Prevalence of non-communicable disease risk factors among nurses and para-health professionals working at primary healthcare level of Bangladesh: a cross-sectional study

Mithila Faruque, Lingkan Barua, Palash Chandra Banik, Sharmin Sultan, Animesh Biswas, Abdul Alim, Pradip Kumar Sen Gupta, Liaquat Ali

ABSTRACT

Objective To determine the prevalence of non-communicable disease (NCD) risk factors among nurses and para-health professionals (PHPs) working at primary healthcare centres in Bangladesh. In addition to this, we also investigated the association of these risk factors with the categories of health professions.

Design Cross-sectional study and the sampling technique was a census.

Setting The study site was a medical university of Bangladesh where the study population was recruited by NCD Control Programme of Directorate General of Health Services to participate in a 3-day training session from November 2017 to May 2018.

Participants A total of 1942 government-employed senior staff nurses (SSNs) and PHPs working at Upazila Health Complexes.

Primary and secondary outcome measures The data were collected using a modified STEPwise approach to NCD risk factors surveillance questionnaire of the World Health Organisation (V.3.2). The prevalence of NCD risk factors was presented descriptively and the \( \chi^2 \) test was used to determine the association between NCD risk factors distribution and categories of health professions.

Results The mean age of the participants was 37.6 years (SD 9.5) and most of them (87.6%) had a diploma in their respective fields. Physical inactivity (86.9%), inadequate fruits and/vegetable intake (56.3%) and added salt intake (35.6%) were the most prevalent behavioural risk factors. The prevalence of central obesity, overweight, raised blood glucose and raised BP were 83.5%, 42.6%, 19.2% and 12.8% respectively. Overall, the NCD risk factors prevalence was higher among PHPs compared with SSNs. A highly significant association (\( p<0.001 \)) was found between risk factors and the categories of health professions for tobacco use, alcohol intake, added salt intake and physical inactivity.

Conclusion High NCD risk factors prevalence and its significant association with SSNs and PHPs demand an appropriate risk-reduction strategy to minimise the possibility of chronic illness among them.

INTRODUCTION

Non-communicable diseases (NCDs) are the leading cause of mortality worldwide and recognised threats to socioeconomic developments. Currently, NCDs are considered as new priorities that put an additional burden on the existing healthcare system of developing countries. Major NCDs include cardiovascular diseases (CVDs), cancer, diabetes and chronic respiratory diseases that kill an estimated 15 million people annually. Most of these premature deaths occur in low- and middle-income countries (LMICs). NCDs are gradually increasing in these countries due to rapid urbanisation, sedentary lifestyles and the increasingly available nutrient-poor processed foods. Other than health impacts, NCDs have a socioeconomic impact that quickly drains household resources of the affected individual due to exorbitant costs of expensive lifelong care. However, the capacity of the healthcare system of LMICs is...
limited to manage the short-term health conditions like emerging infectious diseases and maternal health but not accustomed to tackle NCDs as it needs long-term management using a multidisciplinary approach.3

Like other LMICs, Bangladesh has a huge burden of NCDs that contributed 67% of all deaths as per recent evidence.5 Among the total deaths, 55% are caused by major NCDs and again half of these are by CVDs.5 A nationally representative survey revealed that 76% of Bangladeshi adults showed at least two or more and 38% showed three or more NCD risk factors.6 These risk factors are preventable, and their detection is much easier and cost-effective compared with the diseased state. Hence, the risk factors approach for prevention and control of NCDs become popular and recognised.

Healthcare professionals (HCPs) are an essential and a diverse group of workforce that devote most of their time to building a healthier society.7 They primarily include qualified physicians, nurses, medical assistants, medical scientists, lab technologists, pharmacists, and other non-clinical support staff such as administrative staff.8 Based on their knowledge and training, it might be assumed that they make healthy lifestyle choices and have better health compared with others.9 It is also expected that the prevalence of cardiometabolic diseases and their risk factors would be relatively low among them. However, certain occupation-related risk factors like physical and mental stress from work shifts, overtime, providing medical care under life-and-death circumstances, etc. exposes them to high-risk behaviour of impending NCDs.10 In this regard, a pedometer-based study among Nigerian nurses and para-health professionals (PHPs) (pharmacists and physiotherapists) found that most of the HCPs did not meet the recommended levels of physical activity, and this was significantly associated with adverse health outcomes.11 Thus, the health of medical professionals is of great concern and should not be overlooked.

