Nutritional Status of Under-five Children among Urban Slum Dwellers in Dhaka City, Bangladesh

Tanjina Rahman[1]*, Md. Abdullah Al Mamun[1], Susmita Ghosh[1], Shakil Ahmed[2], M. Akhtaruzzaman[3], Fahmida Karim Munni[4], Sumaiya Chowdhury[5]

[1]Assistant professor, [2]Student, Dept. of Food Technology and Nutrition Science, Noakhali Science and Technology University, Bangladesh, [3]Professor, [4]Student, Institute of Nutrition and Food Science, University of Dhaka, [5]Student, North South University, Bangladesh.

Abstract

Background Childhood malnutrition is a leading public health issues in Bangladesh. Present study focused on current nutritional status among underprivileged children (0 to 59 months), living in selected slum areas of Dhaka city.

Methods Data were collected from 138 under-five children and their mothers in a cross-sectional study using simple random sampling from two slums (Mirbag and Modhubag) of Dhaka city. A structured questionnaire was administered to collect demographic, anthropometric (involving stunting, wasting and underweight) and other information related to nutritional status.

Results Anthropometric data revealed, the prevalence of both stunting and underweight was more in female child, 29% and 41% respectively, whereas the prevalence of wasting was more than 50% in both male and female. Qualitative analysis of mother's food intake revealed that, major portion of diet came from plant source whereas animal sources contributed trivial portion. Tendency to skip meal also reflected poor food intake both in quality and quantity.

Conclusion Findings of this study revealed, nutritional status of under-five children is associated with multiple factors contributes to childhood undernutrition and attempts should be taken to improve the nutritional status of this disadvantageous cohort, living in impoverished areas of an affluent city of Dhaka.

***Key Words**: Caregiver, Food intake pattern, Malnutrition, Under-five children*

Introduction

As malnutrition is not considered as a disease, it remains a hidden health problem and quietly steals the energy, retards growth and development and lowers body resistance to infection. Therefore, the problem of malnutrition is either directly or indirectly related to the mortality and morbidity of children in developing countries and under-5 children are the most vulnerable to be affected by malnutrition[(1)]. Nearly 3 million under-five children die every year due to malnutrition[(2)]. Bangladesh is the ninth most crowded nations on the planet[(3)]. Approximately 1,203 people for every sq. km lives in Bangladesh[(4)] and Dhaka is the capital of Bangladesh, one of the most densely populated urban communities on the planet[(5)]. Practically 28% individuals of Dhaka city are living in the slums under entirely hopeless condition[(6)] and the majority of them are undernourished, unskilled and don't know about the healthy benefit of nourishments[(7)]. Because of poor sanitation and blocked living with 4 to 5 individuals,

Corresponding author:
Dr. Tanjina Rahman
Assistant professor, Dept. of Food Technology and Nutrition science Noakhali Science and Technology University Mailing address: 7/E, West Hazipara, Rampura, Dhaka-1217, Bangladesh.
Mobile phone: +8801816676010
E-mail: trahman26.ftns@nstu.edu.bd

they frequently suffer from diseases like dysentery, diarrhea, typhoid, dengue and pneumonia[8].

Although, Bangladesh has made great progress in the provision of food for its huge number of residents, still the country encounters issues in meeting the need of proper amount of dietary nutrients for each of its individual[9]. Especially, typically innocent, defenseless, vulnerable, and minor children are regularly experiencing lack of healthy nourishment and malnutrition[10]. The nutritional status of these youngsters is an alarming hint of the nation's wellbeing, sustainable nutrition, and economy. Malnutrition or lack of healthy sustenance of under-five children is a major issue in slums of Dhaka[11]. Malnutrition is one sort of circumstance in which long lasting absence of at least one or more nutrient hinders physical turn of events or causes explicit clinical problems, for example low birth weight, stunting, wasting, underweight, vitamin A deficiency, iodine insufficiency problem, iron inadequacy anemia, and so forth[12]. Bangladesh is one of the nations with the most elevated rate of children malnutrition[4] and chronic malnutrition is experienced by up to 40% of children under the age 5 years[13] and the scenario of malnutrition is even worse among the slums children in Dhaka city[14]. Common nutrition deficiency for under five children of slums in Dhaka city are Protein-energy malnutrition, iron deficiency anemia, iodine inadequacy problems, and vitamin A insufficiency[15] and the principle explanations behind that is their helpless social, poor monetary and demographic conditions, including family income, resources, morbidity, work, absolute family expenditure, mother's knowledge, social organizations, cleanliness and sanitation and utilization information[7,8]. One of the ICDDR,B's center for Nutrition and Food Security baseline survey in Bangladesh indicated that under nutrition is high among young children, 41% of children were discovered stunted, 33% underweight and 11% wasting[16] .

