



## Nutritional status of under-5 Rohingya Children admitted for Diarrheal Diseases at Primary Health Centers in Cox's Bazar District of Bangladesh

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### Abstract

**Background:** One of the leading causes of mortality and morbidity in under-5 children is Diarrhea. Malnutrition, in association with the diarrheal disease, affect children negatively. On 2018, Bangladesh saw massive influx Rohingya people with almost 29% under-5 children. **Objective:** The purpose of the present study was to determine the prevalence of malnutrition among children admitted with acute diarrheal diseases at the Primary health Centers at Cox's Bazar. **Methodology:** This cross-sectional study was conducted among the diarrhea affected under-5 Rohingya children who reported to primary health centers at Cox's Bazar. The study was conducted from January to December 2018. Primary caregiver of 276 respondents were interviewed, their hospital records were reviewed. Data were collected by face-to-face interview using a semi-structured questionnaire. **Results:** The majority (60.1%) of the participants were male. Only 2.9% of the participants reported passing of macroscopic blood in stool. Oral Rehydration Solution (ORS) was not taken by most of the participants (50.7%), prior to visit to the hospital. The mean ( $\pm$ SD) age was 18.54 ( $\pm$ 12.44) months. Among the participants, 14.1% had severe underweight ( $<-3$  WAZ score) and 27.2% had moderate underweight ( $-3$  to  $<-2$  WAZ score). No death was reported, and 97.1% were discharged with advice from the hospital. Statistically significant relationship was found between age of the participants and underweight ( $p<0.05$ ) with a Moderate effect size ( $\Phi=.21$ ). **Conclusion:** The study findings would be helpful to identify the need for raising awareness among Rohingya caregiver and help healthcare providers to become more cautious in treating diarrheal patients. [*Bangladesh Journal of Infectious Diseases, June 2023;10(1):31-37*]

**Keywords:** SUW; AWD; Under-5 children; Rohingya; Bangladesh

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## Introduction

Diarrhea is a leading cause of death and morbidity in children under five. Over 1,300 young infants die each day; that's 526,000 a year, despite available basic, and efficient treatment<sup>1</sup>. Improved hygiene and water supply have reduced diarrheal mortality in recent decades. Unfortunately, diarrheamorbidity is still high<sup>2</sup>. Bangladesh has an under-5 mortality rate of 35/1000 live births<sup>3</sup>. 36.2% of under-5 children were stunted, 15% wasted, 33% underweight<sup>4</sup>.

Diarrhea causes malnutrition. There is undoubtedly a vicious cycle between the two diseases that harm children's physical and cognitive development<sup>5-6</sup>. Diarrhea leads to micronutrient deficits and bring about malnutrition. On the other hand, malnutrition causes a weakened immune system, making the individual more susceptible to diarrhea<sup>7</sup>. So the association between malnutrition and diarrheal mortality and/or morbidity is bidirectional and has been reported for decades as an association between diarrhea and impaired growth and development of young children<sup>8</sup>. Recurrent diarrhea affects weight and height gains the most, leading to impaired human performance, physical growth, and cognitive development, and increase diarrheal frequency, length, and severity<sup>9</sup>. Without anthropometric measurements, malnutrition is often undetected. Edema and apparent wasting aren't sensitive signs of malnutrition for all children.

Since the 1990s, numerous Rohingya have fled Myanmar for Bangladesh. New arrivals during the violence at Rakhine state in 2017, were transported to designated sites and host communities<sup>10</sup>. Lack of facilities and awful living circumstances in camps and settlements contribute to an excessive health need among these unfortunate people. Recent rains and poor access to new settlements exacerbate the problem. Most new arrivals were women and children; approximately 29.0% were under-5 children. Scarcity of human, logistical, and financial resources causes gaps in overall provision of lifesaving health care to affected populations and adjacent communities.

Various indicators are used to identify malnourished children under five. Weight-for-age (W/A) is a child's weight in relation to their age. This indicator shows if a child is 'moderately or severely underweight'. Assuming the child's age is accurate, weight-for-age is a good predictor of acute malnutrition<sup>11</sup>. World Health Organization's (WHO) 'WHO Anthro' program (v 3.2.2) can reliably measure weight-for-age z-score (WAZ)

based on a patient's weight and age. Weight fluctuates with time, reflecting acute malnutrition. Therefore, this study aimed to determine the prevalence of acute malnutrition among under-5 children admitted for diarrheal diseases in primary health centers in Cox's Bazar.

## Methodology

**Study Settings and Subjects:** This cross-sectional study was carried out for the period of one year from January to December 2018. The study place for the current study was Department of Community Medicine of Rajshahi Medical College Hospital, Rajshahi, Bangladesh. The study was conducted in two Rohingya camp areas named as Balukhali and Samlapur. Study population was all 'discharged' under-5 Rohingya children recovered from diarrheal episode and treated at primary health centers in Cox's Bazar.

