

Assess of the malnutrition cases in children under five years in Khartoum State, Sudan

Khalid Rassam Bajiri ^{1,*}, Raed Hamaidy Ahanazi ², Saud Hamdi AlHabeeb ³, Faleh Mohammed Al Qahtani ⁴, Haitham Rasheed Alhaeti ⁴, Basam Faisal Alanazi ⁴, Ibrahim Abdullah Al Faim ⁴, Badr Mohamed Al Shehri ⁴, Abdulaziz Abdulwahab Alsheri ⁴, Talal Suliman M. Alonazy ⁴, Saud Abdulrahman bin Talha ⁴, Hosam Khalid Rassam ⁴, Suad Khalid Rassam ⁴ and Faihan Herab Faraj Almoteri ⁴

¹ Head department Prevention safety, Red Crescent, Riyadh, KSA.

² Psychiatric department, Red Crescent, Riyadh, KSA.

³ Head Dept. Health occupation, Red Crescent, Riyadh District, KSA.

⁴ Red Crescent, Riyadh District, KSA.

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Abstract

The WHO estimates that malnutrition accounts for 54% of child mortality worldwide (about 1 million children) which consider as a noising figure. The aim of this study was to assess the malnutrition cases in children under five years in Jabra locality, Khartoum State, Sudan. A clinic base study funded by Saudi Red Crescent Authority was conducted on 100 children under five years who visit the health facility in the study area. Malnutrition was indicated by stunting, wasting and underweight. A structured questionnaire was also used to obtain the required data of the study participants. Data were analyzed using statistical package for social sciences software (SPSS). The results of this study indicates that, the majority of the children (81%) were well nourished, (9%) were moderate wasted, (3%) were severe wasted and (7%) were overweight. (14%) of the children were severely stunted and (15%) were moderately stunted, (6%) of the children were severely underweight. (17%) of the children showed different signs of illness, (8%) suffered from anemia, (5%) suffered from measles, and (42%) suffered from diarrhea. (83.5%) of the mothers began breastfeeding in the first hour of life, (52.2%) introduced prelacteal food and infant formula, (66%) introduced other food with breastfeeding for more than 6 months, (88.9%) treat their children through health facilities, (54.5%) of the mothers reported that the children had received vitamin A supplementation, more than (50%) of the children eat meat and eggs products every day, (66.7%) of children consumed milk and milk products, (61.5%) consumed legumes, nuts and seeds, (76.9%) consumed cereals daily. These assessments pointed out the needs for governmental aids to help part of those children.

Keywords: Malnutrition; Children Under Five Years; Khartoum State; Sudan

1. Introduction

Malnutrition resulting usually in health problems, it is a deficiency, excess, or imbalance of energy, protein and other nutrients and it adversely affects the body's tissues and form [1]. Malnutrition is not receiving the correct amount of nutrition and it increased in children under five years [2]. *UNICEF* define malnutrition as category of diseases that includes undernutrition (lack of nutrients, which can result in stunted growth, wasting, and underweight) and overnutrition (surplus of nutrients which can result in obesity) [3].

The Lancet Commission suggested expanding the definition of malnutrition to include obesity, undernutrition, and other dietary risks [4]. It is estimated that nearly one in three persons globally has at least one form of malnutrition: wasting, stunting, vitamin or mineral deficiency, overweight, obesity, or diet-related diseases [5]. Stunting is more

* Corresponding author: Khalid Rassam Bajiri.

prevalent in urban slums than in rural areas. The prevalence of undernutrition is highest among children under five [6]. In 2020, 149 million children under five years old were stunted, 45 million were wasted, and 38.9 million were overweight or obese. The following year, an estimated 45% of deaths in children were linked to undernutrition [7]. The prevalence of chronic undernutrition among under-five children in East Africa was identified to be 33.3%. This prevalence of undernutrition among under-five children ranged from 21.9% in Kenya to 53% in Burundi [8].

In Sudan, approximately 3 million children under five suffer from malnutrition annually, out of whom over 610,000 suffer from severe acute malnutrition. Life-saving treatment such as the peanut-based Ready to Use Therapeutic Food (RUTF) can ensure even those in the hardest to reach places can make a full recovery [9].

There has been a global increase in food insecurity and hunger over the past decade. In 2020, one in nine people in the world (about 820 million people worldwide) was hungry [10].

These increases are partially related to the ongoing COVID-19 pandemic, which continues to highlight the weaknesses of current food and health systems. Although COVID-19 is less severe in children than in adults, the risk of severe disease increases with undernutrition [11]. Other major causes of hunger include manmade conflicts, climate changes, and economic downturns.

