

# Prevalence of Malnutrition among Hospitalized Pediatric Patients in a Tertiary Hospital in Jordan: Pilot Study

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**How to cite this paper:** Al-Dabbas, S., Batayneh, Q., Al-Jawhary, R., Alzoubi, M.H. and Altamimi, E. (2024) Prevalence of Malnutrition among Hospitalized Pediatric Patients in a Tertiary Hospital in Jordan: Pilot Study. *Journal of Biosciences and Medicines*, 12, 218-229.

<https://doi.org/10.4236/jbm.2024.128017>

**Received:** June 9, 2024

**Accepted:** August 17, 2024

**Published:** August 20, 2024

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## Abstract

**Introduction:** Failure to thrive (FTT) occurs when a child's growth falls below expected standards, typically due to inadequate nutrient intake. Factors include insufficient oral intake, poor nutrient absorption, and increased metabolic demands. Previous studies have shown high malnutrition rates in hospitalized children due to illness-related metabolic demands, decreased appetite, and inadequate intake. Our objective was to assess the growth and nutritional status of children admitted to King Abdullah University Hospital (KAUH) and identify the prevalence of undernutrition and associated factors. **Methods:** This prospective, cross-sectional cohort study was conducted at KAUH from July to December 2022. We included children aged 2 months to 16 years, excluding those with conditions altering growth parameters. Data were collected through pediatric data sheets, physical examinations, and laboratory tests. Anthropometric measurements were taken, and growth was assessed using CDC growth charts. Nutritional anemia was defined as hemoglobin < 11 and RDW > 16. **Results:** A total of 111 patients were included (56.8% male, median age 65 months). Most patients had normal height (82%) and weight (86.5%) upon admission. However, 14.4% were stunted, 11.7% were underweight, 14.4% were overweight, and 3.6% were obese. Growth impairment correlated with higher anemia rates ( $p = 0.042$ ). Nutritional anemia was present in 12% of patients. No significant relation was found between breastfeeding history and growth retardation, but maternal perception of malnutrition correlated well with actual malnutrition. **Conclusion:** Our study found a malnutrition prevalence of 19.8%, highlighting the need for systematic nutritional screening in hospitalized children. The study's limitations include its small sample size and specific patient population, suggesting the need for larger, multicenter studies for more generalizable results.

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## Keywords

Children, Growth, Stunting, Underweight, Malnutrition, Nutrition, Anemia

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### 1. Introduction

Failure to thrive (FTT) refers to a condition where a child's physical growth does not meet the expected standards compared to their peers. This is typically caused by not receiving the necessary nutrients to meet their individual nutritional needs, resulting in anthropometric parameters falling below the 5th percentile. [1] FTT can be attributed to various factors, including insufficient oral intake (such as eating disorders, lack of food, or developmental delay), inadequate nutrient absorption (such as cystic fibrosis, chronic inflammatory bowel disease, or burns), increased metabolic demands (such as chronic lung disease and cardiac failure), or a combination of these conditions. [2] [3]

A retrospective study on 497 patients found that 59% experienced FTT due to inadequate intake, 20% due to organic causes, 11% due to mechanical feeding issues, and 10% had mixed or unexplained diagnoses. [4] Malnutrition is believed to be common in hospitalized children due to heightened metabolic requirements resulting from their present illness, reduced appetite, concurrent medication usage, and inadequate dietary intake during treatment. [5] [6] Nevertheless, the identification of malnutrition might be impeded by discrepancies among different populations and patients, the utilization of various diagnostic instruments, and the absence of agreement over the definition of malnutrition.

