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Research Article

Determinants of Malnutrition of the Rohingya Refugee Children Living in Cox's Bazar, Bangladesh

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ABSTRACT

Malnutrition is a severe problem of the Rohingya children in Bangladesh. A cross-sectional study was conducted to assess the driving factors of malnutrition of the children (N=500) of Myanmar Refugee living in Ukhia, Cox's Bazar, Bangladesh. The children were measured for height, weight, MUAC (Mid Upper Arm Circumference) and Z-score while their parents were interviewed for the socio-demographic, dietary, sanitation and health information. Results indicated that, the difference between the age of father and mother in Rohingya people was substantially high. The gradually increasing trends of the age of father and mother were significantly associated with the similar propensity of the MUAC of the children. As the status of nutrition improved from SAM (Severe Acute Malnutrition) to Normal, there was a subsequent fall off for the parity score of mother exhibiting overall best parity at 4.9. Similarly, chronological drop off in the family size evolved surprisingly better nutritional status of the children measured in terms of MUAC. Similar to the age of the parents, progression in the expanding trends of the age, height and weight of the children, gradually ruled out their susceptibility towards malnutrition. Better educational qualification of the parents, vividly precipitated improved MUAC in the children. There was a strong and positive significant relationship between father and mother age ($r=0.81$; $P<0.05$), parity and mother age ($r=0.77$; $P<0.05$), parity and family size ($r=0.89$; $P<0.05$) and child age and height ($r=0.84$; $P<0.05$). The Rohingya children who used to put on clean dress, bath regularly, cut nail properly, have footwear and toothbrush exhibited markedly better ($P<0.001$) MUAC compared to those children who did not have those practices. Similarly,

children having practices of hand wash prior to eat, habit of not eating from the floor and use of drinking water from the tube well had improved MUAC compared to those who ignored them. Use of sanitary latrine compared to throwing feces in the hole or letting it open was tightly pertinent to better MUAC. Frequency of 7-8 times breastfeeding a day deliberately pushed forward elevated MUAC. In all respects, normal children pursued the highest MUAC compared to MAM (Moderate Acute Malnutrition)or SAM. Therefore, better hygiene, sanitation, immunization, nutrition and health practices are recommended to boost up the nutrition status of the refugee Rohingya children.

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1. INTRODUCTION

The nutritional status of the children is a reflection of their overall health (Bidlack, 1996). Malnutrition refers to getting too little or too much of certain nutrients which can lead to serious health issues including stunted growth (De Lucia Rolfe et al., 2018), eye problem (Motbainor et al., 2015), diabetesand heart disease (Osmond and Barker, 2000). Malnutrition is marked by a deficiency of energy, essential proteins, fats, vitamins and minerals in a diet (Kemmer et al., 2003; Luxemburger et al., 2003; Abudayya et al., 2007). Over 10 million children aged less than five years die annually from preventable and treatable illnesses and almost all of these deaths occur in poor countries (WHO, 2003). Currently, 195 million under-5 years of age children are affected by malnutrition and 90% of them live in sub-Saharan Africa and South Asia. Out of 195 million, at least 20 million children suffer from severe acute malnutrition and 175 million are undernourished (CSA and ORC, 2006).

The issues of forced migration and refugee are of global concern (Ullah, 2011). This refugee crisis is becoming more and more crucial in context of Bangladesh owing to the frequent and intensified conflicts in the neighboring country Myanmar. Due to recent outbreaks of military massacres in the Rakhine state of Myanmar, thousands of Rohingyas are pouring into Bangladesh every day (Ahmed, 2010; MSF, 2010). The Rohingya people are a stateless Indo-Aryan ethnic group who reside in Rakhine State, Myanmar and now considered as refugee in Bangladesh. Refugees, most of the times are forced to flee leaving a major portion of their assets behind. Even if they find asylum in other countries, a lack of work permit and limited options in the labor market in the host community shrink the chances of achieving their financial stability and education except for minimum access to religious/informal schools organized by UNHCR and other non-governmental agencies (UNHCR, 2007). As a result, the refugees lack access to markets and are unable to afford nutritious foods which make them vulnerable to food insecurity and malnutrition (WFP, 2013).

No systematic research has so far been conducted on the health behavior and nutritional status among the refugee

Rohingya people in Cox's Bazar district as this is a recent issue. The current study, therefore, aims to increase the understanding of the main causes of malnutrition and the ways to improve the health and nutritional status of the under-5 children of the forcibly displaced Rohingya people from Myanmar to Bangladesh.

2. MATERIALS AND METHODS

Study area

The study was conducted in the Ukhiya Upazila of Cox's Bazar district. The Jamtoli camp (Latitude 21°09′22″ N and Longitude 92°08′22″ E) located in the south-eastern part of the Ukhia Upazila was selected for the study. During the study period, the average ambient temperature of the study area was 32.5°C, humidity 78.0%, precipitation 0.0% and wind speed was 13 km/h.

Study design

A cross-sectional survey was conducted in 500 Rohingya households. All the children up to 59 months of the Myanmar Rohingya refugee in Ukhia, Cox's Bazar were considered as reference population and the children up to 59 months of the Myanmar Rohingya refugee in the Jamtoli camp was considered as source population. A sample frame of 4000 households was constructed on the source population-based on following criteria: the household must be Rohingya, father and mother present in the family having at least one child up to 5 years, family size is within 3 to 20 and the family is interested to participate the interview.