Bhattacharyya revealed in "Protein-Energy Malnutrition.." that only 3.5% rural Bangladesh children below 5 years of age were having normal nutritional status according to Gomez classification, 18% suffered from 1st degree, 53% from 2nd degree and 25% from 3rd degree malnutrition[17]. The nutritional survey of rural Bangladesh (1981-82) also revealed that 36% under five children were having normal nutritional status 7% children suffered from acute malnutrition, 44% from chronic malnutrition and 13% suffered from both acute and chronic malnutrition according to Waterlow classification[18]. Ahmed et al. conducted a study on the nutritional situation of Dhaka has discussed the socio-economic situation. The study showed that in the pre-school children, protein energy malnutrition (PEM) appeared to be a serious problem. A high rate of advanced vitamin A deficiency along with severe PEM has been demonstrated. Slum children below five years of age had higher prevalence of acute (11%) and chronic (50%) malnutrition. The study also identified that poverty, lack of knowledge, illness, lack of sufficient services and socio-cultural barriers are the major causes of nutritional problem[19].

Until recently, Bangladesh's development has been mostly driven in the urban areas, which led to a large influx of migrants from the rural to the urban areas. Together with political and economic instability, this influx has forced more people to live below the poverty line, concentrated in the slums. In Bangladesh most of the slum dwellers do not have access to basic amenities such as potable water, electricity, drainage, roads, sanitation, education, health care, recreation, and waste disposal facilities. As a result of this, many urban slum dwellers live in deteriorating conditions that affects human health. The poor nutritional status of slum dwellers creates social and financial burdens to the individual, the family, the community, and the nation. In this alarming situation, it is important to know the insight nature of food intake pattern, lifestyle, and overall nutritional status in the slum community. As children are the national wealth. it will be a vital loss for the nation if we allow them to remain malnourished[20].

The present study was carried out in the urban slums of the Dhaka city among under five children. The objective was to assess the nutritional status of under-five children in urban slum dwellers. A further objective was to identify their dietary habit, immunization status and morbidity pattern and level of knowledge of their caregivers. The study also might be useful as a platform, on which intervention might solve problems to some extent, which may help to take necessary measures to combat malnutrition along with economic and educational development and to identify the factors related to malnutrition, and formulate appropriate

intervention strategy to improve the nutritional status of under-5 children in Bangladesh.

Methods

Study Design, Study Area, Population and Study period

A cross-sectional study including both quantitative and qualitative information were collected. The target population was under five children and their mothers or caregivers from the extreme poor households of Mirbag and Modhubag slums in Dhaka city. Their approximate number was around 300. Four and half months were required from September 15th, 2018 to January 30th, 2019 for data collection. The time preceding and following this period was utilized for data entry and analysis and final presentation of the study.

Sample Size

Simple random sampling technique was used to calculate sample size for this study. The sample size was estimated by considering the prevalence of malnutrition among the children aged below or equal to five years of urban slums. The sample size calculation were measured by using the Cochrane formulae: $n = Z^2PQ/d^2$ $n = Z^2PQ/d^2$[21], where, n is the smallest sample size to be achieved; p is the expected prevalence of malnutrition (wasting) children aged below five years in urban which was 10 % or 0.10[5].; q is the proportion of not being malnourished = 0.90; d is the marginal error = 0.05; Z is a statistic for a confidence level of 95% =1.96. So, n= $[(1.96)^2*0.10*0.90/ (0.05)^2]$ = 138. Based on the sample size determination formula, the required **sample size** of the study was **138** parents or guardians of under-five children.

Data Collection Tool, Inclusion and Exclusion Criteria

A detailed questionnaire of both English and Bengali version, weighing scale (Salter scale), height scale, MUAC (Mid upper arm circumference) tape was used in this study. Extreme poor household's income less than **3000 BDTK** per month (equivalent to **US $50**), household with children aged 0-5 years, mothers/ Guardians who were willing to participate in the study and were able to communicate were considered as inclusion criteria. And children whose mothers/ caregivers were not present at the time of data collection or refused to participate were excluded from the study.

