Original Article

Noncommunicable disease risk factors among postgraduate students in Dhaka city, Bangladesh: a multi-centric cross-sectional study

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Background: Knowing the distribution of noncommunicable disease (NCD) risk factors among emerging adults are of utmost relevance for preventing and controlling NCDs. Hence, this study aimed at assessing the behavioral and metabolic risk factors of NCD among postgraduate students residing in the capital city Dhaka of Bangladesh. In addition to this, we also assessed the clustering of these risk factors among the study population.

Methods: A cross-sectional study was conducted among 388 postgraduate students from the University of Dhaka, North South University, and Bangladesh University of Health Sciences. Students with Bangladeshi nationality who were pursuing a post-graduate degree in the selected universities were the study samples. We applied purposive sampling technique to select the universities and recruit the study population. A self-administered online questionnaire adapted from WHO STEPS survey (version 3.2) was used for data collection.

Results: The mean age of the participants was 26 years. Majority (89.7%) consumed inadequate fruit and vegetables (men: 94.2%, women: 86.2%, P=0.010). The median added salt intake while taking a meal was 1.4 g/day with no difference between sexes. About 11.3% students smoked cigarettes (men: 24.6%, women: 0.9%, P<0.001) and 3.1% consumed alcohol (men 5.3%, women 1.4%, P<0.001). More than quarter (26.3%) of them were overweight (men 32.2%, women 21.7%, P=0.018) and 10.8% were obese (men 7.6%, women 13.4%, P=0.018). Overall, 19.9% participants followed sedentary lifestyles with negligible difference between sexes. Self-reported hypertension was 7.5% (men 12.9%, women: 3.2%, P<0.001) as well diabetes was 2.3% (men: 2.9%, women: 1.9%, P<0.001). Majority of the university students (94.3%) had at least one, more than half (54.9%) had two or more and 15.5% had three or more NCD risk factors.

Conclusions: A high proportion of NCD risk factors among postgraduate students of Dhaka warrants appropriate public health measures to prevent the development of later life NCD in this high-risk population.

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Introduction

Non-communicable diseases (NCDs) are the leading public health issues contributing to 71% of global deaths. Mainly cardiovascular diseases (CVDs), cancers, diabetes, and chronic obstructive pulmonary diseases (COPD) are the major causes of disease burden and 80% of premature deaths occur in lower-middle-income countries (LMICs) like Bangladesh (1,2). Reducing this burden will lead to achieving the sustainable development goal (3). Rapid urbanization, population aging, and lifestyle changes in developing countries increase this burden of NCDs (4,5).

Recently, the concern with the burden of NCD risk factors among younger population has increased (6). The cause of such increased interest may lie in the ability to identify a high-risk profile early to better plan and design public health interventions (7). However, in Bangladesh, previous studies merely attempted to assess the NCD risk factors among younger population. In this regard, a previous study reported a higher burden of NCD risk factors among the undergraduate students of Dhaka city (8). To take an effective initiative, this single evidence is insufficient and demands further studies among a similar group of population. Hence, in this study, we tried to determine the proportion of NCD risk factors among the postgraduate students affiliated with three different universities of Dhaka city, Bangladesh. We present the following article in accordance with the STROBE reporting checklist (available at https://dx.doi.org/10.21037/jxym-21-29).

Methods

Study design and settings

A cross-sectional study was conducted among postgraduate students of three purposively selected universities in Dhaka City. These were the University of Dhaka (DU) in Nilkhet Road, Shahbag; North South University (NSU) in Bashundhara and Bangladesh University of Health Sciences (BUHS) at Darus Salam, Mirpur. The first one is public and the rest of the two are private universities. The University of Dhaka is one of the top public Universities of Bangladesh; North South University is the first private university of Bangladesh having the largest number of students. Bangladesh University of Health Sciences is the first private university related to health science having multidisciplinary programs. These universities get students from different regions of Bangladesh representing different socio-economic backgrounds and cultures. The duration of this study was from July 2020 to December 2020 where data collection was done in November 2020.

