ORIGINAL ARTICLE DOI: https://doi.org/10.52206/jsmc.2023.13.4.818 OPEN ACCESS

Prevalence and Predictors of Under Nutrition among Under-Five Children in Peshawar District, Khyber Pakhtunkhwa, Pakistan

Zaif Ur Rahman,[1] Rubeena Gul,[2] Kashif Ur Rehman Khalil,[2] Humera Gabeen,[3] Khalid Mahmood Quereshi,[4] Aziza Alam[2]

ABSTRACT

Background: Malnutrition is a pressing public health crisis in Pakistan that requires immediate attention. The prevalence of malnutrition is on the rise due to various factors including social and economic factors.
Objectives: To find out the prevalence and causative factors of under nutrition in district Peshawar.
Material and Methods: A cross-sectional study was conducted between January 2022 and December 2022, in the Peshawar district of Khyber Pakhtunkhwa. A sample size of 400 children under the age of five years using a multistage stratified cluster sampling technique. A structured questionnaire was used to collect data, Anthropometric measures were taken to determine the children's nutritional status. Data collected was analyzed using SPSS version 23 for Windows.
Results: The study found that 39.3% of children were suffering from stunting, 16% from wasting, and 22.3% from underweight. Under nutrition was significantly associated with factors such as urban/rural areas, parents' education, maternal factors, family income, gender, and weight at birth (p-value < 0.05). However, there was no statistically significant difference found between family type, maternal television watching, and under nutrition. The study also revealed that children aged =5 months were more likely to be undernourished than older children.
Conclusion: Undernourishment is a critical issue in district Peshawar Khyber Pakhtunkhwa. The prevalence of undernourishment is alarmingly high in rural areas as compared to urban areas.
Keywords: Anthropometric, Stunting, Under nutrition, Underweight, Wasting.

This article may be cited as: Rahman ZU, Gul R, Khalil KUR, Gabeen H, Qureshi KM, Alam A. Prevalence and Predictors of Under Nutrition among Under-Five Children in Peshawar District, Khyber Pakhtunkhwa, Pakistan. J Saidu Med Coll Swat 2024;14(1):51-56. DOI: https://doi.org/10.52206/jsmc.2023.13.4.818

INTRODUCTION

Malnutrition is a serious problem that affects millions of people worldwide. It is a condition that arises due to a lack of proper nutrition, which can be caused by insufficient nutrient and/or energy intake (under nutrition) or excessive nutrients and/or energy intake (over nutrition). Immediate causes of malnutrition are inadequate food intake and illness while underlying causes of malnutrition are food insecurity, socioeconomic factors, environmental factors, inadequate household access to food, unhealthy environment, and no care of children and women.[1,2]

Under nutrition is the primary cause of death among children worldwide. It is a risk factor for illness and mortality, affecting millions of young children and pregnant women globally.[3] The deficiency or lack of micronutrients and macronutrients, or both, can lead to under nutrition. Every year, more than 5.9 million children under the age of five die globally, and 45% of these deaths are attributed to undernutrition.[4]

Malnutrition is more prevalent is south Asian region. Currently, in India, 48% of children under the age of five suffer from stunting, and 43% suffer from wasting.[5] The national household survey in Tanzania reported that the rate of stunting is higher in rural areas compared to urban areas, and boys are more likely to be stunted and wasted than girls.[6] According to the report WHO 2016, there were at least 52 million undernourished children under the age of five globally.[7]

The most commonly used anthropometric indicators for measuring malnourishment in children under five are stunting, underweight, and wasting.[8] Stunting, underweight, and wasting are defined by the World Health Organization as z-scores less than -2 standard deviation of height for age, weight for age, and weight for height, respectively.[9]

Under nutrition among children under five is a global health issue in developing countries, including Pakistan. According to the Pakistan Demographic and Health Survey (PDHS) 2012-13, 45%, 11%, and 30% of children under the age of five are stunted, wasted, and underweight, respectively.[10] Several factors cause undernutrition in children, including socio-economic inequalities, feeding practices, geographical location, household food distribution, and maternal education.[11,12] Undernutrition is more prevalent in rural areas compared to urban areas of Pakistan. Food insecurity and natural disasters further increase undernutrition.[13] Approximately 58% of families in Pakistan are food insecure, which negatively affects children under the age of two.[14,15] They consume less than half of their daily energy and micronutrient requirements than the recommended levels.[16] In 2019, the under-five mortality rate in Pakistan was 67.2 per 1000 live births, down from the previous decade.[17]

1. Institute of Management Sciences, Hayatabad, Peshawar.
2. Khyber Medical College, Peshawar, Pakistan.
3. Saidu Medical College, Swat, Pakistan.
4. Rehman Medical Institute, Peshawar, Pakistan.