Undernutrition can adversely affect physical and mental functioning, and causes changes in body composition and body cell mass, causing the highest mortality rate in children, particularly in those under 5 years, and is responsible for long-lasting physiologic effects [12].

A new classification system for malnutrition was established. Instead of using just weight for age measurements, they combine weight-for-height (indicating acute episodes of malnutrition) with height-for-age to show the stunting that results from chronic malnutrition. Weight for height can be calculated even if a child's age is unknown. The WHO frequently uses these classifications of malnutrition, with some modifications [13].

The World Bank claims to be part of the solution to malnutrition, asserting that countries can best break the cycle of poverty and malnutrition by building export-led economies, which give them the financial means to buy foodstuffs on the world market. It is often possible to manage severe malnutrition within a person's home, using ready-to-use therapeutic foods. In people with severe malnutrition complicated by other health problems, treatment in a hospital setting is recommended. In-hospital treatment often involves managing low blood sugar, maintaining adequate body temperature, addressing dehydration, and gradual feeding [14].

The objective of this study was to assess the cases of malnutrition in children under five years in Khartoum State, Sudan.

2. Material and methods

2.1. Study area

This study was conducted in Jabra locality which is one of seven localities of Khartoum State; it's strategically located in the center of the state with an estimated population of about 750000 of which 8000 being children under five years old.

2.2. Study design

A clinic base study was applied following the instruction of Saudi Red Crescent Authority.

2.3. Study population

The Children under five years old.

2.4. Inclusion criteria

Children under five years old and is permanent residents of the study area

2.5. Exclusion criteria

Children under five years old but not permanent resident of the study areas

Participants who refused to participate in the study

2.6. Sample

Since the study population were less than 10000 for this study the sample size will be 100. The children under five years who visit the health facility in the locality were selected through random systematic sampling technique and a written informed consent was obtained prior to participation.

2.7. Study Variables

Data on the following variables was collected:

2.8. Dependent variables

Malnutrition indicated by stunting, wasting and underweight

2.9. Independent variables

Three categories of factors were assessed as independent variables;

2.10. Child characteristics

Age, sex, birth order, place and types of birth, breastfeeding status and morbidity status (fever, measles, diarrhea).

2.11. Child caring practices

Feeding, hygiene, health care seeking and Dietary intake.

2.12. Data Collection Tools

2.12.1. Questionnaire

A structured questionnaire was used to obtain the required data of the study participants.

2.12.2. Instruments of Anthropometric Measurements

The following instruments were used: a balance, with accuracy of 0.1 Kg for weight, height/length board with accuracy of 0.1 cm to measure height and length.

Infant's age in months was determined by asking the mother about the date of baby birthday.

2.13. Data Analysis

Data were analyzed using statistical package for social sciences software (SPSS). Descriptive analysis was performed and presented in terms of frequencies.

2.14. Ethical Considerations

Approval to carry the study was obtained from the University of Gezira, Ministry of Health research department and from health facilities.

3. Results

3.1. General status of children

Status of children for weight for age (under-weight), height for age (stunting) and weight for height (wasting) according to WHO [15] standards, were assessed. The result indicates that the majority (81%) were well nourished, (9%) children were moderate wasted, (3%) of children were severe wasted and (7%) of children were overweight (Table 1).

Concerning the height for age of the children, (14%) of children were severely stunted and (15%) of children were moderately stunted. Regarding weight for age of the children, (6%) children were severely underweight and (13%) children were moderate underweight (Table 1).

Table 1 Status of children under five years based on WHO criteria

Variables (n=100)	N	%
Weight for height		
Severe wasting	3	3%
Moderate wasting	9	9%
Overweight	7	7%
Well nourished	81	81%
Height for age		
Severe stunting	14	14%
Moderate stunting	15	15%
Well nourished	71	71%
Weight for age		
Severe underweight	6	6%
Moderate underweight	13	13%
Well nourished	81	81%

It was also noticed that, 17% of the children showed different signs of illness; 8% suffered from anemia, 5% suffered from measles, 10% suffered from Acute Respiratory Infections (ARI), 48% suffered from fever and 42% suffered from diarrhea (Table 2).