Study participants

Students doing post-graduation in selected universities were the study population. A purposive sampling technique was applied to select the universities and study samples. A list of postgraduate students was collected from the registrar office of three universities. Students were purposively categorized under three faculties namely Faculty of Public Health, Faculty of Allied Health Sciences, and Faculty of Basic Sciences. Department-wise distribution under those faculties was made based on common departments between two universities. Four departments were taken by this way namely Department of Public Health, Department of Pharmacy, Department of Biochemistry and Molecular Biology, and Department of Microbiology. Two Institutions from the University of Dhaka (Institute of Nutrition and Food Science and Institution of Health Economics) were put under the Faculty of Public Health due to their relevancy to public health and were not chosen based on commonalities. Foreign students were excluded. The total estimated sample size was 524 considering the prevalence of tobacco use 18.9% (8) and 10% non-response. As there were irregular students and the academic activities of the universities were closed due to the coronavirus 2019 pandemic; the student numbers were less than the assumption. Finally, data were collected from 388 students (DU =91, NSU =182, BUHS =115).

Ascertainment of outcome variables

Here, all the behavioral (tobacco use, fruit and vegetables intake, alcohol intake, physical inactivity) and metabolic risk factors (overweight, obesity) were defined according to 'Non-communicable disease risk factor survey Bangladesh 2010' except added salt intake, processed food intake, fast food and soft drink intake (9). The participants who used to take dietary salt during eating meal was categorized as an added dietary salt consumer (10). A processed food was defined as one that has undergone any changes to its natural state (11). Again, the fast-food intake was defined as "food that can be prepared quickly and easily and is sold in restaurants and snack bars as a quick meal or to be taken out" (12). On the other hand, a soft drink was defined as a drink that typically contains carbonated water, a sweetener, and a natural or artificial flavoring (13). Here, intake of a processed food, fast food and soft drink was measured as days/week. In our study, participants who did not engage themselves in any vigorous or moderate intensity activity (work-related/recreational) for at least 75 minutes or 150 minutes per week respectively was considered as 'low physically active' (9).

Data collection instruments and methods

The data collection instrument was developed using the WHO STEPS NCD Risk Factor survey questionnaire with required modification (14,15). The questionnaire consisted of 03 (three) sections including personal information (name, sex, date of birth, educational institution), behavioral information (dietary habit related to fast food, processed food; fruit and vegetables consumption; dietary salt intake; tobacco and alcohol consumption; physical inactivity) and history regarding high blood pressure and high blood sugar; height and weight. Permission was taken from the Chairman and Director of the selected department's prior data collection. Students' online group platform was accessed through contacting their class representatives. Data were collected using a self-administered English version of the online questionnaire (google form) which was shared via Email, WhatsApp, and Messenger, and few participants were contacted over the phone. A study brief was given at the beginning and pictorial show cards were attached to explain food items and serving sizes. A teaspoon's picture was used to determine the amount of added salt while taking a meal. To reduce recall bias, the questions were selected carefully, and participants were given enough time to respond and submit the questionnaire.

Statistical analysis

Data were cleaned and edited using Microsoft Excel 2013. Descriptive analysis (frequency, percentage, mean and standard deviation) was done as appropriate for categorical and quantitative variables. The Chi-square test (χ^2) or Fisher's exact test for categorical variables and Kruskal-Wallis test or *t*-test for continuous variables were performed by the Statistical Product and Service Solutions (SPSS) version 20.0 for Windows (SPSS, Inc., Chicago, IL, USA) to see the association of the NCD risk factors among men and women participants. The statistical tests were considered significant (2-sided) at a level of $P<0.05$. We graphically presented the clustering of NCD risk factors using error bar chart.

Ethical implications

The study was conducted in accordance with the Declaration of Helsinki (as revised in 2013). The study was approved by the National Research Ethics Committee of Bangladesh Medical Research Council (BMRC). Written permission was taken from the Chairman/Director of the departments of respective universities. Informed consent was taken from all participants.

