



## ORIGINAL ARTICLE

# Evaluation of Children Admitted to a Tertiary Hospital in Terms of Malnutrition

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## Abstract

**Introduction:** Malnutrition refers to deficiencies, excesses, or imbalances in a person's intake of energy and/or nutrients. Many families around the world are unable to obtain or have access to nutritious foods such as fresh fruits and vegetables, legumes, meat, and milk. This study aims to evaluate malnutrition in cases admitted to and/or hospitalized in our outpatient clinic.

**Methods:** The goal of our study was to evaluate patients aged 0-18 years for malnutrition who were followed up at the University of Health Sciences, Sancaktepe Training and Research Hospital Department of Pediatrics, between January 1, 2018, and December 1, 2020.

**Results:** Among the cases who presented to the University of Health Sciences, Sancaktepe Training and Research Hospital, Department of Pediatrics, between January 1, 2018, and December 1, 2020, 2495 cases were diagnosed with malnutrition. The mean age of the patients included in the study was  $6.5 \pm 0.2$  years. Of the cases, 1475 were male (59%), and 1020 were female (41%), and enteral product was started in 62% of the cases. Patients diagnosed with malnutrition during this period in our outpatient clinic constitute approximately 2% of all outpatients. Inpatient malnourished cases constitute approximately 1% of hospitalized patients during this period.

**Discussion and Conclusion:** It is known that the immigrant population (Syrian and other ethnic groups) is high in our region and early marriages are common. Birth intervals are usually 1 year and extended family size is common. The education level of mothers is generally at the primary school level and the socioeconomic status of the families is low. Mothers have insufficient knowledge and experience about breastfeeding and complementary feeding. Most families do not have health insurance. It is thought that malnutrition develops due to these reasons.

**Keywords:** Children; Feeding; Gomez; Malnutrition; Waterlow.

Malnutrition refers to deficiencies, excesses, or imbalances in a person's energy and/or nutrient intake. The term malnutrition covers three broad groups of conditions: wasting (low weight for height), stunting (low height for age), and underweight (low weight for age); micronutrient malnutrition, which includes micronutrient deficiencies (significant vitamin and mineral deficiency)

or micronutrient excess; and overweight, obesity, and diet-related noncommunicable diseases (such as heart disease, stroke, diabetes, and some cancers)<sup>[1,2]</sup>.

Many families around the world are unable to obtain or have access to nutritious foods such as fresh fruits and vegetables, legumes, meat, and milk. To prevent malnutrition, adequate nutrition of the mother during

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**Submitted Date:** 07.10.2022 **Revised Date:** 07.10.2022 **Accepted Date:** 10.11.2022

Haydarpaşa Numune Medical Journal

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pregnancy and breastfeeding is essential; the child should ideally be breastfed during the first two years of life and fed nutritious, varied, and safe foods in early childhood. Families should be provided with a healthy environment, including access to basic health, water, hygiene, and sanitation services, and safe physical activity opportunities<sup>[1,2]</sup>.

Malnutrition is common in Türkiye and worldwide and is considered a public health problem. A significant portion of child deaths is thought to be due to malnutrition. Worldwide, an estimated 144 million children under the age of 5 are stunted, 47 million are underweight, and 14 million are severely underweight<sup>[1,2]</sup>.

## Materials and Methods

In our study, we aimed to evaluate patients aged 0-18 years in terms of malnutrition, who were followed up at the University of Health Sciences, Sancaktepe Training and Research Hospital, Department of Pediatrics, between January 1, 2018, and December 1, 2020. According to WHO child follow-up percentile curves, cases with body weight <3p and/or <-1 SDS according to age and gender were included. Gomez classification (weight for age) and Waterlow classification (height for age and weight for height) were used to evaluate the cases. According to Gomez classification, malnourished cases were evaluated as mild (76-90%), moderate (61-75%), and severe ( $\leq 60\%$ ). According to the Waterlow (height for age) classification, malnourished cases are considered mild (90-95%), moderate (85-89%), and severe ( $<85\%$ ). It is considered as mild (81-90%), moderate (70-80%), and severe ( $<70\%$ ) according to Waterlow (weight for height) classification. Patients are evaluated as underweight according to Gomez classification, stunting according to Waterlow classification (height for age), and wasting according to Waterlow (weight for height) classification (Table 1)<sup>[2-4]</sup>. Patients with chronic diseases were not included in our study.