Table 2 Status of health of children under five years

Child signs of illness in last 3 months of the study		
Had been ill	17	17%
Did not ill	2	2%
Did not know	81	81%
Incidence of anemia in last 3 months of the study		
Suffer from anemia	8	8%
Did not suffer	4	4%
Did not know	88	88%
Measles infection in last year of the study		
Yes	5	5%
No	95	95%
Child morbidity in last two weeks		
Acute Respiratory Infections (ARI)	10	10%
Fever	48	48%
Diarrhea	42	42%

3.2. Feeding practice

Table (3) shows that, (94%) of children aged with ever breastfeeding. About (83.5%) of the mothers began breastfeeding in the first hour of life. Most mothers (52.2%) introduced prelacteal food and infant formula. (76.1%) of the mothers reported that they breastfeed their children on demand while only (21.1%) reported that they breastfeed on choice. (66%) introduced other food with breastfeeding for more than 6 month. (89%) of the mothers charged the baby feeding. Regarding changes in child feeding during illness majority (88.2%) of mothers provide additional food while (9.8%) prevented child from breastfeed. (88.9%) treat their children through health facilities. The table also reveals that (58.5%) of mothers serve food to their children individually. Nearly (48.8%) feed child 3 - 4 times. On vitamins supplementation, (54.5%) of the mothers reported that the children had received vitamin A supplementation, (15.2%), (3%) and (27.3%) received vitamin B complex, vitamin C and other types of vitamins, respectively. Iodine salt supplementation was not commonly administered only (26.9%) of children was given salt.

Table 3 Infant and young child feeding practice

Feeding indicator	Category	N	%
Ever breastfeed (n=100)	Yes	94	94%
	No	6	6%
Initiation breastfeeding (n=97)	After birth (within 1 hr)	81	83.5%
	After the first hour of birth	14	14.4%
	After the first day	1	1%
	Don't know	1	1%
First liquid given after birth pre- lacteal feed (n = 23)	Boiled Water	3	13%
	Milk	4	17.4%
	Formula	12	52.2%
	Others	4	17.4%
Time of child breastfeed (n=71)	Scheduled	15	21.1%
	On demand	54	76.1%
	Others	2	2.8%
Introduction of other food with breastfeeding (n = 100)	2-4 months	3	3%
	4-6 months	31	31%
	More than 6 months	66	66%
Person in charge of baby feeding (n=100)	Mother	89	89%
	Sister	5	5%
	Grandmother	5	5%
	Others	1	1%
Change in child feeding during illness (n = 51)	Preventing from breast	5	9.8%
	Providing additional food	45	88.2%
	Others	1	2.0%
Treatment during sickness (n=99)	Usually home treatment	10	10.1%
	Through traditional healers	1	1.0%
	Through health facility	88	88.9%
Serving child food (n=82)	Together with others in one plate	26	31.7%

	Individually	48	58.5%
	Others	8	9.8%
Feeding per day (n=82)	Twice	12	14.6%
	3 - 4 times	40	48.8%
	More than 4 times	30	36.6%
Vitamins administered (n=66)	Vitamin A	36	54.5%
	Vitamin B complex	10	15.2%
	Vitamin C	2	3%
	Others	18	27.3%
Iodine salt administered (n=78)	Yes	21	26.9%
	No	57	73.1%

3.3. Food consumption

Table (4) shows that, (55.1%) and (53.8%) of children eat meat and eggs products, respectively, every day, while (44.9%) and (46.2%) eat meat and eggs products, respectively, once a week. (21.1%) had fed their children fish or seafood daily while majority (78.2%) had fed their children fish or seafood weekly. (66.7%) of children consumed milk and milk products daily and (33.3%) of children consumed milk and milk products weekly. Legumes, nuts and seeds are highly consumed (61.5%) daily and (38.5%) consume it weekly. (76.9%) consumed cereals daily compared to (56.4%) dark green leafy vegetables. Consumption frequencies of fruits by the children were relatively high (61.5%) every day and (38.5%) reported every week.

Table 4 Child food diversity

Food group (n=78)	Daily		Weekly	
	N	%	N	%
Meat	43	55.1%	35	44.9%
Fish/sea food	17	21.1%	61	78.2%
Eggs	42	53.8%	36	46.2%
Milk and milk products	52	66.7%	26	33.3%
Legumes, nuts and seeds	48	61.5%	30	38.5%
Cereals	60	76.9%	18	23.1%
Dark green leafy vegetables	44	56.4%	34	43.6%
Fruits	48	61.5%	30	38.5%

4. Discussion

The result of the study indicates that, (9%) children were moderate wasted, (3%) of children were severe wasted and (7%) of children were overweight. Concerning the height for age of the children, (14%) of children were severely stunted and (15%) of children were moderately stunted. In Similar study, in South Sudan, the prevalence of undernutrition explained by stunting, underweight and wasting in under-five children were 23.8%, 4.8% and 2.3%, respectively [16]. In Tanzania, the prevalence of stunting, among children under five varied from 41% in lowland and 64.5% in highland areas. Undernutrition by underweight and wasting was 11.5% and 2.5% in lowland and 22% and 1.4% in the highland areas of Tanzania, respectively [17].