Results

A total of 388 postgraduate students of three different public/private universities of Dhaka city participated in this study. Among the respondents, more than half (55.9%) of the participants were female. The mean age of the participants was 26 years. We have presented the distribution of risk factors in a quantitative manner giving midpoints and dispersion in *Table 1*. The median consumption of fruit and vegetables was 2.0 servings per day (men 1.8, women 2.1). The median added salt intake while taking a meal was 1.4 g/day with no differences between sexes. The average days of fast food and soft drinks consumption was 2 days/week (SD, 1.4). Majority (89.7%) of the respondents consumed less than recommended minimum 5 servings of fruit and vegetables per day (men: 94.2%, women: 86.2%, P=0.010). Prevalence of cigarette smoking among the respondents was 11.3% (men 24.6%, women 0.9%, P<0.001). Among them 6.2% consumed tobacco in the form of e-cigarette (men 12.3%, women

Table 1 Distribution of noncommunicable disease risk factors among the postgraduate university students of Dhaka, Bangladesh (n=388)

Risk factors	Both sexes (n=388)	Men (n=171)	Women (n=217)	P values*
Fruit/vegetables, servings/day, median (IQR)	2.0 (1.3, 3.1)	1.8 (1.0, 2.6)	2.1 (1.2, 3.4)	0.003
Added salt intake (n=127), gram/day, median (IQR)	1.4 (1.4, 1.4)	1.4 (1.4, 1.4)	1.4 (1.4, 2.1)	0.733
Processed food intake, days/week, median (IQR)	2.0 (1.0, 3.0)	2.0 (1.0, 3.0)	2.0 (1.0, 3.0)	0.996
Fast food and soft drink intake, days/week, median (IQR)	2.0 (1.0, 3.0)	2.0 (1.0, 3.0)	2.0 (1.0, 3.0)	0.132
Body mass index, kg/m^2‡, median (IQR)	23.5 (20.8, 26.6)	24.2 (22.0, 26.4)	22.6 (20.4, 26.6)	0.654
Tobacco use, n (%)				
Cigarette smoking	44 (11.3)	42 (24.6)	2 (0.9)	<0.001
e-Cigarette ever used	24 (6.2)	21 (12.3)	3 (1.4)	<0.001
Alcohol intake (last 30 days), n (%)	12 (3.1)	9 (5.3)	3 (1.4)	<0.001
Inadequate fruit or vegetable intake (<5 servings/day), n (%)	348 (89.7)	161(94.2)	187 (86.2)	0.010
Sedentary physical activity†, n (%)	77 (19.9)	33 (19.3)	44 (20.3)	0.810
Overweight (BMI ≥25–29.9 kg/m^2), n (%)	106 (27.3)	57 (33.3)	49 (22.3)	0.018
Obesity (BMI ≥30 kg/m^2), n (%)	42 (10.8)	13 (7.6)	29 (13.4)	0.018
Self-reported hypertension§, n (%)	29 (7.5)	22 (12.9)	7 (3.2)	<0.001
Intake of medication for hypertension, n (%)	16 (55.1)	10 (45.5)	6 (85.7)	0.093
Self-reported diabetes‖, n (%)	9 (2.3)	5 (2.9)	4 (1.8)	<0.001
Intake of medication for diabetes, n (%)	6 (66.7)	2 (40.0)	4 (100.0)	0.167

*, all P values are statistically significant at a threshold of <0.05 using χ^2-test for categorical variables (Fisher's exact test indicating by italicized P value) and Kruskal-Wallis test for continuous variables (*t*-test for body mass index); †, physical activity <150 minutes/week; ‡, mean (standard deviation) of body mass index: both sex, 24.2 (4.9); men, 24.3 (3.9); women, 24.1 (5.7); §, BP ≥140/90 mmHg; ‖, fasting blood glucose >6.9 mmol/L or random blood glucose >11.1 mmol/L . IQR, interquartile range; BMI, body mass index.

