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Evaluation of malnutrition and factors affecting malnutrition in hospitalized pediatric patients

Hilmi Onur Kabukcu[1], Fethiye Yildiz[1], Dilara Senturk[1], Cansu Aydin Altuntas[2], Gokcen Tugce Ozsut[2], Eren Yildiz[1]

[1]Kastamonu University, Faculty of Medicine, Department of Pediatrics, Kastamonu, Türkiye
[2]Ankara Bilkent City Hospital, Department of Pediatrics, Ankara, Türkiye

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Abstract

In this study, we aimed to determine the prevalence of malnutrition, which is an important cause of morbidity and mortality in childhood in our country, among hospitalized children and to investigate its relationship with socio-demographic factors. In this prospective, single-center study, we recorded anthropometric measurements and sociodemographic data of 501 patients hospitalized in the Pediatric Ward of Kastamonu Training and Research Hospital between November 2023 and February 2024 and questioned risk factors with the help of a questionnaire. Weight-for-age, height-for-age, body weight-for-height under 5 years of age and body mass index Z scores over 5 years of age were recorded for each patient. We compared risk factors with Z scores of anthropometric measurements. The malnutrition rates of the patients included in the study were 4.6% in body weight-for-height, 11.2% in weight-for-age, and 18.8% when calculated according to body weight-for-height and body mass index. In our study, we found that patients under the age of 1 year, patients with low maternal education level and families with low socioeconomic status were at high risk for malnutrition. We also found that malnutrition decreased with increasing daily screen time. Our study revealed that malnutrition is still an important problem in hospitalized children and is more common at early ages. In this context, routine use of standardized assessment tools to monitor children's growth and development is recommended. In addition, community-based interventions such as education of mothers and improving the socioeconomic status of families may be effective in reducing the prevalence of malnutrition.

Keywords: Hospitalized children, malnutrition, socio-demographic factors

Introduction

Protein-energy malnutrition (PEM) is also known that malnutrition weakens the immune system in children and predisposes them to infection. Therefore, it is known that malnutrition status in hospitalized pediatric patients is associated with mortality, morbidity and length of hospitalization [1-6]. While a multicenter study conducted in tertiary care hospitals in Europe reported the rate of malnutrition in hospitalized pediatric patients as 22%, in a large-scale study conducted by Beşer et al. in Turkey, 1513 patients from 26 cities were examined and the rate of malnutrition in hospitalized pediatric patients was found to be 9.5% [7,8].

Since malnutrition is common in hospitalized pediatric patients in our country, socioeconomic factors leading to malnutrition in hospitalized pediatric patients remain important. These factors mainly include inadequate daily calorie intake, unbalanced diet, intrauterine growth retardation, low maternal education level, large family structure, incomplete immunization, poverty, wrong policies of governments and disasters [2]. In a study conducted in Saudi Arabia, maternal education level, maternal age, economic status of families, exposure to infectious diseases and diarrhea were found to be associated with malnutrition, while in another study conducted in India, low socioeconomic status, duration of breastfeeding, number of people in the family and vaccination were found to be associated with malnutrition [9,10]. In addition, malnutrition may also result from abnormal nutrient loss, increased energy expenditure or decreased food

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Corresponding Author: Hilmi Onur Kabukçu, Kastamonu University, Faculty of Medicine, Department of Pediatrics, Kastamonu, Türkiye
Email: onurkabukcu89@gmail.com

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intake secondary to diseases. The diseases associated with malnutrition are mainly cystic fibrosis, chronic renal failure, chronic liver disease, childhood malignancies, congenital heart disease and neuromuscular diseases [3,11].

In this study, we aimed to determine the prevalence of malnutrition, which is an important cause of morbidity and mortality in childhood in our country, among hospitalized children and to investigate the relationship between this condition and socio-demographic factors.