In Bangladesh, together with qualified doctors, nurses and PHPs provide health services both in urban and rural areas. Due to the massive shortage and dispropor- tionate distribution of skilled health workers, they have to provide services in an overburdened, understaffed, and insufficiently equipped setting12 that causes unusual physical and mental stress. Their health condition is still a neglected issue in Bangladesh, and data on this issue is completely lacking. Hence, our primary objective was to determine the prevalence of NCD risk factors among nurses and PHPs working at primary healthcare centres in Bangladesh. Besides, we sought to explore the association of these risk factors with the categories of health professions.

MATERIALS AND METHODS

Study design

This was a cross-sectional study conducted among nurses and PHPs of Bangladesh employed by the government at primary healthcare centres. The Non-communicable Disease Control (NCDC) cell of the Directorate General of Health Services (DGHS) selected HCPs from all Upazila Health Complexes of the country, covering 8 divisions and 64 districts, and sent them to a medical university in Dhaka in 70 batches, with 30 participants in each batch. Total 1942 senior staff nurses (SSNs) and PHPs (subassistant community medical officer, medical technologist, pharmacist and sanitary inspector) of 20–60 years of age underwent a 3-day training on NCD management during November 2017 to May 2018 and the data for this study were collected in this period. The sampling technique used was census as all these trainees participated in the study.

Data collection procedures

For each batch, data were collected in three steps, following the standardised method of WHO STEPwise approach to Surveillance (STEPS) of NCD risk factors.13 In the first step, a pretested self-administered questionnaire was distributed on the first day of the training, which the participants answered after giving their informed written consent. This questionnaire was a modified version of the STEPS questionnaire (WHO V.3.2) that gathered information about the participants’ sociodemographic, behavioural (tobacco and alcohol consumption, physical activity, dietary habits, added salt intake) and metabolic risk factors (raised blood glucose, raised BP). We used the pictorial show cards to make them understand the fruit/vegetable servings and various types of physical activities.

In the second step, anthropometry and blood pressure (BP) were measured as per the standard protocol described in ‘Non-communicable disease risk factors survey Bangladesh 2010’.14 Anthropometry included the participants’ height, weight, waist circumference (WC) and hip circumference (HC). We also calculated their body mass index (BMI) and waist-to-hip ratio to categorise obesity. The BP was recorded two times using an aneroid sphygmomanometer and first measurement was taken after 15 min rest prior to measurement and 3 min after interval prior to second measurement. The mean of the two measurements was used to determine the final BP. All anthropometric values were measured in the International System of Units (SI) and the parameters of BP were taken in mm Hg. The third step was to measure their fasting capillary blood glucose (after a minimum of 8 hours’ fasting) on the second day of training. The capillary blood glucose was measured using glucometer with aseptic precautions. The survey questionnaire (English and Bengali version) and informed consent form are submitted as supplementary files (see online supplemental files 1-3).

Ascertainment of the key variables

Current tobacco use

Those who smoked or used smokeless tobacco in the past 30 days were considered as ‘current tobacco user’. Smokeless tobacco use denotes the use of chewing tobacco with betel nut, such as jarda, gul, sada pata and khoir.14

Open access
Alcohol consumption
Alcohol consumption was measured by asking the respondents if they have consumed ever in a lifetime and within the past 30 days as the current user.14

Dietary habit
Participants were asked about the number of days. They ate fruits and vegetables in a week and the number of servings on those days they took. One standard serving size equal to 80 g (WHO, STEPS V.3.2). Less than five (<5) servings of fruits and/vegetable intake a day was considered inadequate.14

Added salt intake
The participants who used to take dietary salt during eating meal was categorised as an added dietary salt consumer.

Physical activity
We collected information only on their work-related physical activity, which was assessed in terms of the minutes that made them breathless or they felt palpitation if the physical activity continued for at least 10 min. Then the total duration of such physical activity in a day was converted into the metabolic equivalent of task or MET-minute to express the intensity of physical activity. We asked the respondents how many days a week and how much time they spent (in minutes) each of that day in doing vigorous and moderate activities. We categorised physical activity as less active (≤600 MET-minutes per week), moderately active (= 600–3000 MET-minutes per week) and highly active (≥3000 MET-minutes per week).14 The detailed measurement of dietary servings and physical activity was added as supplementary files (see online supplemental file 4).

