

# Nutritional Status of Children Admitted to the Pediatric Department at a Tertiary Care Hospital, Sana'a, Yemen

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## Abstract:-

**Background:** Malnutrition among hospitalized children is known to negatively affecting their response to therapy and prolong their hospital stay.

**Objectives:** This study aimed to detect malnutrition among hospitalized children at the time of admission.

**Patient & method:** This is a cross-sectional hospital-based study, conducted at Al-Gumhourri Teaching Hospital, Sana'a, Yemen, from July to December 2019. All the patients from 1 month to 5 years of age had been included; anthropometric measures were obtained at the time of admission. Mean z- scores for weight-for-age, length/height-for-age, weight for length/height and prevalence of underweight, stunting and wasting were calculated using the new WHO growth standards.

**Results:** Two hundred and eighteen children were enrolled during the study period. The number of moderate to severely malnourished children was 106 with a prevalence of 48.6 %. Of the malnourished children 78 (73.6%) were male and 92 (86.8%) of them were below the age of 2 years. Most of the malnourished children were admitted to the hospital due to infectious diseases such as chest infection in 38 (35.8%) and gastroenteritis in 26 (24.5%). According to the WHO growth standards, 97 (91.5%), 78 (73.6%) and 52 (49.1%) children had underweight, stunting and wasting, respectively. Nonexclusive breastfeeding, illiterate mother, low family income and recurrent diarrhea were found to be independent risk factors of malnutrition.

**Conclusion:** Initial screening for malnutrition should be performed on hospital admission so children can receive appropriate nutrition support in addition to the specific care for their illnesses.

**Keywords:-** Prevalence, Malnutrition, Hospitalized Children, Yemen.

## I. INTRODUCTION

Malnutrition is tremendously influencing the health of children. It leads to compromised physical and mental development. It also increases the likelihood of childhood morbidity and fatality [1]. In Yemen, malnutrition has been a serious problem for years. The Global Nutrition Report (GNR) issued by the International Food Policy Research Institute (IFPRI) 2016, stated Yemen among the worst seven countries globally in the chronic malnutrition indicator (stunting) and the worst six countries in the severe acute malnutrition indicator (wasting) in children less than five. [2]. However, malnutrition among hospitalized children can go unrecognized by healthcare professionals [3, 4]. Deprived nutritional status at admission to the hospital is adversely affected clinical outcomes, disturbs immune response, increase the likelihood of getting infections, complicating their illnesses and be at risk for more nutritional deterioration during the hospital stay [5,6,7,8]. Moreover, these intimidating effects lead to hindered recovery and lengthen hospitalization; thus increasing the financial burden and limiting hospital bed availability [9, 10, 11]. The prevalence of malnutrition in hospitalized children ranged from country to country. Depending on a Brazilian study, 16.3% of children < 5 years old shown under-nutrition on admission [12]. One in five children is malnourished on admission to hospital, this result was found by one Canadian multicenter trial [13]. The prevalence of malnutrition on admission varied from 6.1 to 13.3% in some western studies [14, 15]. Because of the absence of particular policies for nutritional screening on hospital admission this often, goes unobserved [11]. Early detection of malnutrition in children on admission to the hospital offers a chance for interference such as prompt nutritional support, which could lead to better clinical outcomes, shorter hospitalization, and prevents the long-term complications of malnutrition on growth and development [16, 17]. Moreover, recognition of the prevalence of malnutrition in hospitalized children may serve as a reference landmark for the surveillance of nutritional status in the population of the region and then in the country as a whole [18]. By reviewing the literature, there are few publications in Yemen and region [18, 19], and the published data are somewhat inadequate. Thus, this study meant to determine the magnitude of malnutrition among hospitalized children and to detect malnutrition amongst

children on admission to bring attention and care to that problem.