**Data Collection Method and Instruments:** Convenience sampling technique was used. It was used a semi-structured questionnaire and a checklist to collect data through face-to-face interviews and reviewing available hospital records. Data was collected by the authors. WAZ score was calculated via 'WHO Anthro' software (v 3.2.2). Diarrhea was called when there was passage of loose or watery stools, three times or more in 24 hours. Acute watery diarrhea was defined as  $\geq 3$  loose stools per day lasting less than 14 days without any blood instools.

Invasive diarrhea was considered when there was presence of blood in the stool. Diarrheal Episode was leveled as three (3) or more loose stools lasting more than a day and separated from another episode by at least 48 hours or more without diarrhea. Severely underweight was defined as children whose WAZ is below minus 3 (-3) standard deviations (SD) below the mean on the WHO Child Growth Standards<sup>12</sup>.

Moderately underweight was defined as children whose WAZ was below minus 2 (-2) standard deviations (SD) below the mean on the WHO Child Growth Standards<sup>11</sup>.

**Statistical Analysis:** Data were checked and verified at both field and central levels to ensure quality. Data were kept safely under the control of the principal investigator. We checked all data thoroughly to verify its relevancy and consistency. Incomplete and missing data were sorted out and verified. Data were coded, categorized, cleaned, and

entered into SPSS software. We carried out double data entry to perform a quality control check of the data. The study used Statistical Package for Social Science (SPSS) software for data analysis. We tested the normality of the variable “Presence of Underweight” via the Schapiro-Wilk test ( $t = 0.625$ ,  $p$ -value  $< 0.01$ ), so distribution of the variable was found to be significantly different from normal distribution; hence, non-parametric test was used to find association.

In the case of descriptive statistics, we estimated frequency distribution, percentage, mean, and standard deviation. Continuous data were reported in terms of mean and standard deviation, while categorical variables were portrayed by counts and percentages. In the case of inferential statistics, we used the Chi-square test to find any association between categorical variables. A  $p$ -value  $< 0.05$  was considered statistically significant. All statistical tests were two-sided and performed at a significance level of  $\alpha = 0.05$ .

**Ethical Considerations:** Before commencing the study, the research protocol was approved by the research committee (Local ethical committee) of Rajshahi Medical College. Then it was assured that obtained information and records would be kept confidential, and would only be used for research purpose and the findings would be helpful for planning the management procedure of Rohingya children who are suffering from both diarrhea and malnutrition simultaneously.

**Results**

Out of 276 participants, the majority (47.5%) was within the age group  $\leq 12$  months; mean ( $\pm$ SD) age was 18.54 ( $\pm 12.44$ ) months. Two-thirds (60.1%) of the participants were male. The majority of the participants (68.1%) suffered from diarrhea for a total 12-72 hours with a mean ( $\pm$ SD) duration of

39.87 hours ( $\pm 37.61$ ). In the study, most of the participants (58.7%) did not suffer from underweight.

The percentage of Moderate underweight group was 27.2% and severe underweight was 14.1%. Majority (97.1%) of the participants were suffering from AWD and rest had Invasive diarrhea. Most of the participants (50.7%) didn't take ORS before admission (Table 1).

**Table 1: Distribution of Participants by Baseline Characteristics (n=276)**

Variables	n(%)
<b>Age group (Months)</b>	
• $\leq 12$	131(47.5)
• 13-24	92(33.3)
• $>24$	53(19.2)
Mean ( $\pm$ SD)	18.54( $\pm 12.44$ )
<b>Gender</b>	
• Male	166(60.1)
• Female	110(39.9)
<b>Duration of diarrhea (Hours)</b>	
• $<12$ hours	58 (21.3)
• 12-72 hours	188 (68.1)
• $>72$ hours	30 (10.9)
Mean ( $\pm$ SD)	39.9( $\pm 37.61$ )
<b>Nutritional Status</b>	
• Mild to no underweight	162(58.7)
• Moderate underweight	75(27.2)
• Severe underweight	39(58.7)
<b>Type of diarrhea</b>	
• Acute Watery diarrhea	268(97.1)
• Invasive diarrhea	8(2.9)
<b>ORS taken before coming to hospital</b>	
• Yes	126(49.3)
• No	140(50.7)

#: Percentage; SD: Standard deviation

**Table 2: Comparison between of Characteristics and Mean Age**

Description	N (276)	Demographic criteria	P value	Effect size
<b>Gender*</b>		<b>Age (Mean<math>\pm</math>SD)</b>		
• Male	166	8.79 $\pm$ 2.08	0.02	0.166
• Female	110	8.23 $\pm$ 2.27		
<b>Underweight**</b>			0.001	0.049
• Mild to no Underweight	162	16.281 $\pm$ 11.193		
• Moderate Underweight	75	21.271 $\pm$ 13.753		
• Severe Underweight	39	22.641 $\pm$ 12.910		

\*\* Kruskal-Wallis Test, \* Mann Whitney Test,  $p < 0.05$ : Significant at 95% CI.

