A profile of illnesses prevailing in the secondary schools of rural communities of Bangladesh

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Abstract

Background and objectives: The childhood population in Bangladesh is ~20% of the 166.5 million. The rural population comprises almost 70%. Approximately, Bangladesh has more than 23,500 high schools. There has been no published data on the profile of illness commonly observed among the high school children. The aims of the study were a) to determine a profile of common illness among the students of rural high schools; b) to assess the nutrition status related to socio-economic class and c) to find out the correlations between anthropometry and blood pressure and between anthropometry and blood glucose status.

Methods: The study was conducted in purposively selected high schools in Santhia thana under the district of Pabna. Local leaders and the school teachers volunteered to communicate the study objectives and investigation details to the eligible students. The teachers prepared the list of participants. All the willing participants were advised to attend the investigation site in the morning in a fasting state. Each participant was interviewed. Socio-demographic and clinical history was taken. Investigations included anthropometry – height (ht), weight (wt), waist- and hip-circumference (waist, hip). Adiposity indices namely body mass index (BMI = wt in kg/ht in met. sq.), waist/hip ratio (WHR) and waist/ht ratio (WHtR) were calculated. Resting blood pressure was taken. Clinical examination (general and systemic) was done. Fasting blood glucose (FBG) was estimated using glucometer strip and blood grouping by test kit. Test kit was also used for detection of urinary protein.

Results: From six schools, 1069 students (boys/girls = 392/677) of age 10 to 19 years participated in the study. The participants from middle class family were 52.7% and upper were 14.4%. Their mothers were mostly housewives (95.5%) and only 16% had academic education of ten years or more. The mean (± SD) values of BMI, WHR, WHtR and FBG were 18.2 (± 2.9), 0.81 (± 0.07), 0.43 (± 0.05) and 5.26 (± 0.45) mmol/L respectively. Adiposity was significantly higher in upper socio-economic class than the middle and lower class, though no differences were observed in blood pressure and blood glucose level. Of the illnesses, the most common were sinusitis (21.4%), tonsillitis (13.3%) and toothache plus dental caries (10.7%).

Conclusions: The most common illnesses were sinusitis, tonsillitis and dental caries. Anthropometric measures indicated that adiposity was not uncommon in rural children. Though adiposity was found higher among the upper than the lower socio-economic class, blood pressure and blood glucose level showed no difference indicating equal risk of non-communicable diseases (NCDs) irrespective of socio-economic class. These findings envisage that the existing status of child health might lead to NCDs in adult life. We suggest adiposity, blood pressure and blood glucose status of a high school cohort may be prospectively followed for eventual future health events.

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Introduction
There were substantial number of studies that addressed health of children, adolescents and adults [1–5]. Some observed nutritional trend from 1975 to 2016 [1] and some found the childhood adiposity [3,6]. But there are very few studies conducted on illness commonly encountered by school children in rural communities of Bangladesh. There has been no published data neither in rural nor even in the urban communities on illness nature of secondary schools. This study was taken to determine the nature and extent of illnesses commonly affecting rural school children. Additionally, the study investigated the association between a) nutrition (adiposity) and socio-economic class, b) adiposity (BMI, WHR, WHtR) and fasting blood glucose (FBG) status and c) adiposity and blood pressure (SBP - systolic blood pressure, DBP - diastolic blood pressure).

Methods
The protocol was approved by the Ethical Review Committee of Bangladesh Diabetes Somity (BADAS).

Site selection: The study was purposively conducted at six selected schools of Santhia thana under Pabna district. These schools enroll the children from remote villages not connected with roads. Most of the children attend school on foot and in groups.

The local elected body of Vulbaria Union Council (UC) under Santhia was communicated. The UC members agreed to cooperate. They suggested the names of schools. The study team discussed the study procedure (clinical history, anthropometry, blood pressure, clinical examination, fasting blood glucose) in detail with the school teachers. The teachers agreed to volunteer to communicate with the students and informed them the procedural details. The students who showed their interest to participate in the study were enlisted by the respective class teachers.

Enlistment of participants: The school teachers made the list of willing participants. The students of class five to class ten were considered eligible. The study team discussed with the participants about the objectives and stepwise investigation procedure before the day of investigation. The printed questionnaire sheet was explained to the participants. They were advised to attend the school campus in the next morning in fasting condition.

Investigations: Investigations included interviewing, anthropometry, blood pressure measurement, clinical examination, estimation of blood glucose, determination of blood grouping and proteinuria.

Each participant was interviewed with the help of the class teacher on: a) clinical history (present illness, medication if any, past illness and treatment); b) mothers’ education and occupation; c) family income and number of family members for assessment of social-economic class.

