and mortality effects of infectious diseases. Breast milk prevents half of the infectious disease deaths in 6-23-month-old children (Victora et al., 2016: 475-490). However, in this study, breastfeeding duration was not found to be affecting infection frequency. There was no statistical difference between the groups ($p>0.05$). Breast

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International Refereed Academic Journal of Sports, Health and Medical Sciences
January - February - March No: 38 Winter Term Year: 2021
Uluslararası Hakemli Akademik Spor Sağlık ve Tıp Bilimleri Dergisi
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(TRADEMARK)
(2015/04315- 2015-GE-18972)

milk is not only a good source of food for the growing baby, but also includes antibodies, cytokines, growth factors, antimicrobial agents, and specific immune cells, and it also plays a role in the immune system with its proteins. Thus, breast milk protects the baby from infections until the baby's own immune system matures (Atıcı et al., 2007:1-5).

It has been revealed in the studies that handwashing habit reduces the infectious diseases in the society and is effective in protecting especially from respiratory and gastrointestinal tract disease and, the rate of getting sick decreases with the increase of hygiene awareness (Aiello et al., 2008: 1372-1381; Bloomfield et al., 2007: 27-64). In this study, when the relationship between the child's hand-face washing habit in the morning and handwashing habits before and after the meal, after coming home and after using the toilet and the infection frequency was examined, it was determined that those who had low handwashing habit had an infection 4 or more times a year but the difference between the groups was not statistically significant ($p>0.05$). The fact that those with low handwashing habits had infection 4 and more times per year in the study is compatible with other studies (Aiello et al., 2008: 1372-1381; Bloomfield et al., 2007: 27-64). In the studies, it was determined that better hand hygiene reduced gastrointestinal diseases by 31% and the rate of respiratory diseases by 21% (Aiello et al., 2008: 1372-1381). In another study, it was found that the handwashing habit which is the key part of hygiene at home and in the community provided significant protection against gastrointestinal, respiratory, and skin infections. The effect of hand hygiene against infectious diseases can be increased by gaining the handwashing habit at the right time and the right way (Bloomfield et al., 2007: 27-64).

In this study, the relationship between the frequency of cleaning of the room where the child is staying and the infection frequency is examined. It was determined that out of the children of parents who cleaned the room 1 and more times a week, 84.2% had infection 1-3 times a year and 15.8% had infection 4 and more times a year; on the other hand, 59.3% of the children of parents who cleaned the room 2-3 times a week had infection 1-3 times a year and 40.7% had infection four and more times a year. The difference between the groups was found to be statistically significant ($p<0.05$).

According to the hygiene hypothesis, the child can be protected with an adaptive immune system against the development of allergic diseases and infections through contact with older siblings or other non-hygienic factors (Bloomfield et al., 2006: 402-425). The result of the study is compatible with hygiene

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(TRADEMARK)
(2015/04315- 2015-GE-18972)

hypothesis. The hygiene hypothesis is presented to explain the increased prevalence of asthma and allergic diseases. Increased life standards and hygienic conditions have been reported to reduce the likelihood of infection at an early age. It has been suggested that the maturation of the immune system will be inadequate and allergic diseases and infections will be seen more frequently as a result of this situation (Janse et al., 2014: 250-256). It is claimed that asthma and other allergic diseases have increased especially in developed societies as a result of improvement in hygienic conditions, shrinkage in family structure, improvement in home comfort, and decreased cross-infection among young individuals in the family. Hygiene hypothesis has been tried to be explained as "Inadequate exposure to infectious agents in childhood increases the risk of development of asthma and allergic disease". In summary, the hygiene hypothesis emphasizes that the shrinkage of large families with a western lifestyle not only leads to a decrease in infections at small ages but also causes an increase in the prevalence of atopic diseases (Karaduman et al., 2016:13). Although no consensus has been reached on this subject, it has been reported that there is a complex relationship between the immune response of the host, the properties of microorganisms, the level and variety of environmental exposure, and the genetic background (Von Mutius, 2007: 433-439).