On December 30, 2020, Ethics Committee approval was obtained with the number 2020/49 at the non-interventional research ethics committee of the University of Health Sciences, Sancaktepe Training and Research Hospital. The

study was conducted in accordance with the Declaration of Helsinki.

## Statistical Analysis

The Statistical Package for Social Sciences (IBM Corp. Released 2012. IBM SPSS Statistics for Windows, Version 21.0. Armonk, NY: IBM Corp.) and Microsoft Excel (MS Office 2010) were used for data analysis. Descriptive statistics such as frequencies and percentages were used to present the data, and a  $p$ -value  $<0.05$  was considered statistically significant for differences.

## Results

Among the cases who presented at the University of Health Sciences, Sancaktepe Training and Research Hospital, Department of Pediatrics, between January 1, 2018, and December 1, 2020, 2495 cases were diagnosed with malnutrition. The mean age of the patients included in the study was  $6.5 \pm 0.2$  years. Of these, 1475 (59%) were male, 1020 (41%) were female, and enteral product was started in 62% of the cases. Patients diagnosed with malnutrition during this period in our outpatient clinic constituted approximately 2% of all outpatients. Inpatient malnourished cases constituted approximately 1% of hospitalized patients during this period. According to the Gomez classification, 1147 (47.9%) were mild, 1063 (42.6%) were moderate, and 235 (9.5%) were evaluated as severely malnourished. Celiac antibodies (Tissue Transglutaminase IgA, Anti-endomysium antibody, etc.) were positive in 0.7% ( $n=18$ ) of the cases whose cause of malnutrition was investigated. These cases were referred to Pediatric Gastroenterology for further investigation. According to the Waterlow (height for age) classification, 63% ( $n=1572$ ) of the cases were defined as mild, 32.3% ( $n=806$ ) as moderate, and 4.7% ( $n=117$ ) as severe malnutrition. Severely malnourished cases were referred to Pediatric Endocrinology for further investigation. According to the Waterlow (weight for height) classification, 57.6% ( $n=1437$ ) of the cases were defined as mild, 37.1% ( $n=926$ ) as moderate, and 5.3% ( $n=132$ ) as severe malnutrition.

**Table 1.** Nutritional Anthropometry in Children

Anthropometric Method	Definition
Gomez Classification	mild (76-90%), moderate (61-75%), severe ( $\leq 60\%$ )
Waterlow Classification (height for age)	mild (90-95%), moderate (85-89%), severe ( $<85\%$ )
Waterlow Classification (weight for height)	mild (81-90%), moderate (70-80%), severe ( $<70\%$ )
WHO Classification (z score)	mild (-1/-2 SDS), moderate (-2/-3 SDS), severe malnutrition ( $<-3$ SDS)

**Table 2.** Characteristics of patients

Characteristics	Malnutrition		p
	n	(%)*	
Gender			
Male	1475	59	0.57
Female	1020	41	
Gomez Classification			
Mild	1147	47.9	<b>0.0001</b>
Moderate	1063	42.6	
Severe	235	9.5	
Waterlow Classification (height for age)			
Mild	1572	63	<b>0.0001</b>
Moderate	806	32.3	
Severe	117	4.7	
Waterlow Classification (weight for height)			
Mild	1437	57.6	<b>0.0001</b>
Moderate	926	37.1	
Severe	132	5.3	
WHO Classification (z score)			
Mild	1289	51.7	<b>0.0001</b>
Moderate	1130	45.3	
Severe	76	3	

\*Percentages have been calculated with respect to the total malnutrition (n=2495).