After completion of the interviewing session each student was investigated for a) anthropometry (height, weight, waist- and hip-circumference; b) blood pressure (SBP, DBP); c) fasting blood glucose using glucometer. The anthropometry measurements, blood pressure and fasting blood glucose were determined as cited in the previous study [7]. Finally, blood grouping was done using blood grouping test kit and a semi-quantitative dipstick test kit was used for detection of proteinuria.

Then every participant was examined clinically. Both general and systemic examinations were done by the two physicians of the team. General examination determined any gross deformity, anemia, jaundice and edema. Systemic examination included alimentary, respiratory, cardiovascular and musculoskeletal system. Presence of abnormalities of vision (finger count and color), ear (discharge), nose (polyp, septal deviation), throat (tonsils), oral cavity (ulcer, spongy gum), teeth (decay/caries) and skin (scabies, ringworm, pigmentation) were sought.

Statistical analyses: The socio-demographic data were presented in percentages. The illness prevalence data were also presented in percentages. Unpaired t-test was applied to compare the characteristics between boys and girls. All the quantitative variables were shown as— a) mean with standard deviation, b) mean with 95% confidence interval (CI). Comparisons of BMI, WHR, WHR, BP, DBP and FBG are shown according to social class using ANOVA.
Results
A total of 1069 students (boys/girls = 392/677) volunteered the study. The mean age of participants was 13.5 ± 1.47 years. Socio-demographic variables of the participating students are shown in Table-1. More than half of the participants were from the middle and less than a third were from the upper socio-economic class. Almost a third of their mothers were illiterate. More than half of the mothers had no access to academic education though they knew how to put their signature. Only 3.4% mothers had graduation equivalent to 12 or more years of schooling. As regards mothers’ occupation, almost all were housewives (95.5%). Very few had employment at local rural non-government organization (NGOs). The mean family size of the children was 4.7 (95% CI: 4.63, 4.79).

Table-1: Socio-demographic characteristics of the participants (n = 1069) of school children

| Characteristics                        | N (%) |
|----------------------------------------|-------|
| Sex                                     |       |
| Boys                                   | 394 (36.7) |
| Girls                                  | 679 (63.3) |
| All                                    | 1073 (100) |
| Socio-economic class                   |       |
| Upper                                  | 155 (14.4) |
| Middle                                 | 565 (52.7) |
| Lower                                  | 353 (32.9) |
| Mothers’ education                     |       |
| Illiterate                              | 348 (32.4) |
| Read and write                         | 554 (51.6) |
| (no academic education)                |       |
| Secondary (SSC/HSC)                    | 135 (12.6) |
| Graduate (and plus)                    | 36 (3.4)  |
| Mothers’ occupation                    |       |
| Housewife                              | 1025 (95.5) |
| Employment (local NGOs)                | 48 (4.5)  |
| Family size                            |       |
| (number of family members)             |       |
| Mean                                   | 4.7 (4.63–4.79) |
| (95% confidence interval)              |       |

Table-2 illustrates the biophysical characteristics of all participants and compares these variables between boys and girls. They were the students of academic class from VI (6th) to X (10th). The mean (± SD) of age was 13.5 (± 1.47) (y); and their height, weight, waist-girth and hip-girth were 153 (± 8.96) cm, 43.2 (± 9.10) kg, 65.3 (± 7.78) cm and 80.4 (± 7.76) cm, respectively. The comparisons between boys and girls showed, despite significantly higher age in the boys, the girls had significantly higher BMI, SBP and DBP; whereas, the boys had significantly higher WHR and FBG.

Correlations of blood pressures (both SBP and DBP) and FBG with adiposity variables (BMI, WHR, WHRR) were shown in Table-3. Adjusted for age and sex, both SBP and DBP correlated significantly with the adiposity variables namely BMI, WHR and WHRR; whereas, FBG did not, though it showed significant correlation with SBP.

The investigated biophysical characteristics (age, height, weight, waist, hip, BMI, WHR, WHtR, pulse, SBP, DBP, FBG) were put on view according to sex for each academic class in Table-4a, 4b and 4c. The values were displayed in mean with 95% confidence interval (CI).

Table-5 demonstrates the values of the anthropometry at 15th, 85th and 95th levels for possible lower and upper limits of nutrition and adiposity. Likewise, the values of SBP, DBP and FBG at the same levels (15th, 85th and 95th) may be used to assess the trend of metabolic outcomes related to non-communicable diseases.