## II. METHODS

A cross-sectional, hospital-based study was conducted in Al Gumhouri Teaching Hospital (AGTH), Sana'a-Yemen from July to December 2019. AGTH is a referral hospital. It receives the patients from the city itself, in addition to referred cases from peripheral districts. The pediatric department is one of the main departments in the hospital with a capacity of 40 beds. Pediatric patients aged 1 month to 5 years, who were admitted in the general pediatric wards, were included. Critically ill patients, neonates, oncology, surgery patients, and those who refused to give consent to participate in the study were excluded. Permission to conduct the study was obtained from the hospital administration and signed written or verbal consents were taken from the mother/caretakers of all patients before including them in the study.

The demographic data and the anthropometric measurements were collected within the first 24 hours after admission. All measurements were made in a standard way by a pediatrician experienced in pediatric nutritional assessment. Weight in kg and height/length in cm were measured. Height/Length was measured to the nearest 0.1 cm, using a stadiometer provided by the UNICEF. Weight was measured using the Seca Germany balance with an accuracy of 5 grams. Following the measurement, the mother/caretaker was interviewed. The children's documents (Sex, age, weight, height/length, and diagnosis at the time of admission were recorded), and all the necessary information were filled in a predesigned questionnaire. Weight and length measurements were converted to Z-scores for weight-for-age (WAZ) length-for-age (LAZ), and weight-for-length (WLZ) based on WHO standards [20]. A cut-off of  $-2$  Z scores for these indices was used for classifying children as undernourished. ( $<-2$  Z scores) or well-nourished ( $\geq -2$  Z scores). Moderate and severe malnutrition were defined as Z-scores  $<-2$  and  $<-3$ , respectively. The malnourished children were classified using three categories: underweight (WAZ  $<-2$  Z scores), stunting (LAZ  $<-2$  Z scores), and wasting (WLZ  $<-2$  Z scores). As nutrition and nutritional status vary with age, the children were divided into groups; 1-6 months, 7-12 months, 13-24 months, 25-36 months, 37-48 months, and 49-60 months.

The data were analyzed using the SPSS program (version 21). Descriptive statistics (percentages and means) and Chi-square were used. Multivariate analysis by stepwise logistic regression was done to identify the associated risk factors of malnutrition. A p-value  $< 0.05$  was considered statistically significant.

## III. RESULTS

During the study period, 218 children were studied, 106 of them were malnourished, giving a prevalence of 48.6% for malnutrition among hospitalized children. The mean ( $\pm$ SD) age of the malnourished patients was 15.6

( $\pm 11.9$  SD) months, ranged from 2 to 54 months. Most of the patients were males (73.6%) with a male to female ratio of 2.8:1 (Table 1). The majority 92 (86.8%) of the patients were  $< 2$  years old with a peak among the age group of 7-12 months (45.3%) (Figure 1). Regarding the residence of the patients, 66 (62.3%) were from the urban area while 40 (37.7%) were from the rural area. A severe degree of malnutrition was found in 40 (37.7%) of the patients while 66 (62.3%) had a moderate degree (Table 1). Most of the children were admitted to the hospital due to infectious diseases: chest infection in 38 (35.8%), gastroenteritis in 26 (24.5%) (Table 2). The overall prevalence of malnutrition in terms of underweight, stunting, and wasting were 97 (91.5%), 78 (73.6%), and 52 (49.1%), respectively (Table 3). Nonexclusive breastfeeding, illiterate mother, low family income, large family, and recurrent diarrhea were associated factors of malnutrition (Table 4).