A cross-sectional study was conducted in Egypt, involving 500 hospitalized patients under the age of 3. The nutritional status of these patients was evaluated using the Screening Tool for Risk on Nutritional Status and Growth (STRONG-kids). The results showed that 37.8% of the patients were classified as being at high risk for malnutrition, 42.6% had a moderate risk, and 19.6% had a low risk. [7] An Iranian study examined the occurrence of malnutrition in hospitalized patients aged 1 month to 18 years, using BMI Z score and WHO cut-off criteria for children. The findings revealed that upon admission, 35% of the patients were identified as malnourished, with 21% classified as mild, 3% as moderate, and 10% as severe. [8] A study conducted in Malaysia measured anthropometric parameters, including weight, length/height, mid-upper arm circumference (MUAC), and triceps skinfold thickness, in 285 children aged 3 months to 15 years. The study found that the prevalence of acute undernutrition was 11% and chronic undernutrition was 14%. [2] In addition, a study conducted in Spain revealed that the frequency of malnutrition among pediatric patients in hospitals was 8.2%. [9] Another study conducted in Spain also reported similar findings. The incidence of malnutrition was 7.1% for mild cases and 0.7% for severe cases of acute malnutrition. The prevalence of moderate chronic malnutrition was 2.7%, whereas the prevalence of severe chronic malnutrition was 1.4%. [10]

Still a major worldwide health concern, malnutrition affects children in many different areas, having major consequences for their development and growth. Research conducted in Yemen, [11] Senegal, [12] India, [13] and Myanmar [14] emphasizes how common and varied malnutrition is. Primary school children in Myanmar must deal with both undernutrition and overnutrition, which suggests the need for thorough public health campaigns. [14] Poor dietary diversity and socioeconomic issues cause high rates of malnutrition among newborns in Dakar, Senegal's suburbs. [12] Likewise, poor nutrition and limited access to healthcare aggravate severe acute malnutrition (SAM), which is common among youngsters in Mumbai, India, [13] and Aden, Yemen. [11] We advocate for the inclusion of systematic screening for nutritional status as a standard component of routine assessments during hospitalization. [5] [6] The objective of our study is to conduct a comprehensive assessment of the growth and nutritional condition of every child admitted to the pediatric ward at King Abdullah University Hospital (KAUH) upon their admission. Our goal is to determine the prevalence of undernutrition among hospitalized children and identify the associated factors with being undernourished.

## **2. Methods**

### **2.1. Study Design**

A prospective, observational, cross-sectional cohort study was conducted at King Abdullah University Hospital (KAUH) from July 2022 to December 2022. Before recruitment, the caregivers of all participants were provided with an explanation of all aspects of the study in order to obtain informed consent.

### **2.2. Participants**

The study encompassed children admitted to the children's service at KAUH who met the inclusion criteria, ranging from 2 months to 16 years old. Oncological cases, unstable patients, and those transferred from the ICU or with conditions altering growth parameters were excluded, while both medical and surgical cases were included.

### **2.3. Data Acquisition**

A three-part process was implemented when gathering data.

#### **2.3.1. Pediatric Data Sheet**

- It was designed based on previous data sheets used in similar studies, including the following data to be gathered from the caregivers:
- Personal, medical, social, and family history.
- Data on chronic diseases, chronic drug intake, feeding issues, recurrent vomiting, choking, difficulty swallowing, abdominal pain, picky eating, food allergies, diarrhea, family history of feeding problems, failure to gain weight, and growth issues.

### 2.3.2. Physical Examination

- Evaluation of malnutrition characteristics, including muscle atrophy, hair brittleness/loss, skin rashes, bleeding, and edema.
- Anthropometric parameters were measured, including weight, height, and Body Mass Index (BMI) calculation.

### 2.3.3. Laboratory Tests

- Basic laboratory results were obtained, including hemoglobin, mean corpuscular volume, mean corpuscular hemoglobin, red blood cell distribution width, platelets, urea, creatinine, total protein, and albumin.

## 2.4. Anthropometric Measurements and Assessment

- **Weight:** Determined using a chair scale for children and a specialized infant scale for infants, with the weight of the diaper subtracted. Participants were requested to wear lightweight clothes and refrain from wearing shoes.
- **Stature:** Measured to the nearest 0.1 cm.
- **BMI:** Determined by dividing body mass in kilograms by the square of body height in meters [weight in kg/(height in meters)<sup>2</sup>].