The complaints or illnesses presented or observed are shown in Table-6. Of the otolaryngologic (ear, nose and throat) illnesses, sinusitis and tonsillitis were the most common complaints or illnesses. Alimentary system including orodental hygiene, though thought to be the most common, only a total of 18% were observed; and of these, tooth decay (dental caries) was the highest (10.7%). Only 711 participants were tested for the presence of proteinuria. Gross proteinuria (3+) was found in 0.4%. For the musculoskeletal system, history of fracture and plaster was observed in 9.3% though there was no deformity. Bone deformity following fracture was found in 1.3%. Testing of blood group revealed that the most common group was B+ve (33.4%), followed by O+ve (27.0%) and A+ve (24.3%).
Anthropometric measures (BMI, WHR, WHtR) for nutrition and adiposity were compared among the socio-economic classes; and so are the blood pressures (SBP, DBP) and fasting blood glucose (Table 7 and 8). Of the adiposity measures, BMI of upper class had significantly higher than the lower class but the difference was neither significant between upper and middle and nor between middle and lower class. The upper class had significantly higher WHR than middle class and the middle class had significantly higher than their lower counterparts. Again, the upper class had significantly higher WHtR than the lower and also the middle class. All these analysis indicate that adiposity was more prevalent among the upper socio-economic class students than their lower counterparts. Of these adiposity measures, WHtR proved to be the robust adiposity index as it could detect the slightest difference among the three social classes.

Table-2: Characteristics of total participants (n = 1069) including comparisons between boys and girls

| Variables | Both (n = 1069) | Boys (n = 392) | Girls (n = 677) | p^* |
|-----------|---------------|---------------|----------------|-----|
| Age (y)   | 13.5 ± 1.47   | 13.6 ± 1.61   | 13.3 ± 1.37    | 0.001 |
| Height (cm)| 153.3 ± 8.96 | 157.8 ± 10.8  | 150.6 ± 6.3    | 0.000 |
| Weight (kg)| 43.2 ± 9.10  | 45.2 ± 10.7   | 42.0 ± 7.8     | 0.000 |
| Waist (cm)| 65.3 ± 7.78   | 67.0 ± 7.7    | 64.1 ± 7.7     | 0.000 |
| Hip (cm)  | 80.4 ± 7.76   | 80.0 ± 8.4    | 80.5 ± 7.4     | 0.271 |
| BMI       | 18.2 ± 2.92   | 17.9 ± 2.91   | 18.4 ± 2.9     | 0.006 |
| WHR       | 0.813 ± 0.065 | 0.839 ± 0.062 | 0.796 ± 0.062  | 0.000 |
| WHtR      | 0.426 ± 0.046 | 0.424 ± 0.041 | 0.425 ± 0.048  | 0.815 |
| Pulse/min | 82.86 ± 10.46 | 79.8 ± 10.4   | 84.4 ± 10.6    | 0.000 |
| SBP (mmHg)| 100.9 ± 13.7  | 99.5 ± 15.5   | 101.4 ± 13.1   | 0.029 |
| DBP (mmHg)| 64.3 ± 9.0    | 63.0 ± 9.7    | 65.1 ± 8.6     | 0.000 |
| FBG (mmol/L)| 5.26 ± 0.45  | 5.44 ± 0.42   | 5.23 ± 0.47    | 0.001 |

SD – standard deviation; p^* – values after unpaired t-test between boys and girls; BMI – body mass index (weight in kg/height in met. sq.); FBG – fasting blood glucose; SBP – systolic blood pressure, DBP – diastolic blood pressure; WHR – waist-to-hip ratio; WHtR – waist-to-height ratio.

Table-3: Correlations among biophysical variables controlling for age and sex

| Variables | SBP | DBP | FBG | BMI | WHR | WHTR |
|-----------|-----|-----|-----|-----|-----|------|
| SBP       | r   | .646 | .075 | .329 | .070 | .246 |
| p         | .000* | .015* | .000* | .022* | .000* |
| DBP       | r   | 1.000 | .055 | .267 | .074 | .198 |
| p         | .073 | .000* | .015* | .000* |
| FBG       | r   | 1.000 | -.016 | .050 | -.003 |
| p         | .597 | .099 | .930 |
| BMI       | r   | 1.000 | .175 | .727 |
| p         | .000* | .000* |
| WHR       | r   | 1.000 | .641 |
| p         | .000* |