Sample size

The sample size for the study was determined by using the following formula (Kadam and Bhalerao, 2010):

$$n = \left(\frac{z}{m}\right)^2 \times p(1-p)$$

Where,
n= required sample size; z= confidence interval 95% = 1.96
p= prevalence of malnutrition among Rohingya children= 11%
m= margin of error at 2.75%

Therefore,

$$n= \left(\frac{1.96}{0.0275}\right)^2 \times 0.110(1-0.110) \approx 496$$

The sample size was further increased by 1% to account for contingencies such as non-response or recording error. Thus, the total sample size was 500 (N + 1% = 496 + (496×0.01) = 500).

Data collection

A structured questionnaire containing both open and close-ended questions related to the anthropometry, socio-economic, demographic, hygiene, sanitation, nutrition, health and behavioral practices of the households in the Rohingya camp were constructed. The households to be interviewed were identified by walking door to door from the entrance to the end of the camp until the target sample size was reached. Ethical guidelines of the Declaration of Helsinki IV (WHO, 2001) were followed for the study. The questionnaire was pretested in zones outside the sampling area and re-examined on the premise in a face to face interview (Tinson et al., 2008). After the pilot test, the questionnaire was validated. The data

set was checked for blank, double-entry, wrong entry, scrutinized and entered into MS Excel to transform data from categorical to the numerical codes.

Figure 1. Study population (Rohingya children)

Calculation of MUAC

MUAC (Mid Upper Arm Circumference) is the circumference of the left upper arm which is measured at the mid-point between the tip of the shoulder and elbow. Procedure to measure MUAC is as follows: (a) bend the left arm, find and mark with a pen in the olecranon process and acromion (b) mark the mid-point between these two marks (c) with the arm hanging straight down, wrap a MUAC tape around the arm at the midpoint mark (d) measure to the nearest 1 mm (WHO, 2006).

Calculation of Z-score

There are three ways of measuring Z-score such as height-for-age, weight-for-age and weight-for-height. In this study, we used weight-for-height Z-score. At first, child weight was measured (kg) with seca weight scale and then child height was measured in cm by height board. After collecting height and weight, Z-score was calculated by WHO Child Growth Standard (WHO, 2006).

Measurement of body weight

A seca scale was used to determine the bodyweight of the study respondents. The scale was placed on an even floor to reduce bias. Children were weighed with light underclothes without shoes. Children stood upright in the middle of the scale, facing the field worker and looking straight ahead. They stood with feet flat and slightly apart until the measurement

was recorded on the questionnaire. If the child could not stand up, then at first mother stood on the weight scale and weight was recorded indirectly with mother. The weight measurements were taken before breakfast to avoid diurnal variations.

Measurement of height

A standard wooden height board was used to measure the height of the children. Height was measured with the child facing the fieldworker, shoulders relaxed, buttocks and heels touching the board. The child's arms were relaxed at the sides, legs straight and knees together and head in the plane board. Each child's height was taken barefooted. Direct reading of height was recorded to the nearest five millimeters (0.5 cm) and then repeated and the average of the two measurements was recorded. If height was less than 87 cm, then it was taken as length and if 87 cm or above then it was taken as height (WHO, 2006).

Measurement of nutrition status

Nutrition status was measured by both MUAC and Z-scores (WHO, 2006). In this report, child nutrition status indicated as severe acute malnutrition (SAM), moderate acute malnutrition (MAM) and as well as normal when they met requirements of MUAC and Z-score range (WHO, 2006).

Statistical evaluation

Both qualitative and quantitative data were analyzed for descriptive statistics, i.e., mean, median, minimum, maximum and standard error. Bartlett's test and Cook and Weisberg test for equality of variance and homoscedasticity confirmed that, the distribution of MUAC was non-Gaussian and heteroskedastic. Additionally, associations among response and most of the explanatory variables were non-linear (confirmed by augmented components plus residual plots and locally weighted scatter plot smoothing). Therefore, the assumptions of ANOVA and multivariate were ruled out and the following flexible generalized linear model was constructed:

$$Y_{ij} = \mu + T_i + \varepsilon_{ij}$$

Where:

Y_{ij}: The dependent variable (MUAC)
μ: The overall mean
T_i: The effects of factors (i=1, 2)
ε_{ij}: The random residual error

The sample size per arm was >30 and the main explanatory variables were dichotomous. As a result the 'Z'-test was used to differentiate the influences of hygiene, sanitation, nutrition, immunization and health factors on MUAC. Finally, the interrelationship among the principal driving factors of malnutrition was determined by using multiple correlation coefficient matrix in STATA (Stata/SE 14.1, Stata Statistical Software, Stata Corporation, College Station, TX, USA). The significance of all tests was set at 5% level.

