

Current Situation of Malnutrition among Children Under Five Years of Age at Aden Governorate - Yemen

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Abstract:

It is estimated that nearly 45% of deaths in children under five are attributable to malnutrition, which is a significant factor hindering the development of 230 million children and subjecting 50 million children to severe wasting. The ongoing civil war in Yemen has exacerbated the nation's preexisting challenges, including poverty, an inadequate healthcare system, and a scarcity of key resources like as water and medications. Severe malnutrition has significantly escalated as a pervasive issue in Yemen. The objective of the study is to evaluate the nutritional condition of children under five years of age and to identify the relevant factors. A descriptive cross-sectional study was performed on children under the age of five. Structured questionnaires were employed to collect data, and various parameters of malnutrition were examined. The study involved 410 Yemeni children aged under 5 years. The findings of this study indicated that the prevalence of malnutrition among females (53.7%) exceeds that of boys (46.3%), with breastfeeding children at 34.1%, and children weaned before four months constituting 29.3%. Moreover, the individuals examined who had malnutrition achieved full recovery at a rate of about 26.8%. This study highlights the significant effect of hunger on child health in Yemen, especially under the continuing civil conflict. The significant prevalence of malnutrition, along with barriers to food access, healthcare, and nutrition education, demands immediate intervention. Tackling malnutrition is crucial for safeguarding children's well-being and fostering sustainable development in Yemen.

Keywords: malnutrition, poverty, children, Aden, Yemen

INTRODUCTION

Malnutrition denotes an energy imbalance resulting from inadequate or excessive energy consumption in an individual. Malnutrition constitutes a significant public health issue, particularly among children, with its consequences magnified, resulting in a higher mortality risk for children than for adults if untreated. Malnutrition in children under five years of age continues to be prevalent. The WHO 2020 research indicates that around 144 million children under the age of 5 experience stunted growth, 47 million are classified as wasted, 14.3 million are severely wasted, and 38.3 million are overweight or obese.

Yemen is among the most impoverished Arab nations and exhibits the highest malnutrition rates on the Arabian Peninsula. Since March 2015, Yemen has been experiencing a profound humanitarian and security crisis. The intensifying conflict and compromised social services have adversely affected the health and nutritional status of children and the entire population. The food distribution system in the country has been significantly disrupted.

Nevertheless, efforts have been made to acquire statistics on malnutrition to tackle this situation. Few studies have been undertaken to evaluate the nutritional status of children. [10].

The political instability and persistent conflict in Yemen result in a continuous humanitarian disaster. The war has further deteriorated the country's economy, caused unemployment, compromised social services, undermined health systems, and led to shortages of food, medical supplies, water, and developmental progress. This has intensified health issues and malnutrition among youngsters and the general population. [11, 12, 13]. Ultimately, childhood malnutrition is seen as a significant public health issue, mostly concerning child growth and development. [14,15].

Approximately fifty percent of children in Yemen are afflicted by chronic malnutrition. Organizations dedicated to eradicating hunger report that over 370,000 children in Yemen are experiencing severe malnutrition. Furthermore, 1 million children under the age of 5 are at risk of acute malnutrition; specifically, in Hodeida, nearly 100,000 children in this age group face the threat of severe malnutrition.

This study aims to investigate the incidence of malnutrition and its correlation with several factors related to acute malnutrition in children under five years old in the communities of Aden governorate amid the ongoing conflict in Yemen. The results of this study will assist program designers and policymakers in developing and enhancing inter-sectoral health and nutritional initiatives.

MATERIAL AND METHODS

A cross-sectional study was carried out at Al-Sadaqa Teaching Hospital in Al-Sheikh Othman District- Aden Governorate-Yemen. Semi- structural questionnaires were used to gather information such as gender, age, education level and occupation of the parents, economical status of the family, number of children, food pattern of the child, health status of the child and source of water..

Collection of Data

The study gathered data from roughly 410 youngsters, with 42 included in the sample. Eight children were disqualified from the trial for failing to adhere to its criteria, which required regular hospital visits.

Data were gathered through a structured questionnaire, encompassing various details including the child's gender, age, parental education level, occupation, family status, number of children, child's dietary habits, health status prior to treatment, and water source.

Additionally, the local laboratory at Al-Sadaqa Teaching Hospital gathered data from laboratory examinations.

