Nutritional Status, Dietary Food and Nutrient Consumption Patterns in Monga Affected Area of the Northern Part of Bangladesh

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ABSTRACT
Monga is a common phenomenon in the northwestern part of Bangladesh and food insecurity and nutritional problem are more severe. The purpose of the study was to assess the nutritional status, dietary foods and nutrient intake of the Monga affected people in the northern part of Bangladesh. A cross-sectional survey was carried out among the randomly selected 125 households in the Ramna union of Chilmari, by a well-designed semi-structured questionnaire. The results indicate that 45.5, 49.4 and 20.8% of children less than 5 years of age were stunted, underweight and wasted, respectively. The prevalence of stunting, underweight and wasting of the school going children (aged 5-10 years) were also 35, 48.9 and 31.6%, respectively. More than half of adolescent were severely chronic energy deficient. The average per capita intakes of calorie, protein, fat, carbohydrate and total food was 2455.4 kcal, 55.06, 18.37, 512.58 and 1050 g, respectively. The most significant amount of the dietary energy comes from cereals (about 80%) and followed by potato and vegetables. In conclusion, high prevalence of chronic malnutrition (stunting) was recorded in the under 5 years children. Though it was observed that, the average per capita energy (2455 kcal) and food (1053 g) intake was satisfactory but the intra family food distribution was not in proper balance and their dietary intake highly monotonous.

Key words: Monga, dietary intakes, nutritional status, chronic energy deficiency

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school going age. The school going children are more prone to under nutrition due to high demand of nutrient in growing age and associate with poor socioeconomic status, ignorance and lack of health promotional facilities (Khan et al., 1990). According to Nutrition, Health and Demographic Survey of Bangladesh, 2011, the higher prevalence of stunting (42%) and underweight (45%) were observed in rural areas and 18% children were severely stunted in rural areas (Akhtaruzzaman et al., 2013). The report indicate that one fourth of the population in Bangladesh at age 15 to <49 years were suffering from chronic energy deficiency or thinness (BMI <18.5) and about 25% of adult were undernourished or thin (BMI <18.5) at aged 46-<60 years in Bangladesh (Akhtaruzzaman et al., 2013).

Results from the previous national nutrition survey in Bangladesh observed that nutritional status had improved from 1975-1976 to 1981-1982 but remained unchanged during the last two decades and intakes of energy and macronutrients in rural Bangladesh declined from 1962-1964 to 1981-1982 and 1995-1996 (Jahan and Hossain, 1998). Anemia and vitamin A deficiency have remained unchanged during the last three decades and are still public health problems in Bangladesh, the prevalence of anemia is 46% (BBS and UNICEF., 2004) and night blindness is 2.4% (WHO/WFP/UNICEF., 2007) among pregnant women. In Bangladesh, a large segment of the population in Monga affected areas fails to consume food items with the required components and at the required level to fulfill the nutritional requirements. The lack of capacity is mainly due to food poverty, which constrains the poor people to access the required quantity and quality of food and ensure food security. Moreover, there may also exist for some people who fail to consume a balanced basket of food due to lack of nutritional knowledge and other reasons (BBS., 2010). The purpose of the study was to assess the nutritional status of the Monga affected population in the northern part of Bangladesh in a different age, also to measure the food and nutrition consumption by the vulnerable groups and percapita consumption patterns.

MATERIALS AND METHODS

Study area and population: Kurigram district is the poorest and vulnerable among the district of Bangladesh. Chilmari is the second smallest Upazila of the Kurigram district in respect to area and population and it is geographically located on the bank of the rivers of Tista and Jamuna. The upazila occupies an area of 224.97 km², including 37.53 km² riverine areas. Our study areas consist of three villages namely Kharkharia, Mudafat and Patrakhata are under the union of Ramna of the Chilmari upazila. A cross sectional study was conducted in March 2010, among three villages of the Ramna union of Chilmari and 125 households were selected as randomly among three villages (Kharkharia = 42, Mudafat = 41 and Patrakhata = 42). A questionnaire was developed to obtain relevant information such as education, occupation, socioeconomic data, family size and etc. and the duration of questionnaire was a 3 h.