*The mean difference is significant at the 0.05 level; r – correlation coefficient; p – level of significance; SBP and DBP correlated significantly with BMI, WHR and WHtR; whereas, FBG showed no correlation with these anthropometric variables.
Table-4a: The biophysical characteristics are shown according to sex by academic class (mean with 95% CI)

| Variables | Class | N  | Boys Mean | 95% CI    | N  | Girls Mean | 95% CI    |
|-----------|-------|----|-----------|-----------|----|------------|-----------|
| Age (y)   | VI    | 102 | 11.9      | 11.8-12.0 | 138 | 11.8       | 11.7-11.9 |
|           | VII   | 83  | 12.8      | 12.6-12.9 | 153 | 12.2       | 12.1-12.2 |
|           | VIII  | 80  | 13.7      | 13.6-13.9 | 99  | 13.4       | 13.2-13.5 |
|           | IX    | 46  | 14.7      | 14.5-14.9 | 135 | 14.2       | 14.1-14.3 |
|           | X     | 83  | 15.9      | 15.8-16.0 | 154 | 15.1       | 15.0-15.1 |
| Total     | 394   |     | 13.6      | 13.5-13.8 | 679 | 13.3       | 13.2-13.4 |
| Height (cm)| VI    | 102 | 147.0     | 145.2-148.8 | 138 | 147.0     | 146.0-148.1 |
|           | VII   | 83  | 156.1     | 154.3-158.0 | 153 | 149.2     | 148.2-150.1 |
|           | VIII  | 80  | 161.0     | 159.1-162.9 | 99  | 151.6     | 150.4-152.8 |
|           | IX    | 46  | 163.7     | 161.6-165.7 | 135 | 152.4     | 151.4-153.4 |
|           | X     | 83  | 166.0     | 164.5-167.5 | 154 | 153.0     | 152.1-154.0 |
| Total     | 394   |     | 157.7     | 156.6-158.8 | 679 | 150.6     | 150.1-151.1 |
| Weight (kg)| VI    | 102 | 36.2      | 34.5-37.9  | 138 | 37.8      | 36.6-39.0  |
|           | VII   | 83  | 43.1      | 40.9-45.2  | 153 | 39.5      | 38.4-40.7  |
|           | VIII  | 80  | 47.6      | 45.4-49.8  | 99  | 43.0      | 41.7-44.3  |
|           | IX    | 46  | 51.1      | 48.8-53.3  | 135 | 43.8      | 42.6-45.0  |
|           | X     | 83  | 52.6      | 50.9-54.2  | 154 | 45.8      | 44.6-47.0  |
| Total     | 394   |     | 45.1      | 44.1-46.2  | 679 | 42.0      | 41.4-42.5  |
| Waist (cm)| VI    | 102 | 62.0      | 60.7-63.3  | 138 | 61.2      | 60.0-62.5  |
|           | VII   | 83  | 65.9      | 64.3-67.6  | 153 | 63.5      | 62.3-64.7  |
|           | VIII  | 80  | 69.2      | 67.3-71.1  | 99  | 63.8      | 62.5-65.0  |
|           | IX    | 46  | 69.7      | 67.8-71.7  | 135 | 66.8      | 65.5-68.2  |
|           | X     | 83  | 70.2      | 69.0-71.4  | 154 | 66.0      | 64.8-67.2  |
| Total     | 394   |     | 66.9      | 66.1-67.7  | 679 | 64.3      | 63.7-64.9  |
| Hip (cm)  | VI    | 102 | 73.9      | 72.4-75.4  | 138 | 76.1      | 74.9-77.3  |
|           | VII   | 83  | 78.3      | 76.7-80.0  | 153 | 78.3      | 77.2-79.3  |
|           | VIII  | 80  | 81.7      | 80.0-83.5  | 99  | 80.8      | 79.5-82.1  |
|           | IX    | 46  | 84.3      | 82.5-86.2  | 135 | 83.0      | 81.9-84.1  |
|           | X     | 83  | 85.0      | 83.8-86.2  | 154 | 84.6      | 83.5-85.7  |
| Total     | 394   |     | 80.0      | 79.2-80.8  | 679 | 80.6      | 80.0-81.1  |

CI – confidence interval.

Table-4b: The biophysical characteristics are shown according to sex by academic class (mean with 95% CI)

| Variables | Class | N  | Boys Mean | 95% CI    | N  | Girls Mean | 95% CI    |
|-----------|-------|----|-----------|-----------|----|------------|-----------|
| BMI       | VI    | 102 | 16.6      | 16.0-16.7 | 138 | 17.4       | 16.9-17.8 |
|           | VII   | 83  | 17.6      | 16.8-18.1 | 153 | 17.7       | 17.2-18.1 |
|           | VIII  | 80  | 18.3      | 17.5-18.9 | 99  | 18.7       | 18.2-19.2 |
|           | IX    | 46  | 19.0      | 18.3-19.7 | 135 | 18.8       | 18.3-19.3 |
|           | X     | 83  | 19.1      | 18.5-19.6 | 154 | 19.5       | 19.1-20.0 |
| Total     | 394   |     | 17.9      | 17.6-18.2 | 679 | 18.4       | 18.2-18.6 |
Table 4c: The biophysical characteristics are shown according to sex by academic class (mean with 95% CI)