3. RESULTS

Descriptive statistics

The age difference between father and mother in Rohingya people was substantially high (Mean 39.9 vs. 28.3, 36.7 vs. 26.9, 36.7 vs. 25.4 year in SAM, MAM and Normal groups, respectively). Age of father and mother was significantly

associated with the increasing trends of the MUAC for the children and the vice versa (Table 1). As the status of nutrition improved from SAM to Normal, there was a subsequent fall off in parity score of mother exhibiting overall best parity at 4.9. Similarly, chronological drop off in the family size evolved surprisingly better nutritional status of the children measured in terms of MUAC. Progression in the up-scaling trends of the age, height and weight of the children, gradually ruled out their susceptibility towards malnutrition. Higher educational qualification of father (Figure 2) and mother (Figure 3) of the Rohingya people precipitated apparently improved MUAC in the children. Overall, normal children pursued the highest MUAC followed by MAM and SAM (Figure 9).

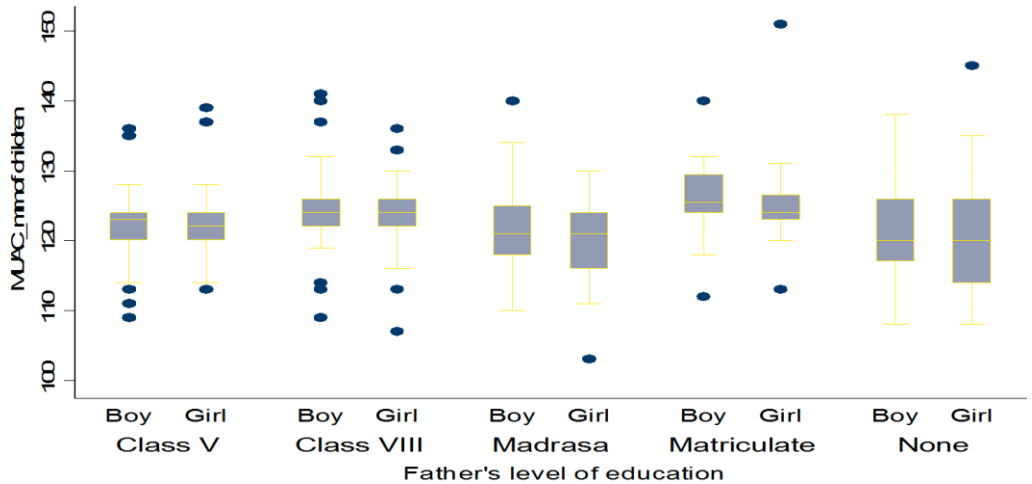

Figure 2. Distribution of MUAC according to the father's level of education and sex of the Rohingya children (N=500)

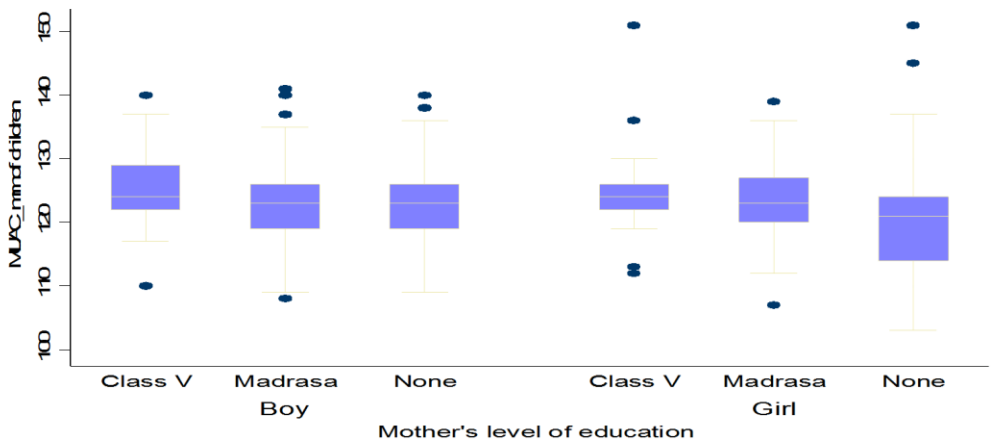

Figure 3. Distribution of MUAC according to the mother's level of education and sex of the Rohingya children (N=500)

Table 1. Descriptive statistics of different variables

Variables	Estimate	Nutritional status			
		SAM[1]	MAM[2]	Normal	Overall
Father age	Mean	39.9	36.7	36.7	37.3
	Median	40.0	37.0	37.0	37.0
	Min	24.0	20.0	25.0	20.0
	Max	59.0	58.0	57.0	59.0
	SE[3]	0.9	0.5	0.7	0.4
Mother age	Mean	28.3	26.9	25.4	26.9
	Median	28.0	26.0	26.0	27.0
	Min	18.0	17.0	19.0	17.0
	Max	41.0	40.0	34.0	41.0
	SE	0.5	0.3	0.4	0.2
Mother parity	Mean	5.5	5.1	3.7	4.9
	Median	5.0	5.0	4.0	5.0
	Min	2.0	1.0	1.0	1.0
	Max	13.0	13.0	7.0	13.0
	SE	0.24	0.13	0.14	0.10
Family size	Mean	8.1	8.2	6.6	7.9
	Median	8.0	8.0	7.0	8.0
	Min	5.0	3.0	5.0	3.0
	Max	15.0	16.0	10.0	16.0
	SE	0.2	0.1	0.1	0.1
Child age	Mean	14.0	18.1	22.0	18.1
	Median	12.0	18.0	18.0	16.5
	Min	6.0	6.0	6.0	6.0
	Max	42.0	59.0	49.0	59.0
	SE	0.8	0.5	1.2	0.5
Child height	Mean	70.5	74.7	76.7	37.3
	Median	69.1	73.9	75.1	37.0
	Min	58.0	57.8	60.4	20.0
	Max	96.3	108.3	104.5	59.0
	SE	0.8	0.5	1.0	0.4
Child weight	Mean	6.7	7.8	9.3	7.9
	Median	6.5	7.6	8.2	7.5
	Min	3.9	5.0	5.9	3.9
	Max	12.1	14.4	84.0	84.0
	SE	0.1	0.1	0.8	0.2
MUAC[4]	Mean	113.8	122.9	130.1	122.5
	Median	113.0	123.0	128.0	123.0
	Min	103.0	115.0	125.0	103.0
	Max	123.0	135.0	151.0	151.0
	SE	0.3	0.2	0.5	0.3