Statistical analysis

The Statistical Package for Social Sciences (SPSS) software version of 25 was used to analyze the data. Data were statistically tested at a critical level for statistical significance of 95% ($p=0.05$)

RESULTS AND DISCUSSION

This study involved 410 children, comprising 190 males (46.3%) and 220 females (53.7%). The majority of children, at 56% of the total, were under 11 months of age. Table 1 presents the demographic attributes of the respondents.

Table.1 Demographic characteristics of children under five of age n=410

Characteristics		Children	
		Number	Percentage
Sex	Male	190	46.3%
	Female	220	53.7%
	Total	410	100%
Age group	< 6 months	100	24.4%
	6-10 months	130	31.6%
	11-15 months	90	22.0%
	16-20 months	70	17.1%
	21-35 months	0	0
	36-40 months	20	4.9%
	41-50 months	0	0
	Total	410	100%

The distribution of respondents according to nutritional status is delineated in Table 2. The total number of Severely Acute Malnourished (SAM) children, as determined by Weight-for-Height Z scores (WHZ) and Mean Upper Arm Circumference (MUAC), was 36 children (87.8%) out of a total of 41 children, while Moderate Acute Malnutrition (MAM) was identified in 5 children (12.2%) of all screened cases. Table 4.2 indicates that children aged 6-10 months are the most severely impacted by mild acute malnutrition, whereas those aged 36-40 months are the least afflicted. Nutritional condition of children based on for-age z score <2.

Table 2: Distribution of the nutritional status of children under five years

Age Group	Moderate Acute Malnutrition				Severe Acute Malnutrition			
	Male		Female		Male		Female	
	No. of Children	%	No. of Children	%	No. of Children	%	No. of Children	%
< 6 months	0	0.0	10	100.0	40	44.4	50	55.6
6-10 months	20	66.7	10	33.3	80	80.0	20	20.0
11–15 months	10	100.0	0	0.0	20	25.0	60	75.0
16–20 months	0	0.0	0	0.0	10	14.3	60	85.7
36–40 months	0	0.0	0	0.0	10	50.0	10	50.0

Table 2 clearly indicates that the initial four groups of children with severe acute malnutrition exhibit closely aligned percentages, succeeded by the group least impacted, specifically within the 36-40 month age range, where only two cases were analyzed out of the total cohort involved in this study.

Table 3 presents the mean and standard deviation of moderate and severe acute malnutrition, categorized by gender and assessed through Weight-for-Height Z-scores (WHZ) and Mid-Upper Arm Circumference (MUAC). In contrast, Table 4.4 illustrates the distribution of children experiencing Global Acute Malnutrition (GAM), which encompasses both moderate and severe acute malnutrition, among all children under five years monitored in this study. .

Table 3: Distribution of the nutritional status of children under five years of age by MUAC * and WHZ ** according to age group

Classification By Age Group	Moderate Acute Malnutrition				Severe Acute Malnutrition			
	WHZ**		MUAC*		WHZ**		MUAC*	
	Mean ± St.d		Mean ± St.d		Mean ± St.d		Mean ± St.d	
	Male	Female	Male	Female	Male	Female	Male	Female
< 6 months	-	$(-4) \pm 0$	-	-	$(-4) \pm 0$	$(-3) \pm 1$	-	-
6-10 months	$(-3) \pm 1$	$(-2) \pm 0$	10 ± 0	12 ± 0	$(-3) \pm 0$	$(-4) \pm 1$	9 ± 4	11 ± 1
11–15 months	$(-2) \pm 0$	-	12 ± 0	-	$(-4) \pm 0$	$(-3) \pm 1$	9 ± 0	10 ± 1
16–20 months	-	-	-	-	$(-4) \pm 0$	$(-7) \pm 8$	9 ± 0	10 ± 1
36–40 months	-	-	-	-	$(-4) \pm 0$	$(-4) \pm 0$	12 ± 0	10 ± 0

(* MUAC, Mean Upper Arm Circumference; ** WHZ, Weight-for-Height Z- score)

Table 4: Distribution of the nutritional status of children under five years of age by MUAC * and WHZ ** according to age group