| Variables | Class | N   | Mean  | 95% CI   | N   | Mean  | 95% CI   |
|-----------|-------|-----|-------|----------|-----|-------|----------|
| Pulse/min | VI    | 102 | 80.1  | 77.9, 82.1 | 138 | 82.3  | 80.6, 83.9 |
|           | VII   | 83  | 82.6  | 80.5, 84.8 | 153 | 85.0  | 83.5, 86.5 |
|           | VIII  | 80  | 78.4  | 75.9, 80.8 | 99  | 84.7  | 82.5, 87.0 |
|           | IX    | 46  | 78.2  | 76.2, 80.2 | 135 | 84.9  | 83.3, 86.5 |
|           | X     | 83  | 79.6  | 77.3, 81.8 | 154 | 85.5  | 83.8, 87.3 |
| Total     |       | 394 | 79.9  | 78.9, 80.9 | 679 | 84.5  | 83.7, 85.3 |
| SBP (mmHg)| VI    | 102 | 90.2  | 88.0, 92.4 | 138 | 96.9  | 94.4, 99.4 |
|           | VII   | 83  | 96.2  | 93.4, 99.0 | 153 | 100.0 | 98.0, 102.0 |
|           | VIII  | 80  | 101.9 | 98.8, 105.0 | 99  | 100.2 | 97.6, 102.8 |
|           | IX    | 46  | 108.0 | 103.9, 112.1 | 135 | 103.0 | 100.9, 105.0 |
|           | X     | 83  | 108.7 | 105.7, 111.7 | 154 | 106.8 | 105.0, 108.6 |
| Total     |       | 394 | 99.8  | 98.3, 101.3 | 679 | 101.5 | 100.5, 102.5 |
| DBP (mmHg)| VI    | 102 | 57.4  | 56.0, 58.8 | 138 | 63.0  | 61.4, 64.7 |
|           | VII   | 83  | 60.4  | 58.3, 62.6 | 153 | 64.8  | 63.4, 66.3 |
|           | VIII  | 80  | 64.5  | 62.7, 66.3 | 99  | 67.0  | 65.4, 68.6 |
|           | IX    | 46  | 67.3  | 64.8, 69.9 | 135 | 64.5  | 63.3, 65.8 |
|           | X     | 83  | 68.0  | 66.0, 70.1 | 154 | 66.7  | 65.4, 68.0 |
| Total     |       | 394 | 62.9  | 61.9, 63.8 | 679 | 65.1  | 64.5, 65.8 |
| FBG (mmol/L)| VI    | 102 | 5.28  | 5.21, 5.36 | 138 | 5.14  | 5.05, 5.22 |
|           | VII   | 83  | 5.32  | 5.24, 5.40 | 153 | 5.27  | 5.21, 5.33 |
|           | VIII  | 80  | 5.37  | 5.25, 5.48 | 99  | 5.29  | 5.21, 5.37 |
|           | IX    | 46  | 5.28  | 5.15, 5.40 | 135 | 5.27  | 5.19, 5.35 |
|           | X     | 83  | 5.93  | 4.67, 7.20 | 154 | 5.17  | 5.08, 5.25 |
| Total     |       | 394 | 5.44  | 5.18, 5.71 | 679 | 5.23  | 5.19, 5.26 |

CI – confidence interval; SBP – systolic blood pressure; DBP – diastolic blood pressure; FBG – fasting blood glucose.
**Table-5:** Anthropometric measures, blood pressure and fasting blood glucose levels at 15th, 85th, 95th percentiles are shown separately for male and female students

| Variables                      | 15th Boys | 15th Girls | 85th Boys | 85th Girls | 95th Boys | 95th Girls |
|--------------------------------|-----------|------------|-----------|------------|-----------|------------|
| Age (y, approximate)           | 11.5      | 11.5       | 15.5      | 15.5       | 16.5      | 16.5       |
| Height (cm)                    | 145.0     | 143.5      | 163.0     | 160.5      | 169.0     | 168.0      |
| Weight (kg)                    | 35.0      | 34.0       | 55.0      | 50.0       | 60.0      | 59.0       |
| Waist (cm)                     | 58.5      | 56.5       | 76.5      | 71.5       | 82.5      | 79.0       |
| Hip (cm)                       | 74.5      | 71.5       | 90.5      | 87.5       | 95.5      | 93.0       |
| BMI                            | 15.8      | 15.4       | 21.6      | 21.1       | 24.9      | 23.4       |
| WHR                            | 0.76      | 0.74       | 0.88      | 0.87       | 0.91      | 0.91       |
| WHtR                           | 0.39      | 0.38       | 0.49      | 0.47       | 0.53      | 0.52       |
| SBP (mmHg)                     | 85        | 85         | 110       | 110        | 118       | 118        |
| DBP (mmHg)                     | 55        | 55         | 70        | 70         | 75        | 77         |
| FBG (mmol/L)                   | 4.75      | 4.75       | 5.65      | 5.65       | 5.75      | 5.80       |

The above findings may be compared with that of table 1, which showed significant differences between sexes; but at the level of 15th, 85th and 95th percentile the measures are almost similar. BMI – body mass index (weight in kg/height in met. sq); FBG – fasting blood glucose; SBP – systolic blood pressure; DBP – diastolic blood pressure; WHR – waist-to-hip ratio; WHtR – waist-to-height ratio.