Anthropometric data: A portable beam balance was used to measure weight to the nearest 0.5 kg after the subjects removed their shoes and heavy clothing. The balances were frequently checked with the use of standard weights. Two types of wooden scales were used for measuring height: one for measuring recumbent length to the nearest centimeter in children aged <24 months and the other for measuring height to the nearest centimeter in older children and adults. Nutritional status assessed by Weight for Height Z-score (WHZ), Weight for age Z-score (WAZ), Height for Age Z-score (HAZ) and Body Mass Index (BMI = weight(kg)/height (m²). Malnourished (stunted, wasted and underweight) was defined as those below -2 SD of the median reference value and for adult Chronic Energy Deficiency (CED) was employed (BMI <18.5 kg m⁻²).

Dietary record: Household food consumption was assessed by 24 h food weighing method. For measuring the intra household food distribution by the individual family member especially
vulnerable group, 24 h food recall method was used. For accurate measurement of the dietary record, serving plates, cups and spoons were displayed to get nearest possible approximation of serving size food consumed. Equivalent raw food was calculated using as the conversion factor. Bangladeshi Food Table by HKI (Darnton-Hill et al., 1988) was used to estimate food consumption.

**Per capita nutrient intake:** The number of family members and visitors eating each meal can be recorded and a man value assigned to each person, weight according to their age and sex. Rome scale is used, males above 14 years of age are assigned a value of 1.0, females above 11 years of age and boys 11-14 years, a value of 0.90, children aged 7-10 years, a value of 0.75, children between 4-6 years, a value of 0.40 and children less than 4 years, a value of 0.15 (Jensen et al., 1984). The amount of each food consumed by the entire household can then be divided by the corresponding total man value to provided food intake per person.

**Statistical analysis:** Data are expressed as Mean±SD for parametric values and median (range) for non-parametric values. Independent sampled t-test was used for normally distributed data. A p-value of <0.05 was considered as significant. All the statistical analysis was performed with the SPSS data (SPSS Inc, Chicago, IL, USA).

**RESULTS**

**Nutritionals status of the study population:** It observed that 45.5% children less than 5 years aged were stunted (HAZ≤-2.0 SD), about half of children (49.4%) were underweight (WAZ≤-2.0 SD) and one fifth (20.8%) were wasted (WHZ≤-2.0 SD). It also found that female were more stunted and wasted compared to male but more male were underweight than female and 21.4% girl were severely stunted (Table 1). Table 2 depicts the nutritional status of the school going children (5 to less than 10 years) by height for age, weight for age and weight for height Z-score. It observed that 35% children were stunted (HAZ≤-2.0 SD), about half of children (48.9%) were underweight (WAZ≤-2.0 SD) and 31.6% were wasted (WHZ≤-2.0 SD). It also found that male children were more stunted and wasted compared to females but more female was underweight than male. The prevalence of stunting and underweight is less common of older aged child such as 5-10 years children and adolescent Childs but the highest level of wasting is observed among the children in 5 to less than 10 years and lowest at

| Status          | HAZ  | WAZ  | WHZ  |
|-----------------|------|------|------|
| ≥1.01 SD        | M (N = 49) | F (N = 28) | B |
| ±1 SD           | 4.0  | -    | 2.6  | - |
| -1.01 to -1.99 SD | 28.6 | 32.1 | 27.3 | 17.6 |
| -2.0 to -2.99 SD | 28.6 | 26.8 | 28.6 | 43.1 |
| ≤-3.0 SD        | 14.3 | 21.4 | 16.9 | 9.8 |

| Status          | HAZ  | WAZ  | WHZ  |
|-----------------|------|------|------|
| ≥1.01 SD        | M (N = 49) | F (N = 51) | B |
| ±1 SD           | 3.9  | 2.1  | -    | - |
| -1.01 to -1.99 SD | 26.1 | 29.4 | 27.8 | 15.2 |
| -2.0 to -2.99 SD | 37.0 | 33.3 | 35.1 | 39.1 |
| ≤-3.0 SD        | 2.2  | 5.9  | 4.1  | 13.0 |

Data are presented as a percentage, N: No. of subjects, HAZ: Height for age, WAZ: Weight for age, WHZ: Weight for height

Table 1: Classification of nutritional status of children aged 6-59 months

Table 2: Classification of nutritional status of children aged 60-119 months

Data are presented as a percentage, N: No. of subjects, HAZ: Height for age, WAZ: Weight for age, WHZ: Weight for height
adolescent in this study. It observed that the prevalence of stunting was more common among adolescent female more than 40% compared to adolescent boys (Table 3). Male adolescent was more severe chronic energy deficient about 66% compared to female adolescent about 38% (Table 4) and in both sexes more than half adolescent were severely chronic energy deficient. But in case of adult two-third was normal according to body mass index (Table 5).

