Cardiovascular disease risk factors among school children of Bangladesh: a cross-sectional study

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ABSTRACT

Objective Primarily, we assessed the distribution of cardiovascular disease (CVD) risk factors among school children living in urban and rural areas of Bangladesh. In addition to this, we sought the association between place of residence and modifiable CVD risk factors among them.

Design, setting and participants This cross-sectional study was conducted among 854 school children (aged 12–18 years) of Bangladesh. Ten public high schools (five from Dhaka and five from Sirajgonj district) were selected randomly and subjects from those were recruited conveniently. To link the family milieu of CVD risk factors, a parent of each children was also interviewed.

Primary and secondary outcome measures Distribution of CVD risk factors was measured using descriptive statistics as appropriate. Again, a saturated model of binary logistic regression was used to seek the association between place of residence and modifiable CVD risk factors.

Results Mean age of the school children was 14.6±1.1 years and more than half (57.6%) were boys. Overall, 4.4% were currently smoker (urban—3.5%, rural—5.2%) with a strong family history of smoking (42.2%). Similar proportion of school children were identified as overweight (total 9.8%, urban 14.7%, rural 5%) and obese (total 9.8%, urban 16.8%, rural 2.8%) with notable urban-rural difference. More than three-fourth (80%) of them were physically inactive with no urban-rural variation. Only 2.4% consumed recommended fruits and/ or vegetables (urban—3.1%, rural—1.7%). In the adjusted model, place of residence had higher odds for having several modifiable CVD risk factors: current smoking (OR: 1.807, CI 0.872 to 3.744), inadequate fruits and vegetables intake (OR: 1.094, CI 0.631 to 1.895), physical inactivity (OR: 1.082, CI 0.751 to 1.558), overweight (OR: 3.812, CI 2.245 to 6.470) and obesity (OR: 7.449, CI 3.947 to 14.057).

Conclusions Both urban and rural school children of Bangladesh had poor CVD risk factors profile that demands further nation-wide large scale study to clarify the current findings more precisely.

INTRODUCTION

Cardiovascular disease (CVD) is a major health emergency and number one cause of premature death across the globe. Low-income and middle-income countries are disproportionately affected, counted 80% of deaths due to CVD.1 In this context, South Asians are more vulnerable racial group having high prevalence of coronary heart disease as compared with other ethnicity.2 Among the South Asian countries, China and India are carrying huge burden of CVD due to rapid demographic, social and economic transition. As a neighbouring country of India, in Bangladesh, CVD accounts for 27% of deaths due to all causes, whereas non-communicable diseases (NCD) account for 52% of all deaths.3 Last, NCD risk factors survey of Bangladesh4 reflected clean-cut urban-rural variation in distribution of risk factors and though rural population was socioeconomically deprived but high risk factor burden was reported for them. Moreover, clustering phenomenon was also observed among the Bangladeshi population that demands special strategy for prevention and control of NCD.4 Hence, recent initiatives have specifically targeted children and adolescent for NCD prevention programme.

Atherosclerosis is a major underlying mechanism of CVD that initiated in childhood and...
under the influence of certain conventional risk factors it progresses gradually. Though it begins during childhood, throughout the life course, the process is modified by the interaction of genetic and environmental factors. In this regard, familial history of CVD is important that reflects genetic susceptibility and interactions between genetic, environmental, cultural and behavioural factors. Previous research suggests that one of factors contributing to the development of atherosclerosis is the environment. Based on a population based prospective study, Lind et al concluded that circulating levels of organic pollutants were associated with atherosclerosis. They also suggested that organic pollutants may be an independent risk factor for myocardial infarction. However, this multiple risk factors mediated underlying atherosclerotic progress remain apparent and hence the significance underscores the necessity of screening programme among children and youth, which may help to predict future burden. Children are particularly vulnerable to the negative health aspects associated with urban life, as they have the least independence from and are most manipulated by their living and built environment. Such urban trends are fuelling levels of overweight and obesity that significantly impact on the cardiovascular health of city living children. Worldwide, 1 in 10 school-aged children is estimated to be overweight. Globally in 2010, the number of overweight children under the age of 5 is estimated to be over 42 million. Close to 35 million of these are living in developing countries. There is strong evidence that an epidemic of childhood obesity has led to a significant increase in the prevalence of cardiovascular risk factors, which, if left unchecked, is likely to lead to an epidemic of premature CVD. In these circumstances, current study aims to assess the prevalence of CVDs risk factors among urban and rural school going children of Bangladesh. In addition to this, we sought the association of different modifiable CVD risk factors with the living area.

