ORIGINAL ARTICLE

Influence of various demographic factors on nutritional status of children under five years of age

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Author`s Contribution

[1] *Conceived, designed, statistical analysis & editing of manuscript*

[2-3] *Data collection and manuscript writing*

[4] *Statistical analysis and proof reading of the manuscript*

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ABSTRACT

Background: Malnutrition in under five children is prevalent in our country. It makes them prone to infections and increases child mortality. This can be controlled by identifying and modifying the predisposing factors.

Objective: To assess nutritional status and to analyze the influence of various demographic factors on nutritional status of under five children.

Methodology: This cross-sectional study was conducted in Shifa Falahi and Community Health center in Islamabad over a period of 2 years (June 2018 till July 2020). Children under five years of age were included. Information was collected from mothers on a self-designed questionnaire. Weight and height of children was recorded and classified according to WHO Z score. Data was evaluated on SPSS 20. Univariate analysis was done to determine independent effect of each predictor on outcome.

Results: Total of 280 patients were enrolled. 162 (57. 9%) of them were malnourished. Stunting was seen in 24.6% cases, while 26.1% were underweight. Wasting was seen in 19.6% cases. More males were stunted (27.9%) and underweight (27.27%) as compared to females (21.2%) and (24.8%) respectively. Low household income (p value 0.014), poor maternal education (p value 0.018), joint family system (0.002), unboiled drinking water (0.008) and repeated diarrheas (0.02) were found significantly associated with malnutrition. Most of the mothers (>75%) had adequate knowledge of breast feeding, vaccination, seeking medical advice for their babies.

Conclusion: All forms of childhood malnutrition are prevalent. Poor socioeconomic status and maternal illiteracy are strong contributors towards malnutrition. Unboiled drinking water and diarrheas are further aggravating the nutritional status of children.

Keywords: *Malnutrition, anthropometry, undernutrition, stunting.*

Introduction

Adequate nutrition, in early childhood, is essential to ensure a strong immune system and proper physical and intellectual development. Childhood malnutrition is generally taken as undernutrition until mentioned the other way round. All over the globe there are 165 million malnourished children under five years of age.[1,2]

Malnutrition is the root cause of morbidity and mortality among the children. The risk of death becomes nine times higher for a child suffering from malnutrition as compared to a healthy subject.[2] For the survivors, it compromises their physical and mental development, which results in poor health condition and academic achievement. It has

been estimated that 170 million (30%) of children under the age of five in the world are moderately or severely stunted, and 110 million (19%) are moderately or severely underweight.[3]

This burden of malnutrition is not evenly distributed in different regions of the world. More than half of world's malnourished children live in South East Asia (India, Bangladesh and Pakistan).[4] It is therefore one of the major public health challenges in these countries including ours. Compared to our neighboring countries, Pakistan has one of the highest levels of prevalence of child malnutrition.[5] According to the National Nutrition Survey 2011, 33% of all children were underweight, nearly 44% were stunted, 15% are wasted.[6] In Pakistan, nearly 800,000 children die every year; 35 per cent of them, i.e. 280,000 deaths, occur due to malnutrition.[7] In the last two decades, there has been almost no reduction in the prevalence of child malnutrition in Pakistan compared to our neighboring countries.[6,7]

Multiple factors have been identified contributing towards childhood malnutrition. These include low birth weight, inadequate breast feeding, inappropriate weaning, maternal illiteracy, lack of proper knowledge of nutrition, micronutrient intake, parity, birth spacing, household socioeconomic status, poor sanitation, vaccination, and infectious diseases.[8] Well-nourished children grow naturally and perform to the best of their abilities in academics, they remain healthy both physically and mentally and result in less burden on hospitals and parental worries.

