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Original Article

Evaluation of Acute and Chronic Malnutrition Indicators in Children at Tishreen University Hospital

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Abstract *- Background: malnutrition is a major public health concern, which could be associated with a high rate of mortality and morbidity. During the crisis, the pediatric population is the most vulnerable group. Objective: the study aimed to evaluate the prevalence of malnutrition indicators and the associated risk factors in children aged 2-10 years. Patients and Methods: an observational cross-sectional study was conducted for one year, starting January 2022, at Tishreen University Hospital in Latakia, Syria. Results: out of 1069 children, 13.8% were classified as stunted, and 11.2% were classified as underweight. 13.1% of children (aged 24-60 months) were wasted. The main risk factors associated with malnutrition were prematurity, low birth weight, low mother's and father's educational level, high Number of children, and residence (displaced). Conclusion: The prevalence of malnutrition was higher than the previous national and present global rates. Acute malnutrition indicators were more prevalent, which might turn into chronic malnutrition.*

Keywords *- Anthropometric measurements, Malnutrition, Stunting, Underweight, Wasting.*

1. Introduction

Malnutrition is a major public health concern associated with a high rate of mortality and morbidity [1]. It is a pathological state resulting from a relative or absolute deficiency or excess of one or more essential nutrients [2]. Undernutrition comprises four groups: micronutrient deficiencies or insufficiencies (a lack of significant vitamins and minerals), underweight (low weight for age), wasting (low weight for height), and stunting (low height for age) [3].

Wasting and stunting reflect acute and chronic exposures to nutritional deficiency, respectively. Underweight reflects both acute and chronic exposures to nutritional deficiency [4].

Anthropometric measurements in paediatrics play an important role in detecting nutritional changes, and they offer a noninvasive technique for assessing the size, proportions, and composition of the human body [5].

Causes of malnutrition are closely linked to overall living standards and basic needs, such as access to food, housing, and health care [6].

Worldwide, under the age of five, 110 million (19%) are moderately or severely underweight, and 170 million (30%) are moderately or severely stunted [7]. In Asia, approximately half of all stunted children under five years of age (51 million), as well as in Asia live two-thirds of all wasted children [8].

Malnutrition is a fundamental cause of mortality and morbidity in the children population [9]. Approximately half of the mortality in children is attributed to undernutrition around the world [10]. To ensure early childhood intellectual development, proper physical and a strong immune system and adequate nutrition are indispensable [11,12].

On-going surveillance is essential for detecting nutritional stress in a population, whether caused by natural or conflict-related hazards. It provides information on trends and allows interpretation of malnutrition prevalence as compared to expected seasonal changes, especially in the absence of baseline data, to determine benchmarks for the gravity of the nutritional situation [13,14].

In the last decade, there has been a major crisis in Syria, in which access to food becomes difficult, food prices rise and its quality declines, which affects the nutrition of individuals, especially children. Therefore, the nutritional status of children should be assessed, which is reflected in the health and nutritional status of society.

2. Patients and Methods

2.1. Study Population

After approval by the local research ethics committee, an observational analytic cross-sectional study was conducted. 1069 outpatient children aged 2-10 years enrolled at Tishreen University Hospital for one year starting from January 2022.

2.1.1. Eligibility Criteria were as Follows

Children from 2-10 years of age enrolled and with chronic diseases affecting growth were excluded from the study.

2.2. Questionnaire and Examination

A full examination, including Anthropometric measurements of weight and height, was performed. The questionnaire included the following variables: (sex, age, height, weight, gestational age, birth weight, single or multiple pregnancies, breastfeeding or formula feeding, residence, educational level of mother and father, mother's and father's occupation, mother's age, mother's and father's smoking, number of children in the family).

2.2.1. Anthropometric measurements

Height and weight were measured at the same time with precise instruments (scale and measuring tape). Measurements were taken in light clothing without shoes. Height was measured from the base of the feet to the top of the head. The child was standing straight, with his back to the wall and feet together, and the child was looking forward with eyes straight.Anthropometric measurements are classified according to the WHO's nutritional status classification in the table below.