## IV. DISCUSSION

Malnutrition among hospitalized children adversely affects their response to treatment and prolongs their hospital stay. It also has a long-standing influence on growth, development, and well-being [21]. To our knowledge, this may be the only study in Yemen searching for the prevalence of moderate and severe malnutrition among children on hospitalization. The prevalence of moderate to severe malnutrition among the studied population at the time of admission was 48.6%. It is significantly higher than that described in developed countries such as Germany, 24.1% [22], Spanish, 8.2% [23] and Canada, 8.8% [21] and some developing countries, such as Romania, 37% [24], Mexico, 12.2%, Colombia, 27% [25], Iraq and 26.3% [18]. However, it was similar to stated rates in other developing countries, like Argentina 49.6% [25]. Some other developing countries stated higher prevalence rates of malnutrition in their hospitalized children, as Thailand (50-60%) [26] and Brazil, 71.2% [27]. A study from India documented a prevalence of malnutrition of 64.3% (28).

These variations in the prevalence of malnutrition in these studies could be due to variations between the classifications of malnutrition that used in each study, the studies' sites or differences in nutritional designs, socioeconomic status, and associated illnesses. The prevalence of malnutrition among hospitalized children is high although the different results of these studies.

As per WHO growth standards, our study shows that 97 (91.5%) of the children were underweight, 78 (73.6%) were stunted and 52 (49.1%) were wasted. This is consistent with a study from Iran by Mahdavi et al. who found that 48.6% of the children were underweight, 30.7% were stunted and 32.2% were wasted [29], and that from India by Shreyash et al. which shows that 39.33%, 46%, and 17.5% children had underweight, stunting and wasting respectively [28]. In this study, respiratory diseases 38 (55.1%) and digestive diseases 26 (42.6%) were the most frequent causes for hospitalization. These are also the most common causes for admission found in several studies from developing

countries such as Brazil [12], Iraq [18] and Colombia [25]. A study conducted in Aden by Badi and Ba-Saddik in 2016, reported that pneumonia and gastroenteritis were the most co-morbidities to severe acute malnutrition among hospitalized children [19]. The current study showed a higher male prevalence (73.6%) which is similar to numerous former studies [18, 30, and 31]. This common result could be due to the different patterns of growth according to gender [32] and could be also due to the different behavior towards male and females in a country like Yemen where socially boys has more importance than girls. Our data revealed that the majority 92 (86.8%) of malnourished cases were below the age of 2 years with a peak among the age group of 7-12 months (45.3%) which is nearly the same as what was reported by Najdat Shukur in Iraq (79%) [18]. This might be related to the lack of breastfeeding, early weaning, and inappropriate introduction of complementary diet, which is the main reason for malnutrition in infants and children in Yemen [33]. In developing countries, malnutrition is usually witnessed in the rural community in comparison to the urban community. This is likely due to lack of access to medical care services, lower socioeconomic status, and lack of, or inadequate knowledge on child care practices (e.g. feeding and child hygiene) [34]. On the contrary, this study showed that 66 (62.3%) of the patients came from urban communities. This may be due to financial constraints and the great distance between the patient's home and the health facilities. In the present study, illiteracy, poverty, recurrent diarrhea, and nonexclusive breastfeeding were the main associated causal factors to malnutrition in children. This is consistent with other studies from developing countries [35, 36, 37]. However, of the limitations of this study, it is a single center study and may not be representative of the all-Yemeni children.

## V. CONCLUSION

The high frequency of malnutrition between hospitalized children in this study advocates that early screening for malnutrition is mandatory on hospitalizing every child. This strategy may lead to a better outcome as the child can take proper nutritional and specific care.

## RECOMMENDATIONS

The application of a screening test for the nutritional status of the hospitalized children to identify patients who require nutritional support is highly recommended due to the high prevalence of malnutrition among hospitalized children documented in this study. Additionally, it is recommended to launch, and offer adequate nutritional management to improve response to treatment, prevent complications, and shorten hospital stay. At the same time, we require health education of the people through a well-organized program and health information strategies focused on young children's hygiene and feeding practices.