Children's growth was evaluated using the Centers for Disease Control and Prevention (CDC) growth charts (BMI-for-age, height-for-age, and weight-for-age). [15] Abnormal growth patterns were defined by specific Z-score criteria: a stature-for-age Z-score less than -2 was categorized as stunted, a weight-for-age Z-score less than -2 was considered underweight, a BMI-for-age Z-score less than -2 indicated thinness, a BMI-for-age Z-score greater than 1 signified overweight, and a BMI-for-age Z-score greater than 2 denoted obesity.

## 2.5. Ethical Considerations

The KAUH Institutional Review Board (IRB) authorized the study, granting the approval number 20220362. Informed consent was obtained from the caregivers of all participants, and all procedures were conducted in accordance with ethical guidelines.

### Statistical Analysis

We reported the median with interquartile range (IQR = 1st - 3rd quartiles) when more appropriate, which was due to the skewness of the data. Continuous variables were expressed as mean  $\pm$  standard deviation (SD) or as percentages. The two percentages were compared using the t-test. The alpha significance criterion was  $p < 0.05$ , and all significance tests were two-tailed. The software Statistical Package for Social Sciences (version 25.0; IBM Corporation, Armonk, NY, USA) was employed to import and analyze the data.

## 3. Results

### 3.1. Demographics

A total of 111 patients were included in the study, with 63 males (56.8%) and 48

females (43.2%). The age range of the patients was from 2 months to 16 years, with a median age of 65 months (**Table 1**).

**Table 1.** Patients demographics.

Features	Number (%)
Age (Median, Inter-quartile Range Q1 - Q3)	65.76 (36.25 - 124.5) months
<b>Sex:</b>	
Male	63 (56.8%)
Female	48 (43.2%)
<b>Known medical illness</b>	
Yes	47 (42.3%)
No	64 (57.7%)
<b>Cause of Admission</b>	
- Infectious disease	27 (24.3%)
- Neurological disease	11 (9.9%)
- Respiratory disease	17 (15.3%)
- Gastrointestinal disease	9 (8.1%)
- Nephrology disease	14 (12.6%)
- Surgical disease	6 (5.4%)
- Endocrine disease	8 (7.2%)
- Hematological disease	3 (2.7%)
- Rheumatological disease	2 (1.8%)
- Not documented	14 (12.6%)

### 3.2. Admission Causes

The causes of admission are listed in descending order based on frequency. Among the 111 patients, 47 (42.35%) had pre-existing chronic conditions, whereas 64 (57.7%) were previously healthy. The most common causes for admission were infectious problems (27 cases, 24.3%), respiratory conditions (17 cases, 15.3%), and nephrology diseases (14 cases, 12.6%) (**Table 1**).

### 3.3. Nutritional History

According to the pediatric data sheet administered to caregivers, 73% of patients had been or were being breastfed, with weaning around 6 months. Approximately 38% of these patients were weaned predominantly on cereals, 20% on fruits and vegetables, and 11% on table food. Although 27% of children were reported as picky eaters, the majority (88%) of children were on a regular diet without restrictions. Furthermore, around 40% of caregivers reported providing their children with supplements, such as vitamin D, iron, and multivitamins. It

is important to note that 12.6% of caregivers reported that their children were not gaining weight at a sufficient rate, and approximately an equal percentage reported features suggestive of malnutrition (**Table 2**).