Nutritional status	Z-score range
Wasting (acute malnutrition) Moderate Severe	 zWFH < -2 and ≥ - 3 zWFH < - 3
Stunting (chronic malnutrition) Moderate Severe	 zHFA < -2 and ≥ -3 zHFA < -3
Underweight Severe underweight	zWFA < -2 and ≥ -3 zWFA < -3

Source: WHO Global Database on Child Growth and Malnutrition. Available from: http://www.who.int/nutgrowthdb/about/introduction/en/index5.html

2.3. Statistical Analysis

Descriptive statistical parameters (mean, standard deviation, frequency, and percentage) were calculated for each quantitative variable.

Inferential Statistics were calculated using the prevalence rate and prevalence rate ratio. The significance of the difference between different means (quantitative data) was tested using Fisher's exact test for the difference between two independent means. In contrast, different percentages (qualitative data) were tested using Pearson's Chi-square test. Results were considered statistically significant with a p-value<5%.

The data were analyzed using the Statistical Package for Social Science (SPSS) software version 25.

Table 1. Comparison of Socio-Demographic Characteristics between stunting and normal or Excess height groups.

		Normal or Excess height n=917	**stunting n=152**	**P-value**
		PR(PRR)	PR(PRR)	
gestational age	Premature full-term	33(3.6%) 884(96.4%)	14(9.2%) 138(90.8%)	0.004
Birth weight	Low normal	127(13.8%) 790(86.2%)	33 (21.7%) 119 (78.3%)	0.01
the mother's educational level	Preparatory school Secondary school	485 (52.9%) 432 (47.1%)	99 (65.1%) 53 (34.9%)	0.003
the father's educational level	Preparatory school Secondary school	471 (51.4%) 446 (48.6%)	97 (63.8%) 55 (36.2%)	0.003
Number of children	3 or less More than 3	740 (80.7%) 177 (19.3%)	110 (72.4%) 42 (27.6%)	0.014

n: number. PR: prevalence rate. PRR: prevalence rate ratio

3. Results

Out of 1069 outpatient children, 603 were females (56.4%) and 466 males (43.6%). Ages ranged from 24 to 120 months, 436 (40.8%) between 24 and 60 months, and 626 (58.6%) between 60 and 120 months.

13.8% of children were stunted (9.3% were moderately, and 4.6% were severely stunted). 11.2% of children were underweight (6.8% were moderately and 4.4% were severely underweight). 13.1% of children (aged 24-60 months) were wasted (8.3% moderately and 4.8% severely wasted)

The results of comparing the demographic characteristics of the group with the low Anthropometric measurements with normal and excess measurements group are shown in the following tables (1,2,3).

Table 1 shows that low gestational age, low birth weight, low mother's educational level, low father's educational level, and number of children more than 3 were higher in the stunting group.

Table 2 shows that low Birth weight, low mother's educational level, residence (displaced), and number of children over 3 were higher in the underweight group.

Table 3 shows that the low mother's educational level was higher in the wasting group.

Table 2. Comparison of Socio-Demographic Characteristics between underweight and normal or overweight groups

		normal or overweight **n=9**44	**Underweight n=1**24	**P-value**
		PR(PRR)	PR(PRR)	
Birth weight	**Low** **normal**	**133(14.1%)** **811(85.9%)**	**27 (21.8%)** **97 (78.2%)**	**0.02**
the mother's educational level	**Preparatory school** **Secondary school**	**505 (53.5%)** **439 (46.5%)**	**78 (62.9%)** **46 (37.1%)**	**0.029**
Residence	displaced **resident**	**888 (94.1%)** **56 (5.9%)**	**111 (89.5%)** **13 (10.5%)**	**0.047**
Number of children	**3 or less** **More than 3**	**759 (80.4%)** **185 (19.6%)**	**90 (72.6%)** **34 (27.4%)**	**0.031**

n: number. PR: prevalence rate. PRR: prevalence rate ratio

Table 3. Comparison of Socio-Demographic Characteristics between wasting and normal groups.