Material and Methods

This prospective, single-center study included 501 patients between the ages of 1 month and 18 years who were hospitalized in the Pediatric Service of Kastamonu Training and Research Hospital between November 2023 and February 2024 and who were hospitalized for more than 24 hours. Patients with hematologic and oncologic malignancies, patients with congenital gastrointestinal anomalies, patients with renal and hepatic failure, patients admitted to the intensive care unit, patients using appetite stimulants and steroids, patients previously diagnosed with PEM and using enteral products, and patients without parental consent were excluded because anthropometric measurements may have changed recently, and a total of 176 patients were excluded.Height and body weight of the patients were recorded by the same person at the time of hospitalization. The body weights of the patients were measured completely naked under the age of two years using a Beurer brand baby scale with a capacity of 20 kg and an accuracy of 10 grams, and above the age of two years using an adult-style scale with an accuracy of 100 grams. The height of the patients under the age of two years was measured with a height meter with a precision of 0.1 centimeter fixed on the head and feet while lying on a flat surface, and with a height meter with a precision of 0.2 centimeter fixed on the wall while standing in an upright position on a flat surface on a completely bare foot.

In order to detect acute and chronic malnutrition, four different standard deviation scores (SDS) including body weight-for-height, body mass index, weight-for-age and height-for-age were calculated using the World Health Organization (WHO) Anthro program (Version 3.2.2.1, October 2024) after measuring height and body weight in all patients. In the diagnosis of acute malnutrition, SDS of body weight for height was used under the age of five years, while SDS of body mass index was used above the age of five years [8]. If we look at previous definitions of malnutrition; " The range of 81-90% according to the Waterlow classification corresponds to the range in which the Z score is -1/-2 in the WHO classification and although it is defined as mild malnutrition in the Waterlow classification, it is no longer defined as malnutrition according to WHO [12]. Therefore, we accepted patients with SDS -2 and below as malnutrition in our study.

In addition to anthropometric measurements, gender, age, chronic disease status, reason for hospitalization, consanguinity between parents, income earned by family members in a month, age, education level, height and body weight, number of siblings, duration of breastfeeding, place of residence, frequency of eating junk food, eating pattern and daily screen time were recorded with a questionnaire. The ages of the patients were analyzed in three groups as <12 months, 13-59 months and >60 months. Reasons for hospitalization were categorized into five main groups: lower respiratory tract infections (LRTI), upper respiratory tract infections (URTI), acute gastroenteritis (AGE), urinary tract infection (UTI) and other group (cellulitis, epilepsy, surgeries and dental abscess). While recording the financial status of the patients, the minimum wage of 12,000 Turkish Liras (TL), which was the minimum wage at the time of the study, was taken as the basis and analyzed in five groups as <12000 TL, 12000-24000 TL, 24000-36000 TL, 36000-48000 TL and >48000 TL. The frequency of eating junk food was analyzed in four groups as once a day, three times a week, once a week and less than once a week. The eating style of the patients was analyzed in three groups: alone, alone at the family table and with help at the family table. The daily screen time of the patients was analyzed in five groups: none, 0-30 minutes, 31-60 minutes, 61-120 minutes and more than 120 minutes. Age, gender, reasons for hospitalization and presence of chronic diseases were compared with body weight-for-height-under-five years (BWH) and body mass index-for-age (BMI), height-for-age (HFA) and weight-for-age (WFA) SDSs, while other data were compared only with body weight-for-height-under-five years and BMI-for-age SDSs.

Approval of the study, dated 01.11.2023 and numbered 2023-KAEK-138, was obtained from the Ethics Committee of Kastamonu University Faculty of Medicine. Informed consent was obtained from all of the participants in this study.

SPSS for Windows 22.0 program was used for statistical analysis of the study. Continuous variables obtained from the study were given as mean±standard deviation (minimum-maximum), median (quartiles, Q1-Q3). The frequencies of categorical variables were expressed as percentages. Continuous variables were analyzed by Mann Whitney-U test and Kruskall Wallis test according to their suitability for normal distribution, categorical variables were analyzed by Chi-square test and Fisher's Chi-square test according to suitability. Spearman correlation analysis was used for correlational analysis. The statistical significance value for all tests was $p<0.05$, for the Bonferronni corrected Mann Whitney-U test; $p<0.017$ for the comparison of three groups, $p<0.013$ for the comparison of four groups, and $p<0.01$ for the comparison of five groups were considered significant.