Improving nutrition is the way to prevent the negative effects of infectious diseases on growth. The deficiency of even a single nutrient can cause changes in the immune system response. It is observed that the immune response changes even when the deficiency is mild. Among the micronutrients, the most effective on immune response; zinc, selenium, iron, copper, vitamins A, C, E, B6, and folic acid (Chandra, 2002: 73-76). Vitamins A, C, E are antioxidants and, in general, antioxidants are known to play an important role in all aspects of the immune response: phagocyte function, cytokine production, cell-mediated responses, and immunoglobulin production (Çaylak, 2011: 73-83). It facilitates immune competence at all levels with minerals and vitamin interactions (Levy, 1998: 641-647; Rumore, 1993: 506-514). It has been determined that there is no relationship between the children's energy and nutrient consumption and the frequency of infection except for vitamin D. Children who consumed less vitamin D had 4 or more infections yearly ($p<0.05$). It should not be forgotten that vitamin D consumed from food is not efficient in serum vitamin D levels and it would be deceiving to judge diet intake instead of serum levels. More research needs to be done on the effects of vitamin D on the frequency of infection. Vitamin D deficiency induces children to respiratory infections (Maggini et al., 2007: 29-35). Yet because serum levels were not re-

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(TRADEMARK)
(2015/04315- 2015-GE-18972)

corded it is misleading to make a conclusion by food consumption frequency.

This study has some limitations. Firstly, the number of preschool children admitted to the hospital due to infection was low and the duration of the study was short. Secondly, since the data of the study were collected by the questionnaire method, parents' concerns about not remembering or giving wrong answers may have affected the answers given.

CONCLUSION

The preschool period is a critical time for growth and development, and children tend to have frequent infections during these ages. Due to the bilateral relationship between infection and malnutrition, the nutritional status and growth developments of children with frequent infections should be followed closely. Frequent infectious diseases during childhood affect growth and development. In order not to adversely affect growth and development, needed nutrients and energy must be provided during infectious diseases. Increased nutritional needs with age should be considered in children and a healthy and balanced diet should be provided.

REFERENCES

AIELLO, A.E., COULBORN, R.M., PEREZ, V., LARSON, E.L., (2008). Effect of hand hygiene on infectious disease risk in the community setting: a meta-analysis. American Journal of Public Health, 98(8):1372-1381. Doi: 10.2105/AJPH.2007.124610

ATICI, A., POLAT, S., TURHAN, A.H., (2007). Anne sütü ile beslenme. Turkiye Klinikleri Journal of Pediatrical Sciences, 3(6):1-5.

BLOOMFIELD, S.F., AIELLO, A.E., COOKSON, B., O'BOYLE, C., LARSON, E.L., (2007). The effectiveness of hand hygiene procedures in reducing the risks of infections in home and community settings including handwashing and alcohol-based hand sanitizers. American Journal of Infection Control, 35(10):27-64. Doi: 10.1016/j.ajic.2007.07.001

BLOOMFIELD, S., STANWELL-SMITH, R., CREVEL, R., PICKUP, J., (2006). Too clean, or not too clean: the hygiene hypothesis and home hygiene. Clinical & Experimental Allergy, 36(4):402-425. Doi: 10.1111/j.1365-2222.2006.02463.x

CHANDRA, R.K., (2002). Nutrition and the immune system from birth to old age. European Journal of Clinical Nutrition, 56(3):73-76

ÇAYLAK, E., (2011). Hayvan ve bitkilerde oksidatif stres ile antioksidanlar. Tıp Araştırmaları Dergisi, 9(1):73-83

SSTB
www.sstbdergisi.com
International Refereed Academic Journal of Sports, Health and Medical Sciences
January - February - March No: 38 Winter Term Year: 2021
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(TRADEMARK)
(2015/04315- 2015-GE-18972)

ÇINAR, M., USKUN, E., ÖZTÜRK, M., KIŞIOĞLU, A., (2007). Isparta il merkezinde 0-5 yaş grubu çocukların beslenme ve malnütrisyon durumu. Erciyes Tıp Dergisi, 29(4):294-302

DEBOER, M.D., SCHARF, R.J., LEITE, A.M., FÉRRER, A., HAVT, A., PINKERTON, R., LIMA, A.A., GUERRANT, R.L., (2017). Systemic inflammation, growth factors, and linear growth in the setting of infection and malnutrition. Nutrition, 33:248-253. Doi: 10.1016/j.nut.2016.06.013

DEWEY, K.G., MAYERS, D.R., (2011). Early child growth: how do nutrition and infection interact? Maternal & Child Nutrition, 7(3):129-142. Doi: 10.1111/j.1740-8709.2011.00357.x

GINDE, A.A., MANSBACH, J.M., CAMARGO, C.A., (2009). Association between serum 25-hydroxyvitamin D level and upper respiratory tract infection in the Third National Health and Nutrition Examination Survey. Archives of Internal Medicine, 169(4):384-390. Doi: 10.1001/archinternmed.2008.560

GUERRANT, R.L., ORIÁ, R.B., MOORE, S.R., ORIÁ, M.O., LIMA, A.A., (2008). Malnutrition as an enteric infectious disease with long-term effects on child development. Nutrition Reviews, 66(9):487-505. Doi: 10.1111/j.1753-4887.2008.00082.x