Ethical Considerations

This work was carried out in compliance with the ethical guidelines of the Declaration of Helsinki. Prior to the survey, the respondents' permission was taken, and they remained anonymous. Until continuing to fill up the questionnaire, all the participants were told about the specific objective of this study. Participants were only able to complete the survey once and could terminate the survey whenever they wished. Anonymity and confidentiality of the data were ensured. Formal ethical permission for this research was obtained from the respective authority (Urban Primary Health Care Project or UPHCP local office).

Data Management and Analysis Plan

The data were checked and verified. Specific and appropriate computer based statistical programs such as SPSS version 26 (IBM Corp, NY, USA), and MS Office were used for data analysis. A p-value less than 0.05 was considered statistically significant.

Results

Table 1. showed the demographic characteristics of study subjects, where it was found that, half of the children under study aged between 13 to 24 months or 2 years and only 6% were aged <6 months. Around 27% of the children were aged between 6 months to one year and 17% of them were more than 2 years old but less than 5 years. Data were collected from the mothers or caregivers of these children, whose age was primarily less than 35 years, only 8% of mothers were <22 years old. Almost half (57%) of these mothers were illiterate while the remaining 43% only had primary education. Considering marital status, 11% of these mothers were widower, while 43% were divorcee. Only 37% of respondents were reported to be as housewife only, whereas, 22% of them worked in industry, 12% do small business and 29% worked as day laborer for their living. Only 35% of study cohort reported the child's father as the main earning member in their family, whereas more than half of those family (58%) lived by the earning of child's mother and only 7% reported to have other earning members. When the respondents were asked

about their housing condition, it was found that, majority (71%) used to live in houses made of all tin (tin-shaded house), 18% lived in building and remaining 11% lived in Kancha house (made of bamboo fence). More than half of the respondents (55%) were reported to drink water as it is from water supply and 45% reported to use 'boiling' as water purification method before drinking.

Table 1. Demographics of the respondents

Parameters	n (%)	Parameters	n (%)
Child's Age (months)		Mother's Occupation	
≤6	8 (6)	Housewife	51 (37)
7-12	37 (27)	Industry workers	30 (22)
13-24	69 (50)	Small Business	17 (12)
≥25	24 (17)	Day laborer	40 (29)
Mother's Age (years)		Main income earner in family	
≤22	11 (8)	Father	48 (35)
23-28	51 (37)	Mother	80 (58)
≤35	76 (55)	Son/daughter/other	10 (7)
Mother's Education status		Housing condition	
Illiterate	78 (57)	Kancha (Bamboo fence)	15 (11)
Primary	60 (43)	All tin	98 (71)
Marital Status		Building	25 (18)
Widower	15 (11)	Method of water purification	
Married	63 (46)	Boiling	62 (45)
Divorcee	60 (43)	As it is	76 (55)

Data were collected from mothers of 138 U-5 children living in Mirbag and Modhubag Slums, Dhaka.

Table 2. showed the nutritional status of study subjects where it was found that, there were 51% male and 49% female child and according to their height for age anthropometric measurements (stunting), out of 70 male children, approximately, 66% were mildly malnourished, 26% were moderately malnourished and rest 9% was severely malnourished and out of 68 female children, 56% were mildly malnourished, 29% were moderately malnourished and rest 15% were severely malnourished. According to their weight for age anthropometric measurements (underweight), out of 70 male children, 63% were mildly malnourished, and 37% was severely malnourished and out of 68 female

children, 59% were mildly malnourished and 41% was severely malnourished. According to their weight for height anthropometric measurements (wasting), out of 70 male respondents, 33% were mildly malnourished, 57% were moderately malnourished and rests 10% were severely malnourished and out of 68 female respondents, 37% were mildly malnourished, 56% were moderately malnourished and rests 7% were severely malnourished. The differences were not found to be statistically significant. (P>.05). These anthropometric assessment was based on World Health Organization (WHO) 2006 Child growth standards[22].