METHODS
Study design
A cross-sectional study was conducted from January 2018 to December 2018 among the school children of selected rural and urban area of Bangladesh. First, we used multi-stage clustered random sampling to select 10 public high schools, 4 from Dhaka city and 5 from Sirajganj district, representing urban and rural population, respectively (see online supplemental material 1). Finally, a total of 854 (urban—427, rural—427) school children of 12–18 years of age were selected using convenient sampling technique (see online supplemental material 2). To link the family milieu of CVD risk factors, a parent of each children was also interviewed to elucidate their sociodemographic characteristics, behaviours and presence of comorbidity.

Data collection and measurement
Data were collected at mentioned schools through face to face interview using a pretested questionnaire (see online supplemental material 3). Both the children and their parents were interviewed and informed written consent was taken from the parents on behalf of the children at data collection site. Based on the objectives and variables of the study, data were collected from the children about their sociodemographic background, behavioural risk factors and physical measurement. The parents were interviewed for educational attainment, occupation, presence of chronic diseases and their behaviours like tobacco use and alcohol intake.

Physical measurement (height, weight) of the children was carried out following standard method and adequate privacy. The standing height was measured with a height measuring scale with minimal cloths. Then, the body weight was measured using digital weight measuring machine and recorded to the nearest 0.1 kg. Based on height and weight, the obesity was determined using body mass index (BMI) and it was derived as weight (kg)/height in m².

Ascertainment of key variables
Current tobacco user
Those who consumed tobacco in any form in the past 30 days were considered as 'current' user.

Current alcohol user
Those who consumed alcohol in the past 30 days were considered as ‘current’ alcohol user.

Inadequate fruits and/or vegetables intake
Less than five servings of fruits and/or vegetable a day was considered as inadequate.

Added salt intake
It is defined for those participants who used to take dietary salt during eating meal.

Physical inactivity
Physical inactivity was defined as moderate to vigorous activity ≤60 min/day for all 7 days of previous week.

Adiposity
BMI was used to assess the status of adiposity and classified according to WHO growth reference. We categorised adiposity as underweight, normal weight, overweight and obesity.

Quality assurance
Working Groups for data collection was formed with the help of experts and volunteers. The group was divided into two subgroups, namely Intellectuals Group (IG) and Volunteers Group (VG). The IG was formed with the help of experts of Community Medicine, Biostatistics, Health Education & Health Promotion and NCDs. This IG helped in making a training module. They trained the volunteers and discussed all the steps of the study. On the other hand, the VG were formed with the help of a group of undergraduate medical, dental and physiotherapy students. Initially, we got the name of 20 students...
as volunteers. Among 20 students, 12 students were selected based on two post-training evaluation test for the data collection. The VG members helped in pretesting of questionnaire & data collection in Dhaka and Sirajganj, northern part of Bangladesh.

We applied specific measures to improve the quality of the study: (a) the questionnaire was translated into local language and pretested to detect any inconsistency, unclear wording or unusual longer duration to administer; (b) to minimize the recalled bias, the participants got enough time to answer each question and support from their parent was also considered where appropriate; (c) using show cards to better explain dietary servings; (d) maintaining adequate privacy during physical measurements and (e) using robust equipment for physical measurements.