**Table 3: Association between Nutritional Status and Selected Background Characteristics**

Background Characteristics	Malnutrition Present (n=114)	Malnutrition absent (n=162)	P value	Cramer's V (Φ, df)
<b>Age Group (Months)</b>				
• ≤12	41 (36.0%)	90 (55.6%)		
• 13-24	43 (37.7%)	49 (30.2%)	0.003	0.21 (2)
• >24	30 (26.3%)	23 (14.2%)		
<b>Gender</b>				
• Male	65 (57.0%)	101 (62.3%)	0.39	0.054 (1)
• Female	49 (43.0%)	61 (37.7%)		
<b>Duration of Diarrhea (Hours)</b>				
• <12 hours	20 (17.5%)	38 (23.5%)	0.48	0.08(2)
• 12-72 hours	82 (71.9%)	106 (65.4%)		
• >72 hours	12 (10.5%)	18 (11.1%)		
<b>Type of Diarrhea</b>				
• Acute Watery diarrhea	108 (94.7%)	160 (98.8%)	0.07	0.118 (1)
• Invasive diarrhea	6 (5.3%)	2 (1.3%)		
<b>ORS taken before coming to Hospital</b>				
• Yes	61 (53.5%)	75 (46.3%)	0.27	0.971 (1)
• No	53 (46.5%)	87 (53.7%)		

%; Percentage, Post-traumatic stress disorder;  $\chi^2$ : Chi-square test (Fisher's exact);  $p < 0.05$ : Significant at 95% CI;  $\Phi$  = Cramer's V; df: Degree of freedom; Malnutrition Present:  $\leq -2$  SD for WAZ.

Normality of the data regarding age, length of hospital stay, duration of diarrhea was checked via Shapiro-Wilk test. All of them were found to be non-normal ( $p < 0.001$  in each case). So non-parametric was done to compare mean. Mean age of males ( $8.79 \pm 2.08$ ) was significantly greater than that of females ( $8.23 \pm 2.27$ ). A Mann-Whitney test indicated that this difference was statistically significant  $U (N_{male} = 166, N_{female} = 110) = 8119, p = 0.119, r = 0.166$  (Small effect). A Kruskal-Wallis H test showed that there was a statistically significant mean age between the Underweight categories,  $\chi^2 (2) = 13.593, p = 0.001, \eta^2 = 0.049$  (Small effect) with a mean age of 16.281 ( $\pm 11.193$ ) for Mild to no Underweight, 21.271 ( $\pm 13.753$ ) for Moderate Underweight and 22.641 ( $\pm 12.910$ ) for Severe underweight. Dunn test between groups showed that the difference between Severe underweight and Mild to no Underweight group was significant ( $p = 0.009$ ), so was the difference between Moderate underweight and Mild to no Underweight group ( $p = 0.013$ ) (Table 2).

By age of the participants, malnutrition was significantly ( $p < 0.05$ ) higher in 13-24 months (56.6%). The effect size for this finding, Cramer's V, was moderate, ( $\Phi = 0.21, df = 2$ ). Malnutrition was found higher in the age group 13-24 months (37.7%). Age group  $\leq 12$  months were found to be second (36.0%). However, no significant association was found between gender, duration of diarrhea, type of diarrhea, ORS taken before coming to hospital and Presence of malnutrition (Table 3). Univariate analysis was performed using the multinomial logistic regression model to determine the OR for participants with underweight. Age was incorporated into the model for underweight. The univariate analysis revealed that chances of having severe underweight will increase by 4.1% (AOR = 1.041; 95% CI: 1.01-1.07) and chances of having moderate underweight will increase by 3.4% (AOR = 1.034; 95% CI: 1.01-1.06) for every additional increase in age in months (Table 4).

**Table 4: Multinomial Logistic Regression Analysis of Age Affecting Probability of Underweight**

	Category	OR (95% CI)	P values
Age (in months)	Severe Underweight	1.041 (1.01-1.07)	0.003
	Moderate Underweight	1.034 (1.01-1.06)	0.003

p<0.05: Significant at 95% CI, Reference category: Mild to no underweight; OR = Odds ratio

## Discussion

This cross-sectional study was carried out to determine the nutritional status of under-5 Rohingya children who were admitted with diarrhea in primary health centers in Cox's Bazar. The sample size was 276 which was selected using convenience sampling.