GOTO, R., MASCIE-TAYLOR, C. N., LUNN, P.G., (2009). Impact of intestinal permeability, inflammation status and parasitic infections on infant growth faltering in rural Bangladesh. British Journal of Nutrition, 101(10):1509-1516. Doi: 10.1017/S0007114508083554

GÜN, İ., YILMAZ, M., ŞAHIN, H., İNANÇ, N., AYKUT, M., GÜNAY, O., et, al., (2009). Kayseri Melikgazi Eğitim ve Araştırma Bölgesi'nde 0-36 aylık çocuklarda anne sütü alma durumu. Çocuk Sağlığı ve Hastalıkları Dergisi, 52:176-182

HAUTVAST, J., TOLBOOM, J., WILLEMS, J., MWELA, C., MONNENS, L., (2000). Consequences of infections for three-month length increment in young children in rural Zambia. Acta Paediatrica, 89(3):296-301

HUMPHREY, J.H., (2009). Child undernutrition, tropical enteropathy, toilets, and handwashing. The Lancet, 374(9694):1032-1035. Doi: 10.1016/S0140-6736(09)60950-8

JANSE, J.J., WONG, G.W., POTTS, J., OGORODOVA, L.M., FEDOROVA, O.S., MAHESH, P., et, al., (2014). The

SSTB
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International Refereed Academic Journal of Sports, Health and Medical Sciences
January - February - March No: 38 Winter Term Year: 2021
Uluslararası Hakemli Akademik Spor Sağlık ve Tıp Bilimleri Dergisi
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(TRADEMARK)
(2015/04315- 2015-GE-18972)

association between foodborne and orofecal pathogens and allergic sensitisation—EuroPrevall study. Pediatric Allergy and Immunology, 25(3):250-256. Doi: 10.1111/pai.12175

KARADUMAN, A., DURU, N.S., ÇIVILIBAL, M., SAHIN, K., ELEVLI, M., (2016). Frequency of Asthma and Allergic Disorders in Children with Hepatitis A Seropositivity. The Journal of Pediatric Research, 3(1):13-17. Doi: 10.4274/jpr.1987

LEVY, J., (1998). Immunonutrition: the pediatric experience. Nutrition, 14(7):641-647.

MAGGINI, S., WINTERGERST, E.S., BEVERIDGE, S., HORNIG, D.H., (2007). Selected vitamins and trace elements support immune function by strengthening epithelial barriers and cellular and humoral immune responses. British Journal of Nutrition, 98(1):29-35

RUMORE, M., (1993). Vitamin A as an immunomodulating agent. Clinical Pharmacy,12(7):506-514

SİBEL, Ö., ÖZDEMİR, A., CANSEV, M., BAŞAK, K., (2016). Okulöncesi Dönem Çocuklarda Malnütrisyon ve Obezite Prevelansının Değerlendirilmesi: Ankara Örneği. DTCF Dergisi, 56(1):210-225. Doi: 10.1501/Dtcfder_0000001471

SOMECH, R., REIF, S., GOLANDER, A., SPIRER, Z., (2007). Leptin and C-reactive protein levels correlate during minor infection in children. The Israel Medical Association Journal. 9(2):76-78

TBSA. (2014) "Türkiye Beslenme ve Sağlık Araştırması 2010: Beslenme Durumu ve Alışkanlıklarının Değerlendirilmesi Sonuç Raporu." Sağlık Bakanlığı Sağlık Araştırmaları Genel Müdürlüğü, Hacettepe Üniversitesi Sağlık Bilimleri Fakültesi Beslenme ve Diyetetik Bölümü, Ankara Numune Eğitim ve Araştırma Hastanesi. Ankara: Sağlık Bakanlığı Yayın No: 931.

VICTORA, C.G., BAHL, R., BARROS, A. J., FRANÇA, G.V., HORTON, S., KRASEVEC, J., et. al., (2016). Breastfeeding in the 21st century: epidemiology, mechanisms, and lifelong effect. The Lancet, 387(10017):475-490. Doi: 10.1016/S0140-6736(15)01024-7

VON MUTIUS, E., (2007). Allergies, infections and the hygiene hypothesis–the epidemiological evidence. Immunobiology, 212(6):433-439. Doi: 10.1016/j.imbio.2007.03.002

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January - February - March No: 38 Winter Term Year: 2021
Uluslararası Hakemli Akademik Spor Sağlık ve Tıp Bilimleri Dergisi
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(TRADEMARK)
(2015/04315- 2015-GE-18972)

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