**Patient and public involvement**

We collected data from the children who were the students of selected public schools of Dhaka and Sirajganj districts. We also interviewed the parent of the school children. However, none of them were involved directly in the setting of the research question or outcome measures. They did not have any role in designing or implementing this work or interpretation of the results.

**Ethical consideration**

All parents gave their informed written consent on behalf of their children to participate in the study (see online supplemental material 4).

**Data processing and analysis**

All 854 responses were reviewed thoroughly for consistency and completeness. Total 8 responses were found incomplete or inconsistent and hence the final analysis comprised of 846 responses (urban 423 and rural 423). All the data were entered into the computer software Statistical Package for Social Science (SPSS) V.20.0 for Windows (SPSS, Chicago, Illinois, USA).

All estimates of precision were presented at 95% CI in the tables. Descriptive analysis included mean, SD, median and IQR, frequencies and percentages where appropriate. In this study, the p value (two-sided) was considered statistically significant at the threshold of p<0.05. To find the association between CVD risk factors and place of residence, we run a saturated/full model of binary logistic regression. In the saturated/full model, we considered all modifiable CVD risk factors (except smokeless tobacco and alcohol intake as both had low percentage, 0.5% and 0.8%, respectively) according to the rules of variable selection in regression. For binary logistic regression analysis, we calculated ORs and 95% CI for each independent variable. We used the STROBE (Strengthening the Reporting of Observational Studies in Epidemiology) guidelines for reporting the results of cross-sectional observational study (see online supplemental material 6).

**RESULTS**

**Sociodemographic features of the school children**

Sociodemographic features of the school children are presented in table 1. More than three-fourth of them remained below 16 years of age group and their mean age was 14.6±1.1 years, for both urban and rural area. In urban area, the boys to girls ratio of participation was almost equal but a vast difference was reflected in rural area where number of boys was twice of the girls. This is why boys were predominant (57.6%) in this study. Most of the school children (95.4%) were from low-income background and their urban residents were economically more solvent (median monthly income US$366) than the rural residents (median monthly income US$122). The overall median monthly income was US$183 with an IQR of US$122 to US$366.

**CVD risk factors burden among the parents**

Major NCDs were highly prevalent among the parent of respondents and the burden was higher in urban area compared with rural. Among them, the prevalence of diabetes (21.6%) was highest and hypertension (15.1%) was next to it, considering both areas together. More than half (66.4%) of them were tobacco users and urban residents were mostly habituated to this behavioural risk factor. Illiteracy was not differed so far among the parents (mother 11.6%, father 9.3%) but urban-rural comparison of illiteracy reflected very high difference (urban=5.5%, rural=36.4%), seven times higher in rural area compared with urban (table 2).

**Distribution of CVD risk factors among the school children**

The prevalence of different CVD risk factors according to urban-rural distribution is presented in table 3. Among the total school children, 4.4% were currently tobacco users and the habit was mostly practiced in rural area. Abnormal body weight in terms of overweight, obesity and underweight was more in rural area compared with urban but not differed so far (rural 36.2% vs urban 30.75%). More than three-fourth of the school children were physically inactive (81.7%) and habit of alcohol intake was high among the urban children compared with rural (urban 1.2%, rural 0.5%). The physical inactivity as well as fruits and vegetables intake did not show any mentionable urban-rural difference among them.

The associations between location and modifiable CVD risk factors are presented in table 4. Here, place of residence had higher odds for having several modifiable...
CVD risk factors both in unadjusted and adjusted model: current smoking (unadjusted, OR 1.492; adjusted, OR 1.807), inadequate fruits and/ or vegetables intake (unadjusted, OR 1.072; adjusted, OR 1.094), overweight (unadjusted, OR 7.026; adjusted, OR 3.812) and obesity (unadjusted, OR 3.288; adjusted, OR 7.449). However, place of residence showed higher odds for physical inactivity (adjusted OR 1.082) in adjusted model compared with unadjusted. In both adjusted and unadjusted model, place of residence had significant increase in odds for having overweight (p<0.001) and obesity (p<0.001).