Results

Of the 501 patients analyzed in this study, 54.9% were male and the median age was 52.0 (14.0-97.0) months. 46.9% of the participants were aged >60 months and 31.1% were aged 13-59 months. When the hospitalization status of the patients

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was examined, the most common reason for hospitalization was the diagnosis of LRTI with 50.1% (n:251) and the second most common reason was the diagnosis of AGE with 17.6% (n:88) (Table 1).

The anthropometric measurements of the patients are presented in Table 1. The median weight was 17.0 (10.0-25.0) kg and the median height was 101.0 (76.0-124.0) cm. The median weight-for-age SDS value was -0.4 (-1.3-0.4), the median height-for-age SDS value was -0.9 (-1.8-0.1), and the median body weight-for-height SDS value was 0.6.

Table 1. Socio-demographic and anthropometric data of the patients (n:501)

Socio-demographic variables	Avg±SS	Min-max	Median (Q1-Q3)
Age (month)	63.31 ± 55.18	1.0-211.0	52.0 (14.0-97.0)
Weight of cases (kg)	21.68 ± 17.08	3.0-107.0	17.0 (10.0-25.0)
Weight percentile of cases	39.21 ± 32.31	1-99.0	31.0 (10.0-66.0)
Height of cases (cm)	101.52 ± 31.48	30.0-173.0	101.0 (76.0-124.0)
Height percentile of cases	28.51 ± 28.88	0.0-99.0	19.0 (4.0-43.0)
Weight-for-height SDS (BMI SDS over 5 years of age)	0.75 ± 1.87	−6.60-10.2	0.6 (−0.3-1.7)
Weight for age SDS	−0.27 ± 2.76	−8.2-12.0	-0.4 (−1.3-0.4)
Height for age (SDS)	−0.83 ± 1.35	−5.3-3.9	-0.9 (−1.8- −0.1)
	Number (n)		**Percentage (%)**
Gender			
Female	226		45.1
Male	275		54.9
Average age (months)			
1-12 months	110		22.0
13-59 months	156		31.1
>60 months	235		46.9
Reason for hospitalization			
LRTI	251		50.1
URTI	69		13.8
AGE	88		17.6
UTI	13		2.6
Other (surgery, epilepsy, dental, cellulitis, etc.)	80		16.0
Weight-for-height SDS (BMI SDS over 5 years of age)			
≤−2	23		4.6
>−2	478		95.4
Weight for age SDS			
≤−2	56		11.2
>−2	445		88.8
Height-for-age SDS			
≤−2	94		18.8
>−2	407		81.2

Avg: Average; SD: Standard deviation; Min: Minimum; Max: Maximum; LRTI: Lower respiratory tract infection; URTI: Upper respiratory tract infection; AGE: Acute gastroenteritis; UTI: Urinary tract infection

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Of the patients included in the study, 4.6% had body weight-for-height SDS, 11.2% had weight-for-age SDS and 18.8% had height-for-age SDS less than -2. The mean age (52.3±62.9 months) was significantly lower in patients with body weight-for-age SDS less than -2 than in patients with SDS greater than -2 (p=0.049). In patients with an age range of 0-12 months, the proportion of patients with a body weight-for-height SDS less than -2 (10.9%) was significantly higher than the other groups (p=0.001). The proportion of female patients with body weight-for-height SDS less than -2 was 7.1%, while the proportion of male patients was 2.5%. There was a statistically significant relationship between them (p=0.016). In patients with an age range of 0-12 months, the proportion of patients with a weight-for-age SDS less than -2 (18.2%) was significantly higher than the other groups (p=0.010).Regarding the reasons for hospitalization, the rates of weight-for-height SDS, weight-for-age SDS, and height-for-age SDS were similar and there was no statistically significant difference between them (p=0.096, p=0.332, p=0.400, respectively).