Per capita food and nutrient intake and intra family food distribution: Table 6 indicates the average per capita nutrient intake of the selected household. It was found that the mean energy intake, protein, fat, carbohydrate, calcium, iron, thiamine, riboflavin, vitamin C, retinol, Carotene, niacin and zinc were 2455.4 kcal, 55.06, 18.37 and 512.58 g, 424.12, 15, 1.64, 0.63 and 57.58 mg, 39.0 and 9635 μg, 25.47 and 9.58 mg, respectively (Table 6). Though it was observed the average per capita energy intake was satisfactory but the energy source was not in proper balance, for example, 84% energy come from carbohydrate and remaining energy from other two macronutrient. The average per capita daily total food intake of the Monga affected area of Chilmari was found 1053 g (Table 7).

| Table 3: Classification of nutritional status of adolescent aged 10-18 years |
|-----------------------------|-----------------------------|-----------------------------|
| Status           | HAZ (M = 44) | WAZ (F = 43) | WHZ (B) |
| ≥1.01 SD        | 6.8          | 3.4          | 2.2    |
| ±1 SD           | 43.2         | 25.6         | 23.9   |
| -1.01 to -1.99 SD| 27.3         | 32.6         | 34.5   |
| -2.0 to -2.99 SD| 20.5         | 39.5         | 29.9   |
| <3.0 SD         | 2.3          | 2.3          | 2.2    |

Data are presented as a percentage; N: Number of subjects, HAZ: Height for age, WAZ: Weight for age, WHZ: Weight for height

| Table 4: Nutritional status of adolescent according to body mass index |
|-----------------------------|-----------------------------|
| Status | Male (%) | Female (%) | Both (%) |
| Normal | 18.5-24.99 | 6.2 | 31.8 | 18.5 |
| CED I | 17.0-18.49 | 14.6 | 15.9 | 15.2 |
| CED II | 16.0-16.99 | 12.5 | 13.6 | 13.0 |
| CED III | <16.00 | 66.7 | 38.6 | 53.3 |

BMI: Body mass index

| Table 5: Classification of nutritional status of adult, according to body mass index |
|-----------------------------|-----------------------------|
| Status | BMI range | Percentage |
| Normal | 18.5-24.99 | 66.7 |
| CED I | 17.0-18.49 | 26.7 |
| CED II | 16.0-16.99 | 6.7 |

BMI: Body mass index

| Table 6: Per capita average nutrient intake by the household |
|-----------------------------|-----------------------------|-----------------------------|
| Nutrients | Minimum | Maximum | Mean±SD | Energy from macronutrient (%) | 1995-96 | 2010* | 2005* |
| Energy (kcal) | 860.60 | 4771.00 | 2455.40±664 | 100.0 | 1868 | 2344.60 | 2253.20 |
| Protein (g) | 15.33 | 156.36 | 55.06±20 | 9.2 | 46.93 | 65.24 | 61.74 |
| Fat (g) | 0.54 | 44.66 | 18.37±8.9 | 6.8 | 15.96 |
| Carbohydrate (g) | 178.04 | 1057.44 | 512.58±146 | 84.0 | 384 |
| Calcium (mg) | 53.99 | 1591.30 | 424.12±363 | 335.33 |
| Iron (mg) | 4.88 | 68.15 | 15.00±10 | 11.37 |
| Vitamin B1 (mg) | 0.54 | 3.01 | 1.64±0.46 | 1.17 |
| Vitamin B2 (mg) | 0.23 | 2.07 | 0.63±0.55 | 0.48 |
| Vitamin C (mg) | 0.06 | 636.32 | 57.58±68.3 | 32.8 |
| Retinol (μg) | 0.00 | 1028.95 | 39.00±142 | 1668 |
| Carotene (μg) | 0.00 | 67225.70 | 9635.00±1442 | 2763 |
| Niacin (mg) | 8.93 | 58.39 | 25.47±7.39 | 18.35 |
| Zinc (mg) | 3.06 | 21.86 | 9.58±3.44 | - |