**Table 2.** Nutritional history and malnutrition findings.

Feature	Number (%)
<b>Any history of breast feeding?</b>	
Yes	81 (73.0%)
<b>Age of weaning:</b>	
Median (Q1 - Q3 range) months	6 (5 - 6.75) months
<b>Any diet restriction?</b>	
No	98 (88.3%)
Medical diet	4 (3.6%)
Not eating animal proteins	5 (4.5%)
Mainly dairy products	3 (2.7%)
Not weaned yet	1 (0.9%)
<b>Type of weaning food used:</b>	
- Cereals	42 (37.8%)
- Fruits and Vegetables	22 (19.8%)
- Eggs	1 (0.9%)
- Dairy products	24 (21.6%)
- Table food	12 (10.8%)
- Other	10 (9.0%)
<b>Receiving any supplements?</b>	
Yes:	44 (39.6%)
- Iron	15 (13.5%)
- Vitamin D	15 (13.5%)
- Multivitamins	14 (12.6%)
- Omega-3	5 (4.5%)
- High caloric formula	1 (0.9%)
<b>Do you think your child is having any food allergy?</b>	
Yes	16 (14.4%)
<b>Do you consider your child a picky eater?</b>	
Yes	30 (27.0%)
No	
<b>Do you feel your child isn't gaining weight appropriately?</b>	
Yes	14 (12.6%)
<b>Any clinical feature suggestive of malnutrition?</b>	
Yes	13 (11.7%)

### 3.4. Growth Assessment and Prevalence of Growth Impairment

Most of the patients had normal height and weight upon admission, with 82% having a normal height and 96% having a normal weight. However, 16 (14.4%) were found to be stunted, and 13 (11.7%) were underweight. Nine patients (8.1%) were both underweight and stunted at the same time. On the other hand, 16 (14.4%) of the children were overweight, and 4 (3.6%) were obese (**Table 3**).

**Table 3.** Growth indicators at evaluation.

Z-score	Length/Height-for age	Weight-for-age	BMI-for-Age
	N (%)	N (%)	N (%)
Above 2	4 (3.6%)	2 (1.8%)	4 (3.6%)
Between -2 and 2	91 (82%)	96 (86.5%)	For BMI Between -2 and 0.99 Normal or under weight 91 (82.0%)
Less than -2*	16 (14.4%)	13 (11.7%)	Between 1 - 2 (overweight) 16 (14.4%)

\*Nine patients had weight and height for age less than -2 Z-score.

Despite the fact that patients with impaired growth were older than those with normal growth, the age disparity was not statistically significant (p-value 0.36). The two groups did not exhibit any gender differences (p-value 0.48). They also did not demonstrate a significant difference in the presence of chronic medical illness, chronic drug intake, age of weaning, or breastfeeding (p-values: 0.41, 0.92, 0.57 respectively). Interestingly, the family's assessment of their child's inadequate weight gain was in accordance with the results of our cohort's growth impairment, with (p-values: 0.003, and 0.04 respectively).

However, we found that family perception did not play a significant role in identifying if their child is a picky eater or has a food allergy (p-values: 0.54, and 0.90 respectively). In addition, micronutrient supplementation such as vitamin D and iron did not have a significant correlation with protection against growth impairment in admitted children (p-value 0.966).

Compared to children with normal growth patterns, those with growth impairment exhibited a substantially higher rate of anemia (p-value = 0.042) (**Table 4**).

**Table 4.** Comparative analysis of patients with growth issues versus patients with normal growth patterns.

Feature	Patients with growth impairment (N = 22)	Patients with normal growth pattern (N = 89)	95% Confidence interval	p-value
Age (Median, interquartile range) months	94 (39.5 - 132) months	63.1 (36.5 - 121.25) months		0.3612