[1]Severe Acute Malnutrition; [2]Moderate Acute Malnutrition
[3]Standard Error; [4]Mid-Upper Arm Circumference

Anthropometric factors influencing MUAC

The progressive trends of the age of the children significantly (P<0.05) converged MUAC stepping forward SAM to Normal groups followed by MAM (Table 2). Similar to age, height and weight of the children exhibited indicative changes (P<0.05) in their MUAC. Overall, the

MUAC went of plateau hitting the apex while parity as well as family size ranged from 3.7 to 5.5 and 6.6 to 8.1 (Figure 4 and 5).

Table 2. Influencing factors of MUAC[1] score according to the nutritional status of the Rohingya children (N=500)

Variables	Nutritional status			SE[4]	P-value
	SAM[2]	MAM[3]	NORMAL		
Father age	39.9	36.7	36.7	0.36	0.374
Mother age	28.3	26.9	25.4	0.20	0.198
Mother parity	5.5	5.1	3.7	0.10	0.634
Family size	8.1	8.2	6.6	0.09	0.068
Child age	14.0	18.1	21.1	0.45	0.002
Child height	70.5	74.7	76.7	0.39	0.002
Child weight	6.7	8.2	6.6	0.17	0.036

[1]Mid-Upper Arm Circumference; [2]Severe Acute Malnutrition; [3]Moderate Acute Malnutrition; [4]Standard Error

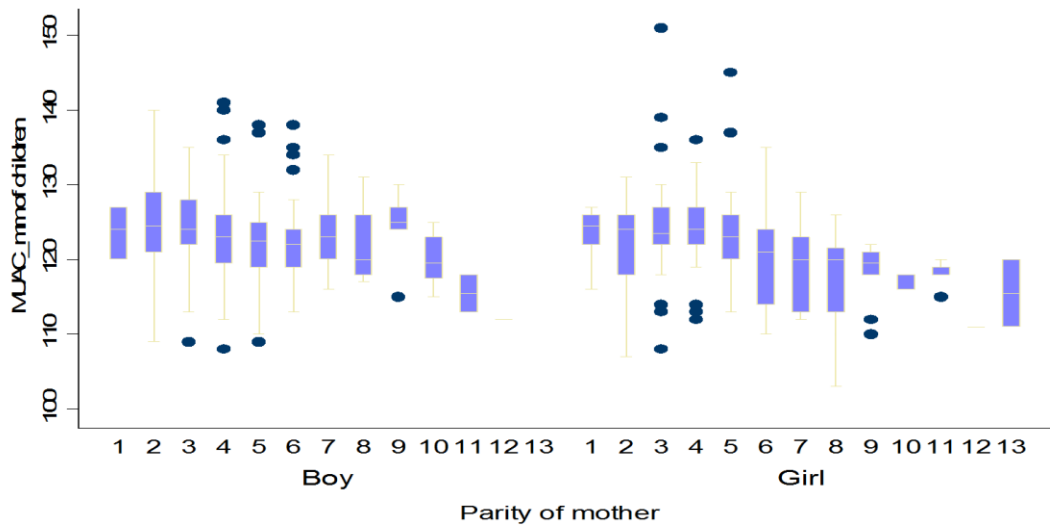

Figure 4. Distribution of MUAC according to parity and sex of the Rohingya children (N=500)

Hygiene, sanitation, nutrition and health factors affecting MUAC

Hygiene, sanitation, nutrition, immunization and health factors exhibited substantial impacts (P<0.001) on MUAC in the study population. It was evident that, children who used to put on clean dress, bath regularly, cut nail properly, have footwear and toothbrush had markedly better (P<0.001) MUAC compared to those children who did not have practices (Table 3; Figure 6). Similarly, children having practices of hand wash before eating, habit of not eating from the floor and use of drinking water from secured sources, i.e., tube well

had improved MUAC compared to those who ignored them (Figure 7). Use of sanitary latrine compared to throwing feces in the hole or letting it open was tightly in accordance with good MUAC (Figure 8). Better nutritional status (Figure 9) and frequency of 7-8 times breastfeeding a day deliberately pushed forward elevated MUAC (Figure 10). Overall, better nutrition, immunization and health practices (Figure 11) boosted up higher (P<0.001) MUAC in Rohingya children.

