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Possible Risk Factors Related to Malnutrition in 6-59-Month Children with Severe Acute Malnutrition in District Pakpattan, Punjab

Muhammad Shahazad Manzoor; BSc*[1] & Muhammad Aqib Saeed; MSc[2]

[1] *Department of Food Science and Nutrition, DHQ Hospital Pakpattan, Punjab, Pakistan.*
[2] *Department of Nutrition Science, Times Institute, Multan.*

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Corresponding author
shahzadmanzoor341@gmail.com
Department of Food Science and Nutrition, DHQ Hospital Pakpattan, 57400, Punjab, Pakistan.

Postal code: 57400
Tel: +92 3056455649

ABSTRACT

Background: Malnutrition is responsible for one third of the mortality rate among children less than 5 years old. Worldwide, 54% of the child deaths are due to malnutrition and the caseload in Pakistan is equal to 46%. In the current study, we attempted to identify the possible risk factors related to malnutrition among 6-59-month children in Pakpattan, Punjab province. **Methods:** A total of 500 severe acute malnourished (SAM) 6-59-month children were assessed during a period of 12 months (March 2018 to Feb 2019) to find out the possible risk factors for SAM. **Results:** Based on the findings, significant possible determinants risk factors related to acute malnutrition include edema, blurred vision, illness history, birth interval, mother body mass index (BMI), complementary feeding, family size, and family member working status. **Conclusion:** Malnutrition risk factors depend upon children nutrition status and early detection of these risk factors may improve the nutrition status and functional recovery in children.

Keywords: *Severe acute malnutrition; Severe wasting; Diseases in children.*

Introduction

According to the definition provided by the United Nations International Children's Emergency Fund (UNICEF), malnutrition is lack of intaking the necessary nutrients (UNICEF / WHO / World Bank Group Joint Child Malnutrition Estimates, 2017). Malnutrition not only causes irreversible cognitive and retarded growth problems, but also leads to different other damages; it also can lead to mortality in children of age up to 5 years (Black, 1996). The malnourished children are also at risk of developing certain infectious diseases like respiratory tract infection, malaria, and diarrhea as well as chronic diseases such as hypertension as compared to properly nourished child (Tette *et al.*, 2015).

Several factors that can lead to malnutrition may have basic, immediate, and underlying causes making a major contribution to child mortality (Darsene *et al.*, 2017). These factors consist of illness history, infant & young child feeding practices, socioeconomic, and demographic status that include poverty, lack of education, and gender discrimination, inability to have pure water and sanitation facility. It is most important to identify these contributing factors that result in death

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among one third of children directly or indirectly (Thompson *et al.*, 2017).

Different types of direct and indirect causing factors that lead to malnutrition contribute to nearly 35% of all deaths in Pakistan among 6-59-month children. These effective factors have negative effects on the individuals' future health, the nation's socioeconomic growth, and the society's productive potential (Bhutta *et al.*, 2013). To slow down the effect of malnutrition, we should determine the malnutrition causative factors and take the appropriate management measures. To this end, a study was conducted in Pakpattan district in Punjab province. According to a survey (2017) by Pakistan Bureau of Statistics (PBS), the total population of Pakpattan was 1.823 million while 0.25 million children were less than 5 years. The current study was conducted in order to determine the possible risk factors associated with severe acute malnutrition.

Materials and Methods

Study design and participants: A cross sectional study design was employed and data were gathered from all mothers/caregivers of children using a well-defined questionnaire under supervision of two female clinical nurses and two public health nutrition professionals. For ensuring the data quality, data collectors and supervisors were required to attend a two-day training course. The pilot study was conducted on 30 participants before initiation of the full-length study. This multi-center study involved one stabilization center at district head quarter (DHQ) hospital Pakpattan, one Tehsil Head Quarter (THQ) hospital, 5 rural health centers (RHCs), and 15 basic health units (BHUs).

To determine the participants' nutritional status and possible risk factors for sever acute malnutrition, a total of 500 children within the age range of 6-59 months were selected during a period of 12 months (March 2018 to February 2019). These children had severe acute malnutrition and mid upper arm circumference (MUAC) < 11.5 cm.