Table2: Nutritional Status of Under-five children participated in the study

	Male, n (%)	**Female, n (%)**
Gender	70 (51)	68 (49)
Level of stunting (Height for age)		
Mild	46 (65.7)	38 (55.9)
Moderate	18 (25.7)	20 (29.4)
Severe	6 (8.6)	10 (14.7)
Level of underweight (Weight for age)		
Mild	44 (62.9)	40 (58.8)
Moderate	- -	- -
Severe	26 (37.1)	28 (41.2)
Level of wasting (weight for height)		
Mild	23 (32.9)	25 (36.8)
Moderate	40 (57.1)	38 (55.9)
Severe	7 (10)	5 (7.4)

Data were collected from 138 U-5 children living in Mirbag and Modhubag Slums, Dhaka. Test Statistics $\chi 2=2.346$, df- 2, P=0.310 for stunting, Test Statistics $\chi 2=1.623$, df- 1, P=0.203 for underweight and Test Statistics $\chi 2=2.346$, df- 2, P=0.310 for wasting.

Figure 1. showed that according to types of food taken as a balanced diet, 100% of subjects were taking cereals (rice, wheat etc.) and either leafy or non-leafy vegetables or both and 100% of sample used fats/oils in cooking daily. Besides, around 37% subjects were reported to take egg, 80% took either sweet or sour fruits or both, 40% took either milk or milk products and only 25% of them took meat/fish on a regular basis. While considering their weekly food intake, at least 87% of subjects took egg over a week, 72% took either meat or fish and only 62% took milk or milk products even over a week.

Figure 1: Food Intake Pattern of the respondents on a daily and weekly basis

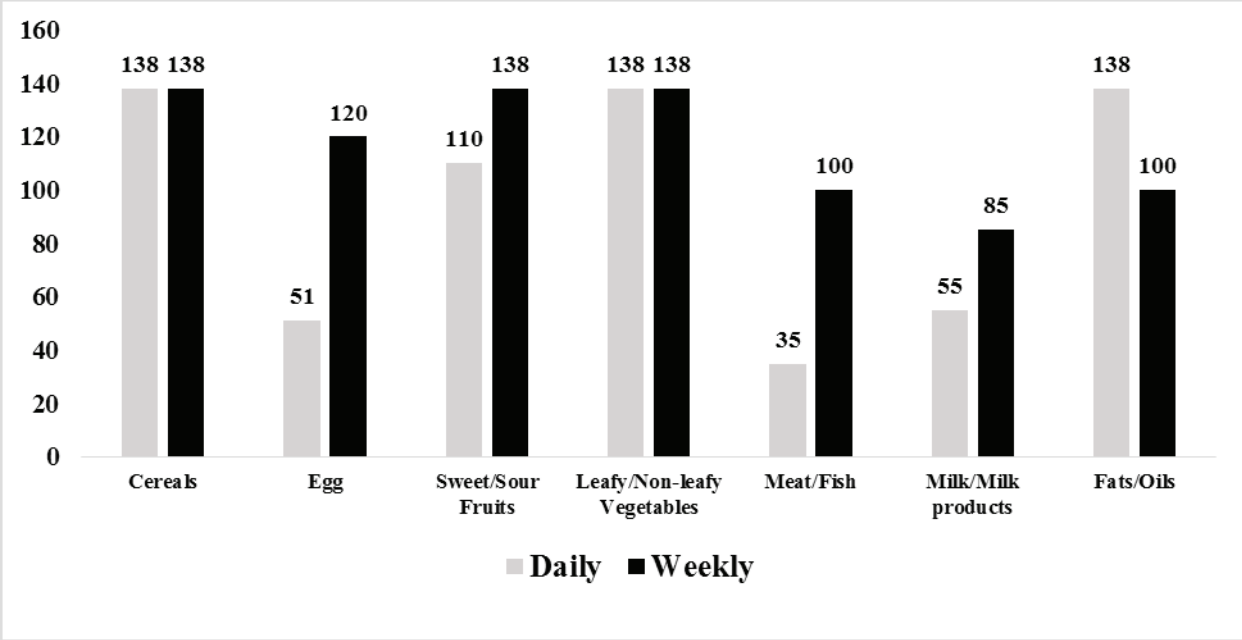

Figure 2 showed the reporting about number of times meal taken by this study cohort where we found that, almost everyone (94%) took breakfast (94%) and dinner (100%), whereas, only 58% subjects took lunch that means almost half of them skipped lunch, however, 36% of them used to take meal in other time of a day.