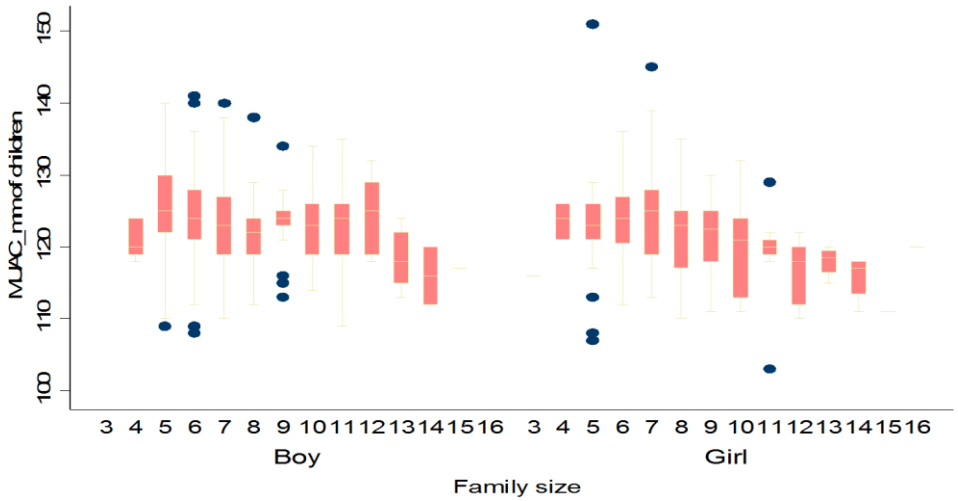

Figure 5. Distribution of MUAC according to family size and sex of the Rohingya children (N=500)

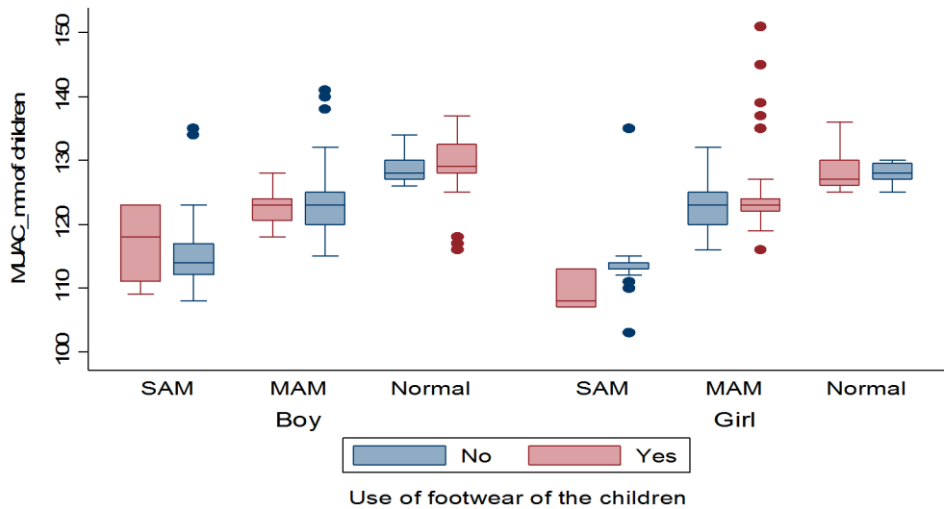

Figure 6. Distribution of MUAC according to use of footwear and sex of the Rohingya children(N=500)

Table 3. Hygiene, sanitation, nutrition, immunization and health factors affecting MUAC in the under-5 Rohingya children

Variables	MUAC (Mean ± SE)		P-value
	Yes	No	
Hygiene factors			
Clean Dress up	123.5±0.05	115.5±0.12	<0.001
Baby Bath Regularly	126.3±0.07	120.2±0.06	<0.001
Nail Cutting Regularly	124.0±0.05	118.4±0.08	<0.001
Use of Footwear	125.6±0.08	121.1±0.05	<0.001
Use of Tooth Brush	124.0±0.07	121.3±0.06	<0.001
Sanitation factors			
Hand Washing Prior to Eat	128.6±0.10	120.8±0.05	<0.001
Eat from Floor	120.9±0.05	126.3±0.08	<0.001
Source of Water	119.0±0.10	123.4±0.05	<0.001
Nutrition factors			
Knowledge about Balanced Diet	125.6±0.08	121.4±0.05	<0.001
Breastfeeding	121.9±0.06	120.8±0.08	<0.001
Complementary Feeding	122.9±0.05	117.4±0.16	<0.001
Knowledge of IYCF	124.0±0.05	118.8±0.08	<0.001
Immunization factors			
BCG dose	123.4±0.05	117.0±0.12	<0.001
Health factors			
Skin diseases	119.9±0.10	123.2±0.05	<0.001
Cold and fever	120.2±0.07	123.8±0.06	<0.001
Diarrhea	116.5±0.10	123.9±0.05	<0.001