Classification By Age Group	Global Acute Malnutrition (GAM) (MAM+SAM)			
	WHZ**		MUAC*	
	Male Mean ± St.d	Female Mean ± St.d	Male Mean ± St.d	Female Mean ± St.d
< 6 months	(-4) ± 0	(-3) ± 1	-	-
6-10 months	(-3) ± 1	(-3) ± 1	9 ± 4	11 ± 1
11–15 months	(-3) ± 1	(-3) ± 1	10 ± 2	10 ± 1
16–20 months	(-4) ± 0	(-7) ± 8	9 ± 0	10 ± 1
36–40 months	(-4) ± 0	(-4) ± 0	12 ± 0	10 ± 0

(* MUAC, Mean Upper Arm Circumference; ** WHZ, Weight-for-Height Z- score)

Nutritional status of study samples:

The data regarding the current nutritional status of the children were gathered during the study by monitoring the study samples treated at the outpatient clinic of Al-Sadaqa'a Teaching Hospital, as well as those admitted to the hospital, utilizing both questionnaires and interviews with the mothers of the children. The data can be encapsulated as follows:

Methods of feeding the child:

The samples of the children in the study were categorized based on their feeding strategy, revealing that 36.6% of the samples were exclusively breastfed. The percentage of children reliant on artificial breastfeeding is 34.1%, nearly equivalent to those dependent on breastfeeding, while 29.3% of children are nourished using both techniques. The categorization of the samples based on the children's feeding strategy is detailed in Table 5.

Table 5: Methods of feeding the children with ages under five years during the survey

Methods of feeding the child under five years during the survey	Number of the children	Percentage
Exclusively breastfeeding	150	36.6%
Artificial feeding	140	34.1%
Both (breastfeeding + artificial feeding)	120	29.3%
Total	410	100%

Duration of breastfeeding in months:

Table 6 presents the duration of breastfeeding in months for a sample of children under five years of age. The data indicates that the majority of children were breastfed for less than six months,

comprising 63.4% of the sample. This is followed by children breastfed for a duration of six to eighteen months, with one child reported to have not been breastfed at all.

Table 6: The duration of breastfeeding in months for the children under five years

Baby's age at weaning from breastfeeding in months	Number of the Children	Percentage
Less than 6 months	260	63.4%
6 - 18 months	120	29.3%
More than 24 months	20	4.9%
The sample did not respond	10	2.4%
Total	410	100%

Table 7 delineates the ages of children in months at which weaning from breastfeeding occurred during the survey of this study. The bulk of children during weaning are under 4 months old, comprising 48.8%, followed by 29.3% for those who continued breastfeeding, while the lowest percentage, 4.9%, pertains to infants aged 7-9 months.

Table 7: the ages of children in months when weaning from breastfeeding

Child's age at weaning from breastfeeding in months	Number of the Children	Percentage
Less than 4 months	200	48.8%
7 - 9 months	20	4.9%
More than 9 months	50	12.2%
Continued breastfeeding during the survey	120	29.3%
The sample did not respond	20	4.9%
Total	410	100%

Average age at initiation of semi-solid feeding for children:

The average age at initiation of semi-solid feeding for the children under five years was approximately six months and half and with a mean and standard deviation of (6.41) and (3.202) respectively.

Physical characteristics of the study samples:

The Mean and Standard Division (SD) for the physical characteristics of samples are shown in the table8.

Table 8: The physical characteristics of the study samples

Physical characteristics of the samples	Mean	SD
Length	0.674	0.184
Weight when entering the center (kg)	5.207	1.593
Target Weight at Checkout (kg)	7.263	2.571
Body mass indicator	12.034	1.582
Measuring arm circumference (cm)	10.103	2.283
The weight when leaving from the center (kg)	5.845	1.777
Standard deviation	-3.829	2.991

Resort to Hospital Admission:

According to the clinical diagnostic of the study samples that underwent medical tests at Al-Sadaqa Teaching Hospital, the percentage of children admitted to the hospital from the total number of samples was 97.6%. Only one sample was processed in the hospital outpatient clinic, representing 2.4% of the total samples.

Classification of the study samples:

The study samples were classified to two groups based on its clinical diagnosis of malnutrition status and those two groups are resumed in the table9 which is shown below.

Table 9: Classification of study samples under five years of age and based on malnourished status

Type of malnutrition	Number of the children	The percentage (%)
SAM	360	87.8%
MAM	50	12.2%
Total	410	100%

The situation upon discharge from the hospital:

The study samples were categorized based on their condition at discharge from the hospital following treatment and regular assessment of their responses. This classification is presented in Table 10, which indicates that only 26.8% of the children fully recovered, while 56.1% exhibited a minimal response to treatment. Additionally, 14.7% of the samples showed no response, and only one sample did not receive treatment during hospitalization.