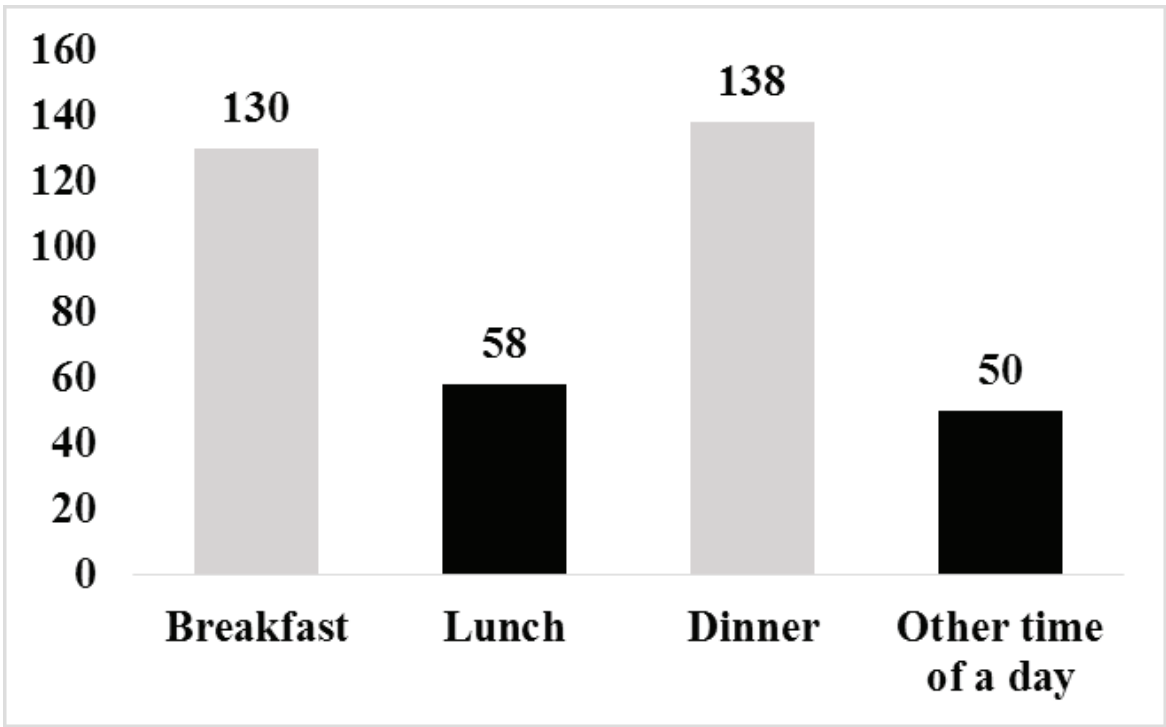

Figure 2: Respondents taking meal at different times of a day

Table 3. showed the dietary habit and level of knowledge of respondents in which according to additional food taken during pregnancy and lactation, about 59% of mothers took additional food during pregnancy and lactation, 41% of them didn't take any additional food. Fifty four percent of mothers did breast feeding to their baby but 46% didn't. Reporting about causes of not breast feeding, 76% of mothers reported

no milk secretion and 24% reported problem in breast. According to duration of breastfeeding in full month, 33% of mother's breast fed their baby for >25 month and 67% breast fed their baby for 19-24 months. According to duration of exclusive breast feeding, 63% of mothers reported to breast fed their baby up to 6 months and 37% only breast fed their baby for less than 6 months. Reporting about use of first ejected breast milk, 67% of mothers reported to give first ejected milk to the baby, and 33% of them reported through away. Around 56% of mother's bottle fed their baby and 43% didn't. Fifty eight percent of mothers gave additional food to their baby after 6 months but 42% of samples didn't do that.

Table 3: Distribution of respondent according to Dietary Habit and Knowledge of caregivers.

Caregiver's responses	**n (%)**	**Caregiver's responses**	n (%)
Additional Food taken during pregnancy and lactation		Duration of only breast feeding	
Yes	81 (58.7)	≤6 months	28 (37.3)
No	57 (41.3)	Up to 6 months	47 (62.7)
Total	138 (100)	Total	75 (100)
Mother Breastfed their baby		Use of first ejected breast milk	
Yes	75 (54.4)	Through away	25 (33.3)
No	63 (45.7)	Given to the baby	50 (66.7)
Total	138 (100)	Total	75 (100)
Causes of not breast feeding		Bottle fed their baby	
Problem in breast	15 (23.8)	Yes	78 (56.5)
No milk secretion	48 (76.2)	No	60 (43.5)
Total	63 (100)	Total	138 (100)
Duration of breast feeding		Any additional food given to their baby	
19-24 months	50 (66.7)	Yes	80 (58.0)
≥25 months	25 (33.3)	No	58 (42.0)
Total	75 (100)	Total	138 (100)