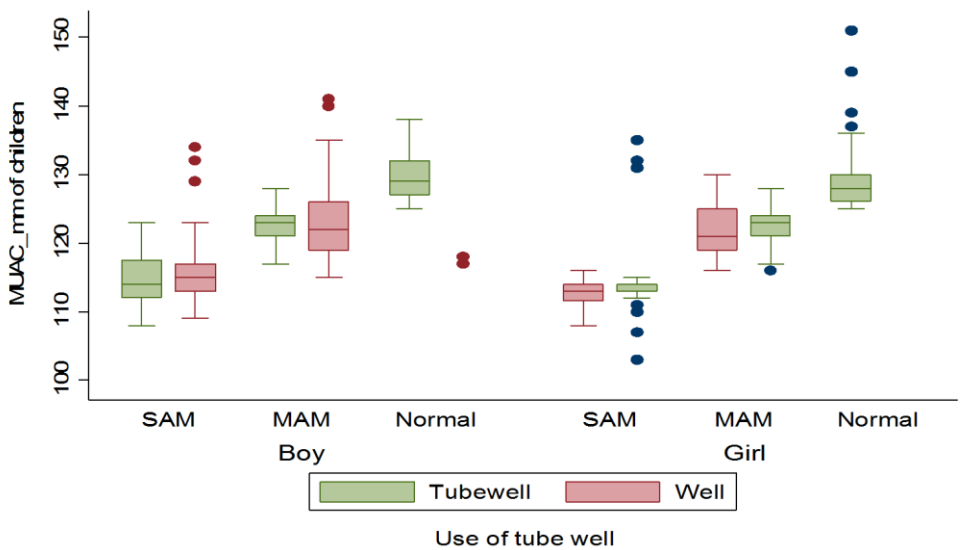

Figure 7. Distribution of MUAC according to use of tube well and sex of the Rohingya children

(N=500)

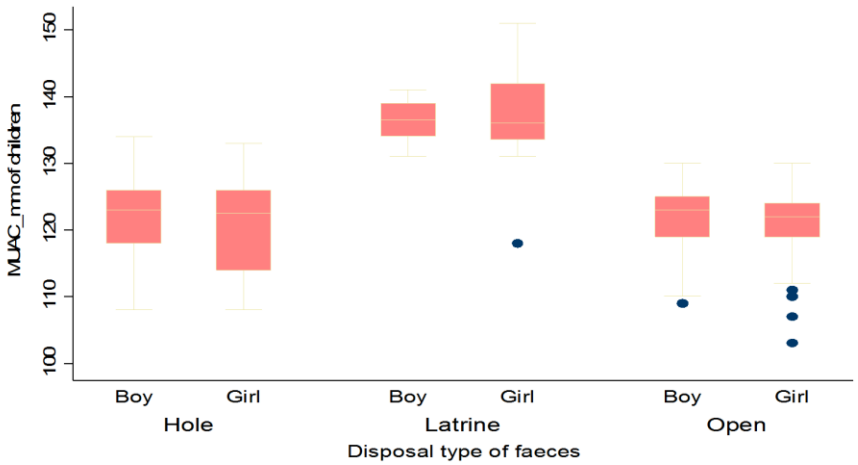

Figure 8. Distribution of MUAC according to disposal type of feces and sex of the Rohingya children (N=500)

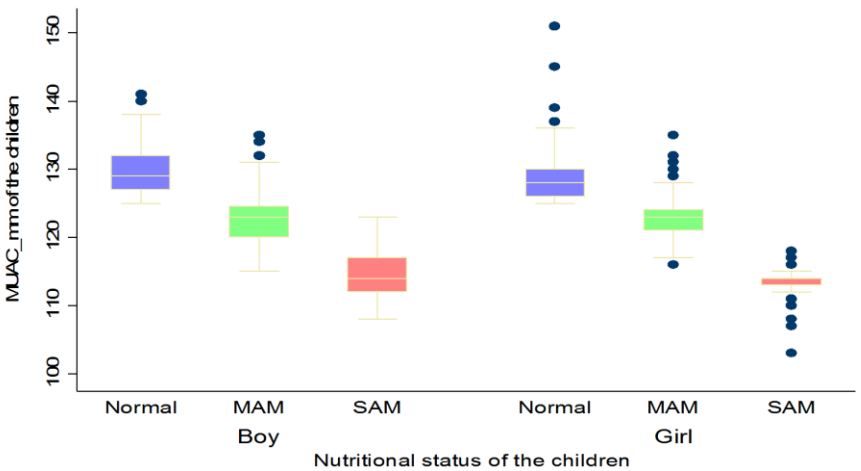

Figure 9. Distribution of MUAC according to nutritional status and sex of the Rohingya children (N=500)

Association of the factors affecting MUAC

A multiple correlation coefficient matrix was constructed to determine the relationship between indicators of nutritional status, anthropometric measurements, child age, father and mother age, mother parity and family size (Table 4). There was a strong, positive, significant relationship between father and mother age ($r=0.81$; $P<0.05$), parity and mother age ($r=0.77$; $P<0.05$), parity and family size ($r=0.89$; $P<0.05$) and child age and height ($r=0.84$; $P<0.05$). On the other

hand, there was a negative, significant relationship between Z-score and family size (r=-0.38; P<0.05), Z-score and parity (r=-0.32; P<0.05) and MUAC and parity (r=-0.24; P<0.05).