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<b>Table (1) Characteristics of the admitted children by the nutritional status</b>							
Characteristic	Malnourished No= 106 (48.6%)		Normal No= 112 (51.4%)		Total No= 218 (100%)		
	No.	%	No.	%	No.	%	
<b>Sex</b>							
Male	78	73.6%	68	60.7%	146	67%	
Female	28	26.4%	44	39.3%	72	33%	
<b>Age</b> Range 52 (2-54) Mean (±SD) 15.61(±11.88)							
1-6	16	15.1%	30	26.8%	46	21.1%	
7-12	48	45.3%	26	23.2%	74	33.9%	
13-24	28	26.4%	29	25.9%	57	26.1%	
25-36	10	9.4%	20	17.9%	30	13.8%	
37-48	2	1.9%	5	4.5%	7	3.2%	
49-60	2	1.9%	2	1.8%	4	1.8%	
<b>Residence</b>							
Urban	66	62.3%	79	70.5%	145	66.5%	
Rural	40	37.7%	33	29.5%	73	33.5%	
<b>Socioeconomic Status</b>							
Low	91	85.8%	73	65.2%	164	75.2%	
Moderate	15	14.2%	39	34.8%	54	24.8%	
<b>Degree of Malnutrition</b>							
Moderate	66	62.3%	0	0.0%	66	62.3%	
Severe	40	37.7%	0	0.0%	40	37.7%	

<b>Table (2): Causes of admission by the nutritional status</b>							
Cause of admission	Malnourished (No. = 106 (46.8%))		Normal No. = 112 (51.4%)		Total No. = 218 (100%)		
	No.	%	No.	%	No.	%	
Chest infection	38	35.8%	31	27.7%	69	31.7%	
Gastroenteritis	26	24.5%	35	31.3%	61	28.0%	
Neurological problem	15	14.2%	26	23.2%	41	18.8%	
Chronic diarrhea	9	8.5%	0	0.0%	9	4.1%	
Cardiac problem	7	6.6%	0	0.0%	7	3.2%	
Renal problem	3	2.8%	4	3.6%	7	3.2%	
Hematological problem	2	1.9%	7	6.3%	9	4.1%	
Others	6	40.0%	9	60.0%	15	100%	

<b>Table (3): Prevalence of malnutrition (according to WHO standard) among admitted children by the sex and age</b>								
	Underweight No = 97 (91.5%)		Stunted No = 78 (73.6%)		Wasted No = 52 (49%)		Total Malnutrition No = 106 (100%)	
	No.	%	No.	%	No.	%	No.	%
<b>Sex</b>								
Male	73	75.3%	52	66.7%	33	63.5%	78	73.6%
Female	24	24.7%	26	33.3%	19	36.5%	28	26.4%
Total	97	100.0%	78	100.0%	52	100.0%	106	100.0%
<b>Age</b>								
1-6	16	16.5%	16	20.5%	6	11.5%	16	15.1%
7-12	44	45.4%	24	30.8%	18	34.6%	48	45.3%
13-24	28	28.9%	24	30.8%	21	40.4%	28	26.4%
25-36	5	5.2%	10	12.8%	5	9.6%	10	9.4%
37-48	2	2.1%	2	2.6%	2	3.8%	2	1.9%
49-60	2	2.1%	2	2.6%	0	0.0%	2	1.9%
Total	97	100.0%	78	100.0%	52	100.0%	106	100.0%

**Table (4): Prevalence of malnutrition (according to WHO standard) among admitted children by the sex and age**

	Underweight No = 97 (91.5%)		Stunted No = 78 (73.6%)		Wasted No = 52 (49%)		Total Malnutrition No = 106 (100%)	
	No.	%	No.	%	No.	%	No.	%
<b>Sex</b>								
Male	73	75.3%	52	66.7%	33	63.5%	78	73.6%
Female	24	24.7%	26	33.3%	19	36.5%	28	26.4%
Total	97	100.0%	78	100.0%	52	100.0%	106	100.0%
<b>Age</b>								
1-6	16	16.5%	16	20.5%	6	11.5%	16	15.1%
7-12	44	45.4%	24	30.8%	18	34.6%	48	45.3%
13-24	28	28.9%	24	30.8%	21	40.4%	28	26.4%
25-36	5	5.2%	10	12.8%	5	9.6%	10	9.4%
37-48	2	2.1%	2	2.6%	2	3.8%	2	1.9%
49-60	2	2.1%	2	2.6%	0	0.0%	2	1.9%
Total	97	100.0%	78	100.0%	52	100.0%	106	100.0%