Pakistan demographic and health survey 2017-18 shows stunting of 24.4% in capital city of Islamabad while severe stunting is 6.8%. There is dire need to look at the current situation.[9,10] Pakistan being a developing country is facing double burden of malnutrition and poverty, both interlinked. Reduction in this burden of malnutrition will not only improve health and quality of life of our population but it will also increase economic productivity. Identifying the modifiable factors and working on these factors is the only way out for us. This study emphasizes on the factors affecting malnutrition in children under 5 years of age.

Methodology

This cross-sectional study was conducted in Islamabad Pakistan, in Shifa Falahi and community health center over a period of 2 years i.e., June 2018- July 2020 and comprised children of <5 years of age. Sample size was 280 (as per sample size calculator Rao Soft Confidence interval 91%). Approval was obtained from the institutional review board Shifa International Hospital (IRB #317-166-2013). Informed written consent was taken from mothers. Simple random sampling technique was used. The data was collected on a self-designed and semi-structured questionnaire.

Study indicators that were recorded included, ethnicity, maternal factors like age, education, profession, father related factors like age, education, income, family set up, total family members, source of drinking water and sanitary system. Data regarding child included age, gender, anthropometry (including height, weight mid upper arm circumference) child's birth weight, breast feeding duration, weaning, dietary habits, repeated diarrheas, vitamin supplementation. Mothers' knowledge about diet, hand washing practices, vaccination and doctors' visits was assessed.

The study population's characteristics were summarized using means with standard deviations (SD) for the continuous variables and percentages for the categorical variables. Predictors of childhood malnutrition (stunting, wasting, and under-weight) were investigated using logistic regression analysis. Univariate analysis was conducted to determine independent effect of each predictor on outcomes. Adjusted OR were calculated to study the predictive power of independent study variables in relation to childhood malnutrition. All statistical analyses were performed using SPSS version 20.0 with the statistically significant set at p value≤0.05.

Study definitions

Stunting: Stunting reflects low height for age z scores. The cut off level of -2.0 z score was used for stunting -3.0z for severe stunting.

Wasting: Wasting is based on low weight for height z scores. A cutoff level of 2.0 was considered as wasted child.[11]

Underweight: Underweight is defined as low weight for age z scores. It was based on cutoff value of 2.0 standard deviation z score.[11]

Results

Study population comprised of 280 patients of age less than 5 years.

Sociodemographic characteristics:

Sociodemographic characteristics are shown in table 1. Joint family system was found in 162(57.9%) cases. Families who were living in accommodations with good sunlight exposure were 170(60.7%). Unboiled drinking water was being used by 206(73.6%) families while closed sanitation system was found in 264(94.3%) cases.

Table 1: Sociodemographic characteristics

Indicators		
Gender	**Number (n)**	**Percentage (%)**
Male	143	51.1%
Female	137	48.9%
Age in years		
<1 year	57	20.3%
1-2 years	64	22.8%
2-3 years	63	22.5%
3-4 years	34	12.1%
4-5 years	62	22.1%
Mothers' education		
No formal education	79	28.2%
Primary	25	8.9%
Secondary	83	29.4%
Higher	93	33.2%
Fathers' education		
No Formal Education	63	22.5%
Primary	23	8.2%
Secondary	85	30.3%
Higher	109	38.9%
Mothers' profession		
Housewife	240	85.7%
Working	40	14.3%
Household income		
5000	13	4.6%
5000-10000	66	23.6%
>10000	201	71.8%
Family size		
1-5	154	55%
6-10	99	35.3%
>10	27	9.6%

Prevalence of stunting

Stunting was found in 66(24.6%) children. It was seen slightly higher in boys 40 (27.9%) than in girls 29 (21.2%). Severe stunting was seen in 44(15.7%) children. Similarly, severe stunting was also higher in boys 24 (16.7%) than in girls 20 (14.6%). Stunting was found more in younger age groups while it decreased in 4-5 years' age group as presented in Table 2.