Data were collected from parents of 138 U-5 children living in Mirbag and Modhubag Slums, Dhaka

Figure 3. showed the reporting of mothers about types of additional food given to their baby after six months of age, where, 28% of mothers reported fruit juice, 65% of them reported khichuri, 100% of mothers reported suji, 41% reported smashed potato, 59% of them reported cow's milk, 17% reported rice powder and only 19% of mothers were reported to give cereals to their baby.

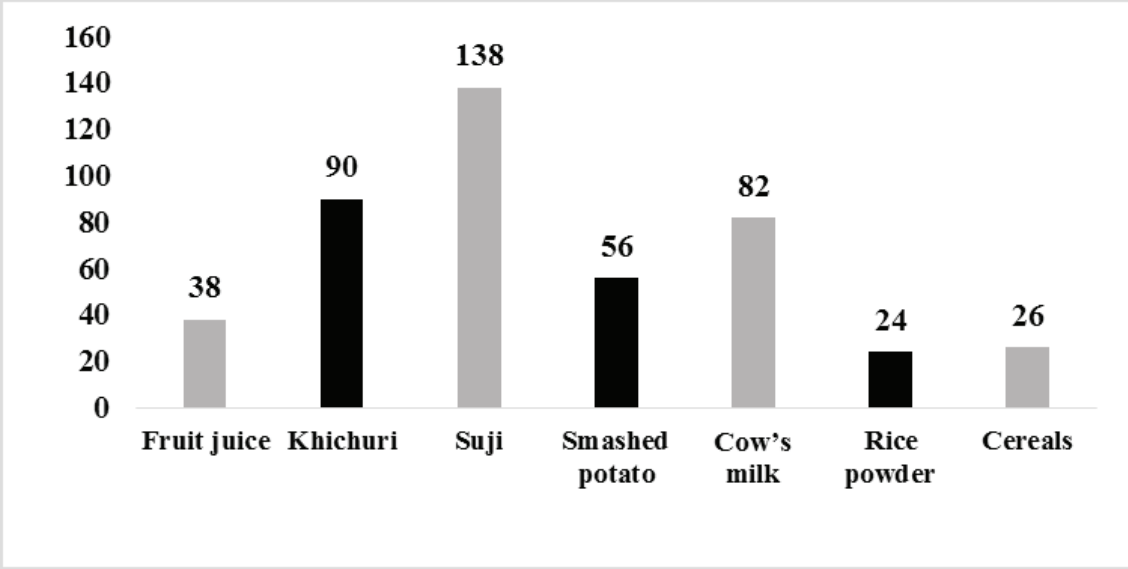

Figure 3. Types of additional food given after 6 months (weaning)

Table 4. showed that according to vaccination status, 100% of children were vaccinated. Reporting about immunization status of the child, 59% reported complete and 41% reported incomplete. According to suffering from any diseases within last 6 months, 62% of subjects were reported to suffer from any disease within last 6 month and 38% weren't suffering from any disease. Reporting about types of diseases, 36% of children suffered from Acute Respiratory Tract Infection (ARI), 43% had diarrhea and measles, 20% had both fever and diarrhea.

Table 4: Distribution of respondent according to Clinical Observation

	n (%)
Vaccination	
Yes	138 (100)
No	-
Immunization status of the child	
Complete	81 (58.7)
Incomplete	57 (41.3)
Suffering from any disease within last 6 months	
Yes	86 (62.3)
No	52 (37.7)
Types of diseases	
Acute Respiratory Tract Infection (ARI)	50 (36.2)
Diarrhea+ measles	60 (43.5)
Fever+ Diarrhea	28 (20.3)
Total	138 (100)

Data were collected from parents of 138 U-5 children living in Mirbag and Modhubag Slums, Dhaka

Discussion

A sensitive indicator of a country's health, economy and sustainable nutrition is the nutritional status of the slum's children. Malnutrition is a serious problem and complex condition that may be influenced by multiple factors such as- household food insecurity, inadequate dietary intake, lack of education, lack of safe drinking water and sanitation and poor medical infrastructure throughout the nation[23]. Under-five children in slums of Dhaka are considered as the most vulnerable group and are at high risk of both morbidity and mortality[11].