The malnutrition status of the patients according to the sociodemographic variables of their families is presented in Table 3. The SDS median value (0.30) was found to be statistically significantly lower in those with a maternal education level of university and above than in those with a maternal education level of primary school (0.80) and high school (0.70) (p=0.004, p=0.003, respectively). The SDS median value of those whose father's education level was high school (0.77) was higher than the others and there was no statistically significant difference between the two groups (p=0.042). Those with a socioeconomic level >48000 TL had the highest SDS median value compared to the other groups (0.74), and there was no statistically significant difference between the groups with regard to socioeconomic level (p=0.254). The SDS median value of those living in the village was the lowest compared to the other groups (0.59) and there was no statistically significant difference between the groups (p=0.987). In the grouping according to the number of siblings, the SDS median value was the highest in the group with 1-2 siblings compared to the other groups (0.70). There was no statistically significant difference between the two groups with respect to the number of siblings (p=0.040).

The relationship between the SDS value of the patients and the number of siblings, maternal BMI and paternal BMI is given in Table 4. There was a low significant positive correlation between the number of siblings and child SDS value (r=0.104, p=0.020). As maternal BMI and paternal BMI increased, child SDS value increased but there was no significant correlation between them (r=0.012, p=0.786, r=0.026, p=0.556, respectively).

The correlation between the SDS value of the patients and the duration of exclusive breastfeeding and the duration of transition to supplementary feeding are shown in Table 5. There was a low significant positive correlation between the duration of exclusive breastfeeding and child SDS (r=0.107, p=0.017). Child SDS increased as the duration of transition to supplementary food increased, but there was no significant correlation between them (r=0.032, p=0.471).

Malnutrition status of the patients according to sociodemographic variables is given in Table 6. The SDS median value (1.25) was statistically significantly higher in patients with chronic disease (p=0.001) compared to those without chronic disease (0.60). SDS median values were similar with respect to the junk food eating habits and the way of eating, and there was no statistically significant difference between the groups (p=0.083, p=0.096, respectively). The SDS median value was found to be statistically significantly higher in the group with 61-120 minutes of daily screen time and in the group with >120 minutes of daily screen time compared to those without daily screen time (p=0.012, p=0.001, respectively).

Table 2. Malnutrition status according to socio-demographic data of the patients

Socio-demographic variables	Weight-for-height SDS (BMI SDS over 5 years of age)			Weight for age SDS			Height-for-age SDS		
	≤−2 (n:23)	>−2 (n:478)	p	≤−2 (n:56)	>−2 (n:445)	p	≤−2 (n:94)	>−2 (n:407)	p
Age. mean. (months)	52.3±62.9	63.8±54.8	0.049*	47.2±56.5	65.3±54.8	0.002*	54.9±47.6	65.3±56.7	0.245*
Gender									
Female (n:226)	7.1	92.9	0.016**	13.7	86.3	0.117**	21.2	78.8	0.208**
Male (n:275)	2.5	97.5		9.1	90.9		16.7	83.3	
Age range (months)									
1-12 months (n:110)	10.9	89.1	0.001**	18.2	81.8	0.010**	17.3	82.7	0.092**
13-59 months (n:156)	1.9	98.1		12.2	87.8		24.4	75.6	
≥60 months (n:235)	3.4	96.6		7.2	92.8		15.7	84.3	
Reason for hospitalization									
LRTI (n:251)	7.2	92.8	0.096**	12.7	87.3	0.332**	18.7	81.3	0.400**
URTI (n:69)	1.4	98.6		10.1	89.9		24.6	75.4	
AGE (n:88)	2.3	97.7		10.2	89.8		14.8	85.2	
UTI (n:13)	0.0	100.0		23.1	76.9		30.8	69.2	
Other (surgery. epilepsy. dental. cellulitis. etc.) (n:80)	2.5	97.5		6.2	93.8		16.2	83.8	

Standard deviation; Min; LRTI: Lower respiratory tract infection; URTI: Upper respiratory tract infection; AGE: Acute gastroenteritis; UTI: Urinary tract infection; *: Mann Whitney- U test; **: Ki- Kare test

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Table 3. Malnutrition status according to family sociodemographic variables