Prevalence of wasting

Wasting was seen in 55(19.6%) of total patients. While 67(23.9%) had severe wasting. Girls 33(24%) had more wasting as compared to boys 22(15. 4%). Wasting was found more in children of 2-4 years age group. On the other hand, 46(16.5%) children were overweight and 7(2.5%) were obese as presented in Table 2

Prevalence of underweight

Overall, 73 (26.1%) children were underweight and 59 (21.1%) were severely underweight. Both boys and girls were equally underweight and all age groups were affected as presented in Table 2.

Large family size (0.00), low birth weight of baby (0.00), junk food daily (0.00), only milk or increased milk consumption (0.001), introduction of meat after 2 years of age (0.002), were found statistically significant with stunting.

Maternal illiteracy, low birth weight and increased milk intake (0.006), low income, unboiled water, poor hand washing practices, daily junk foods intake, large family size were found statistically significant with underweight.

Figures 1 and 2 present the association of stunting and wasting rates by average household income respectively. The prevalence of stunting and wasting was higher in children of poorest households.

Determinants of malnutrition

Certain factors were found associated with stunting, wasting and underweight. Shown in table 3. Unboiled drinking water was found significantly associated with all forms of malnutrition. While low maternal education was found associated with stunting and wasting. Low income, repeated diarrheas, joint family system, sanitary system was associated with stunting.
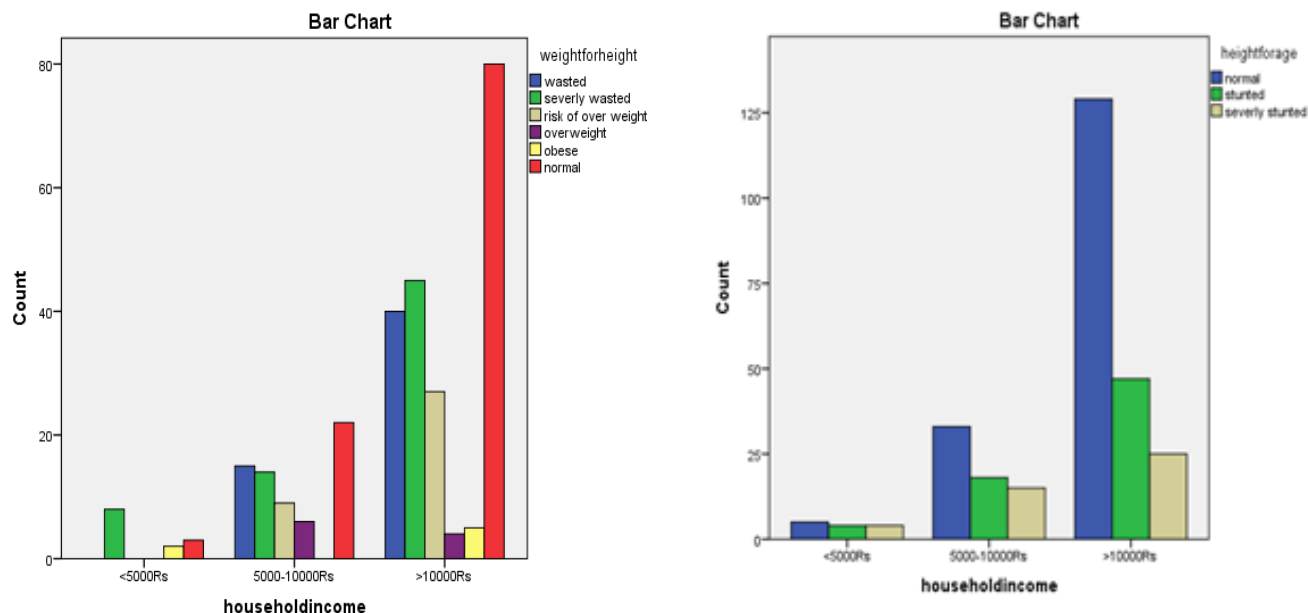
Figure 1 and 2: Association of stunting and wasting rates by average household income respectively.