1.4%, P<0.001). Alcohol was consumed in last 30 days by 3.1% of the respondent (men 5.3%, women 1.4%, and P<0.001). Mean body mass index (BMI) was 23.3 kg/m^2 (SD 5.0). More than quarter (27.3%) of them were overweight (men 33.3%, women 22.3%, P=0.018) and 10.8% were obese (men 7.6%, women 13.4%, P=0.018). Overall, 19.8% of the participants were low physically active with negligible difference between sexes. Clustering of risk factors showed 94.3% of the respondents had at least one risk factor and this overall proportion was similar in both men and women (*Figure 1*). However, sex difference was increased as the number of clusters increased: at least two or more and there after the number of risk factors were higher in men than women (two or more risk factors, overall, 55%, men 63.7%, women 47.9%; three or more risk factors, overall, 15.5%, men 27.5%, women 6%) (*Figure 1*). Self-reported hypertension was 7.5% (men 12.9%, women: 3.2%, P<0.001) as well diabetes was 2.3% (men: 2.9%, women: 1.9%, P<0.001). More than 5 out of 10 (55.1%) hypertensive participants (men 45.5%, women 85.7%, P=0.092) received medication for hypertension and more than 6 out of 10 (66.7%) diabetic participants (men 40.0%, women 100%, P=0.166) received medication for diabetes.

Discussion

For the first time in Bangladesh, NCD risk factors were evaluated in a high-risk population who were relatively young, studying in a unique tertiary education program and representing both public as well as private university students. Our evaluation elucidated the inadequate fruit and vegetables intake, physical inactivity, and overweight/obesity as the highly prevalent NCD risk factors among the postgraduate university students residing in the capital city of Bangladesh. Among them, majority had at least one risk factor and more than half had two or more risk factors of NCD.

Among the behavioral risk factors, we found 89.7%

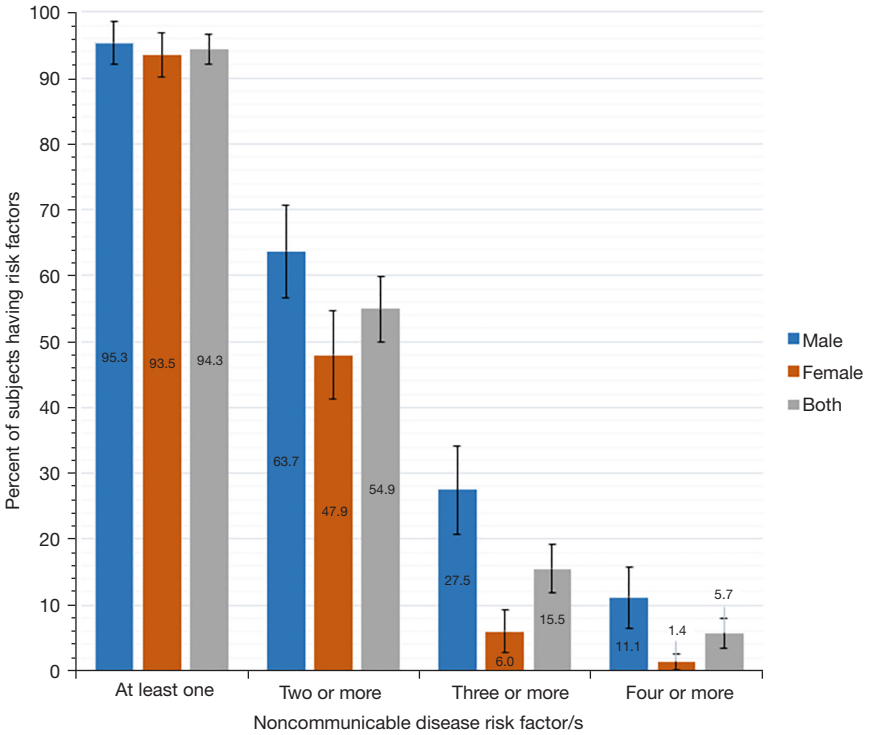

Figure 1 Clustering of noncommunicable disease risk factors among postgraduate university students of Bangladesh (n=388).