**DISCUSSION**

Results of current study demonstrated that CVD risk factors burden among Bangladeshi school going children was high and also at alarming level with negligible urban-rural difference. Among the well-known risk factors, prevalence of smoking (4.4%) was 1.5 times higher than the nationally representative data of ‘Global Youth Tobacco survey 2013’ conducted in Bangladeshi children (2.9%). This percentage is much greater for the children of Pakistan and India, representing 6% and 8.2% smoker, respectively. It has evidenced that family milieu plays an important role in tobacco addiction among children and the prevalence is also high among those having such family history of tobacco use. In this regard, children of current study showed strong family milieu as more than half of their parents were habituated to tobacco use, among which two-third were smoker and rest were smokeless tobacco user. We found that the children of rural area were more habituated to tobacco (smoking/smokeless) use compared with the urban area. The possibility includes parental illiteracy and behaviour of tobacco consumption. In this study, both illiteracy and tobacco consumption was higher among rural parents compared with the urban. This adult pattern of tobacco use among family member is significant as the proportion of smoker exceeded the nationally representative data of the NCD risk factors survey Bangladesh 2010. According to NCD risk factors survey, the rate of adult tobacco user was 23.6%; among them, 18.9% (less than half of the present study) were current smokers and 21.2% (almost similar to the present study) were smokeless tobacco users. Again, the prevalence of diabetes and hypertension among the parents was also greater than the above mentioned survey. The possible causes behind this result variation is that the findings of the present study were among respondent’s family, not among individual member. Besides this, the survey was conducted 8 years ago and was population based where most of the subjects ignored their health problem, even 3 in 10 subjects never measured their blood pressure and 83% of the survey population never measured their blood glucose level.

Findings of current study about body weight were mixed. This is because the burden of abnormal body weight in terms of underweight (7.1%), overweight (9.8%) and obesity (9.8%) was not differed so far. Simultaneous presence of these three varieties of body weight...
indicates impending nutritional transition occurring in Bangladeshi children. Same type of findings regarding body weight was also stated by a Bangladeshi study of Bulbul et al. and a study of Istanbul (Turkey) where coexistence of underweight and overweight was found.\(^20\)\(^21\) The prevalence of overweight and obesity of current study is comparable with the mentioned study of Bulbul et al. where 12.24\% (higher than the present study) of the secondary school children of Bangladesh were overweight and 2.96\% (lower than the present study) were obese.\(^20\) This result variation may be due to difference of age group. In the above mentioned study, the students were 13–15 years age group where current study enrolled different age categories.

Unhealthy eating patterns in childhood can adversely affect health and contribute to chronic disease in later life. Current study detected a vast portion of school children used to take less than the recommended (≥5 servings per day) fruits and/or vegetables. Compared with other neighbouring country of South East Asia (SEA), this finding is very alarming. This is because in a study conducted among school adolescents of five SEA countries (India, Indonesia, Myanmar, Sri Lanka, Thailand) with national data showed much less (76.3\%) prevalence of inadequate