Table 2: Prevalence of stunting, wasting and underweight under 5 years of age

Total number of children		Stunting		Wasting				Underweight	
		stunted <-2SD	severely stunted <-3SD	wasted <-2SD	severely wasted <-3SD	Overweight	obese	Underweight <-2SD	Severely underweight <-3SD
N		n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)
280		69 (24.6%)	44 (15.7%)	55 (19.6%)	67 (23.9%)	46 (16.5%)	7 (2.5%)	73 (26.1%)	59 (21.1%)
Gender									
Boys	143	40 (27.9%)	24 (16.7%)	22 (15.4%)	33 (23%)	23 (16%)	6 (4.2%)	39 (27.27%)	30 (20.9%)
Girls	137	29 (21.2%)	20 (14.6%)	33 (24%)	34 (28.4%)	23 (16.7%)	1 (0.7%)	34 (24.8%)	29 (21.1%)
Age groups (In Years)									
<1	57	16 (28%)	18 (31%)	10 (17.5%)	20 (35%)	6 (10.5%)	4 (7%)	18 (31.5%)	17 (29.8%)
1-2	64	15 (23.4%)	14 (21.9%)	9 (14%)	17 (26.5%)	14 (21.8%)	1 (1.5%)	17 (26.5%)	13 (20.3%)
2-3	63	18 (28.5%)	8 (12.6%)	15 (23.8%)	16 (25.3%)	7 (11.11%)	2 (3.1%)	25 (39.6%)	13 (20.6%)
3-4	34	9 (26.4%)	3 (8.8%)	9 (26.4%)	12 (35.2%)	5 (14.7%)	0	6 (17.6%)	13 (38.2%)
4-5	62	11 (17.7%)	1 (1.6%)	12 (19.3%)	2 (3.2%)	14 (22.5%)	0	7 (11.2%)	3 (4.8%)

Table 3: Results of univariate logistic regression analysis showing determinants of malnutrition

Parameter	Stunting		Underweight		Wasting	
	OR (95% CI)	p value	OR (95% CI)	p value	OR (95% CI)	p value
Mothers' education Uneducated educated	1.39 (1.23-1.56) 1.62 (1.52-1.72)	0.018	1.35 (1.24-1.47) 1.51 (1.44-1.58)	0.019	3.8 (3.4-4.3) 3.4 (3.1-3.7)	0.156
Joint family yes no	1.59 (1.47-1.70) 1.51 (1.38-1.65)	0.002	1.51 (1.44-1.59) 1.40 (1.31-1.49)	0.065	3.6 (3.3-3.9) 3.4 (3.0-3.8)	0.338
Drinking water Boiled Unboiled	1.44 (1.27-1.61) 1.60 (1.49-1.70)	0.008	1.59 (1.48-1.70) 1.42 (1.35-1.49)	0.013	3.0 (2.6-3.5) 3.7 (3.4-4.0)	0.012
Repeated diarrheas Yes no	1.77 (1.57-1.96) 1.50 (1.40-1.60)	0.020	1.45 (1.32-1.58) 1.47 (1.40-1.54)	0.796	3.3 (2.8-3.9) 3.6 (3.3-4.8)	0.428
Sanitary system open closed	1.87 (1.50-2.24) 1.54 (1.45-1.63)	0.011	1.56 (1.31-1.80) 1.46 (1.40-1.52)	0.454	3.2 (2.2-4.2) 3.5 (3.3-3.8)	0.511
Low birth weight Yes no	1.92 (1.51-2.33) 1.54 (1.45-1.63)	0.74	1.76 (1.49-2.04) 1.45 (1.39-1.51)	0.028	3.2 (2.1-4.3) 3.5 (3.3-3.8)	0.533
House hold income <5000 5000-10000 >10000	1.92 (1.51-2.32) 1.72 (1.54-1.90) 1.48 (1.38-1.58)	0.014	1.61 (1.34-1.88) 1.50 (1.37-1.62) 1.45 (1.38-1.52)	0.457	3.3 (2.2-4.5) 3.4 (2.9-3.9) 3.6 (3.3-3.9)	0.713

Knowledge and practice of mothers:

Most of mothers (96.4%) 270 have adequate knowledge of hand washing, start of breast feeding (90.4%) 253, weaning (76.4%) 214, vaccination and regular checkups (79.3%) 222 of the child .252 (90%) consult a doctor for illness of child yet 23.2% frequently visit religious peers for seeking advice regarding child's illness.