Rural intake, N: 125
Table 7: Average per capita food intake by rural household

| Food items (g) | Our study | Energy source (%) | 2010 | 2005 | 1995-95 (National) |
|---------------|-----------|------------------|------|------|--------------------|
| Total         | 1053.0    | 100              | 1000.5 | 946.3 | 730                |
| Cereals       | 570.0     | 80.32            | 485.6  | 485.6 | 434                |
| Rice          | 546.2     |                  | 441.6  | 459.7 |                    |
| Wheat         | 20.3      |                  | 23.3   | 8.0   |                    |
| Others        | 3.5       |                  | 20.7   | 17.9  |                    |
| Root and tuber| 115.0     | 5.66             | 71.5   | 61.9  | 72                 |
| Potato        | 115.0     |                  | 71.5   | 61.9  |                    |
| Vegetables    | 271.4     | 4.8              | 170.0  | 156.5 |                    |
| Leafy vegetables | 61.1   |                  | 36.1   | 43.8  | 23                 |
| Yellow vegetables | 103.7 | | -     | -     | 89                |
| Others        | 106.6     |                  | 133.9  | 112.7 |                    |
| Pulses        | 8.6       | 1.22             | 13.2   | 12.7  | 11                 |
| Meat, poultry, eggs | 9.6  | 0.41             | 20.5   | 17.6  | 13                 |
| Mutton        | 1.5       |                  | 0.5    | 0.6   |                    |
| Beef          | 1.3       |                  | 4.7    | 6.4   |                    |
| Chicken/duck  | 1.1       |                  | 9.0    | 5.8   |                    |
| Eggs          | 5.7       |                  | 5.8    | 4.4   | 4                  |
| Others        | 0.9       |                  | 0.4    | 0.4   |                    |
| Fish          | 36.9      | 2.04             | 45.8   | 39.7  | 33                 |
| Milk/milk produced | 15.2 | 0.6              | 31.8   | 31.0  | 15                 |
| Edible oils   | 11.2      | 4.1              | 18.3   | 14.3  | 8                  |
| Fruits        | 0.3       |                  | 42.6   | 32.4  | 14                 |
| Sugar         | 2.0       | 0.32             | 7.4    | 7.5   | 7                  |
| Miscellaneous*| 12.8      | 0.53             | 98.4   | 87.1  | 7.1                |

*Tea, soft drinks, bread, biscuits, betel nut, betel leaf, condiments, spices, etc. N = 125

Table 8: Intra family nutrient intake by different age group in study area

| Nutrients                  | Age between 2 to under 5 years (N = 59) | Age between 5-9 years (N = 25) | Adolescent girl (10-17 years) (N = 31) | Adult female (18 year and above) (N = 63) | Lactating mother (N = 36) |
|----------------------------|----------------------------------------|---------------------------------|----------------------------------------|-------------------------------------------|---------------------------|
| Energy (kcal)              | 903.0±309                              | 1016.00±304                    | 1402.00±617                            | 1525.00±549                               | 1609.00±597               |
| Protein (g)                | 21.89±11.75                            | 27.22±14.55                    | 34.38±19.33                            | 40.29±23.44                               | 42.00±21.6               |
| Fat (g)                    | 14.26±7.05                             | 12.59±5.73                     | 14.05±8.08                             | 13.91±6.96                                | 13.92±7.54               |
| Carbohydrate (g)           | 169.30±59.9                            | 195.60±65.1                    | 260.00±125.9                           | 305.70±113.1                              | 318.50±112.6            |
| Calcium (mg)               | 469.40±109                             | 223.50±145                     | 248.80±212                             | 319.40±274                                | 340.00±306              |
| Iron (mg)                  | 5.89±4.22                              | 8.06±4.67                      | 10.82±8.13                             | 11.12±7.9                                 | 13.69±9.9               |
| Vitamin B<sub>1</sub> (mg) | 0.55±0.35                              | 0.66±0.31                      | 1.01±0.58                              | 1.08±0.52                                 | 1.19±0.62               |
| Vitamin B<sub>2</sub> (mg) | 0.30±0.35                              | 0.32±0.22                      | 0.41±0.37                              | 0.43±0.31                                 | 0.54±0.43               |
| Vitamin C (mg)             | 18.42±10.7                             | 31.70±31                       | 38.22±28.12                            | 48.12±35.2                                | 44.68±37.2              |
| Retinol (IU)               | 59.50±120                              | 39.67±101                      | 17.94±56.19                            | 21.37±77                                  | 37.97±108              |
| Carotene (μg)              | 4023.70±592                            | 4084.00±543                    | 3612.00±322                            | 4578.70±546                               | 5521.00±675             |
| Niacin (mg)                | 7.71±3.46                              | 9.33±3.36                      | 13.15±6.43                             | 15.02±5.5                                 | 15.84±6.37             |
| Zine (mg)                  | 3.34±1.48                              | 4.75±2.68                      | 6.43±3.86                              | 7.20±4.01                                 | 7.88±4.73              |