Correspondence: Dr. Kashif Ur Rehman Khalil
Department of Community Medicine,
Khyber Medical College, Peshawar, Pakistan.
Email: dr.kashif.khalil@gmail.com

Received: September 25th, 2023 - 1st Revision: December 12th 2023
2nd Revision: February 05th 2024 - Accepted: February 14th, 2024

The Khyber Pakhtunkhwa government imposed a malnutrition health emergency in November 2016.[18,19] The undernutrition in Khyber Pakhtunkhwa (KPK) is more as compare to Punjab and Gilgit Baltistan provinces therefore selected in Khyber Pakhtunkhwa, in which researcher assessed the prevalence of undernutrition and its determinants like parents education, parents occupation and income

MATERIAL AND METHODS

A cross sectional study was conducted from 1st December 2022 to 30th January 2023 in Peshawar Khyber Pakhtunkhwa. Before study ethical approval was obtained from ethical committee Khyber Medical College Peshawar (No169/DME/KMC dated: 28/03/2022). Asample size of 400 was calculated using WHO sample size calculated through Cochrane equation.[1] Multistage sampling technique was used to select children from infant to under 5 years of age and asses them for nutritional status. All those children having congenital anomaly or chronic diseases, such as cardiovascular disease, sickle cell disease, psychiatric, tuberculosis and neural tube defect etc. which were affected the feeding practices of the children were excluded from the study. Undernutrition denotes insufficient intake of energy and nutrients to meet an individual's needs to maintain good health.[2] Causative factors were assessed by LHW through a pretested structured questionnaire.

The undernutrition was assessed through anthropometric variables. Length was measured when the child lying down below the 2 years or when the child was unable to stand. Length measurement was taken for children whose age is less than 2 years. For length measurement shoes were remove and baby was placed on horizontal wooden length board. One side of board was static (head side) and other side was movable (feet side). Baby was place in such a way that his head touch the static side of the board and movable size of the board was move so that it touch the feet of the baby. The length reading was noted.

For height measurement in older than 2 years children the shoes were remove. Children were stand up vertically in such a way that his back should touch the measuring taped and the height was measured in centimeters. The height or length of under five children were taken to the nearest 0.1cm.

Weight of the children was taken by using salter scale. The scale was calibrated and error was removed. All the extra cloths and shoes were removed and the child was weighed. If the child was above 2 years then he/she was weighed in the upright stand position on scale. The weight was taken in kilogram and was recorded to the nearest 0.1 kg.

Data collected was analyzed using SPSS version 23 for windows. Multivariate logistic regression test was applied on town, residency and gender. The significance association between variables were assessed using Chi square test with statistical significant at $P<0.05$.

RESULTS

Mean age of the children were 4.28 ±2.3 S.D. Out of total 400 children 220 (55%) were male and 180(45%) were female. As shown in Table 144 (36%)of children's mothers were illiterate. 100 (25.8%) children's father were illiterate. Majority of the 176(44%) fathers were daily earners.134 (33.5%) of child families were poor and earning less than 20 thousand Rupees a month a month.

This study illustrated that the prevalence of stunting, wasting and underweight were 39.3%, 16% and 22.3% respectively. Table 01 shows distribution of malnutrition on the basis of town, Rural and urban areas and finally gender. The p value in all cases shows significant differences in the degree of malnutrition.

Figure 01 shows environmental factors that may be related to under nutrition. The data showed that the source of safe drinking water of 13.5% families were not improved according to WHO guidelines while 86.5% families source of safe drinking water were improved. Similarly, 14% of families were not having improved sanitation facilities while 86% of population were having improved sanitation facilities.