Socio-demographic variables	Weight-for-height SDS (BMI SDS over 5 years of age)		p
Mother's education level	**Avg±SS (min-max)**	**Median (Q1-Q3)**	
Non-literate (n:14)[a]	0.68±1.17 (−0.70-3.30)	0.48 (−0.27-1.53)	0.013** c-e =0.004*** d-e =0.003***
Literate (n:8)[b]	−0.05 ±0.99 (−2.06-0.82)	0.25 (−0.57-0.71)	
Primary education (n:143)[c]	0.94±1.99 (−6.60-9.20)	0.80 (−0.20-1.84)	
High school (n:233)[d]	0.70±1.86 (−5.46-10.20)	0.70 (−0.11-1.80)	
University and above (n:103)[e]	0.69±1.77 (−5.60-7.70)	0.30 (−0.70-1.15)	
Father's education level			
Non-literate (n:10)	0.38±1.01 (−0.70-2.00)	−0.11 (−0.30-1.53)	0.042**
Literate (n:4)	0.92 ±1.66 (−0.54-3.30)	0.45 (−0.12-1.95)	
Primary education (n:87)	0.53±2.16 (−6.60-10.20)	0.55 (−0.40-1.16)	
High school (n:253)	0.94±5.85 (−5.46-8.80)	0.77 (−0.10-1.93)	
University and above (n:147)	0.57±1.67 (−5.70-7.70)	0.45 (−0.46-1.50)	
Socioeconomic level			
<12000 TL (n:42)	0.15±1.90 (−6.60-3.40)	0.09 (−0.70-1.12)	0.254**
12000-24000 TL (n:92)	0.81±1,.93 (−2.61-10.20)	0.48 (−0.24-1.45)	
24000-36000 TL(n:250)	0.85±1.87(−4.50-9.20)	0.70 (−0.11-1.80)	
36000-48000 TL(n:93)	0.77±1.69 (−5.60-7.70)	0.60 (−0.20-1.80)	
>48000 TL(n:24)	0.58±1.65 (−2.10-4.02)	0.74 (−0.76-1.81)	
Place of residence			
Village (n:47)	0.86±1.92 (−2.56-9.20)	0.59 (−0.15-1.58)	0.987**
District (n:135)	0.72±1.73 (−4.48-7.40)	0.70 (−0.30-1.70)	
Province (n:319)	0.74±1.91 (−6.60-10.20)	0.60 (−0.29-1.70)	
Relative status of parents			
Absent (n:446)	0.77±1.88 (−6.60-10.20)	0.65 (−0.20-1.80)	0.266*
Exist (n:55)	0.58±1.74 (−2.61-7.40)	0.50 (−0.40-1.40)	
Number of siblings			
0 (n:89)	0.39±1.89 (−5.60-7.70)	0.40 (−0.70-1.28)	0.040**
1-2 (n:356)	0.85±1.93(−6.60-10.20)	0.70 (−0,.20-1.80)	
>3 (n:56)	0.67±1.25 (−1.51-4.70)	0.55 (−0.15-1.40)	

*: Mann Whitney- U test; **: Kruskall Wallis test; ***: Mann Whitney- U test with Bonferroni correction

Table 4. Association between maternal BMI, paternal BMI and number of siblings and malnutrition

Malnutrition indicator	Number of siblings	Mother BMI	Father BMI
Weight-for-height SDS (BMI SDS over 5 years of age)	r=0.104 p=0.020*	r= 0.012 p=0.786*	r= 0.026 p=0.556*

r: rho Correlation coefficient; *: Spearman correlation value

Table 5. Association between duration of exclusive breastfeeding and duration of transition to supplementary feeding and malnutrition

Malnutrition indicator	The period of exclusive breastfeeding	Transition time to supplementary nutrition
Weight-for-height SDS (BMI SDS over 5 years of age)	r=0.107 p=0,.017*	r= 0.032 p=0.471*

r: rho Correlation coefficient; *: Spearman correlation value

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Table 6. Malnutrition status according to sociodemographic variables of the child