| Table 2 | Sociodemographic, medical and behavioural characteristics of the parents, n=846 |
|---------|---------------------------------|
| Variables | Urban (n=423) | Rural (n=423) | Both (n=846) |
| Mother's education* | | | |
| Illiterate | 3.1 | 1.4 to 4.8 | 20.1 | 16.3 to 23.9 | 11.6 | 9.4 to 13.8 |
| Primary | 24.8 | 20.7 to 28.9 | 57.4 | 52.7 to 62.1 | 41.1 | 37.8 to 44.4 |
| Secondary | 30 | 25.6 to 34.4 | 17.3 | 13.7 to 20.9 | 23.6 | 20.7 to 26.5 |
| Higher secondary | 18.7 | 15.0 to 22.4 | 3.8 | 2.0 to 5.6 | 11.2 | 9.1 to 13.3 |
| Graduation | 12.5 | 9.3 to 15.7 | 1.2 | 0.2 to 2.2 | 6.9 | 5.2 to 8.6 |
| Postgraduation | 10.9 | 7.9 to 13.9 | 0.2 | 0.1 to 0.6 | 5.6 | 4.1 to 7.1 |
| Father's education* | | | |
| Illiterate | 2.4 | 0.9 to 3.9 | 16.3 | 12.8 to 19.8 | 9.3 | 7.3 to 11.3 |
| Primary | 13 | 9.8 to 16.2 | 42.3 | 37.6 to 47.0 | 27.7 | 24.7 to 30.7 |
| Secondary | 19.4 | 15.6 to 23.2 | 22.5 | 18.5 to 26.5 | 20.9 | 18.3 to 23.6 |
| Higher secondary | 23.4 | 19.4 to 27.4 | 10.2 | 7.3 to 13.1 | 16.8 | 14.3 to 19.3 |
| Graduation | 21 | 17.1 to 24.9 | 6.9 | 4.5 to 9.3 | 13.9 | 11.6 to 16.2 |
| Postgraduation | 20.8 | 16.9 to 24.7 | 1.9 | 0.6 to 3.2 | 11.3 | 9.2 to 13.4 |
| Occupation | | | |
| Job holder | 54.4 | 49.7 to 59.1 | 17.5 | 13.9 to 21.1 | 35.9 | 32.7 to 39.1 |
| Business | 40.2 | 35.5 to 44.9 | 31.9 | 27.5 to 36.3 | 36.1 | 32.9 to 39.3 |
| Agriculture | 0.2 | –0.8 | 44.9 | 40.2 to 49.6 | 22.6 | 19.8 to 25.4 |
| House wife | 2.6 | 21.8 to 30.2 | 1.2 | 0.2 to 2.2 | 1.9 | 1.0 to 2.8 |
| Others | 2.6 | 21.8 to 30.2 | 4.5 | 2.5 to 6.5 | 3.5 | 2.3 to 4.7 |
| Medical characteristics | | | |
| Hypertension | 15.6 | 12.1 to 19.1 | 14.7 | 11.3 to 18.1 | 15.1 | 12.7 to 17.5 |
| Heart disease | 5.2 | 3.1 to 7.3 | 3.3 | 1.6 to 5.0 | 4.3 | 2.9 to 5.7 |
| Diabetes | 31.7 | 27.3 to 36.1 | 11.6 | 8.5 to 14.7 | 21.6 | 18.8 to 24.4 |
| Cancer | 1.2 | 0.2 to 2.2 | 0.7 | –1.6 | 0.9 | 0.3 to 1.5 |
| Chronic respiratory diseases | 8.3 | 5.7 to 10.9 | 7.1 | 4.7 to 9.5 | 7.7 | 5.9 to 9.5 |
| Other chronic diseases | 11.8 | 8.7 to 14.9 | 16.3 | 12.8 to 19.8 | 14.1 | 11.8 to 16.4 |
| Behavioural risk factors | | | |
| Current smoking | 35.5 | 30.9 to 40.1 | 48.9 | 44.1 to 53.7 | 42.2 | 38.9 to 45.5 |
| Current smokeless tobacco use | 21.3 | 17.4 to 25.2 | 27.2 | 23.0 to 31.4 | 24.2 | 21.3 to 27.1 |
| Alcohol intake | 0.9 | –4.8 | 0.5 | –1.4 | 0.7 | 0.1 to 1.3 |

*According to education structure of Bangladesh, Ministry of Education, Government of the People's Republic of Bangladesh.
fruits and vegetable consumption compared with current study (97.2%).又一次，结果与先前的多国研究也一致，该研究在七个国家中，其中两个为非洲国家（77.5%）和另外三个为美国高中生（78.6%）。这种模式的跨国变化可能与水果和蔬菜的可获得性、收入和城市化率有关。