**Table-6:** The prevalence of illnesses observed or reported during investigation

| Organ/System                                 | N (%)          |
|----------------------------------------------|----------------|
| Ear, nose and throat                         |                |
| Discharge from any ear (pus or fluid)        | 29 (1.3)       |
| Perforation of tympanic membrane             | 5 (0.5)        |
| Hearing impairment (self complain and witnessed by fellows) | 45 (4.2)       |
| Nasal polyp/nasal septal deviation           | 32 (3.0)       |
| Frontal headache treated locally as sinusitis| 230 (21.4)     |
| Sore throat, difficulty swallowing, treated locally as tonsillitis | 143 (13.3)   |
| Bad breath (self complain and witnessed by fellows) | 22 (2.1)     |
| Alimentary system                            |                |
| Abdominal pain treated as peptic ulcer disease | 21 (2.0)     |
| Ulcer painful and detected in oral mucosa    | 38 (3.5)       |
| Dental caries (tooth decay, discoloration of teeth) | 115 (10.7)  |
| Unhealthy gum (red, swollen)                 | 25 (2.3)       |
| Respiratory system                           |                |
| Wheezing (breathing difficulty) treated as bronchial asthma | 22 (2.1)     |
| Urinary system (proteinuria was done by strip test: n = 711) |                |
| trace                                        | 51 (7.2)       |
| +                                            | 9 (1.3)        |
| ++                                           | 4 (0.6)        |
| +++                                          | 3 (0.4)        |
| Total                                        | 711 (100)      |
| Musculoskeletal system                       |                |
| Fracture (based on history of plaster)       | 100 (9.3)      |
| Bone deformity (mostly the sequel of fracture) | 14 (1.3)    |
Hematological system (blood group)

| Blood Group | N    | Percentage |
|-------------|------|------------|
| A+ve        | 260  | 24.3       |
| A-ve        | 11   | 1.0        |
| B+ve        | 358  | 33.4       |
| B-ve        | 19   | 1.8        |
| O+ve        | 289  | 27.0       |
| O-ve        | 7    | 0.7        |
| AB+ve       | 114  | 10.6       |
| AB-ve       | 14   | 1.3        |
| Total Rh+ve | 1021 | 95.2       |
| Total Rh-ve | 51   | 4.8        |

Table 7: Distribution of anthropometric measures (BMI, WHR, WHtR), blood pressure (SBP, DBP) and fasting blood glucose are shown according to social class

| Social class | N   | Mean | SD  | 95% CI          |
|--------------|-----|------|-----|-----------------|
| BMI          |     |      |     |                 |
| Upper        | 155 | 18.75| 3.07| 18.27, 19.24    |
| Middle       | 565 | 18.29| 3.04| 18.03, 18.54    |
| Lower        | 353 | 18.01| 2.61| 17.73, 18.28    |
| Total        | 1073| 18.26| 2.92| 18.09, 18.44    |
| WHR          |     |      |     |                 |
| Upper        | 155 | 0.821| 0.056| 0.812, 0.830   |
| Middle       | 565 | 0.806| 0.068| 0.800, 0.811   |
| Lower        | 353 | 0.820| 0.059| 0.813, 0.826   |
| Total        | 1073| 0.812| 0.064| 0.809, 0.816   |
| WHtR         |     |      |     |                 |
| Upper        | 155 | 0.440| 0.051| 0.432, 0.448   |
| Middle       | 565 | 0.426| 0.047| 0.422, 0.430   |
| Lower        | 353 | 0.421| 0.039| 0.416, 0.425   |
| Total        | 1073| 0.426| 0.046| 0.423, 0.429   |
| SBP          |     |      |     |                 |
| Upper        | 155 | 100.5| 14.1| 98.3, 102.7     |
| Middle       | 565 | 101.6| 13.6| 100.4, 102.7    |
| Lower        | 353 | 100.0| 13.8| 98.6, 101.5     |
| Total        | 1073| 100.9| 13.7| 100.1, 101.7    |
| DBP          |     |      |     |                 |
| Upper        | 155 | 65.2 | 8.9 | 63.8, 66.6      |
| Middle       | 565 | 64.5 | 9.0 | 63.8, 65.3      |
| Lower        | 353 | 63.6 | 8.9 | 62.7, 64.6      |
| Total        | 1073| 64.3 | 9.0 | 63.8, 64.9      |
| FBG          |     |      |     |                 |
| Upper        | 155 | 5.27 | 0.41| 5.20, 5.33      |
| Middle       | 565 | 5.25 | 0.46| 5.22, 5.29      |
| Lower        | 353 | 5.25 | 0.45| 5.20, 5.30      |
| Total        | 1073| 5.25 | 0.45| 5.23, 5.28      |