Socio-demographic variables	Weight-for-height SDS (BMI SDS over 5 years of age)		p
Chronic disease	**Avg±SS (min-max)**	**Median (Q1-Q3)**	
Absent (n:441)	0.86±4.56 (−5.60-89.0)	0.60 (−0.30-1.60)	0.001*
Exist (n:60)	1.55±2.44 (−6.60-10.20)	1.25 (0.35-2.80)	
Junk food habits			
1 time per day (n:124)	1.07±2.10 (−3.41-10.20)	0.70 (−0.12-1.80)	0.083**
3 times per week (n:83)	1.15 ±1.76 (−1.39-8.80)	0.70 (−0.03-2.16)	
1 time per week (n:147)	0.69±1.42 (−4.40-4.85)	0.62 (−0.20-1.52)	
Less (n:147)	0.37±1.96 (−6.60-7.70)	0.50 (−0.70-1.60)	
Way of eating			
Alone (n:111)	0.44±1.90 (−5.60-7.40)	0.60 (−0.70-1.31)	0.096**
Alone at the family table (n:252)	0.91±1.88 (−6.60-9.20)	0.70 (−0.07-1.80)	
Helping at the family table (n:138)	0.70±1.77 (−3.80-10.20)	0.59 (−0.53-1.70)	
Daily screen time			
Absent (n:101)[a]	0.23±2.06 (−5.90-7.70)	0.20 (−0.81-1.3)	0.009** a-d=0.012*** a-e=0.001***
0-30 dk (n:45)[b]	0.51±1.92 (−2.94-6.22)	0.30 (−0.86-1.80)	
31-60 dk (n:102)[c]	0.88±1.99 (−5.46-9.20)	0.60 (−0.11-1.60)	
61-120 dk (n:161)[d]	0.83±1.70 (−6.60-10.20)	0.70 (−0.12-1.65)	
>120 dk (n:92)[e]	1.16±1.62 (−3.41-7.40)	0.85 (0.15-2.08)	

*: Mann Whitney- U test; **: Kruskall Wallis test; ***: Mann Whitney- U test with Bonferroni correction; Avg: Average; SD: Standard deviation; Min: Minimum; Max: Maximum

Discussion

In our study, the prevalence of malnutrition and the factors affecting it were investigated in hospitalized children. The malnutrition rates obtained in our study were 4.6%, 11.2%, and 18.8% in BGVA under five years of age and BMI SDS above five years of age. In the UNICEF data published in 2023, it was reported that malnutrition rates ranged between 11% and 20% in low- and middle-income countries [2]. The malnutrition rate obtained in our study (4.6-18.8%) was found to be generally compatible with both United Nations International Children\'s Emergency Fund (UNICEF) data and the rates obtained from studies conducted in Europe (11.9-22%) [13-14]. In a study conducted by Hubert et al. [13] in France, a malnutrition rate of 11.9% was reported in children hospitalized in tertiary hospitals. Similarly, this rate was found to be 13.4% in a study conducted by Lezo et al. [14] in Italy in patients hospitalized in pediatric wards. In a large study conducted on pediatric patients hospitalized in pediatric wards in 14 centers across Europe, the rate of malnutrition was reported to reach 22% [7]. The rates of malnutrition in pediatric hospitalization studies conducted in Turkey were reported as 47.3% in Güleç et al. [15], 28.6% in Şahin et al. [16] and 9.5% in Beşer et al. [8] large-scale study. These differences are thought to be due to the fact that Güleç et al. and Şahin et al. included patients with mild malnutrition according to the Waterlow classification, i.e. the Z score below -1 SDS when determining the malnutrition rate in their studies. Beşer et al., on the other hand, took the Z score as -2 SDS and below, so the malnutrition data are compatible with our study. Of course, other reasons for the difference can be considered as socioeconomic status and geographical region.