According to the WHO classification (z-score), 51.7% (n=1289) of the cases were mild (-1/-2 SDS), 45.3% (n=1130) moderate (-2/-3 SDS), and 3% (n=76) were defined as severe malnutrition (<-3 SDS). The mean BMI was found to be 13.7±0.4 (Table 2).

There were cases that were hospitalized due to malnutrition and/or in whom malnutrition was detected during hospitalization. 58.7% (n=87) of all hospitalized cases were hospitalized for infection-related reasons. The most common infections were bronchiolitis (45%), pneumonia (34%), bacteremia/sepsis (15%), and acute gastroenteritis (6%). Other hospitalized cases (41.3%, n=61) were hospitalized for examination due to malnutrition. The average length of stay was 6 days. 12.6% (n=11) of hospitalized patients were referred to the intensive care unit due to clinical worsening in the service follow-up.

Iron deficiency anemia was found in 52.7% (n=1314) of the cases, vitamin B12 deficiency in 26.4% (n=658), and folate deficiency in 3.7% (n=92) of the cases. The cases were treated and followed up. There were no deaths due to malnutrition during our study.

## Discussion

In the study by Asim et al.<sup>[5]</sup> it was emphasized that the prevalence of malnutrition is high among children in Pakistan, and malnutrition develops due to early marriages, large family size, lack of birth intervals (at least 2 years), inadequate breastfeeding, and exclusive breastfeeding. It is known that the immigrant population (Syrian and other ethnic groups) is high in our region. Similarly, early marriages are common. Birth intervals are usually 1 year, and extended family size is common. Frequent birth intervals, having many children, and mothers' insufficient knowledge and experience in our region result in inadequate breastfeeding and/or exclusive breastfeeding. On the other hand, complementary feeding is often started early (<4 months), late, or inadequately.

Akombi et al.<sup>[6]</sup> reported that the prevalence of malnutrition was 33.2% for stunting, 7.1% for wasting, and 16.3% for underweight in sub-Saharan Africa. In the study by Novignon et al.<sup>[7]</sup> it was stated that malnutrition and socioeconomic conditions are parallel in Ghana. It has been emphasized that individual socioeconomic characteristics such as maternal education level, family residence, antenatal care resources, and health insurance are effective in childhood malnutrition. It has been stated that increasing the literacy of mothers in the country and ensuring that all individuals in the country have health insurance may be effective in improving malnutrition. In our region, the education level of mothers is generally at the primary school level, and the socioeconomic status of the families is not good. In our region, where the immigrant population is dense, a significant part of the families does not have health insurance.

In the study conducted by Özdener et al.<sup>[8]</sup> through interviewing 136 pediatricians across Türkiye, it was stated that physicians applied enteral nutrition therapy to 66% of patients diagnosed with malnutrition, and the rate of compliance with the treatment was 59%. It was emphasized that the factors associated with adherence to treatment were cost, taste, parental education level, economic status, and the level of trust in the treatment method. In our study, similar to Özdener et al.<sup>[8]</sup> enteral products were started in 62% of the cases. Enteral products were initiated in patients with moderate and severe malnutrition, as well as in mildly malnourished patients with nutritional incompatibility.

In a study conducted by Kansu et al.<sup>[9]</sup> with 345 cases (inpatients aged 0-10 years) from 17 centers, the use of 6-month high fiber enteral nutrition was associated with positive results in terms of anthropometry, appetite,

gastrointestinal tolerance, and safety in malnourished children. Similarly, in our study, it is observed that malnourished children who are started on enteral products are generally started on high fiber enteral products (72%), resulting in increased appetite, decreased symptoms such as constipation, and good treatment compliance.

According to the meta-analysis by Das et al.<sup>[10]</sup> in the treatment of severe acute malnutrition, prophylactic antibiotic use and high-dose vitamin A supplementation increase the child's recovery rate and support weight gain. In our study, patients diagnosed with severe acute malnutrition and hospitalized in our service were given antibiotic treatment and high-dose vitamin A support.