**Table (5): Factors associated with malnutrition among admitted children (multivariate analysis by stepwise logistic regression)**

Associated Factors	Total		Malnourished		Normal		OR	AOR	P-value
	No.	%	No.	%	No.	%			
Preterm delivery	28	12.8%	22	20.8%	6	5.4%	4.63	14.44	0.006*
Low socioeconomic status	164	75.2%	91	85.8%	73	65.2%	3.24	-	-
Mother's age at delivery (< 20 years)	43	19.7%	27	25.5%	16	14.3%	2.05	44.47	0.000*
Illiterate mother	159	72.9%	81	76.4%	78	69.6%	1.41	-	-
Working mother	36	16.5%	23	21.7%	13	11.6%	2.11	21.32	0.000*
Low family income (<100,000YR)	143	65.6%	91	85.8%	52	46.4%	2.36	21.63	0.000*
A large family (> 4 members)	141	64.7%	79	74.5%	62	55.4%	0.42	12.95	0.002*
Exclusive breastfeeding < 6 mo.	169	77.5%	92	86.8%	77	68.8%	2.99	-	-
Nil or partial immunization	59	55.7%	29	25.9%	88	40.4%	3.59	-	-
Recurrent diarrhea	102	46.8%	81	76.4%	21	18.8%	14.04	11.62	0.000*

\*. The Chi-square statistic is significant at the .05 level.

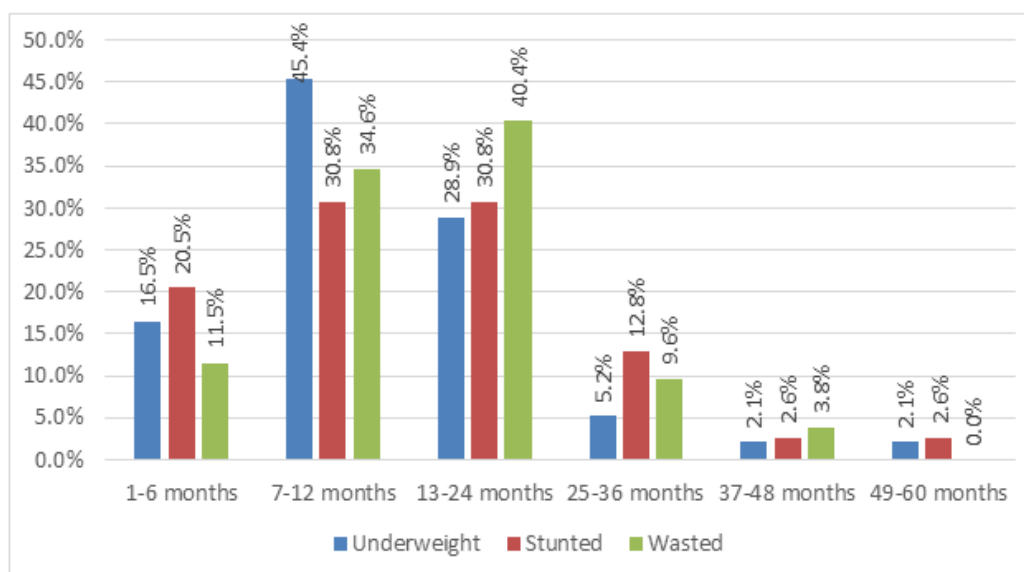


Figure1: The prevalence of malnutrition among admitted children