Maternal factors are given below in Figure 02. Those mothers who had married at the age of 15-19 years were 34.3% while those mothers who had married at the age of 20-29 were 63%, 30-39 years mothers were 2.8 and 40-49 years were zero. Similarly, those mothers who had delivered the child (child that were studied in this study) at the age of 15-19 years were 8.3%, 20-29 years were 42.5%, mothers who had delivered child at the age of 30-39 years were 43.8% and 40-49 years were 5.5.

Figure 03 shows antenatal and postnatal factors associated with malnutrition.

Children's mothers who have zero visit of ANC were 26%, mothers who have 1-2 visits in that specific child pregnancy which we have included in our study were 10%, 3-4 visits mothers were 38.3% and = 5 visits mothers were 25.8%. Mothers who didn't do any postnatal checkup were 14.8%, mothers who had 1-2 visits, 3-4 visits, 5 and greater than 5 visits were 58.5%, 22.3% and 4.5% respectively. There were 28 (7%) children who have not ever breastfeed, 162 (40.5%) were breastfeed less than 12 months, 210 (52.5%) were breastfeed more than 12 months.

Table 01. Demographic Factors

Variables		Frequency	Percentage
Mother Education	Illiterate	144	36.0
	Primary	57	14.2
	Middle	72	18.0
	Secondary and high secondary school	89	22.3
	Bachelor and above	38	9.5
Father Education	Illiterate	103	25.8
	Primary	62	15.5
	Middle	53	13.3
	Secondary and high secondary school	137	34.3
	Bachelor and above	45	11.3
Father Occupation	Jobless	11	2.8
	Govt employee	83	20.8
	Private employee	109	27.3
	Daily laborer/driver	176	44
	Teacher	6	1.5
	Merchant/trader	13	3.3
Family Income	= to 20,000 rupees	134	33.5
	21-30 thousand	115	28.7
	31-40 thousand	71	17.8
	>40000	68	17.0

Table 02. Frequency and Percentages of various types malnutrition

Variables		Total Sample	Stunting	Wasting	Underweight	Total	P Value
Town	Town 1	100	34(34%)	12(12%)	17(17%)	63(63%)	0.034
	Town 2	100	43(43%)	20(20%)	26(26%)	89(89%)	
	Town 3	100	36(36%)	14(14%)	22(22%)	72(72%)	
	Town 4	100	44(44%)	15(15%)	24(24%)	83(83%)	
Residency	Rural	200	87(43.5%)	36(18%)	49(24%)	172(86%)	0.001
	Urban	200	70(35%)	28(14%)	41(20.5%)	139(69.5%)	
Gender	Male	222	89(40%)	36(16.2%)	50(22.5%)	175(78.82%)	0.034
	Female	178	68(38.2%)	28(15.7%)	40(20%)	136(76%)	