In a systematic review by Tam et al.<sup>[11]</sup> micronutrient deficiencies are common in children under 5 years of age in low- and middle-income countries. Iron, folic acid, and multiple micronutrient support treat nutritional anemia in children. It has also been reported to improve stunting and underweight. Vitamin A supplementation likely reduces all-cause mortality, while zinc supplementation reduces the incidence of diarrhea. In our study, multivitamin and zinc supplements were applied to malnourished cases. Iron, Vitamin B12, and Folate treatment were given to anemic cases according to their clinical status. Clinical improvement was observed in malnutrition and anemia.

In the study by Noble et al.<sup>[12]</sup> it was stated that there is evidence that probiotic and synbiotic support during the treatment process of children aged 6-59 months with severe acute malnutrition reduces mortality. Cases hospitalized in our service due to severe acute malnutrition were given probiotic support during hospitalization. A short duration of acute diarrhea (maximum 3 days) was observed in patients who received antibiotic treatment during hospitalization.

According to Merker et al.<sup>[13]</sup> nutritional support was found to be effective in reducing mortality in cases with intense inflammation. Although the study was conducted in the adult group, we observe that it is similar in pediatric cases. We have seen that nutritional support significantly reduces mortality in severely malnourished cases followed in the service or intensive care unit.

According to Visser et al.<sup>[14]</sup> the use of specially formulated products in moderate acute malnutrition increases children's weight, school success, and intelligence scores. In our study, we provided formulated enteral product support to all of our cases with moderate acute malnutrition. We observed weight gain in the cases. The families of the children stated that there was a significant increase in their school success.

According to Valentini et al.<sup>[15]</sup> initiation of early enteral nutrition in hospitalized patients with malnutrition reduced the length of stay in the hospital by approximately 4 days compared to late initiation. Enteral product support was started within 24-48 hours in our hospitalized patients with acute malnutrition.

According to Azimi et al.<sup>[16]</sup> the use of ready-to-use supplementary food (RUSF) in the treatment of mild and moderate acute malnutrition significantly increases daily weight gain and reduces the prevalence of diarrhea. Jadhav et al.<sup>[17]</sup> also stated that a 2-week ready-to-use supplementary food (RUSF) treatment in severe acute malnutrition is more effective than standard nutritional therapy and reduces morbidity. Due to the low socioeconomic level of our patients and the lack of their health insurance, we could not use these products for treatment.

According to Wagnew et al.<sup>[18]</sup> diarrhea, dehydration, and anemia are the most important predictors of mortality in severe acute malnutrition. Lazzerini et al.<sup>[19]</sup> stated that zinc supplementation may be beneficial in children with acute malnutrition 6 months and older. Anticipating these in our patients, we arranged our treatment accordingly.

According to Saleem et al.<sup>[20]</sup> administration of high-dose Vitamin D3 therapy to patients receiving standard therapy in severe acute malnutrition improved the mean weight-for-height or -length z-score and developmental indexes in children. We also administered high-dose vitamin D3 to our patients with severe acute malnutrition during the treatment process.

## Conclusions

Malnutrition is an important public health problem in our country and around the world. In our study, malnutrition in our region was examined, and it aimed to draw attention to the importance of the subject. It is necessary in our country and worldwide to provide training to the community and employees on breastfeeding and complementary nutrition and to raise social awareness.

**Ethics Committee Approval:** On December 30, 2020, Ethics Committee approval was obtained with the number 2020/49 at the non-interventional research ethics committee of the University of Health Sciences, Sancaktepe Training and Research Hospital. The study was conducted in accordance with the Declaration of Helsinki.

**Peer-review:** Externally peer-reviewed.

**Authorship Contributions:** Concept: E.G.; Design: E.G.; Supervision: E.G.; Fundings: E.G., B.Ö.; Materials: E.G., B.Ö.; Data Collection or Processing: E.G., B.Ö.; Analysis or Interpretation: E.G.; Writing: E.G.; Critical Review: E.G.

**Use of AI for Writing Assistance:** Not declared.

**Conflict of Interest:** None declared.

**Financial Disclosure:** The authors declared that this study received no financial support.

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