of participants consumed inadequate (<5 servings/day) fruit and vegetables per day, 19.9% were less physically active and 11.3% used to smoke cigarette. These findings are supported by other studies for inadequate fruit and vegetables intake (16-20) and physical inactivity (20). However, the current prevalence of smoking is much lower than the previous study conducted among undergraduate students of Bangladesh (8). Considering the availability, price, and popularity of fruit and vegetables versus unhealthy junk food, current findings of inadequate fruit and vegetables intake is not surprising, and also supported by a review that reported several determinants of low fruit and vegetables intake among young population (21). This is realistic in an urban city like Dhaka where reducing physical activity previously necessary for work or transportation and also giving rise to environmental factors such as heavy traffic, crime, and poor air quality that can make it difficult to be active outside (22). Moreover, the lack of education programs in the universities emphasizing physical activity is another possibility to such burden of sedentary behavior among the younger population. Other than cigarette smoking, the current proportion of use of e-cigarette is half of the tobacco smoking which is alarming. This increased prevalence of e-cigarette use is possibly influenced by the marketing strategies of industries that targets youth via social media such as Facebook and YouTube, and celebrity endorsements and sponsorships of sporting events (23).

Among the metabolic risk factors, overweight/obesity is highly prevalent among postgraduate university students of Bangladesh. Among the men participants, 33.3% were overweight while 7.6% were obese which is higher than the study that evaluated overweight and obesity among university students from 22 countries (24). The sex difference and overall burden of overweight/obesity in the current study could be explained in the light of the aforementioned physical inactivity and low fruit and vegetables intake among the study population. We identified a considerably low prevalence of hypertension and diabetes among the postgraduate university students of Bangladesh similar to the findings of other countries (25,26). The low prevalence of hypertension and diabetes among university students is not surprising as both of these diseases required a long latent period and duration to expose to the risk factors. As the study population is relatively younger, the influence of these two factors are possibly limited by their age and thus the prevalence is

comparatively lower than the usual adult.

Overall, majority of the university students (94.3%) had at least one, more than half (54.9%) had two or more and 15.5% had three or more NCD risk factors. Interestingly, our findings of three or more NCD risk factors among the university students is exactly coincide with a global study (15.9%) conducted among university students from 24 countries (27).

The study has several limitations. Especially, purposive sampling technique, small sample size, and self-reported assessment of NCD risk factors may elevate the risk of selection bias, less generalizability, and recall bias. Besides, the coronavirus 2019 pandemic also forced us to collect data using the online platform.

Despite these limitations, this study has some important aspects. First, this is the first study in Bangladesh that assessed NCD risk factors among students of three different universities. Second, the universally accepted STEPS survey was applied with modification to get the picture of risk factors that may compare with the national data of similar age groups. Third, the data was collected from the specific group of the population who are educationally homogenous and had the ability to understand the questions and respond well than the general population. Hence, we believe the current study provided a valid estimate of NCD risk factors that will help to design interventions in the future.

Conclusions

The present study findings denote that fruit and vegetables intake, physical inactivity, and overweight/obesity are the most prevalent NCD risk factors among postgraduate university students of Bangladesh. As all of the identified highly prevalent NCD risk factors are clustered and also modifiable, the authority of universities should incorporate the "multiple health behavior changes interventions" into the university health promotion activities and the university curriculum to prevent future surge of NCDs among this high-risk population.

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Footnote

Reporting Checklist: The authors have completed the STROBE reporting checklist. Available at https://dx.doi.org/10.21037/jxym-21-29

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Ethical Statement: The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. The study was conducted in accordance with the Declaration of Helsinki (as revised in 2013). The study was approved by the National Research Ethics Committee of Bangladesh Medical Research Council (BMRC) and informed consent was taken from all the participants. It was a classroom assignment that was considered as a partial fulfillment of the requirement for the course of 'Advanced Research Methods in NCD' and hence verbal permission was taken from the chairman of the Ethical Review Committee of the Bangladesh University of Health Sciences. To collect data, written permission was also taken from the Chairman/ Director of the departments of respective universities.

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