Measurements: Anthropometric data were collected by measuring the participants' length/height and weight. For children < 24 months, weight was measured using hanging weight scale and length was measured in recumbent position using length board. For measuring height and weight of children > 24 months, weight board and seca (SECA. Germany) weight scale were used, respectively. Edema was spotted by thumb pressing at the upper or lower limbs. Information was also collected about the child's illness history and other complication. Functionality and instrument validation were checked on daily basis. Based on the WHO growth chart, children having *z*-score weight for height (WHZ) ≤ 3 SD were considered in the category of severe acute malnutrition.

Both inpatient and outpatient male/female individuals with a weight for height z-score (WHZ) ≤ -3 SD with or without signs of edema along with their mothers/caretakers were recruited as participants in this study. Children with any kinds of physical deformity like congenital deformity/birth defects, wounds, burns hands which may affect anthropometric measurement were excluded for this study. Children having normal health status without any medical complications were also excluded.

Ethical considerations: Ethical clearance was obtained from the Independent Institutional Ethical Committee (IIEC) of Bio Equivalence Study (BeST) center of DHQ Hospital Pakpattan. Written and signed informed consent was obtained from all respondents after the purpose of the study and confidentiality assurance were explained to them. Moreover, the participants were explained about the voluntary participation in the study. Participants with diarrhea, respiratory tract infections, and under-nutrition were referred to the Child Out-patient department for further management.

Data analysis: Descriptive analysis was used to determine the participants' illness history, feeding practices, and socioeconomic status. Pearson Chi-Square and cross tabulation were applied to

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estimate the association of possible risk factors to child weight loss due to malnutrition.

Results

The prevalence of severe acute malnutrition was prominent in females (53%) as compared to males (47%). Children were categorized with regard to their age; 6-24 months (91.8%) and 25-59 months (8.2%). The average weight and length of children were 6.72 ± 1.19 kg and 63.77 ±7.0 cm, respectively as shown in **Table 1**. Overall, 384 (75%) of the studied participants were from rural areas, while 116 (25%) belonged to the urban areas.

About 59% of mothers were illiterate; while 26%, 12%, and 3% had primary secondary, secondary, and higher secondary education, respectively. Similarly, 28.8%, 39.8%, 19.6%, and 11.8% of the fathers were illiterate, had primary, secondary, and higher secondary education, respectively. Regarding the mothers' occupation, majority (63.4%) of the mothers were housewives. Father occupation was categorized into the businessman (36.8%), self-employed (55.8%), and government employee (7.8%). Furthermore, 73.2%, 24.6%, and 2.2% of the participants belonged to the lower, middle, and upper social classes.

Less than half (45.8%) of children were exclusively breastfed during the first 6 months while the remaining number of participants (54.2%) were not breastfed at that age. Only 10.6% of mothers initiated breastfeeding within 24 hrs after the child birth. Children who received exclusive breastfeeding were having good nutrition status compared to those who did not receive breastfeed. Findings show a highly significant association ($P \leq 0.05$) between breastfeeding and child nutrition status.

As shown in **Table 2,** a significant association ($P \leq 0.05$) was found between mothers' age and nutritional status of children; so that the child nutritional status improved by the mother's age; in other words, the rate of child weight loss decreases. Furthermore, 48% of mothers had 18-24 years old in the first child birth and overall, 68% of children's weight loss was in this group. Majority (72.8%) of the families had less than 4 members. Two thirds (72.6%) of children had very low birth weight. Considering the child birth order, 29.8% of the children were the first baby, 44.6% were the 2nd baby in the family, while 25.6% were the 3rd or more in the family. The findings showed that majority of the second children were malnourished compared to others. Mothers' mean gap to previous pregnancy was 1.18 ± 0.42 years, which indicates a short period since the mother has not restored her good nutrition status while she was already breastfeeding to the baby.

The finding showed a significant association ($P \leq 0.05$) between maternal education status to the nutrition status of children; the child nutrition status improved as the mother's level of education increased.