In the present study, the prevalence of stunting was 29% in female and 26% in male child, prevalence of underweight, 37% in male and 41% in female, and the prevalence of wasting was found to be more than 50% in both male and female; whereas studies showed that, the prevalence of stunting (height-for-age, weight for age, weight for height z-score<2) is 51%, underweight is 47.4%, and wasting is 20.3% in preschool children of slum area in Bangladesh[22,24]. UNICEF/WHO/World Bank Group revealed Progress against global nutrition targets 2019 that, there is no progress or worsening of under-five wasting, on course in under-five stunting, some progress in low birth weight, and no progress or worsening in exclusive breastfeeding[25]. The present study also reveals that only 54.4% mother breast feed their baby and only 62.7% mothers exclusively breast feed their baby. The main reason for not to breast feed their children is no milk secretion of mothers (76.2%). Protein is considered as the building blocks of body but from their dietary record, consumption of protein source was very low, whereas majority of the respondents (100%) were reported to take cereals, especially rice and either leafy or non-leafy vegetables regularly from all food groups that clearly shows that their dietary energy demand was fulfilled by cereals and it is also correlated with another study done in southern part of Bangladesh that also evaluate dietary intake pattern of under-five children and lactating mothers[9].

Food habit pattern and dietary knowledge among the respondents were observed and compared with the formerly recorded data to see whether those are consistent with the present data. To assess dietary habit and knowledge of mothers, the percentage reported in the present study differs a little from other studies[26,27]. To assess immunization status and morbidity pattern among respondents, the percentage reported in the present study were not consistent with the previous study conducted by others.[28,29].

This present study was a community-based cross-sectional study encompassing two small slums (Mirbag and Modhubag) of Dhaka city and is observational in nature. Therefore, the results from this study may not show a complete diversification of findings which might be present in the entire city. No dietary analysis was done for study subjects in terms of the quantitative analyses of macro or micronutrients and the questionnaire was used to grasp only a snapshot of the dietary intake pattern of the respondents which is somewhat qualitative in nature. Due to constraints of time and resources, as well as limited sample size, results might not truly represent that of the wider city. Several variables were highly sensitive for which an accurate picture could not be obtained.

Conclusion

Based on the findings of this study, it was revealed that, both under-five children and their mothers' diet predominantly consist of foods from plant origin that also indicates their poor quality of dietary protein intake from plant sources. This might be a reason for their poor growth and development as well. Some recommendations can be put forward, such as health educational programs for the parents should be organized to increase their level of knowledge to reduce the prevalence of malnutrition throughout impoverished urban areas in Bangladesh. Nutritional supplementation and child health programs, which are currently focused on impoverished rural areas, should not exclude informal settlements in urban areas. An integrated approach should be taken to help ensuring dietary diversity as well as food security among urban slum dwellers in Dhaka city. Similarly, Exclusive breastfeeding practice campaign could also be arranged in this part of the country.

Acknowledgments: Marium Sultana, Farhana Akter, Nasrin Sultana, Md. Sajjadul Hoque, MS students of the department of Food Technology and Nutrition Science, Noakhali Science and Technology University.

Conflict of Interests : The authors declare that they have no competing interests.

Sources of financial support : This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