在当前研究中，大多数参与者不活跃，基于推荐的活动时间超过60分钟/天，连续7天。这一不活跃水平高于其他研究中在印度（62.5%）和马来西亚（56.2%）开展的研究，分别为62.5%、56.2%和24.5%。可能原因在于不同的体育活动测量方法。在先前可比的研究中，印度遵循了当前研究的方法。但是马来西亚研究使用了Physical Activity Questionnaire for Older Children（PAQC），将其分类为低、中和高。再次，印度研究是在城市儿童中进行的，而当前研究包括了城市和农村参与者。

总之，城市-农村分布的当前研究结果显示，心血管风险因素，即肥胖、酒精摄入、身体活动不足和主要慢性病，城市地区更为常见。另一方面，心血管风险因素如烟草使用、不充足的水果和/或蔬菜摄入、不适当的盐分摄入以及低教育水平和低社会经济地位在农村参与者中更为常见。高肥胖和在城市地区的高肥胖率也得到了以前的全国范围的流行病学研究的证实。20  

### Table 3  CVD risk factors among the school children of Bangladesh, n=846

| CVD risk factors                        | Urban (n=423) | Rural (n=423) | Both (n=846) |
|-----------------------------------------|--------------|---------------|--------------|
|                                        | %            | 95% CI        | %            | 95% CI        | %            | 95% CI        |
| Current smoker                          | 3.5          | 1.7 to 5.3    | 5.2          | 3.1 to 7.3    | 4.4          | 3.0 to 5.8    |
| Current smokeless tobacco user          | 0            | 0             | 0.9          | −3.0 to 1.8   | 0.5          | 0.02 to 1.0   |
| Current alcohol user                    | 1.2          | 0.2 to 2.2    | 0.5          | −0.2 to 1.2   | 0.8          | 0.2 to 1.4    |
| Inadequate fruits and/ or vegetables intake | 96.9      | 95.2 to 98.6  | 98.3         | 97.1 to 99.5  | 97.6         | 96.6 to 98.6  |
| Added salt intake                       |              |               |              |               |              |
| Daily                                   | 30.5         | 26.1 to 34.9  | 38.8         | 34.2 to 43.4  | 34.6         | 31.4 to 37.8  |
| Occasional                              | 31.0         | 26.6 to 35.4  | 33.6         | 29.1 to 38.1  | 32.3         | 29.1 to 35.5  |
| Physical inactivity                     | 82.5         | 78.9 to 86.1  | 80.9         | 77.2 to 84.6  | 81.7         | 79.1 to 84.3  |
| BMI, kg/m² (mean±SD)                    | 21.1±3.8     | 18.9±2.7      | 20±3.5       |               |              |
| Abnormal body weight                    |              |               |              |               |              |
| Underweight                             | 4.5          | 2.5 to 6.5    | 9.7          | 6.9 to 12.5   | 7.1          | 5.4 to 8.8    |
| Overweight                              | 14.7         | 11.3 to 18.1  | 5.0          | 2.9 to 7.1    | 9.8          | 7.8 to 11.8   |
| Obesity                                 | 16.8         | 13.2 to 20.4  | 2.8          | 1.2 to 4.4    | 9.8          | 7.8 to 11.8   |

.BMI, body mass index; CVD, cardiovascular disease.