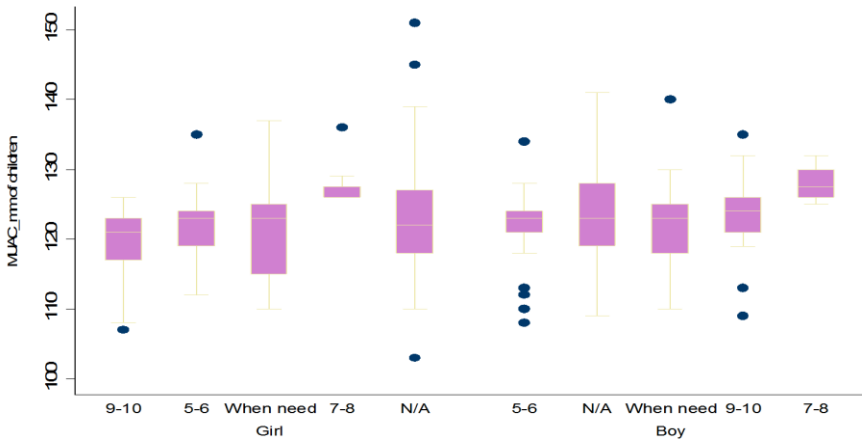

Figure 10. Distribution of MUAC according to the frequency of breastfeeding and sex of the Rohingya children (N=500)

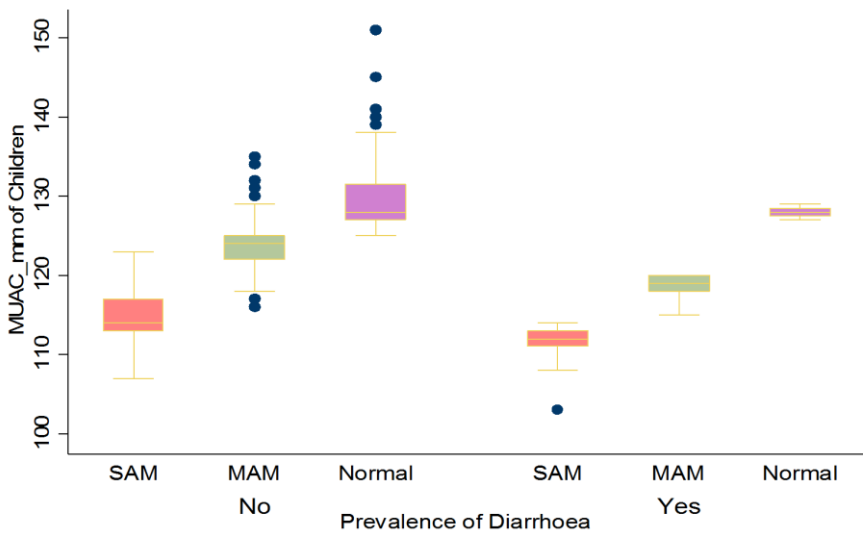

Figure 11. Distribution of MUAC according to prevalence of diarrhea and sex of the Rohingya children (N=500)

4. DISCUSSION

Anthropometric factors

Studies conducted over the last few years in the world indicated that, multiple anthropometric factors can affect child

nutrition. Mother's level of education (Demissie and Worku, 2013), low household wealth index (Souza *et al*., 2012), inadequate purchase power and access issues (Jesmin et al., 2011), low health literacy (Shibulal, 2012) and misconceptions (Asgary et al., 2015) affect child nutrition. In the makeshift camps of Ukhia, most of the living women are less educated and their knowledge of nutrition is very poor which is associated with malnutrition of their children.

Poor growth rate of children was associated with insufficient household income (UNHCR, 2013; Dawson-Hahn et al., 2016), low education level of caregivers (Teng and Zaliah, 2011; UNHCR, 2013), big household size, large number of children (UNHCR, 2013), parity and age of the children (Engebretsen et al., 2008). The parents with a low level of education cannot ensure proper care of their children which leads them to the malnutrition (Teng and Zaliah, 2011; UNHCR, 2013).

Table 4. Correlation coefficient matrix (N=500) of the factors affecting MUAC and Z-score in the under-5 years of age of Rohingya children

Variables	FA	MA	MP	FS	CA	CW	CH	ZS	MS
Father age (FA)	1								
Mother age (MA)	0.81*	1							
Mother parity (MP)	0.61*	0.77*	1						
Family size (FS)	0.46*	0.64*	0.89*	1					
Child age (CA)	0.10*	0.12*	-0.04	0.06	1				
Child weight (CW)	-0.01	-0.02	-0.09	-0.04	0.38*	1			
Child height (CH)	0.03	0.05	-0.06	0.04	0.84*	0.42*	1		
Z-Score (ZS)	-0.14*	-0.21*	-0.32*	-0.38*	0.02	0.11*	-0.07	1	
MUAC (MS)	-0.16*	-0.18*	-0.24*	-0.19*	0.42*	0.28*	0.43*	0.03*	1

Literacy of mother, in particular, mother's level of education played a highly important role in their own and children's health. Many studies considered the role of mothers' education level on children's nutrition as an effective factor in reducing malnutrition (Ansari et al., 2009; Ramazanpour et al., 2013). A literate mother can effectively utilize scarce resources in adequate for the welfare of the children than an illiterate mother with higher resources does (Yarparvar, 2006). Thus, the effect of women's education on the nutritional status of their children is exerted through their roles as providers of household health and nutrition (Yarparvar, 2006).