References

1. Mclaren D, Read WCJTL. Classification of nutritional status in early childhood. 1972;300(7769):146-8.
2. Black RE, Victora CG, Walker SP, Bhutta ZA, Christian P, De Onis M, et al. Maternal and child undernutrition and overweight in low-income and middle-income countries. The lancet. 2013;382(9890):427-51.
3. UU EJTWFCC. Central Intelligence Agency. 2014.
4. Herforth A, Jones A, Pinstrup-Andersen P. Prioritizing nutrition in agriculture and rural development: guiding principles for operational investments. 2012.
5. Organization WH. Climate change and health country profile 2015: Bangladesh. 2015.
6. Holden M, Roseland M, Ferguson K, Perl AJHI. Seeking urban sustainability on the world stage. 2008;32(3):305-17.
7. Pryer JA, Rogers S, Normand C, Rahman AJPhn. Livelihoods, nutrition and health in Dhaka slums. 2002;5(5):613-8.
8. Rahman M, Alam SJBJNFS. Nutritional status of children in slums of Dhaka. 2015;5(6):1.
9. Rahim ATM, Bhattachaijee L, Shaheen N. Dietary intake pattern of lactating mother and under five children in selected districts of southern Bangladesh.
10. Haque M, Bhuiyan M, Naser M, Arafat Y, Suman KJJNHFE. Nutritional status of women dwelling in urban slum area. 2014;1(3):1-14.
11. Arifeen SE, Black RE, Caulfield LE, Antelman G, Baqui AH, Nahar Q, et al. Infant growth patterns in the slums of Dhaka in relation to birth weight, intrauterine growth retardation, and prematurity. 2000;72(4):1010-7.
12. Blossner M, De Onis M, Prüss-Üstün A. Malnutrition: quantifying the health impact at national and local levels: World Health Organization; 2005.
13. UNICEF UJNY. Improving child nutrition: the achievable imperative for global progress. 2013:1-14.
14. Faruque ASG, Ahmed AS, Ahmed T, Islam MM, Hossain MI, Roy S, et al. Nutrition: basis for healthy children and mothers in Bangladesh. 2008;26(3):325.
15. Kim R, Mejia-Guevara I, Corsi DJ, Aguayo VM, Subramanian SJSS, Medicine. Relative importance of 13 correlates of child stunting in South Asia: Insights from nationally representative data from Afghanistan, Bangladesh, India, Nepal, and Pakistan. 2017;187:144-54.
16. Ahmed T, Mahfuz M, Ireen S, Ahmed AS, Rahman S, Islam MM, et al. Nutrition of children and women in Bangladesh: trends and directions for the future. 2012;30(1):1.
17. Bhattacharyya AJWron, dietetics. Protein-energy malnutrition (Kwashiorkor-Marasmus syndrome): terminology, classification and evolution. 1986.
18. Hels O, Hassan N, Tetens I, Thilsted SHJEjocn. Food consumption, energy and nutrient intake and nutritional status in rural Bangladesh: changes from 1981–1982 to 1995–96. 2003;57(4):586-94.
19. Ahmed FJTSAjotm, health p. Nutritional situation of Dhaka. 1992;23:59.
20. Kotloff KL, Blackwelder WC, Nasrin D, Nataro JP, Farag TH, van Eijk A, et al. The Global Enteric Multicenter Study (GEMS) of diarrheal disease in infants and young children in developing countries: epidemiologic and clinical methods of the case/control study. 2012;55(suppl_4):S232-S45.
21. William GC. Sampling techniques. Canada: John Willey & Sons Inc. 1977.
22. Turck D, Michaelsen KF, Shamir R, Braegger C, Campoy C, Colomb V, et al. World health organization 2006 child growth standards and 2007 growth reference charts: a discussion paper by the committee on nutrition of the European society for pediatric gastroenterology, hepatology, and nutrition. Journal of pediatric gastroenterology and nutrition. 2013;57(2):258-64.
23. Haseen F. Malnutrition among Bangladeshi women in ultra poor households: prevalence and determinants. Retrieved September. 2005;20:2006.
24. UNICEF B. National micronutrients status survey. Institute of Public Health and Nutrition Accessed August. 2013;16:2018.
25. Mishu AA, Chowdhury S, Bipasha MS, Raisa TS, Zayed NM. MATERNAL NUTRITIONAL STATUS AS DETERMINANTS OF CHILD

MALNUTRITION UNDER AGE 5 IN BANGLADESH: A MULTIVARIATE APPROACH. International Journal of Management (IJM). 2020;11(8).

26. Haque M, Islam K. Socio-economic condition, dietary pattern and nutritional status of pre-school ethnic children in Bandarban district of Bangladesh. J Nutr Health Food Eng. 2018;8(6):395-402.
27. NIPORT M. and ICF: Bangladesh demographic and health survey 2014. Technical report, National Institute of Population Research and Training …; 2016.
28. Mohsena M, Goto R, Mascie-Taylor CN. Regional variation in maternal and childhood undernutrition in Bangladesh: evidence from demographic and health surveys. WHO South-East Asia journal of public health. 2015;4(2):139-49.
29. Akhtaruzzaman M, Nazrul Islam Khan M, Aktar F, Islam SN. Nutrition, health and demographic survey of Bangladesh-2011. Institute of Nutrition and Food Science, University of Dhaka; 2013.