D i s c u s s i o n

This study is one of the very few local studies using WHO, Z score for classification of childhood malnutrition. The results of our study reinforced that malnutrition is widespread among the children under-five year old, and has not improved since last two decades.[2,10] As per Pakistan's demographic and health survey 2017-18, 38% children are stunted and 17% are severely stunted while we found 24.6% stunted and 15.7% severe stunting.[11] The difference in numbers is probably because our study included children of Islamabad region only.

In the same survey 7% of children were found wasted while 2% had severe wasting which is a number far less than we observed 19.6% and 23.9% respectively. Underweight and severely underweight figures of ours were also high i.e., 26.1 and 21.1% respectively. A sub analysis of PDHS 2013 showed similar high figures of underweight i.e., 26.7%.[12] Failure to achieve significant improvement in malnutrition figures is observed. Instability of governments, inflation, lack of policies to facilitate poor and low-income families are contributing towards this condition.

The trends of malnutrition are not the same in South Asian region, with Pakistan and India being the most affected countries having stunting and underweight rates in the range of 40-50% and 30-40% respectively.[12] Our neighboring country shows figure that is even higher than ours. A community based cross sectional survey in our neighboring country India Haryana showed burden of underweight and severe underweight 41.3% and 14% respectively.[13] Countries like Bangladesh and Sri Lanka have achieved significant improvement in child

malnutrition in recent years.[12] Slight male predominance of malnutrition in our study is in contrast to the gender bias observed in certain local studies.[14]

At 6-11 months of age malnutrition was found in greatest frequency by Zulfiqar et al and Achakzai.[14,15] We noticed stunting and underweight children mostly of age 2-3 years while wasting was most frequent at 3-4 years of age. Breast feeding is discontinued by this age and child is totally on weaning diet, at this time. There are many myths involving complimentary feeding of children and pregnant women which acts as a base to the poor health outcomes in children.[16] Cultural norms and average household food probably is the contributing factor for this age malnutrition. If we are more vigilant to supplement the child with multivitamins and counsel for optimal diet, this can improve the condition.

The results of our study also revealed that there was a highly significant chance for being of stunted, wasted and underweight in children belonging to the lower quintiles as compared to highest quintiles, and almost similar findings were reported in studies from Africa.

Low household income is significantly associated with overall malnutrition in our study as was seen by Stavros and Emil.[17-19] Low family income forces people to opt unhealthy food options that promotes malnutrition and infections which cannot be properly addressed by family due to financial issues. A survey of 12 countries proved that an increase in the income of individual households, or of the nation as a whole, reduces malnutrition by the same proportion.[20] Low level of parental education, especially of the mother, is known to be significantly associated with childhood malnutrition as is the case in present study.[13,18,19,21]

There is dire need to improve the educational status of females. It is 46.47% as per 2017 statistics of Pakistan. It has been found that children of educated mothers are more nourished than illiterate mothers. A study from Indonesia shows that a mother's education is a strong predictor of her child's nutritional improvement over time.[22] In Pakistan we have mostly joint family system of living. This has significant association with stunting as reported by Aurengzeb et al in their study of hospitalized children as seen in our study.[18] In Pakistan only 20% population has accessibility to safe drinking water. It is

significantly associated with malnutrition.[21] Being simple modifiable factor, this can be addressed at household level. Repeated diarrheas are found to be significantly associated with (0.020) stunting in our study. Prevalence of diarrhea in under five children is 23.1% as per PDHS 2012-13. It can cause mortality in the face of malnutrition as described by Radhini et al.[23]