## Continued

<b>Sex</b>			-14.718% to 27.847%	0.489
Female N (%)	8 (36.7%)	40 (44.9%)		
Hx. Of chronic medical illness N (%)	11 (50%)	36 (40.4%)	-12.298% to 31.132%	0.417
Chronic drug ingestion N (%)	5 (22.7%)	21 (23.6%)	-21.166% to 16.857%	0.929
Any breast feeding N (%)	15 (68.2%)	66 (74.2%)	-12.383% to 28.629%	0.572
<b>Weaning Age</b>				
Median (Q1 - Q3) months	6 (5.75 - 6.0) months	6 (4.0 - 6.0) months		
Receiving supplements (Vitamins, Iron, ...)	9 (40.9%)	36 (40.4%)	-22.059% to 20.889%	0.966
<b>Family perception of the child nutritional and growth status:</b>				
- Picky eater	5 (22.7%)	26 (29.2%)	-15.860% to 22.675%	0.545
- Had food allergy	3 (13.6%)	13 (14.6%)	-19.547% to 13.491%	0.905
- Not gaining weight appropriately	7 (31.8%)	7 (7.9%)	6.724% to 45.146%	0.003
Presence of malnutrition features	5 (22.7%)	8 (9.0%)	-1.093% to 34.867%	0.075
Anemia	7 (31.8%)	12 (13.5%)	0.604% to 39.903%	0.042

### 3.5. Nutritional Anemia

Nutritional anemia, defined as hemoglobin < 11 and RDW > 16, was present in 14 patients, regardless of whether they had growth impairment or not. The median age was 62.5 months, and the majority of these patients were males (11 or 78.6%). Among them, 4 patients (28.6%) were underweight and stunted, and 7 patients (50%) had chronic diseases (Table 5).

**Table 5.** Nutritional Anemia (Hemoglobin < 11 and RDW > 16) in our cohort at the time of evaluation (N = 14).

<b>Features</b>	
<b>Age</b>	
Median (inter-quartile range, Q1 - Q3)	62.5 (35.75 - 123.75) months
<b>Sex</b>	
- Male: N (%)	11 (78.6)
<b>Associated Growth Impairment:</b>	
- Underweight and Stunted	4 (28.6%)
Presence of chronic diseases	7 (50%)

## 4. Discussion

Our primary goal was to assess the nutritional status of children aged 2 months to 16 years admitted to the pediatric ward at KAUH. We aimed to determine the

incidence of malnutrition among these patients and identify the risk factors contributing to undernutrition, facilitating early detection and intervention. Our research showed that 19.8% of hospitalized patients were malnourished, while 3.6% were obese.

In our cohort, the prevalence of malnutrition was 19.8%, nearly double the rate reported in Spain, where a study of 852 patients admitted to a tertiary hospital found an 8.2% prevalence of malnutrition. This Spanish study associated malnutrition mainly with nervous and respiratory diseases, comprising 45.8% of cases [10]. Conversely, a study at Mofid Children's Hospital in Tehran found a 35% malnutrition prevalence at admission using BMI Z scores based on WHO cutoffs [8]. In Thailand, a prospective cohort study conducted between December 2018 and May 2019 across four tertiary care hospitals found an overall malnutrition prevalence of 44.5% [16].

In Malaysia, anthropometric measurements of 285 children aged three months to 15 years revealed rates of 11% for acute undernutrition and 14% for chronic undernutrition [9]. These variations in prevalence can be attributed to differences in populations, patient types, assessment tools, and definitions of undernutrition in children.

Based on the definitions of underweight and stunting (Z-score less than  $-2$ ), we found that approximately 14% of patients were stunted, and 12% were underweight. In contrast, Shaaban *et al.* reported higher prevalence values in their study on nutritional risk screening of hospitalized children aged between 1 and 36 months at the Children's Hospital, Ain Shams University, Cairo, Egypt, finding that 57.8% were underweight and 58.4% were stunted based on WHO definitions [7]. A prospective study of 117 children admitted for scheduled elective general surgical procedures in a Nigerian tertiary hospital found similar results to ours, reporting that 14.5% were undernourished and 11.1% were stunted [17].

The similarity between our results and the second study may be attributed to similarities in the studied age groups and sample sizes, unlike the first study which involved a different age range and possibly different sample characteristics.

In our cohort, half of the patients with growth impairment had known chronic medical issues. This finding aligns with Prasadajudio *et al.*'s findings of growth impairment rates in children with chronic illnesses in developing countries. They concluded that malnutrition prevalence in pediatric hospital patients might be underestimated and often begins before admission. Their study revealed that patients with chronic illnesses, especially those with cardiac and renal problems, had the highest malnutrition rates [18].