In this study, and regarding weight for age of the children, (6%) children were severely underweight and (13%) children were moderate underweight. 17% of the children showed different signs of illness, 8% suffered from anemia, 5% suffered from measles, 10% suffered from ARI, 48% suffered from fever and 42% suffered from diarrhea.

WHO [7] stated that, pneumonia, malaria, and measles, can cause malnutrition. Malnutrition can also result from abnormal nutrient loss due to diarrhea or untreated coeliac disease. In infants, a lack of breastfeeding may contribute to undernourishment.

Broad spectrum antibiotics are recommended in all severely undernourished children with diarrhea requiring admission to hospital. A severely malnourished child who appears to have dehydration, but has not had diarrhea, should be treated as if they have an infection [18].

The data of this study shows that, about (83.5%) of the mothers began breastfeeding in the first hour of life. Most mothers (52.2%) introduced prelacteal food and infant formula. (76.1%) of the mothers reported that they breastfeed their children on demand while only (21.1%) reported that they breastfeed on choice. (66%) introduced other food with breastfeeding for more than 6 month. (54.5%) of the mothers reported that the children had received vitamin A supplementation, (15.2%), (3%) received vitamin B complex, and (27.3%) vitamin C.

It was found that, vitamin A deficiency affects one third of children under age 5 around the world, leading to 670,000 deaths and 250,000–500,000 cases of blindness [19]. Undernutrition due to lack of adequate breastfeeding is associated with the deaths of an estimated one million children annually [20]. It is not just the total amount of calories that matters but specific nutritional deficiencies such as vitamin A deficiency, iron deficiency or zinc deficiency can also increase risk of death [21].

The result of this study also show that, about half of the children eats meat and eggs every day and (78.2%) had fed their children fish or seafood weekly. (66.7%) of children consumed milk and milk products and (61.5%) of children consumed legumes, nuts and seeds daily. (76.9%) consumed cereals daily compared to (56.4%) dark green leafy vegetables. Consumption frequencies of fruits by the children were relatively high (61.5%) every day and (38.5%) reported every week.

In 2008, the UN's World Food Program, the biggest non-governmental distributor of food, announced that it would begin distributing cash and vouchers instead of food in some areas. The aid agency Concern Worldwide piloted a method of giving cash assistance using a mobile phone operator, Safaricom, which runs a money transfer program that allows cash to be sent from one part of a country to another [22]. Specially formulated foods do appear to be useful in treating moderate acute malnutrition in the developing world. These foods may have additional benefits in humanitarian emergencies, since they can be stored for years, can be eaten directly from the packet, and do not have to be mixed with clean water or refrigerated. In young children with severe acute malnutrition, it is unclear if ready-to-use therapeutic food differs from a normal diet [23].

Food and drink can help prevent dehydration in malnourished people with diarrhea. Eating (or breastfeeding, among infants) should resume as soon as possible. Sugary beverages like soft drinks, fruit juices, and sweetened teas are not recommended as they may worsen diarrhea [18].

In Sudan, approximately 3 million children under five suffer from malnutrition annually, out of whom over 610,000 suffer from severe acute malnutrition. Malnutrition is preventable, children who are well nourished have a better chance of being healthy, able to develop, learn and be productive members of their community. Locally-grown Sudanese peanuts contain enough protein, fats and macronutrients to treat children with severe acute malnutrition which is a major cause of death in children under five. Life-saving treatment such as the peanut-based Ready to Use Therapeutic Food (RUTF) can ensure even those in the hardest to reach places can make a full recovery [23]. The results obtained did not differ greatly than CBS [24] report that, in Sudan, 38% of children under five are stunted, 18% are severely stunted, 33% are underweight (low weight-for-age) and 12% are severely underweight. In Khartoum state Malnutrition in children under five years estimated at 21.9% stunting, 14.5% wasting and 23.2% underweight.

5. Conclusions

The high levels of malnutrition in the present study underline the great need for nutritional intervention. Timely introduction of appropriate complementary feeding is a key factor in child growth. The results indicated that mothers introduced the children complementary food too early in life which may be a major contributory factor for the incidences observed in this study.

Compliance with ethical standards

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Disclosure of conflict of interest

No conflict of interest to disclosed.