Table 3 illustrates that disease status and its contribution was closely associated to severe acute malnutrition. A significant association ($P \leq 0.05$) was found between diarrhea and weight loss since 49.6% of children were suffering from diarrhea at the time of hospital visit with the history of weight loss. Based on the findings, 47.8% of children had vomiting, while the remaining children had no vomiting. An association ($P \leq 0.05$) was observed between the respiratory tract infection (RTI) and weight loss and only 55.8% of children had no acute respiratory infection, cough, or bronchopneumonia. Children with good appetite included 40% of the participants, while poor appetite was significantly associated ($P \leq 0.05$) with weight loss in children (60%). Clinical signs for edema were observed in 28.3% of children. The remaining participants (71.7%) had no complaint about any kind of bilateral or pitting edema. Children (44.8%) with vitamin A deficiency had common signs including blurred vision, bitot's spot, foamy eyes, or any kind of photo phobia.

The result showed that vaccination decreased the burden of RTI. Results showed a significant association ($P \leq 0.05$) between vaccination and RTI; children (61%) who were vaccinated had no RTI complication in comparison with those who were not.

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Table 1. Demographics characteristics of the participants

Variables	N (%)
Age	
6-24 month	459 (92)
24-59 month	41(8)
Gender	
Male	235 (47)
Female	265 (53)
Residence	
Urban	116 (25.0)
Rural	384 (75.0)
Mother education	
Illiterate	295(59.0)
Primary	133 (26.6)
Secondary	60 (12.0)
Higher Secondary	12 (2.4)
Mother occupation	
House wife	317(63.2)
Govt. employee	4(0.8)
Private employee	150(30.2)
Own business	29 (5.8)
Father education	
Illiterate	144 (28.8)
Primary	199 (39.8)
Secondary	98 (19.6)
Higher secondary	59 (11.8)
Father occupation	
Govt. employee	39 (7.8)
Private employee	279 (55.6)
Self-employee	182 (36.6)
Family income status	
Lower class	368 (73.2)
Middle class	121 (24.6)
Upper class	11 (2.2)
Housing condition	
Own	254 (50.8)
Rent	91 (18.2)
Semi pacca	155 (31.0)

Table 2. Frequency distribution of feeding practices

Variables	N (%)
Maternal age at birth (y)	
18-24	242 (48.4)
25-31	187 (37.4)
32<	71 (14.2)
Mother weight status	
Under weight	451 (90.2)
Normal weight	35 (7.0)
Over weight	14 (2.8)
Family size	
< 4 members	364 (72.8)
> 5 members	136 (27.2)
Type of family	
Nuclear	333 (66.6)
Joint	121 (24.0)
Extended	46 (9.2)
Birth weight	
According to gestational age	69 (13.8)
Low birth weight (LBW)	363 (72.6)
Very low birth Weight (VLBW)	68(13.6)
Breastfeeding history of 0-6 month	
Offered	229 (45.8)
Not offered	271 (54.2)
Initiation of Breastfeeding	
Within 1 hour after birth	53 (10.6)
Exclusive breastfeed for six month	270 (54.0)
Continue breastfeeding 6- 24 month	177 (35.4)
Complementary feeding startup	
4-6 month	56 (11.2)
6-9 month	302 (60.4)
>9 month	142 (28.4)
Bottle feeding status	
Offered	418 (83.6)
Not offered	82 (16.4)

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Table 3. Children's illness history

Variables	N (%)
Diarrhea status	
Present	248 (49.6)
Absent	252 (50.4)
Vomiting status	
Yes	239 (47.8)
No	261 (52.2)
Respiratory tract infections	
Present	221 (44.2)
Absent	279 (55.8)
Appetite status	
Good	200 (40)
Poor	300 (60)
Breastfeeding status	
Breastfeed	181 (36.2)
Not Breastfeed	319 (63.8)
Edema condition	
Present	141 (28.2)
Not Present	359 (71.8)
Weight loss history	
Weight loss	322 (64.4)
No Weight loss	178 (35.6)
Blurring of vision status	
Yes	221 (44.2)
No	279 (55.8)

Discussion

This study was similar to the research conducted in Ethiopia, in which the researchers employed similar age categories to extract the data regarding the causative risk factors of severe acute malnutrition (Tosheno *et al.*, 2017). The results of this study were in contrast to the study conducted in district Nowshera province Khyber Pakhtunkhwa. In this study, the prevalence of severe acute malnutrition was higher in females (54.9%) than males (45.1%) compared to our findings, where the prevalence was 53% in females and 47% in males (Ali *et al.*, 2015).