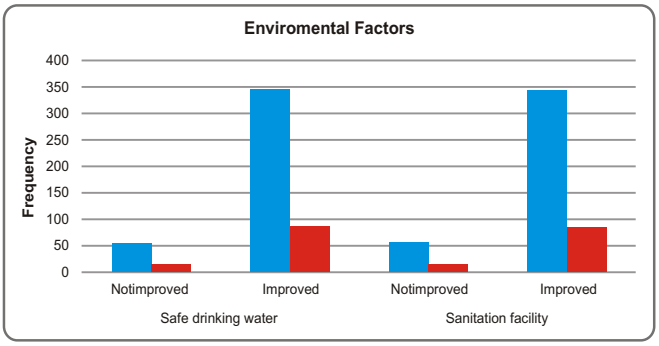


Figure 01. Environmental factors associated with Malnutrition

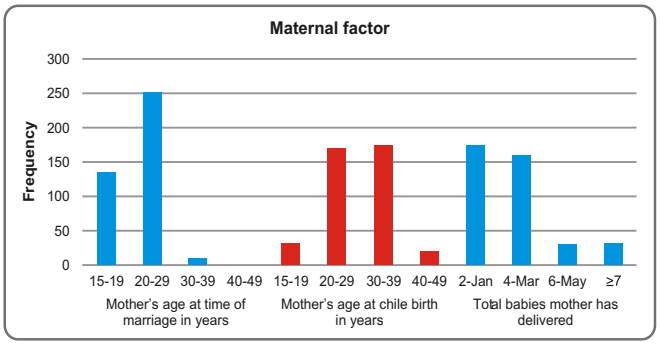


Figure 02. Maternal factors associated with malnutrition

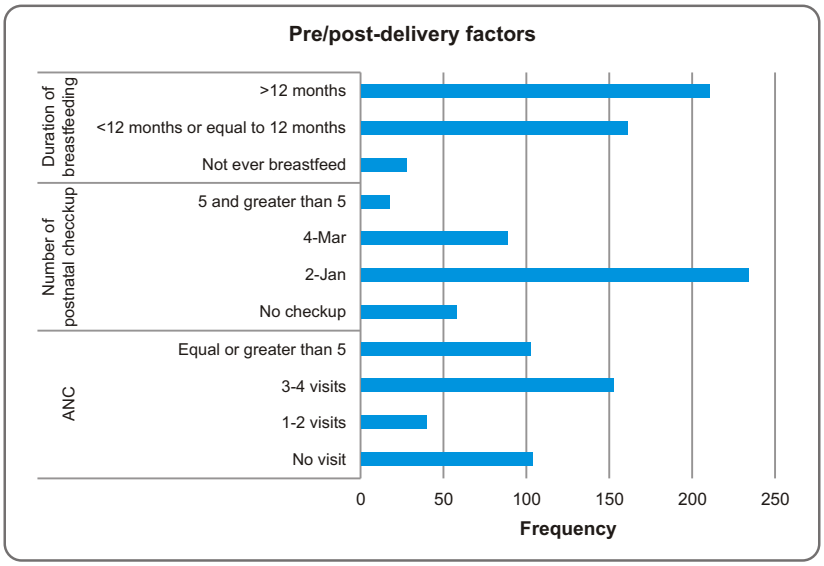


Figure 03. Antenatal and Postnatal Fcators associated with malnutrition

DISCUSSION

This study illustrated that the prevalence of stunting, wasting and underweight were 39.3%, 16% and 22.3% respectively. The prevalence of under nutrition in this study is co-related with KPK under nutrition values (40%, 15%, 23.1%) but less than the national values.

Factors associated with malnutrition include place of residency (whether it's rural or urban), parents' education, marital status, family income, family size, birth spacing, and feeding practices. Our study examined the prevalence and predictors of undernutrition in different towns and union councils. We found that changes in undernutrition rates may be due to the rural/urban status of the towns and union councils. This aligns with studies conducted in Jakarta, India, Indonesia, and Ethiopia, which found that populations living in rural areas are more susceptible to malnutrition.[20-22]

Family income is a crucial factor that affects child nutrition. Families with lower income often face inadequate nutrition and poor sanitation facilities, leading to undernourishment in children. Research has shown that family income has a significant impact on children's nutritional status. Our study found that children below the age of five from poor-class families had higher odds of malnutrition due to the rich-poor differences. This finding is consistent with a study conducted by Akombi BJ et al. in Nigeria, where children from poor households were more stunted than those from rich families.[23] Similar results were also reported in studies conducted in Nepal and Iran.[24,25] Mass media also plays a vital role in reducing malnutrition by providing awareness and valuable information about health. Our study found that mothers from households that did not read newspapers had more undernourished children compared to mothers from households that did read newspapers.