Based on the definition of nutritional anemia (Hemoglobin  $< 11$  and RDW  $> 16$ ), 14 out of 111 patients (12%) were found to be anemic. Consistent with our findings, a study on the prevalence of malnutrition and its correlates among children undergoing elective general surgical procedures in a tertiary hospital in a developing country reported that 16.2% were anemic [18].

In contrast, Saengnipanthkul *et al.* found that 32.7% of patients without underlying hemolytic disorders or cancer were anemic in a multi-site tertiary medical center study in Thailand. This discrepancy may be due to their larger sample size compared to ours, in addition to population-related factors [16].

While examining the associations between nutritional history, family perception of child growth, and the prevalence of malnutrition, our study found no relation between breastfeeding history and growth retardation. This aligns with a study conducted at a single hospital in Malaysia [9], but the results are not generalizable due to the small sample size and inherent recall bias.

Interestingly, mothers' perception of their children having malnutrition correlated well with actual malnutrition. This finding is consistent with a previous Turkish study that reported a good correlation between maternal estimation of a child's weight and growth [19]. Such insights can serve as useful indicators for further assessment when rapidly evaluating child growth. Asking about parental perception of a child's growth might signal the need for additional evaluation.

## 5. Conclusion

We found that malnutrition prevalence in admitted pediatric patients at KAUH is 19.8%. However, the major drawbacks of our study are the small sample size, which limits the ability to draw definitive conclusions, and the fact that it was conducted in a tertiary referral hospital. This setting likely selected a specific population of children with chronic and potentially complex illnesses, making the generalization of the results more difficult. To address these limitations, a multicenter, prospective study utilizing a broader range of assessment tools is necessary. This approach would provide a more representative sample and enhance the reliability and applicability of the findings.

## Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

## References

- [1] Franceschi, R., Rizzardi, C., Maines, E., Liguori, A., Soffiati, M. and Tornese, G. (2021) Failure to Thrive in Infant and Toddlers: A Practical Flowchart-Based Approach in a Hospital Setting. *Italian Journal of Pediatrics*, **47**, Article No. 62. <https://doi.org/10.1186/s13052-021-01017-4>
- [2] Lee, W. and Ahmad, Z. (2017) The Prevalence of Undernutrition Upon Hospitalization in Children in a Developing Country: A Single Hospital Study from Malaysia. *Pediatrics & Neonatology*, **58**, 415-420. <https://doi.org/10.1016/j.pedneo.2016.08.010>
- [3] Larson-Nath, C. and Biank, V.F. (2016) Clinical Review of Failure to Thrive in Pediatric Patients. *Pediatric Annals*, **45**, e46-e49. <https://doi.org/10.3928/00904481-20160114-01>
- [4] Peterson Lu, E., Bowen, J., Foglia, M., Ribar, E., Mack, M., Sondhi, E., *et al.* (2023)