and the mean intake different food items such as cereals, potato, vegetables, pulses, meat and poultry, fish, milk and milk product, cooking oil, fruits, sugar and miscellaneous were 570.0, 115.0, 271.4, 8.6, 9.6, 36.9, 15.2, 11.2, 0.3, 2.0 and 12.8 g, respectively. It was observed that more significant amount of the dietary energy comes from cereals, that about 80% of the total energy and followed by potato, vegetables, edible oil and fish. No significant correlation was observed of family income and household family size with energy and total food intakes.

In this study, we able to show the average food and nutrient intake by different age group such as child 2 to under 5 years, younger children aged 5-9 years, adolescent girl aged 10-17 years, adult female and lactating mother (Table 8 and 9). It was observed that energy, protein, carbohydrate, calcium, iron, vitamin B<sub>1</sub>, Vitamin B<sub>2</sub>, Vitamin C, niacin and zinc intake increased gradually from under 5 children to lactating mothers. But in case of dietary fat, rational and carotene consumption did not observe any trend by increasing age of the study population or their nutrient requirement. In case of food intake, it was found that the total quantity of food intake increased from under 5 years
Table 9: Average food intake of different age group

| Food items (g) | Age between 2 to under 5 years (N = 59) | Age between 5-9 years (N = 25) | Adolescent girl (10-17 years) (N = 31) | Adult female (18 year and above) (N= 63) | Lactating mother (N = 36) |
|----------------|----------------------------------------|--------------------------------|----------------------------------------|------------------------------------------|--------------------------|
| Total          | 437.65                                 | 471.4                          | 649.4                                  | 734.8                                    | 727.0                    |
| Cereals        | 147.50                                 | 180.4                          | 257.4                                  | 280.0                                    | 290.8                    |
| Rice           | 136.20                                 | 174.7                          | 233.1                                  | 264.0                                    | 258.0                    |
| Wheat          | 6.00                                   | 1.0                            | 8.5                                    | 12.0                                     | 23.8                     |
| Others         | 5.30                                   | 4.7                            | 13.8                                   | 4.0                                      | 9.0                      |
| Root and tuber | 53.50                                  | 65.8                           | 105.2                                  | 135.1                                    | 126.3                    |
| Potatoes       | 53.50                                  | 65.8                           | 105.2                                  | 135.1                                    | 126.3                    |
| Vegetables     | 136.80                                 | 147.8                          | 214.6                                  | 231.1                                    | 232.2                    |
| Leafy vegetables | 53.30                           | 29.2                           | 50.7                                    | 41.3                                     | 56.0                     |
| Yellow vegetables | 34.50                        | 80.5                           | 45.4                                    | 86.3                                     | 93.4                     |
| Others         | 49.00                                  | 38.1                           | 118.5                                  | 103.5                                    | 82.8                     |
| Pulses         | 7.30                                   | 4.5                            | 18.5                                   | 12.3                                     | 13.5                     |
| Meat, poultry, eggs | 8.15                  | 2.5                            | 4.1                                    | 4.2                                      | 4.7                      |
| Mutton         | 0.00                                   | 0.0                            | 0.0                                    | 0.0                                      | 0.0                      |
| Beef           | 1.75                                   | 0.4                            | 0.0                                    | 0.8                                      | 0.0                      |
| Chicken/duck   | 1.00                                   | 0.0                            | 0.0                                    | 0.0                                      | 0.0                      |
| Eggs           | 5.40                                   | 2.1                            | 4.1                                    | 3.4                                      | 4.7                      |
| Others         | 0.00                                   | 0.0                            | 0.0                                    | 0.0                                      | 0.0                      |
| FISH           | 12.70                                  | 23.7                           | 14.1                                   | 30.5                                     | 23.3                     |
| Milk/milk prod | 23.00                                 | 18.4                           | 9.7                                    | 7.1                                      | 12.1                     |
| Edible oils    | 8.00                                   | 6.8                            | 7.6                                    | 7.4                                      | 7.8                      |
| Fruits         | 4.50                                   | 0.6                            | 2.5                                    | 0.0                                      | 0.0                      |
| Sugar          | 3.70                                   | 1.3                            | 1.2                                    | 1.5                                      | 2.1                      |
| Miscellaneous  | 32.50                                  | 19.6                           | 14.5                                   | 25.6                                     | 14.2                     |