The income of a family is a crucial factor that has a direct correlation with child undernourishment. Our research indicates that households with seven or more children are statistically linked to undernourishment. When the number of children in a family increases, it becomes more challenging for the household to provide nutritious food to all members, especially the children. This can make it difficult for parents to give each child enough time and proper care, increasing their risk of malnourishment. Our findings are in line with other studies conducted in India[12] Uganda[13] and Ethiopia.[14]

Low birth weight is a critical factor that contributes to the increase in stunting prevalence. In Low and Middle-Income Countries (LMICs), studies have shown that intrauterine growth restriction is responsible for around 20% of childhood stunting. In the present study, it was observed that children with low birth weight had seven times higher odds of stunting under the age of five. In Pakistan, a study conducted on children under 24 months reported that children with a birth weight of less than 2.5 kg were three times more susceptible to stunting in the future than children of the same age group with a birth weight of 2.5 kg or higher.[26] Another study conducted in Bangladesh by Rahman et al. estimated that the Relative Risk of stunting in low birth weight children was 1.23 compared to their counterparts.[27]

Level of education of the mother influences the quality of care and attention the child receives, whether from the mother or a caregiver. Shockingly, children with mothers who have lower levels of education are twice as likely to experience malnutrition compared to those whose mothers have higher levels of education. A recent study conducted in Karachi by Ali et al. further supports this claim, showing a statistically significant difference in malnutrition rates between children of illiterate mothers

and those of educated mothers (P < 0.05).[28] Our own study has found similar results, with mothers who have higher levels of education having a negative association with child under nutrition. It is therefore essential that we prioritize education for women, particularly in underprivileged communities, to ensure the healthy growth and development of future generations.

Strengths and weaknesses

The present study is very important in determining various factors related to malnutrition in children. This baseline data is useful for public health experts to adopt various policy measures to combat malnutrition. The study limitations are less sample size and economic constrains. This study can be extended to provincial level if proper funds are provided by health department and international organizations that will help to assess these factors on large scale

CONCLUSION

Our study findings clearly demonstrate that undernourishment is a critical issue in district Peshawar KPK, and it is linked to several factors, such as sociodemographic factors, maternal care during pregnancy, environmental factors, and child factors. Additionally, our results indicate that the prevalence of undernourishment is alarmingly high in rural areas as compared to urban areas. This can be attributed to various factors such as socioeconomic inequalities, lack of access to primary healthcare services, and inadequate basic social work services. Therefore, it is imperative to address these factors at the earliest and work towards providing better healthcare and social work services to the rural population to prevent undernourishment.

Ethical Consideration

This study was approved by the ethical review board of Khyber Medical College, Peshawar, Pakistan.

Funding

There is no role of any funding agency in this study.