Statement of ethical approval

Approval to carry the study was obtained from the University of Gezira, Ministry of Health research department and from health facilities.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

References

- [1] Hickson M, Smith S, eds. *Advanced nutrition and dietetics in nutrition support*. Hoboken, NJ. p. 3. ISBN 978-1-118-99386-6. 2018.
- [2] Woldemichael A, Kidane D, Shimeles A. Food inflation and child health. *The World Bank Economic Review*, 2022, 36 (3): 757–773.
- [3] UNICEF. *Progress for Children: A Report Card on Nutrition*. UNICEF. <https://www.unicef.org>. 2012.
- [4] Swinburn B, Kraak V, Allender S. The Global Syndemic of Obesity, Undernutrition, and Climate Change: The Lancet Commission report. *The Lancet*, 2019, 393(10173): 791–846.
- [5] WHO. The double burden of malnutrition. Policy brief. Geneva: World Health Organization; 2017.
- [6] Murarkar S, Gothankar J, Doke P, Pore P, Lalwani S, Dhumale G, Quraishi S, Patil R, Waghachavare V, Dhobale R, Rasote K, Palkar S, Malshe N. Prevalence and determinants of undernutrition among under-five children residing in urban slums and rural area, Maharashtra, India: a community-based cross-sectional study. 2020, *BMC Public Health*, 20(1).
- [7] WHO. *Fact sheets - Malnutrition*. www.who.int. Geneva: World Health Organization; 2021.
- [8] Tesema G, Yeshaw Y, Worku M, Tessema Z, Teshale A. Pooled prevalence and associated factors of chronic undernutrition among under-five children in East Africa: A multilevel analysis. *PLOS ONE*, 2021, 16(3), p.e0248637.
- [9] UNICEF. Malnutrition in Sudan. UNICEF Middle East and North Africa. <https://www.unicef.org/sudan/malnutrition>. 2023.
- [10] Mark HE, Dias da Costa G, Pagliari C, Unger SA. *Malnutrition: the silent pandemic*. 2020, *BMJ*. 371: m4593.
- [11] Kulkarni R, Rajput U, Dawre R, Sonkawade N, Pawar S, Sonteke S. Severe Malnutrition and Anemia Are Associated with Severe COVID in Infants. *Journal of Tropical Pediatrics*, 2020, 67(1). doi: 10.1093/tropej/fmaa084.
- [12] Sobotka L. *Basics in clinical nutrition*. 4th ed. Prague: Galen. 2012.
- [13] Grover Z, Ee LC. Protein energy malnutrition. *Pediatric Clinics of North America*, 2009, 56 (5): 1055–1068.
- [14] Bhutta ZA, Das JK, Rizvi A, Gaffey MF, Walker N, Horton S. Evidence-based interventions for improvement of maternal and child nutrition: what can be done and at what cost?. *Lancet*. 2013, 382 (9890): 452–477.
- [15] WHO. Child growth standards length/height-for-age, weight-for-age, weight-for-length, weight-for height and body mass index-for-age: Methods and development. World Health Organization, Geneva. 2006,

- [16] Kiarie J, Karanja S, Busiri J, Mukami D, Kiilu C. The prevalence and associated factors of undernutrition among under-five children in South Sudan using the standardized monitoring and assessment of relief and transitions (SMART) methodology. 2021, *BMC Nutrition*, 7(1).
- [17] Mrema J, Elisaria E, Mwanri A, Nyaruhucha C. Prevalence and Determinants of Undernutrition among 6- to 59-Months-Old Children in Lowland and Highland Areas in Kilosa District, Tanzania: A Cross-Sectional Study. *Journal of Nutrition and Metabolism*, 2021, pp.1-9.
- [18] WHO. *Management of diarrhea with severe malnutrition. The Treatment of diarrhea: a manual for physicians and other senior health workers (4 ed.)*.pp. 22–24. ISBN 978-92-4-159318-2. 2005.
- [19] Black RE. Maternal and child undernutrition: global and regional exposures and health consequences. *The Lancet*, 2008, 371(9608): 253.
- [20] Brady JP. *Marketing breast milk substitutes: problems and perils throughout the world. Archives of Disease in Childhood*, 2012, 97 (6): 529–532.
- [21] UNICEF. Improving Child Nutrition – The achievable imperative for global progress. UNICEF, <https://www.unicef.org>. 2013.
- [22] *World Food Programme. Cash roll-out to help hunger hot spots. World Food Programme. December 8, 2008.*
- [23] Schoonees A, Lombard MJ, Musekiwa A, Nel E, Volmink J. Ready-to-use therapeutic food (RUTF) for home-based nutritional rehabilitation of severe acute malnutrition in children from six months to five years of age. *The Cochrane Database of Systematic Reviews*, 2019 (5): CD009000.
- [24] CBS, Central Bureau of Statistics. Multiple Indicator Cluster Survey 2014 of Sudan, Final Report. Khartoum, Sudan. UNICEF Sudan, 2016.