		normal **n=**379	wasting **n=57**	**P-value**
		PR(PRR)	PR(PRR)	
the mother's educational level	**Preparatory school** **Secondary school**	**201 (52.9%)** **178 (47.1%)**	**39 (65.1%)** **18 (34.9%)**	**0.02**

n: number. PR: prevalence rate. PRR: prevalence rate ratio

4. Discussion

The study showed a significant high prevalence of acute malnutrition. In this analysis, 13.8% of children were stunted, 11.2% of children were underweight, and 13.1% of children aged 24-60 months were wasting. The increase in the prevalence of both wasting and underweight indicates an increase in the prevalence of acute malnutrition. According to the WHO Global Health Observatory, the prevalence of wasting, stunting, and underweight in children under five in Syria was 11.5%, 28%, and 10% respectively in 2010 [15].

The global prevalence of undernutrition in children under 5 years of age, as reflected by the number affected by stunting, wasting, and underweight, has declined in the past three decades. The global prevalence of stunting, wasting, and underweight in 2022 was 22.3%, 6.8%, and 9.6 % respectively. In the Eastern Mediterranean Region (EMRO), approximately the same proportion of children was affected by wasting (6.9%) in 2022, while a quarter (25.1%) of all children under 5 years of age were affected by stunting and 11% were underweight [16,17].

In the Middle East and North Africa (MENA) region, the prevalence of stunting in children was 22.0%. It was 25.7% in children aged 2-5 years old and 16.5% in children aged 6 and older [18].

Compared to the study results, we found that the prevalence of wasting and underweight is higher than the global and regional prevalence. These results show the impact of the crisis in Syria on the nutritional status of the population, especially children.

The age difference between the current study, WHO reports, and other studies in the region may explain the lower rate of stunting.

Economic crises negatively impact nutrition and health, which have immediate consequences and long-term effects on individuals and societies, especially children [19].

Inadequate household food security is one of the underlying causes of malnutrition. Food security is characterized by having the combination of available food, proper utilization of food, and access to nutritious foods. It can be caused by shocks at the household or community levels, such as in cases of wars and economic crises. Food insecurity at the household level relates more to the household economy and determinants of how food is used. These determinants include Mother's level of awareness and education [20].

Food insecurity caused by the monsoon season in Bangladesh was not associated with stunting but with wasting through decreased dietary diversity and lower household income [21].

The repeated instances of food insecurity increased the prevalence of stunting through the accumulation of bouts of wasting, leading to linear growth failure [22]. Therefore, the increasing prevalence of wasting in this age group in the current study may later turn into stunting with the accumulation of causes.

Ysak et al. found that children in rural areas, children aged 6 years and older by birth order, and children who lived in households with two or more children under the age of 5 were more likely to be malnourished than their peers [23].

M Chopra found that father migration, home quality, low maternal education, short duration of breastfeeding, and low birth weight were more prevalent in the malnourished group [24].

5. Limitations of the Study

The present study is observational, the necessary biochemical measurements can be made to provide a true picture of the levels of nutrient deficiencies to provide measures to help these children meet their nutritional needs and growth goals. The study was carried out at a single hospital, which may not represent the situation at the national level; therefore, broader studies should be conducted. The results of the study reflect the measurements of children attending the hospital, which may introduce a certain degree of sampling bias.

6. Conclusion

It is essential to monitor children's growth consistently, and it not only reflects their nutritional status but also is a vital indicator of the overall health of society.

There is a significant prevalence of malnutrition in our health center; the most important risk factors for malnutrition were: prematurity, low birth weight, low mother's educational level, low father's educational level, high Number of children, and residence (displaced).

Conducting extensive field studies is necessary to determine the nature of the problem at the national level and to implement educational measures for parents on the causes of malnutrition, its risks, and methods of prevention.

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