Conflict of Interest

Authors declared no conflict of interest

REFERENCES

1. Black MM, Trude AC, Lutter CK. All children thrive: integration of nutrition and early childhood development. Annual Review of Nutrition. 2020 Aug 21;40:375-406. DOI: https://doi.org/10.1146/annurev-nutr-120219-023757
2. Akombi BJ, Agho KE, Hall JJ, Merom D, Astell-Burt T, Renzaho AM. stunting and severe stunting among children under-5 years in Nigeria: A multilevel analysis. BMC pediatrics. 2017;17(1):15. DOI: https://doi.org/10.1186/s12887-016-0770-z
3. Mekonen J, Addisu S, Mekonnen H. Prevalence and associated factors of chronic undernutrition among under five children in Adama town, Central Ethiopia: a cross-sectional study design. BMC research notes. 2019;12(1):1-6. DOI: https://doi.org/10.1186/s13104-019-4552-1
4. Mkhize M, Sibanda M. A review of selected studies on the factors associated with the nutrition status of children under the age of five years in South Africa. International Journal of Environmental Research and Public Health. 2020 Nov;17(21):7973. DOI: https://doi.org/10.3390/ijerph17217973
5. Wicaksono F, Harsanti T. Determinants of stunted children in Indonesia: A multilevel analysis at the individual, household, and community levels. Kesmas: Jurnal Kesehatan Masyarakat Nasional (National Public Health Journal). 2020 Feb 1;15(1): 48-53. DOI: https://doi.org/10.21109/kesmas.v15i1.2771
6. Wete AT, Zerfu TA, Anbese AT. Magnitude and associated factors of wasting among under five orphans in Dilla town, southern Ethiopia: 2018: a cross-sectional study. BMC nutrition. 2019;5(1): 1-10. DOI: https://doi.org/10.1186/s40795-019-0295-6
7. Shahid M, Cao Y, Shahzad M, Saheed R, Rauf U, Qureshi MG, et al. Socio-economic and environmental determinants of malnutrition in under three children: Evidence from PDHS-2018. Children. 2022 Mar 4;9(3):361. DOI: https://doi.org/10.3390/children9030361
8. Juma OA, Enumah ZO, Wheatley H, Rafiq MY, Shekalaghe S, Ali A, et al. Prevalence and assessment of malnutrition among children attending the Reproductive and Child Health clinic at Bagamoyo District Hospital, Tanzania. BMC public health. 2016;16(1):1094. DOI: https://doi.org/10.1186/s12889-016-3751-0
9. Sachdev HS, Sinha S, Sareen N, Pandey R, Kapil U. Survival and recovery in severely wasted under-five children without community management of acute malnutrition programme. Indian pediatrics. 2017;54(10):817-24. DOI: https://doi.org/10.1007/s13312-017-1142-y
10. Rahman MS, Howlader T, Masud MS, Rahman ML. Association of low-birth weight with malnutrition in children under five years in Bangladesh: do mother's education, socio-economic status, and birth interval matter?. PloS one. 2016 Jun 29;11(6):157-814. DOI: https://doi.org/10.1371/journal.pone.0157814
11. Akombi BJ, Agho KE, Hall JJ, Merom D, Astell-Burt T, Renzaho AM. Stunting and severe stunting among children under-5 years in Nigeria: A multilevel analysis. BMC pediatrics. 2017;17(1): 1-16. DOI: https://doi.org/10.1186/s12887-016-0770-z
12. Bagchi A, Sardar JC, Karmakar PR. Feeding Practice and Nutritional Status of Under Five Children: A Cross Sectional Descriptive Study in a Slum Community of West Bengal. International Journal of Research and Review. 2021;8(2). 197-203
13. Oyinwola OI, Ahmed P, Odusanya OO, Oyasakin AB. Prevalence and risk factors of acute malnutrition among pre-school children in internally displaced person settlements within Abuja Municipal Area Council. Nigerian Journal of Paediatrics. 2022 Aug 30;49(2):122-30. DOI: https://doi.org/10.4314/njp.v49i2.5