Our study demonstrated that, parity of mother and family size had a leading effect on child nutrition. If one mother has lots of children, then the nutrition status of them fall day by day because the mother cannot take care of her children properly (Demissie and Worku, 2013). Large family size induces food insecurity, inadequate care, lack of hygiene and sanitation as well as insubstantial health services resulting malnutrition (Shibulal, 2012). It was reported that, family size and mother parity adversely affect child MUAC (Fotso and Kuate, 2005). In addition, age of father and mother highly influenced child nutrition, when mother

age increased and father age decreased, then child status was good (Shibulal, 2012).

In contemporary African communities, dietary diversity score was consistently and positively associated with various nutritional indicators (height-for-age, weight-for-age, weight-for-height, mid-upper arm circumference and triceps skinfold) of children aged 12-36 months (Black et al., 2008). Another study reported that, in children aged 6-23 months, the anthropometric measurement was significantly correlated with children's height-for-age Z-score, weight-for-age Z-score and weight-for-height Z-score, independent of socioeconomic status (Goel et al., 2007).

Hygiene and sanitation factors

Nutrition and health are highly associated with hygiene and sanitation (Souza et al., 2012). For children, maintenance of personal hygiene helps improve the quality of their life and longevity. Hygiene, sanitation, nutrition and health are important determinants of malnutrition in the refugee populations (Teng and Zalilah, 2011). Our study illustrated that, clean dress up, regular bath, nail cutting, wearing footwear and tooth brushing habit had a positive effect on the health and nutrition status of the children. Similar results were reported elsewhere (Richmond and Kotelchuck, 1984; Smith and Hadded, 2000).

Pure drinking water reduces the risk of child malnutrition. Therefore, the children having access to tube well water had improved MUAC compared to those who did not have. Sources of drinking water are also important for health. Hygiene practices and sanitation behaviors are also important factors for maintaining good nutrition status. Our study demonstrated that, the use of sanitary latrine compared to throwing in the hole or letting it open was responsible for good MUAC since indiscriminate disposal of feces is an important predisposing factor of child health.

Health and immunization factors

Diarrheal diseases (Balk et al., 2005), skin diseases, worm infestations (Shibulal, 2012) and dental diseases are most commonly associated with poor personal hygiene which lead to the malnutrition of the. Among children under 5 years old, about 17% of all the deaths occur due to diarrhea and annually at least 1500 million episodes of diarrhea occur in this group and about 4 million children's death occur due to diarrhea (Onyango and Angienda, 2010). Child malnutrition is highly associated with diarrhea which substantially increases the risk of child mortality (Black et al., 2008).

Repeated infections in children could be prevented by childhood immunization (Balk et al., 2005; Casapia et al., 2006). Our study highlighted that, Rohingya children with higher immunization score had better growth status. Complete immunization during childhood reduces the risk of getting common childhood infections and infectious diseases (Balk et al., 2005; Casapia et al., 2006). Sickness in children is always associated with loss of appetite and reduced food intake which could lead to significant weight loss. It was reported that, children who had recent fever or diarrhea were more likely to be less MUAC and that children with

complete immunization were less likely to be less MUAC (Hossain et al., 2016).

Nutrition factors affecting MUAC

It was reported that, breastfeeding played a crucial role in the nutrition of the children. If the children were not breastfed in time and frequency then it enhanced the risk of malnutrition because both were important in breastfeeding (CARE, 2010). It was also reported that, the best IYCF (Infant and Young Child Feeding) practices, i.e., breastfeeding and complementary feeding reduced the risk of malnutrition of the children (WHO, 2003).

Association of the factors

Our study revealed that, there was a strong relationship between father and mother age and MUAC. When father and mother were in middle age, then child MUAC was good because when parents were adult and physically strong then they could take care of their children. It indicated that, the age of father and mother was one kind of driving factors of malnutrition (Shibulal, 2012). The study also unfolded the association of parity and family size with child MUAC. When parity and family size increased then child MUAC decreased and malnutrition upraised. Thus, it appeared that, parity and family size was one of the root causes of malnutrition (Fotso and Kuate, 2005). Similarly, when the family size and parity increased then Z-score decreased with an inflated rate of malnutrition (Fotso and Kuate, 2005).

5. CONCLUSION

Anthropometric, hygiene, sanitation, immunization, nutrition and health issues are the principal driving factors of malnutrition of the under-5 years old children of forcibly displaced Myanmar nations living in Ukhia, Cox's Bazar, Bangladesh. The prevalence of malnutrition among the refugee children is alarming. The entire spectrum of the nutritional and health behavior of the forcedly migrated under five years old children need to be addressed immediately.

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Author's Contribution

Md. Emran Hossain designed the study, supervised the research team and performed statistical analyses. Moshfequa Rahman Khan conducted data collection, developed analytical plan and drafted the manuscript. Md. Altaf Hossain and Md. Abdul Aziz provided insight in the research protocol. All authors read and approved the final manuscript.

Conflict of Interest

We declare that we have NO affiliations with or involvement in any financial, non-financial or professional organizations or entity in the subject matter or materials discussed in this manuscript.

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