One of the limitations of our study was that maternal nutritional status could not be assessed as the child was not always accompanied by mother and this was a single encounter data collection. Maternal malnutrition has significant impact on child's nutritional status as described by Attia et al.[24] In addition to reinforcing and counselling for child's diet, mothers should also be counselled for their own diet and supplements on the same visit. Every factor contributing towards malnutrition is interlinked. In spite of having knowledge of all of them, we are unable to control malnutrition in our children. Counselling for awareness of mothers and families and policies at government level to cater these issues is required.

Conclusion

We have high magnitude of childhood malnutrition without any significant improvement for last decade. There is dire need to look into the significant factors of poverty, illiteracy and provision of safe drinking water at government level to deal with this serious issue.

References

1. Asim M, Nawaz Y. Child malnutrition in Pakistan: evidence from literature. Children. 2018; 5(5):60.
   DOI: https://doi.org/10.3390/children5050060
2. Khan GN, Turab A, Khan MI, Rizvi A, Shaheen F, Ullah A, Hussain A, Hussain I, Ahmed I, Yaqoob M, Ariff S. Prevalence and associated factors of malnutrition among children under-five years in Sindh, Pakistan: a cross-sectional study. BMC Nutrition. 2016; 2(1):1-7.
   DOI: https://doi.org/10.1186/s40795-016-0112-4
3. United Nation International Children's Emergency Fund (UNICEF). Levels and Trends in Child Malnutrition,2014 (online). Available from:
   http://www.unicef.org/media/files/Levels_and_Trends_in_Child_Mortality_2014.pdf
4. United Nations Children's Fund, World Health Organization, World Bank Group. Levels and trends in child malnutrition UNICEF – WHO World Bank Group joint child malnutrition estimates Key findings of the 2015 edition.(online)
   Available from: URL:
   http://www.who.int/nutrition/publications/jointchildmalnutrition.

5. Di Cesare M, Bhatti Z, Soofi SB, Fortunato L, Ezzati M, Bhutta ZA. Geographical and socioeconomic inequalities in women and children's nutritional status in Pakistan in 2011: an analysis of data from a nationally representative survey. Lancet Glob Health. 2015; 3(4):e229-39.
DOI: https://doi.org/10.1016/S2214-109X(15)70001-X

6. Masibo PK, Makoka D. Trends and determinants of undernutrition among young Kenyan children: Kenya Demographic and Health Survey; 1993, 1998, 2003 and 2008–2009. Public Health Nutr. 2012; 15(9):1715-27.
DOI: https://doi.org/10.1017/S1368980012002856

7. Human Rights Commission of Pakistan. State of Human Right in 2014 Lahore: Human Rights Commission of Pakistan; (online) 2015.
Available from:
http://hrcpweb.org/hrcpweb/data/HRCP%20Annual%20Report%202014%20-%20English.pdf.

8. Ahsan S, Mansoori N, Mohiuddin SM, Mubeen SM, Saleem R, Irfanullah M. Frequency and determinants of malnutrition in children aged between 6 to 59 months in district Tharparkar, a rural area of Sindh. J Pak Med Assoc. 2017; 67(9):1369-73.

9. Mahmood A, Sultan M. National Institute of Population Studies (NIPS)(Pakistan), and Macro International Inc. Pakistan Demographic and Health Survey. 2006; 7:123-45.

10. Owoaje E, Onifade O, Desmennu A. Family and socioeconomic risk factors for undernutrition among children aged 6 to 23 Months in Ibadan, Nigeria. Pan Afr Med J. 2014;17.
DOI: https://doi.org/10.11604/pamj.2014.17.161.2389.