In our study, the ratio of weight-for-height SDS ≤ -2 was found to be 10.9% in children aged 1-12 months. It is obvious that the first year of life is the most important year in terms of growth and development. When we look at the literature, there are various studies showing that the rate of malnutrition is high in the first years of life. In the data published by UNICEF in 2023, it was stated that children between the ages of 6-24 months were in the high risk group due to insufficient protein and energy intake and that the nutrition of this age group should be monitored more closely [2]. According to the latest reports of the World Health Organization, it has been reported that the rate of malnutrition in children aged 1-2 years can reach up to 20% in low- and middle-income countries. It was emphasized that malnutrition increases the risk of impaired development, particularly in the first year of life [1]. A study conducted in India in 2022 showed that basic nutrient deficiencies in the first year of life increased the risk of malnutrition by 13% [10]. In their study, Balhara et al. [17] emphasized the permanent effects of early malnutrition on child development and pointed out that this period is the most important period for intervention. In a study conducted in Sudan, it was reported that the rate of severe acute malnutrition in children aged 1-12 months was 18% and this age group should be supported more in accessing health services and necessary nutrients [9]. In a study conducted by Beşer et al. [8] on hospitalized pediatric patients in Turkey, it was reported that the group with the highest rate of malnutrition was 1-12-month-

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old infants; the rate of malnutrition in this age group was 11%. In addition, it was reported that 60% of children with weight-for-height SDS below -2 were under 2 years of age, and it was pointed out that malnutrition was more common as a result of malnutrition in the first two years of life. The findings in Beşer et al. and other literature show that the age-related differences in our study are compatible with national and international results. The decrease in malnutrition rates with advancing age in our study may be explained by the decrease in growth rate and more regularization of eating habits.

In our study, malnutrition rates were found to be higher in girls than in boys. In the report published by UNICEF, it was emphasized that there was no difference between the sexes in terms of malnutrition in general, but in some societies, malnutrition may be more common in girls due to difficulties in access to nutrition and health services [2]. According to the latest reports of the World Health Organization, no significant sex-based difference in malnutrition rates has been observed. Nonetheless, it has been noted that girls may face an increased risk of malnutrition in certain regions as a result of cultural and socioeconomic factors [1]. In a study conducted in Sudan, no difference was found between genders in terms of malnutrition [9]. Beşer et al. [8] reported that the effect of gender on malnutrition rates was limited, but cultural and socioeconomic factors may affect gender differences. Although the findings in our study are compatible with some national and international studies, there are inconsistencies with the studies in the literature regarding the differences in malnutrition between genders. This difference may be attributed to socioeconomic status, cultural differences and geographical differences.

In our study, a significant relationship was found between low maternal education level and high rates of malnutrition in children. In particular, it was observed that malnutrition rates were higher in children of mothers with primary education and lower education levels. These findings were thought to be due to the fact that mothers with higher education level make better decisions in child care. Similar findings were found in the study by Singh et al. [10] and it was emphasized that maternal education facilitated making more informed decisions in child care. In the studies conducted by Smith et al. [18] and Khan et al. [19] in 2024, it was found that the rate of malnutrition may decrease with the improvement of the education level of mothers. According to the Turkey Demographic and Health Survey (TDHS) 2018 Report, it was reported that malnutrition rates in children decreased as the education level of mothers and fathers increased; especially the high education level of mothers positively affected the nutritional status of children [20]. The findings in our study are compatible with both national and international literature.

In our study, higher rates of malnutrition were observed in children in the low income group, but this difference was not statistically significant. This may be due to the fact that families with low socioeconomic status do not have sufficient access to quality foods. According to UNICEF 2023 data, it has been reported that malnutrition rates in families with low income levels may increase up to 25% [2]. In the 2023 Development Initiatives Report, inadequate socioeconomic conditions were reported to increase the risk of malnutrition in children [21]. Beşer et al. [8] also reported that low socioeconomic status was a significant risk factor for malnutrition. The findings of our study are consistent with both national and international literature. In this context, it is of great importance to develop and implement policies to improve socioeconomic status by both central and local governments.

In our study, malnutrition rate was found to be higher in children with chronic diseases. Although chronic diseases that may lead to malnutrition were not included in our study, chronic diseases that may not affect malnutrition such as asthma and epilepsy were included. The high prevalence of malnutrition in our study may be explained by increased metabolic needs and decreased food intake. In an article published in 2024, it was emphasized that nutritional disorders were common in children with chronic kidney disease and malnutrition increased morbidity and mortality in these patients [22]. In a study conducted in Turkey in 2023, it was determined that chronic diseases increased the risk of developing malnutrition in hospitalized children [23]. The findings of our study are compatible with both national and international literature. Prevention of malnutrition especially in hospitalized pediatric patients will significantly reduce mortality and morbidity. In this context, anthropometric measurements of all hospitalized children should be carefully examined and special calorie diets should be adjusted for children with malnutrition in the presence of a dietician.