Poor feeding skills and appetite was a major ailment in child morbidity; in the studied population, 60% of the participants had poor appetite, resulting in the reduction of calorie intake and weight loss (Hall *et al.*, 2018). Only 36% of the children received exclusive breastfeeding that was 26.5% in a study conducted among children with 6-59 months of age at Somali region of Ethiopia (Babatunde and Qaim, 2010).

Birth interval was associated with the malnutrition, which is similar to a study conducted in Ethiopia; children born within 24 months of the preceding birth were more prone to malnutrition. Breastfeeding was also associated with the mother's education level because educated mothers consider the benefits of breast milk in preventing the diseases. In this study, we found that only 10% of the females breastfed their babies within one hour after birth, while majority of the females were unaware of kangaroo care or introducing colostrum to the baby that leads to malnutrition. A significant association was found between weaning or start of complementary feeding and the history of weight changes. This is similar to the study conducted in Blue Hora District, South Ethiopia in which the odds of malnutrition increased in children who started complementary feeding before six months of age. This is due to the fact that these children take less than 6 meals than the requirements, as compared to children who started complementary feeding within 6-9 months (Asfaw *et al.*, 2015). Mother and primary care taker's age had a close association with the weight loss. In this study, bottle feeding did not show any association with the findings (Singer *et al.*, 2011). However, in Ethiopia, children who preferred bottle feeding were more malnourished than others. A study conducted in Pakistan showed that mothers' body mass index (BMI) was associated with the child's malnutrition. In other words, lower BMIs showed higher odds of child malnutrition while in our study, results were quite close to the significant association of mother BMI to child weight loss (Arif *et al.*, 2012).

National Nutrition Survey (2011-12) stated that the mother's education and employment had a close association with the child malnutrition (Bhutta *et al.*, 2011). The findings of the current study with regard to the mothers' education and occupation are similar to those reported by NNS (Bhutta *et al.*, 2011).

We found that severe acute malnutrition was common in children within the age range of 6-59 months that reflected poor nutrition status and is considered as a major public health problem. Study findings showed that child gender (female),

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age, history of illnesses, lower birth weight, improper breastfeeding, introduction of the bottle feed at early ages, lower mother BMI status, poor economic status, as well as mother's employment and education status were considered as the major risk factors in the child severe acute malnutrition. Insufficient dietary intake and poor socio-economic status lead to poor immune system and increase the level of malnutrition in children of age 6-59 months. The findings of this study can be used by the authorities and non-government organizations so that they can take the necessary measures to improve this status.

Conclusions

According to the results of this study, malnourished children should be supplemented or fortified with foods on massive scale using different health facilities. Furthermore, the nutrition surveillance system should monitor the program in every nutrition situation to treat malnutrition and other micronutrient deficiencies. To this end, the governmental organizations, non-governmental organizations, and social stake holders are required to introduce proper health care delivery systems to improve nutrition status by conducting educational courses and awareness programs by the aid of mass media. Intervention program should be launched concerning family planning, properly vaccinated children in the society, and decreasing poverty, so that the health system can be improved to reduce malnutrition in the community.

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Authors' contributions

Shahazad Manzoor M had full access to the study data and took responsibility for veracity of data including concept, study design, and data analysis, especially any adverse effect; Aqib Saeed M contributed to data evaluation, drafting, and interpretation. All authors revised the final manuscript for important intellectual contents and approved the final version of manuscript.

Conflicts of interest

The authors declare that they have no conflicts of interests.

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