*Tea, soft drinks, bread, biscuits, betel nut, betel leaf, condiments, spices, etc

children (438 g) to adult female (735 g) but the food consumption of lactating mother slightly lower compared to adult female. The quantity of maximum food items comes from only three food groups such as cereals, roots and tuber and vegetables in all groups of the study population. Consumption of animal product such as meat and poultry, fish, milk and milk product was negligible amount. Edible oil, pulses and fruit consumption were also low in all study groups.

**DISCUSSION**

The prevalence of stunting of the under 5 years children in our study was about 45.5%, that is higher compared to previous studies that are Bangladesh Demographic and Health Survey 2007 and 2011 and Nutrition, Health and Demographic Survey of Bangladesh (NIPORT., 2009, 2013; Akhtaruzzaman et al., 2013). In Nutrition, Health and Demographic Survey of Bangladesh 2011 preliminary report, it was found that at national level the prevalence of stunting is about 40.2% in both girls and boys and the prevalence is higher (42%) in rural areas than the urban area (37%) in case of both sexes (Akhtaruzzaman et al., 2013). Overall, 17% children are severely stunted and in rural areas, prevalence is higher than urban areas (about 18% versus 14%) in both sexes, this figure is almost similar in our study. It is also found in this study that the prevalence of stunting is more common in girl compared to the male child. The high prevalence of stunting or chronic malnutrition of the study may be due to long time low dietary intake and poor sanitation condition. Lack of proper growth, according to age is more common in the study area, that’s about 50% children of under 5 years of age are underweight. The prevalence of underweight is higher in our study compared to 36% in BDHS-2007 (NIPORT., 2009), in Rajshahi division it was 43.3 and 45% by NHDSBD-2011 at national level (Akhtaruzzaman et al., 2013). The proportion of severely underweight children was 17.3% of girls and 15.3% of boys in previous studies NHDSBD-2011 but in our study it was 20% in girl, 9.8% of boys and 13.6% in both sexes (Akhtaruzzaman et al., 2013). Weight for height or wasting is considered the acute malnutrition or current nutritional status due to the current shortage of food or infection. The
prevalence of wasting in our study is higher than previous studies (NIPORT, 2009) but lower than recent NHDSBD-2011 (Akhtaruzzaman et al., 2013). But in our study the prevalence of severely wasted is only 3.9%, that is lower than the previous report NHDSBD-2011 (severely wasted children was 6.5% of girls and 7.2% in boys) (Akhtaruzzaman et al., 2013) and in another report at the Rajshahi division it observed the Global Acute Malnutrition (GAM) was 15.2% and Severe Acute Malnutrition (SAM) was 3.8% (NIPORT., 2009). Severe wasting condition increases the risk of mortality.