### Table 4  Association of modifiable CVD risk factors with place of residence, n=846

| Risk factors                              | Place of residence (urban, rural) | Place of residence (urban, rural) |
|-------------------------------------------|-----------------------------------|-----------------------------------|
|                                           | P value  | Unadjusted OR | 95% CI | P value  | Adjusted OR | 95% CI |
| Current smoking                           | 0.242    | 1.492         | 0.763 to 2.918 | 0.112    | 1.807       | 0.872 to 3.744 |
| Inadequate fruits and/or vegetables intake | 0.792    | 1.072         | 0.639 to 1.799 | 0.749    | 1.094       | 0.631 to 1.895 |
| Added salt intake                         | 0.001*   | 0.610         | 0.457 to 0.815 | 0.013*   | 0.678       | 0.500 to 0.921 |
| Physical inactivity                       | 0.534    | 0.895         | 0.632 to 1.269 | 0.673    | 1.082       | 0.751 to 1.558 |
| Underweight                               | 0.004*   | 0.438         | 0.250 to 0.768 | 0.068    | 0.589       | 0.333 to 1.041 |
| Overweight                                | <0.001*  | 7.026         | 3.751 to 13.159 | <0.001*  | 3.812       | 2.245 to 6.470 |
| Obesity                                   | <0.001*  | 3.288         | 1.965 to 5.502  | <0.001*  | 7.449       | 3.947 to 14.057 |

We adjusted all variables included in the table: current smoking, inadequate fruits and/ or vegetables intake, added salt intake, physical inactivity, underweight, overweight and obesity.

*Significant p value.

CVD, cardiovascular disease.
alcohol intake were consistent with the NCD risk factors survey of Bangladesh where urban population showed high prevalence. The possible explanation of urban-rural variation of alcohol consumption includes influence of social and cultural factors like religious cultural practices, community and family relationships, economic conditions, the availability of alcohol and the enforcement of alcohol laws. In current study, urban-rural variation of CVD risk factors possibly due to the result of urbanisation and it is believed that in addition to genetic or familial predisposition, environmental factors like undernourishment in early life, adoption of an urbanised lifestyle or a combination of both factors may contribute to high prevalence of NCD risk factors. In this study, parents of rural participants had low socioeconomic status as well as education level and both are considered as the influencing factors for adoption of harmful habits like unhealthy diet and tobacco use among the family members.

In this study, place of residence had higher odds for having several modifiable CVD risk factors including current smoking, inadequate fruits and/or vegetables intake, physical inactivity, overweight and obesity. Previous studies reported significant urban-rural difference for tobacco consumption and the rate was higher among rural compared with urban children, similar to our study. The BMI of school children is significantly differed between urban and rural area was also justified by an Indian study of Punjab. Again, two other studies reported same difference in dietary pattern among urban and rural children. It was noted that children of low-income communities and rural area has less access to healthy foods environment that exposes them to unhealthy diets than their counterpart advantaged communities. In our study, overweight and obesity showed highly significant association with place of residence that can also be explained by the physical activity levels of the school children. Like our study, previous study also informed that physical activity levels differed based on living area. The BMI of school children is significantly differed between urban and rural area was also justified by an Indian study of Punjab. Again, two other studies reported same difference in dietary pattern among urban and rural children. It was noted that children of low-income communities and rural area has less access to healthy foods environment that exposes them to unhealthy diets than their counterpart advantaged communities.

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Limitations
Several factors might influence the results of this study and considered as weakness. First, our study is a cross-sectional study in design; it only provides an association and not causation. Second, the application of convenience sampling and recalled method to collect data may elevate the risk of selection bias and recalled bias, respectively. Although we adjusted all the potential risk factors in the binary logistic regression, there are also probability of having residual confounders. Besides these, blood pressure measurement is not included in this study which is an important CVD risk factor. Due to methodological issue, the findings of this study are also not possible to generalise for all Bangladeshi school children.

Strengths
Other than these limitations, this study is important as it estimated the prevalence of CVD risk factors among school children for the first time in Bangladesh. Moreover, first time urban-rural comparison was done to show the difference of CVD risk factors burden. This study generated baseline data on CVD risk factors burden that will help the policy makers of Bangladesh to take an initiative.

CONCLUSION
Children of Bangladesh are bearing a significant burden of CVD risk factors that will add extra load on the healthcare systems. But evidence about their cardiovascular health is still insufficient that demands further large-scale nationwide study to detect the actual burden and preventive approach as appropriate.

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