SD – standard deviation; CI – confidence interval; BMI – body mass index (wt in kg/ht in met. sq); WHR – waist-to-hip ratio; WHtR – waist-to-height ratio; SBP – systolic blood pressure; DBP – diastolic blood pressure; FBG – fasting blood glucose.
Table 8: Multiple comparisons of anthropometric measures (BMI, WHR, WHtR), blood pressure (SBP, DBP) and fasting blood glucose (FBG) are shown according to social class using ANOVA (Scheffe)

| Dependent Variable | (I) SEC | (J) SEC | Mean difference (I-J) | p   |
|--------------------|---------|---------|----------------------|-----|
| **BMI**            | Upper   | Middle  | 0.46683               | 0.211 |
|                    | Lower   | Upper   | 0.74604               | 0.030 |
|                    | Middle  | Upper   | -0.46683              | 0.211 |
|                    | Lower   | Upper   | 0.27921               | 0.370 |
|                    | Upper   | Middle  | 0.01550*              | 0.029 |
|                    | Lower   | Upper   | 0.00160               | 0.967 |
|                    | Middle  | Upper   | -0.01550*             | 0.029 |
|                    | Lower   | Upper   | -0.01390*             | 0.006 |
|                    | Upper   | Middle  | 0.01446*              | 0.002 |
|                    | Lower   | Upper   | 0.01969*              | 0.000 |
|                    | Middle  | Upper   | -0.01446*             | 0.002 |
|                    | Lower   | Upper   | 0.00523               | 0.243 |
| **WHR**            | Upper   | Middle  | -1.069                | 0.694 |
|                    | Lower   | Upper   | 0.492                 | 0.934 |
|                    | Middle  | Upper   | 1.069                 | 0.694 |
|                    | Lower   | Upper   | 1.561                 | 0.249 |
| **SBP**            | Upper   | Middle  | 0.675                 | 0.711 |
|                    | Lower   | Middle  | 1.554                 | 0.202 |
|                    | Middle  | Upper   | -0.675                | 0.711 |
|                    | Lower   | Upper   | 0.879                 | 0.356 |
| **DBP**            | Upper   | Middle  | 0.01114               | 0.964 |
|                    | Lower   | Middle  | 0.01658               | 0.931 |
|                    | Middle  | Upper   | -0.01114              | 0.964 |
|                    | Lower   | Upper   | 0.00543               | 0.985 |

*The mean difference is significant at the 0.05 level. BMI, upper class had significantly (p = 0.03) higher than the lower counterpart; whereas, middle class differed neither from the upper nor from the lower. WHR differed significantly between upper and middle (p = 0.029) and between middle and lower (p = 0.006). WHtR differed significantly between upper and middle (p = 0.002) and between upper and lower (p < 0.001). In contrast, SBP, DBP and FBG showed no significant differences among the classes.

**Discussions**

This study is the first of its kind not only in Bangladesh but also in other neighboring countries. There has been no published report addressing common illnesses encountered by the school children of Bangladesh. This study was designed to determine the common illnesses affecting our rural school going children and adolescents. Many studies on school health observed the trend of nutrition, obesity and other NCDs [1-9], though none studied the prevalence of common illnesses whether be it communicable or non-communicable diseases.
Possibly, the global health is in transition experiencing a wide spectrum of diseases. The developed world has low prevalence of communicable diseases; whereas, the developing countries have the double burden of both communicable and non-communicable diseases. Thus, the above mentioned studies [1-9] underlined the global trend of increasing NCDs. A very large study on “Child and adolescent health from 1990 to 2015” observed the global burden of diseases, injuries, and risk factors from 1990 to 2015 [10], but not any specific illness.