11. Beer SS, Juarez MD, Vega MW and Canada NL. Pediatric malnutrition: Putting the new definition and standard into practice. Nutr Clin Pract.2015; 30(5):609-24.
DOI: https://doi.org/10.1177/0884533615600423

12. Abbasi S, Mahmood H, Zaman A, Farooq B, Malik A, Saga Z. Indicators of malnutrition in under 5 Pakistani children: a DHS data secondary analysis. J Med Res Heal Edu. 2018; 2:1-0.

13. Yadav SS, Yadav ST, Mishra P, Mittal A, Kumar R, Singh J. An epidemiological study of malnutrition among under five children of rural and urban Haryana. J Clin Diagn Res: JCDR. 2016; 10(2):LC07.
DOI: https://doi.org/10.7860/JCDR/2016/16755.7193.

14. Laghari ZA, Soomro AM, Tunio SA, Lashari K, Baloach FG, Baig NM, et al. Malnutrition among children under five years in District Sanghar, Sindh, Pakistan. Gomal J Med Sci. 2015; 13: 54-7

15. Achakzai P, Khan R. Nutritional status and associated factors among children less than five years of age in tehsil Zarghoon town, District Quetta, Baluchistan. J Ayub Med Coll Abbottabad. 2016; 28(1):146-51.

16. Khan S, Ammara U, Arshad R, Naz F, Ishfaq K. A descriptive study of double burden of malnutrition in mothers of children with severe acute malnutrition admitted in Children Hospital and Institute of Child Health, Multan. J Pak Med Assoc. 2020; 70(3):417-420.
DOI: https://doi.org/10.5455/JPMA.290318

17. Petrou S, Kupek E. Poverty and childhood undernutrition in developing countries: a multi-national cohort study. Soc Sci Med. 2010; 71(7):1366-73.
DOI: https://doi.org/10.1016/j.socscimed.2010.06.038.

18. SandA, Kumar R, Shaikh BT, Somrongthong R, Hafeez A, Rai D. Determinants of severe acute malnutrition among children under fve years in a rural remote setting: A hospital based study from district Tharparkar-Sindh, Pakistan. Pak J Med Sci. 2018; 34(2):260-265.
DOI: https://doi.org/10.12669/pjms.342.14977

19. Harris J, Nisbett N. The Basic Determinants of Malnutrition: Resources, Structures, Ideas and Power. Int J Health Policy Manag. 2020 Dec 26. Epub ahead of print. PMID: 33590741.
DOI: https://doi.org/10.34172/ijhpm.2020.259.

20. Ghosh S. Factors Responsible for Childhood Malnutrition: A Review of the Literature. Curr Res Nutr Food Sci J..2020; 8(2) 360-370
DOI: https://doi.org/10.12944/CRNFSJ.8.2.01

21. Daud MK, Nafees M, Ali S, Rizwan M, Bajwa RA, Shakoor MB, Arshad MU, Chatha SA, Deeba F, Murad W, Malook I. Drinking water quality status and contamination in Pakistan. Biomed Res Int. 2017; 2017:7908183.
DOI: https://doi.org/10.1155/2017/7908183.

22. Waters H, Saadah F, Surbakti S, Heywood P. Weight-for-age malnutrition in Indonesian children, 1992–1999. Int J Epidemiol. 2004; 33(3):589-95.
DOI: https://doi.org/10.1093/ije/dyh074

23. Karunaratne R, Sturgeon JP, Patel R and Prendergast AJ. Predictors of inpatient mortality among children hospitalized for severe acute malnutrition: a systematic review and meta-analysis. Am J Clin Nutr. 2020; 112(4):1069-79.
DOI: https://doi.org/10.1093/ajcn/nqaa182.

24. Bari A, Sultana N, Mehreen S, Sadaqat N, Imran I, Javed R. Patterns of maternal nutritional status based on mid upper arm circumference. Pak J Med Sci. 2020; 36(3):382-86.
DOI: https://doi.org/10.12669/pjms.36.3.1331