In another study in 6-15 years orphanages child, in Bangladesh and it was found stunting 8.7%, wasting 2.7% and underweight 13%, respectively (Karim and Zahid, 2012), those values are significantly lower compared to our study at the same age. In Kenya one of study in the primary school at 4-11 years children, it observed 24.5% were stunted, 14.9% underweight and 9.7% were wasted (Mwaniki and Makokha, 2013), all of those values are lower compared to our study. A study carried out in Zambia among school children showed that 28.9% were stunted, 14.5% underweight and 3.9% were wasted (Kadiyala and Gillespie, 2004), those values also lower compared to our study at age 5 to <10 years and adolescent also. In some previous study such as Zanzibar (Stoltzfus et al., 1997) and in Bangladesh (Ahmed et al., 1998) reported that the prevalence of stunting increased with age but in this study it is opposite. School going children at 5 to <10 years aged were more stunted compared to girl this finding is similar to previous studies in Brazil (Parraga et al., 1996). The Body Mass Index (BMI) is used to measure thinness or obesity and is calculated by dividing weight in kilograms by the square of height in meter. A cutoff point of BMI <18.5 is used to define thinness or chronic energy deficiency and BMI ≥25 usually indicates overweight and BMI ≥30 indicates obesity. In our study it was observed that 33.4% adult women were suffering from Chronic Energy Deficiency (CED), this finding is higher compared to BDHS-2011 (they found at 24%) and NHDSBD-2011 findings (NIPORT., 2013; Akhtaruzzaman et al., 2013).

The result indicates that cereals, potato and vegetable consumption is comparatively higher in our study compared to previous national survey but meat product and fruit consumption are significantly lower. At 2010, the average quantity of food items consumed was estimated at 1,000 g, i.e., one kilogram per capita per day at the aggregate level. It was 947.8, 893.1 and 913.8 g in 2005, 2000 and 1995-96, respectively but in rural areas the average food intake was 1000.5, 946.3, 898.7 and 910.5 g in 2010, 2005, 2000 and 1995-96 respectively (BBS., 2010; Jahan and Hossain, 1998). It was observed that the average Per capita food intake was higher in the Monga affected area than the average per capita intake of previous studies such as HIES 2010, HIES-2005, 1995/96 national nutrition survey and also Hels (BBS, 2010; Jahan and Hossain, 1998; Hels et al., 2003). The food consumption pattern of the Monga affected area in our study was dominated by cereals contributing about up to 80% of the total dietary energy, as against the internationally accepted value 54-55% for developing countries (FAO/UNU/WHO., 2004), similar finding was also found in the previous study in Bangladesh (Yusuf et al., 2008). According to HIES-2010, 72.2% of the total calorie received by an individual at the rural level came from cereals of which rice alone contributed 65.0%, this value is lower than our study (BBS., 2010). Per capita potato and vegetable intake was comparatively higher in the study area than in previous household income and expenditure survey in Bangladesh.

The higher amount of calorie intake was also observed in the Monga affected area compared to previous studies in the rural area in Bangladesh (HIES-2010, HIES-2005 and 2000), that was 2344.6 kcal in 2010, 2253.2 kcal in 2005 and 2263.2 kcal in 2000, respectively (BBS., 2010). The opposite trend was observed in the case of protein intake in our study compared to previous national survey in rural area. Per capita protein intake was lower in our study than all HIES from 2000-2010 (BBS., 2010). In term of intra family food distribution female children in every age were neglected in our society, especially they take food in the house after taking food of male household members. The
average energy consumption of adult females in our study is lower than previous studies of the same group in Bangladesh (Karim and Tasnim, 2014). In Kenya one study in the primary school at 4-11 years children, it observed 1940 g total food intake but in our study it was found only 471 g at age of 5-9 year (Mwaniki and Makokha, 2013). In another study in the orphaned child in Bangladesh, it observed that the average food intake was 1297 g at age 6-15 years (Karim and Zahid, 2012). That value is comparatively higher compared to our study at age 5-9 and 10-17 year groups.

CONCLUSIONS

High prevalence of chronic malnutrition (stunting) was recorded in the under 5 years children in the Monga affected area compared to previous studies and girls were more stunted and wasted compared to the male child. Though it was observed the average per capita energy (2455 kcal) and food (1053 g) intake was satisfactory, but the energy source was not in proper balance, for example 84% energy come from carbohydrate and remaining energy from other two macronutrients. At the same time, according to intra family food distribution it was found that adolescent girl, adult female and lactating women can not meet their energy requirement because female members in every age were neglected in our society, especially they take food in the house after taking food of male household members.

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