There is little opportunity to compare the findings of this study with any other study due to paucity of data. Only one study from Bangladesh compared the NCDs according to socio-economic class. In their study it was found that the burden of NCDs was higher in low income people in rural area while it was higher in urban high income group [11]. This study was limited to rural schools and showed no significant difference of SBP, DBP and FBG when compared between upper vs. middle and middle vs. lower socio-economic class (Table-7 and 8). It is interesting to note that the adiposity (anthropometric) measures did differ significantly among the social class though blood pressure and blood glucose did not. More interesting was that the adiposity (BMI, WHR, WHtR) measures correlated well with blood pressure but none with blood glucose level (Table-3). In India, Moola et al. found that two-thirds of primary school children were suffering from health problems and boys and girls were equally affected [12]. They also observed that the sufferings were most prevalent (95%) in the lower economic class. Our findings are not consistent with the findings of Moola et al.

The strength of the study is that all anthropometric and other measures were presented separately for boys, girls for each class and both combined. The quantitative variables were presented at the level of 15th, 85th and 95th percentiles for boys and girls (Table-5) for the assessment and also for the comparison with different age-groups and different community populations. It is of interest to note that differences of BMI, WHR and WHtR among the upper, middle and lower classes were significant but not for SBP, DBP and FBG. It is not clear why there was no significant difference of blood pressure and blood glucose between upper and lower classes despite the upper class had significantly higher adiposity. Possibly, the effect of adiposity on blood pressure and blood glucose is not manifested in childhood or even in adolescent. A well designed cohort study from childhood through adulthood would explain this interesting observation.

There are weaknesses of the study. Firstly, we could not take the fathers’ education and occupations. The diagnosis of illness or disease was solely based on the statement of student with the assistance of his/her class teacher. No ancillary investigation could be done and there may be some error in detection of illnesses. The major limitation was that we could not assess eye (vision) problems properly.

Of the illnesses, the most common were sinusitis (21.4%), tonsillitis (13.3%) and toothache plus dental caries (10.7%). The level of adiposity, blood pressure and blood glucose may envisage the school health problems in general and future dimension of the adult health in particular. We strongly propose to undertake a cohort study for tracking the adiposity, blood pressure and blood glucose for its effect on future adult health, which would help to predict risks of NCDs.

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Conflict of interest

The authors declare no conflict of interest.

References

1. NCD Risk Factor Collaboration (NCD-RisC). Worldwide trends in body-mass index,
underweight, overweight, and obesity from 1975 to 2016: a pooled analysis of 2416 population-based measurement studies in 128.9 million children, adolescents, and adults. *Lancet*. 2017; **390**(10113): 2627–2642.

2. World Health Organisation. Childhood overweight and obesity. [accessed on 18 September 2018]; Available from: http://www.who.int/dietphysicalactivity/childhood/en/

3. Jones G, editor. The impact of demographic transition on socio-economic development of Bangladesh: future prospects and implications for public policy. Bangladesh: UNFPA Bangladesh; 2015.

4. Ahmed T, Mahfuz M, Ireen S, Ahmed AMS, Rahman S, Islam MM, et al. Nutrition of children and women in Bangladesh: trends and directions for the future. *J Health Popul Nutr*. 2012; **30**(1): 1–11.

5. National Institute of Population Research and Training (NIPORT), Mitra and Associates, and ICF International. Bangladesh demographic and health survey 2014: key indicators. Dhaka, Bangladesh, and Rockville, Maryland, USA: NIPORT, Mitra and Associates, and ICF International; 2015. 66 p.

6. Biswas T, Islam A, Islam MS, Pervin S, Rawal LB. Overweight and obesity among children and adolescents in Bangladesh: a systematic review and meta-analysis. *Public Health*. 2017; **142**: 94–101.

7. Sayeed MA, Rhaman MM, Fayzunnessa N, Khanam PA, Begum T, Mahtab H, et al. Childhood diabetes in a Bangladeshi population. *J Diabetes Mellitus*. 2013; **3**(1): 33–37.

8. Headey D, Hoddinott J, Ali D, Tesfaye R, Dereje M. The other Asian enigma: explaining the rapid reduction of under nutrition in Bangladesh. *World Dev*. 2015; **66**: 749–761.

9. Hodges EA. A primer on early childhood obesity and parental influence. *Pediatr Nurs*. 2003; **29**(1): 13–16.

10. Kassebaum N, Kyu HH, Zoeckler L, Olsen HE, Thomas K, Pinho C. Child and adolescent health from 1990 to 2015: findings from the global burden of diseases, injuries, and risk factors 2015 study. *JAMA Pediatr*. 2017; **171**(6): 573–592.

11. Biswas T, Islam A, Islam MS, Pervin S, Rawal LB. Socio-economic inequality of chronic non-communicable diseases in Bangladesh. *PLoS One*. 2016; **11**(11): e0167140.

12. Moola RSR, Biyyala R, Bhuma VR. A study on health problems among government primary school children in rural area of Kadapa district, Andhra Pradesh. *Int J Community Med Public Health*. 2019; **6**(5): 2172–2175.