In Bangladesh, childhood malnutrition is still considered as a public health concern as the prevalence of malnutrition cannot be ignored. According to a study conducted by Ferdous F et al. in Mirzapur, Bangladesh, it is shown that there is an increased chance of several diarrheal episodes among children suffering from malnutrition, especially from resource-poor families. The burden of diarrheal disease is higher in resource-poor settings.<sup>13</sup> In emergency conditions like camps, the resource is minimal and people live in an overly-crowded situation. In these conditions, we can get an idea about body mass relative to age using WAZ indicator as the most common use of Weight-for-Age as an indicator is to monitor growth, and also to assess changes in the severity of malnutrition over time.

In present study, out of 276 participants, the majority (46.7%) were in the age group of  $\leq 12$  months, which corresponds with Afroza Khatun's study in Kushtia.<sup>14</sup> The mean age of the participants was 18.54 ( $\pm 12.44$  SD) months. This shows that there is a preponderance of males (60.1%) over females (39.9%). WHO defines diarrhea as the passing of three or more loose stools (which take the shape of the container) within 24 hours. A new episode of diarrhea can occur after two full days without diarrhea. Bouts of diarrhea lasting for less than 14 days are defined as acute, episodes continuing for more than 14 days are identified as persistent.<sup>15</sup> In this study we found that 97.1% of the participants were suffering from Acute watery diarrhea, and only 2.9% of the participants were suffering from Invasive diarrhea. Persistent diarrhea was not found in our study.

We also found that 27.2% of children with diarrhea were suffering from moderate underweight. A total of 14.1% of children with diarrhea were suffering from severe underweight. 27.2 % (n = 75) of children with diarrhea were found to be suffering from moderate underweight. About 35.0% of hospitalized children had moderate malnutrition, according to a study conducted in South Africa, which supports the findings of our current study.<sup>16</sup> Again, it has been shown that a child's hydration

state at the time of admission may have an effect on his or her nutritional status; therefore, this may have contributed to the high proportion since we only used admission weights<sup>17</sup>.

Underweight was found to be statistically significant in relation to the age group of the participants (p < 0.001). Most of the participants (68.1%) had a history of duration of diarrhea for 13-72 hours. We can prevent most of the diarrheal deaths simply by prevention and treatment of dehydration. A study by Munos MK in 2010 stated that almost 93% of all diarrheal deaths might be prevented by using ORS.<sup>18</sup> However, in this study we have found that 50.7% of participants did not take ORS before coming to the hospital. This indicates a lack of Knowledge regarding the use and effect of ORS among the caregivers.

The study had several limitations. As it required recall on the part of the participants and answers for these might have been influenced by recall bias. As the study was done in an emergency situation, there was a restriction on the movement of the Rohingya people. As a result, data regarding hospital stay may have been affected and thus excluded from the study. Finally, weight during admission was not taken into account. As hydration status is known to affect the weight of the patient, discharge weight would have been a better indicator to identify malnutrition.

## Conclusion

Malnutrition is a public health concern for Bangladesh. As the Rohingya people are forced to vacate their houses and take refuge in various makeshift camps in Bangladesh, various health related issues impact their health. Diarrhea and malnutrition are two of them. Our study has demonstrated the prevalence of malnutrition among under-5 Rohingya children with diarrhea reporting to primary health centers in Cox's bazar to be quite high. Age was found to be significantly associated with malnutrition.

It was also found that the caregiver of under 5 Rohingya children are reluctant or lack knowledge about ORS and the importance of its use during diarrhea. However, they do tend to seek health care for their children. The study suggests devising new policies to increase awareness regarding ORS use among Rohingya caregivers and also proposes that the healthcare workers should be more cautious in treating diarrheal patients.



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**Conflict of Interest**

The authors have no relevant conflicts of interest to declare.

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**Contribution to authors:**

Md. Fuad Al Fidah, Syeda Sumaiya Efa, Md. Jawadul Haque: Conception and design, or design of the research; Md. Fuad Al Fidah, Md. Emam Hossain, Tanvir Haider, Dipankar Roy: the acquisition, analysis, or interpretation of data; conceptualized and designed the overall study. Md. Fuad Al Fidah, Dipankar Roy, Tanvir Haider: involved in data collection; Md. Fuad Al Fidah, Syeda Sumaiya Efa, Md. Jawadul Haque: Drafting the manuscript or revising it critically for important intellectual content. Md. Emam Hossain, Md. Fuad Al Fidah, Dipankar Roy: involved in data input and data cleaning. Md. Fuad Al Fidah, Syeda Sumaiya Efa, Tanvir Haider: conducted data analysis. Md. Fuad Al Fidah, Syeda Sumaiya Efa, Md. Jawadul Haque: drafted the manuscript. All authors reviewed and approved the final manuscript.

**Data Availability**

Any questions regarding the availability of the study's supporting data should be addressed to the corresponding author, who can provide it upon justifiable request.

**Ethics Approval and Consent to Participate**

The Institutional Review Board granted the study ethical approval. Since this was a retrospective study, not every study participant provided formal informed consent.

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