14. Kebede D, Merkeb Y, Worku E, Aragaw H. Prevalence of undernutrition and potential risk factors among children under 5 years of age in Amhara Region, Ethiopia: evidence from 2016 Ethiopian Demographic and Health Survey. Journal of Nutritional Science. 2021;10:22. DOI: https://doi.org/10.1017/jns.2021.17
15. Gebru TT, Abady GG, Teklu FG, Tesfamichael YA, Bitow MT, Tekola KB, et al. Assessment of wasting and associated factors among under five children of Wukro town, Tigray regional, North Ethiopia: a cross sectional study. The Pan African Medical Journal.2019;33. DOI: https://www.dx.doi.org/10.11604pamj.2019.33.330.18808
16. Teshome B, Kogi-Makau W, Getahun Z, Taye G. Magnitude and determinants of stunting in children underfive years of age in food surplus region of Ethiopia: the case of west gojam zone. Ethiopian Journal of Health Development. 2009;23(2). DOI: https://doi.org/10.4314/ejhd.v23i2.53223
17. Mozumder AKA, Kane TT, Levin A, Ahmed S. The effect of birth interval on malnutrition in Bangladeshi infants and young children. Journal of biosocial science. 2000;32(3):289-300. DOI: https://doi.org/10.1017/S0021932000002893
18. Argaw A, Hanley-Cook G, De Cock N, Kolsteren P, Huybregts L, Lachat C. Drivers of under-five stunting trend in 14 low-and middle-income countries since the turn of the millennium: a multilevel pooled analysis of 50 Demographic and Health Surveys. Nutrients. 2019;11(10):24-85. DOI: https://doi.org/10.3390/nu11102485
19. Saleemi M, Ashraf R, Mellander L, Zaman S. Determinants of stunting at 6, 12, 24 and 60 months and postnatal linear growth in Pakistani children. Acta Paediatrica. 2001;90(11):1304-8. DOI: https://doi.org/10.1111/j.1651-2227.2001.tb01580.x
20. Aboagye RG, Ahinkorah BO, Seidu AA, Frimpong JB, Archer AG, Adu C, et al. Birth weight and nutritional status of children under five in sub-Saharan Africa. Plos one. 2022 Jun 9;17(6): 269-279. DOI: https://doi.org/10.1371/journal.pone.0269279
21. Nshimyiryo A, Hedt-Gauthier B, Mutaganzwa C, Kirk CM, Beck K, Ndayisaba A, et al. Risk factors for stunting among children under five years: a cross-sectional population-based study in Rwanda using the 2015 Demographic and Health Survey. BMC Public Health. 2019;19(1):1-10. DOI: https://doi.org/10.1186/s12889-019-6504-z
22. Mulu E, Mengistie B. Khaliq A, Wraith D, Miller Y, Nambiar S. Association of infant feeding indicators and infant feeding practices with coexisting forms of malnutrition in children under six months of age. Nutrients. 2022 Oct 12;14(20):4242. in Sekela District, Western Ethiopia: a comparative cross-sectional study. BMC nutrition. 2017;3(1):1-9. DOI: https://doi.org/10.3390/nu14204242
23. Ahmed S, Nazimuddin SM, Qambrani ZA, Radhan AH, Ahmed CR, Chohan MN. Various Risk Factors of Severe Acute Malnutrition in Children Under 5 Years of Age Presenting at a Secondary Care Hospital. Pakistan Journal of Medical & Health Sciences. 2023 Jun 1;17(04):355. DOI: https://doi.org/10.53350/pjmhs2023174355
24. Gemechu DS, Worku Y, Alemu A, Gerema U. Determinants of severe acute malnutrition among children aged 659 months in the pastoral community of Liban District, Guji Zone, Oromia Regional State, Southeastern Ethiopia: a casecontrol study. Journal of Nutritional Science. 2021;10:e101. DOI: https://doi.org/10.1017/jns.2021.98
25. Habib A, Kureishy S, Soofi S, Hussain I, Rizvi A, Ahmed I, et al. Prevalence and Risk Factors for Iron Deficiency Anemia among Children under Five and Women of Reproductive Age in Pakistan: Findings from the National Nutrition Survey 2018. Nutrients. 2023 Jul 28;15(15):33-61. DOI: https://doi.org/10.3390/nu15153361
26. Khaliq A, Wraith D, Miller Y, Nambiar S. Association of infant feeding indicators and infant feeding practices with coexisting forms of malnutrition in children under six months of age. Nutrients. 2022 Oct 12;14(20):42-49. DOI: https://doi.org/10.3390/nu14204242
27. Mehmood Z, Afzal T, Khan N, Ahmed B, Ali L, Khan A, et al. Prevalence and determinants of stunting among preschool and school-going children in the flood-affected areas of Pakistan. Brazilian Journal of Biology. 2021 Jul 9;82. DOI: https://doi.org/10.1590/1519-6984.249971
28. Sanin KI, Khanam M, Rita RS, Haque MA, Ahmed T. Common factors influencing childhood undernutrition and their comparison between Sylhet, the most vulnerable region, and other parts of Bangladesh: Evidence from BDHS 200718 rounds. Frontiers in Nutrition. 2023 Jan 9;9:999520. DOI: https://doi.org/10.3389/fnut.2022.999520

DATA SHARING STATEMENT: The data that support the findings of this study are available on request from the corresponding author. The data is not publicly available due to privacy or ethical restrictions.

AUTHORS' CONTRIBUTION

The following authors fullfill authorship criteria as per ICMJE guidelines;

Rahman ZU, Gul R:	Substantial contribution to conception and design, drafting the manuscript, final approval, agreed to be accountable for all the work.
Khalil KUR, Gabeen H:	Substantial contribution to conception and design, data acquisition, drafting the manuscript, final approval, agreed to be accountable for all the work.
Qureshi KM:	Analysis and interpretation of data, drafting the manuscript, final approval, agreed to be accountable for all the work.
Alam A:	Analysis and interpretation of data, critical revision,final approval, agreed to be accountable for all the work.

This is an Open Access article distributed under the terms of the Creative Commons Attribution-NonCommercial 4.0 International License, which permits unrestricted use, distribution & reproduction in any medium provided that original work is cited properly.