- Etiologies of Poor Weight Gain and Ultimate Diagnosis in Children Admitted for Growth Faltering. *Hospital Pediatrics*, **13**, 394-402. <https://doi.org/10.1542/hpeds.2022-007038>
- [5] Bellanti, F., lo Buglio, A., Quiete, S. and Vendemiale, G. (2022) Malnutrition in Hospitalized Old Patients: Screening and Diagnosis, Clinical Outcomes, and Management. *Nutrients*, **14**, Article 910. <https://doi.org/10.3390/nu14040910>
- [6] Joosten, K.F. and Hulst, J.M. (2008) Malnutrition in Pediatric Hospital Patients: Current Issues. *Nutrition*, **24**, 995-1001.
- [7] Shaaban, S., Nassar, M., El-Gendy, Y. and El-Shaer, B. (2019) Nutritional Risk Screening of Hospitalized Children Aged <3 Years. *Eastern Mediterranean Health Journal*, **25**, 18-23. <https://doi.org/10.26719/emhj.18.019>
- [8] Imanzadeh, F., Olang, B., Khatami, K., Hosseini, A., Dara, N., Rohani, P., *et al.* (2018) Assessing the Prevalence and Treatment of Malnutrition in Hospitalized Children in Mofid Children's Hospital during 2015-2016. *Archives of Iranian Medicine*, **21**, 302-309.
- [9] Durá-Travé, T., San Martín-García, I., Gallinas-Victoriano, F., Vaquero Iñigo, I. and González-Benavides, A. (2016) Prevalence of Malnutrition in Hospitalised Children: Retrospective Study in a Spanish Tertiary-Level Hospital. *JRSM Open*, **7**, 1-8. <https://doi.org/10.1177/2054270416643889>
- [10] Moreno Villares, J.M., Varea Calderón, V. and Bousoño García, C. (2017) Malnutrición en el niño ingresado en un hospital. Resultados de una encuesta nacional. *Anales de Pediatría*, **86**, 270-276. <https://doi.org/10.1016/j.anpedi.2015.12.013>
- [11] Badi, M.A. and Ba-Saddik, I.A. (2016) Severe Acute Malnutrition among Hospitalized Children, Aden, Yemen. *Open Journal of Epidemiology*, **6**, 121-127. <https://doi.org/10.4236/ojepi.2016.62012>
- [12] Jessika, I., Mbaye, F., Diallo, A., Ly, F. and Sembène, P.M. (2023) Evaluation of Malnutrition in Infants Aged 0-59 Months in the Suburbs of Dakar. *Health*, **15**, 349-366. <https://doi.org/10.4236/health.2023.154024>
- [13] Chainani, E. (2018) Analysis and Intervention of Severe Acute Malnutrition in Children at an Urban Public School in Mumbai, India. *Open Journal of Preventive Medicine*, **8**, 131-141. <https://doi.org/10.4236/ojpm.2018.84013>
- [14] Hlaing, M.M., Ohnamr, M., Tun, S., Khine, T., Win, W.W., Hlaing, S.S., *et al.* (2021) Dual Burden of Malnutrition among Primary School Children in Myanmar. *Food and Nutrition Sciences*, **12**, 115-123. <https://doi.org/10.4236/fns.2021.122010>
- [15] Kuczmarski, R.J., Ogden, C.L., Guo, S.S., *et al.* (2002) 2000 CDC Growth Charts for the United States: Methods and Development. Vital and Health Statistics, National Center for Health Statistics, 1-190.
- [16] Saengnipanthkul, S., Apiraksakorn, A., Densupsoontorn, N. and Chongviriyaphan, N. (2023) Prevalence and Risk Factors for Pediatric Acute and Chronic Malnutrition: A Multi-Site Tertiary Medical Center Study in Thailand. *Asia Pacific Journal of Clinical Nutrition*, **32**, 85-92.
- [17] Adigun, T. and Ogundoyin, O.O. (2020) Prevalence of Malnutrition and Its Correlates among Children Coming for Elective General Surgical Procedures in a Tertiary Hospital of a Developing Country. *Annals of Medical Research and Practice*.
- [18] Prasadajudio, M., Devaera, Y., Noormanto, N., Kuswiyanto, R.B., Sudarmanto, B., Andriastuti, M., *et al.* (2023) Disease-Related Malnutrition in Pediatric Patients with Chronic Disease: A Developing Country Perspective. *Current Developments in Nutrition*, **7**, Article 100021. <https://doi.org/10.1016/j.cdnut.2022.100021>

- [19] Yalçın, S.S., Serdarođlu, E. and İnce, O.T. (2016) Parental Perception and Child's Nutritional Status. *The Turkish Journal of Pediatrics*, **58**, 63-68.  
<https://doi.org/10.24953/turkped.2016.01.009>