In our study, an increase in malnutrition rates was observed with an increase in the number of siblings. This relationship may be due to the decrease in per capita income in the family as the number of siblings increases. Elmanssury et al. [9] reported that a large family structure leads to a decrease in resources per child and this may increase the risk of malnutrition. A study conducted in Ghana reported that as the number of siblings increased, the risk of malnutrition increased due to decreased per capita food intake because of food sharing [24]. If we look at the studies conducted in Turkey, in a study conducted with children aged 0-5 years in Diyarbakır, it was found that the rate of malnutrition increased with increasing number of siblings [25]. The findings in our study are compatible with both national and international literature. In this context, especially children in families with low socioeconomic status and extended family structure should be closely monitored in terms of malnutrition and trainings should be given in terms of family planning.

In our study, it was observed that the rate of malnutrition decreased as the duration of exclusive breastfeeding increased. This was thought to be due to the fact that exclusive breastfeeding, especially in the first six months of life, is an optimal nutrient for infant growth. In a study conducted in Ethiopia on children aged 24-59 months, it was reported that more malnutrition was

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found in children with a shorter duration of breastfeeding [26]. In a study conducted in Malatya on children aged 9 months-4 years, the duration of breastfeeding was found to be lower in children with malnutrition [27]. The findings of our study are consistent with both national and international literature. In this context, it is essential to promote awareness and provide support to mothers regarding breastfeeding practices in order to reduce the risk of malnutrition in children.

In our study, it was observed that malnutrition rates were lower in children with a daily screen time of 120 minutes or more. This finding was thought to be related to the decrease in energy consumption due to the decrease in physical activity as daily screen time increased. When the studies in the literature are examined, it has been reported that physical activity decreases as the daily screen exposure time increases and obesity increases as a result [28,29]. Bekar et al. [29] showed that increasing screen time and screen addiction in children may have negative effects on eating behaviors. The findings in our study are compatible with both national and international literature. Although increasing daily screen time decreases malnutrition, we do not recommend screen exposure to reduce malnutrition because its negative effects on socialization and sleep patterns are known.

The systematic evaluation of patient data covering a wide age group (1 month-18 years) makes our study strong. Moreover, the detailed analysis of the association of malnutrition with different socioeconomic and medical factors increases the generalizability of the results. This study was conducted in a single center, and therefore caution should be exercised when generalizing the results to populations in different regions. Furthermore, the survey methods used may be subject to subjective bias. In addition, the sample distribution does not represent regional diversity, which may limit the applicability of the findings. Seasonal variations that could potentially influence nutritional status were also not taken into account.

Conclusion

Our study revealed that malnutrition is still a major problem in hospitalized children and is more prevalent at an early age. In this context, the routine use of standardized assessment tools to monitor children's growth and development is recommended. In addition, children with malnutrition should be supported socioeconomically by the government. Based on the data obtained in our study, it is known that maternal education level carries a high risk for malnutrition. Therefore, since increasing the educational level of parents is important for the prevention of malnutrition in children, attention should be paid to parent education programs and programs to increase public awareness. In addition to the diseases that are the main cause of hospitalization, the importance of paying attention to the nutritional status of children is emphasized. Early recognition of malnutrition, rapid implementation of appropriate treatment approaches and even prevention of malnutrition will play a critical role in reducing childhood morbidity and mortality rates in hospitals.

Conflict of Interests
The authors declare that there is no conflict of interest in the study.

Financial Disclosure
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Ethical Approval
This study was performed in line with the principles of the Declaration of Helsinki.The study was approved by Kastamonu University Ethics Committee for Clinical Studies (date: 01.11.2023 and numbered 2023-KAEK-138).

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