Table 10: The Situation upon discharge the children from the hospital in percentage

Status	Number of the children	The percentage (%)
Full recovery	110	26.8%
Simple response	230	56.1%
Lack of respond	60	14.7%
Lagged	10	2.4%
Total	410	100%

Redistribution of study samples according to the height and weight:

The study samples were redistributed the children under five years which were subjected to the treatments in the hospital according to their height and weight as given in the tables 11 and 12 respectively and the data were given in numbers and percentages.

Table 11: Redistribution of the samples according to the height

Height/cm	Number of children	(Percentage) %
45 – 77 cm	380	92.7%
78 – 109 cm	20	4.9%
110 – 138 cm	-	-
139 – 170 cm	10	2.4%
Total	410	%100

Table 12: Redistribution of the samples according to the weight

Weight/Kg	Number of children	(Percentage) %
2 – 3.75 Kg	70	17.1%
3.76 – 5.50 Kg	170	41.5%
5.51 – 7.25 Kg	140	34.1%
7.26 – 9 Kg	30	7.3%
Total	410	100%

Comparing of laboratory examinations before and after entering the centre:

Table 13: Comparing of laboratory examinations before and after entering the center

Name of the Examination	Results of Examinations				
	Mean		Mean Differences	T Statistical	Sig. (P-Value)
	Before	After			
CREATININE	0.815 ± 0.802	0.585 ± 0.610	0.2300	2.429	0.020
SODIUM	137.275 ± 14.131	138.925 ± 8.654	-1.6500	-1.136	0.263
CALCIUM	7.900 ± 1.464	8.480 ± 1.253	-0.5800	-4.182	0.000
POTASSIUM	3.633 ± 1.711	4.272 ± 1.437	-0.6385	-5.658	0.000
UREA	27.342 ± 11.230	22.336 ± 9.905	5.0062	5.081	0.000
WBC	14,031.00 ± 5,777.77	14,032.50 ± 5,649.93	-1.500	-0.003	0.998
RBC	5.662 ± 8.593	6.009 ± 8.830	-0.3470	-2.842	0.007
HGB	9.033 ± 1.994	9.548 ± 1.931	-0.5145	-3.299	0.002
ESR	18.185 ± 11.082	19.382 ± 8.467	-1.1974	-0.911	0.368
RBS	52.110 ± 39.193	62.357 ± 45.399	-10.2476	-3.067	0.006

Table 13 indicated a considerable reduction in creatinine levels, with an average difference of 0.230. (2.429) T and a P-Value of 0.020, which is below the significance threshold of 0.05. The sodium level of the sample before to analysis was determined to be an average of 138.925, indicating an average increase of 1.65, which is not deemed noteworthy.

The average calcium level of the sample prior to entering the center was 7.900, whereas after exiting the center, the average calcium level climbed to 8.480, indicating a mean difference of 0.580. Potassium: The average potassium level of the sample prior to entering the center is 3.633, while the average potassium level of the sample upon exiting the facility is 4.272. UREA: The mean UREA level of the sample prior to entering the center is 27.342, while the mean UREA level for the same sample after exiting the center is 22.336. The average WBC level of the sample prior to entering the center was 14.031, and post-exit, it was 14.0325.

The average RBC level before entering the center was 5.662, and after leaving, it was 6.009. The average HGB level before entering the center was 9.033, and after departure, it was 9.548. The average ESR level before entering the center was 18.185, and after leaving, it was 19.382. The average RBS level of the sample prior to entering the center was 52.110, while after exiting the center, the average RBS level for the same sample was 62.357. This indicates an average increase of 10.2476 in RBS levels, which is statistically significant with a T value of 3.067 and a P-Value of 0.006, falling below the significance threshold of 0.05.

CONCLUSION

This study demonstrates the necessity of developing effective programs to address malnutrition in the region, considering the identified causes and prioritizing children who are at heightened risk. Delivering pertinent health information is also crucial. The investigation indicated that the prevalence of wasting in the area was severe. The frequency of feeding children, exclusive breastfeeding, and child age were substantially correlated with wasting.

Disclaimer

The article has not been previously presented or published, and is not part of a thesis project.

Conflict of Interest

There are no financial, personal, or professional conflicts of interest to declare.

Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript

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