Generalised obesity
The participants were considered as obese and overweight when BMI ≥30 kg/m² and 25–29.9 kg/m², respectively.15 Central obesity was categorised according to the cut-off value specified by the International Diabetes Federation—waist–hip ratio ≥0.90 for men and ≥0.85 for women.16

Raised capillary blood glucose
When fasting blood glucose is ≥7.0 mmol/L and/or on antidiabetic treatment for raised blood glucose.17

Raised BP
When systolic BP ≥140 mm Hg and/or diastolic BP ≥90 mm Hg and/or on antihypertensive treatment for raised BP.18

Quality assurance
The investigators ensured the quality control by self-monitoring data collection like assistance in filling up the questionnaire by explaining the meaning of the terms for risk factors and employing trained personnel to measure the height, weight, WC, HC, BP, and capillary blood glucose. Observers were engaged from other departments of the University for quality control. In addition to assuring the quality, we also maintained certain protocols to reduce potential biases: (1) pre-testing of the questionnaire and professional sensitivity; (2) using standard methods of measurement as per STEPS survey of Bangladesh 201014; (3) using show cards to better explain dietary servings and physical activities; (4) maintaining adequate privacy during physical measurements and (5) using robust equipment for measurements.

Patient and public involvement
None of the study participants 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
Each participant was informed about the objectives of the study and its outcome, the necessity of an invasive procedure, and data safety issues. Data were collected after written informed consent was obtained. Ethical approval to conduct the study was taken from the Ethical Review Committee of the University and it is submitted as a supplementary file (see online supplemental file 5). Blood glucose measurement reports were delivered to the participants instantly, and they were advised according to their glycaemic status.

Data processing and analysis
All 1942 responses were reviewed thoroughly for consistency and completeness. A total of 30 responses were found incomplete or inconsistent, and hence the final analysis comprised of 1912 responses. The obtained data were then cleaned, edited, and verified before coding and entering them into an excel sheet, and then transferred to the software Statistical Package for Social Science (V20.0) for Windows (SPSS). The analysis was carried out in SPSS, and the outputs were tabulated. Descriptive statistics were presented as the frequency, percentage, IQR and mean with SD where appropriate. All estimates of precisions were presented at a 95% CI. The association between NCD risk factors and the categories of health professions was evaluated using the χ² test. The findings were considered statistically significant at the level of p<0.05. The SPSS datasheet is submitted as a supplementary file (see online supplemental file 6).

The following risk factors were used for analyses: tobacco use, alcohol use, inadequate fruits and/vegetable intake, added salt intake, low physical activity, overweight, obesity, raised blood glucose, and raised BP. Here, all the behavioural and metabolic risk factors were categorised as per the definition used in the ‘Non-communicable disease risk factors survey Bangladesh 2010’14 except added salt intake, and central obesity. We used the Strengthening the Reporting of Observational Studies in Epidemiology guidelines for reporting the results of a cross-sectional observational study (see online supplemental file 7).
more than half of the participants (56.3%) did not follow the WHO recommendation, and no job-specific difference was detected among them. Current tobacco usage and alcohol consumption were higher among PHPs than among SSNs (Table 2).

Here, most of the behavioural risk factors were significantly associated with the professional categories (SSNs and PHPs).

**Prevalence of metabolic risk factors of NCD**

Among the metabolic risk factors, most of the participants had central obesity (83.5%), overweight (42.6%), raised blood glucose, (19.2%) and raised BP (12.8%). A comparison between SSNs and PHPs showed that proportion of overweight (45.6% vs. 39.6%) and raised BP (14.9% vs. 10.6%) were high among the PHPs whereas the prevalence of central obesity (82.6% vs. 84.3%), generalised obesity (7.2% vs. 9.6%) and raised blood glucose (37.4% vs. 30.6%) were higher among SSNs (Table 3).

Among the metabolic risk factors of NCD, overweight (p=0.008), raised BP (p=0.005) and generalised obesity (p=0.007) showed a significant association with the categories of health professions.

**RESULTS**

**Sociodemographic and professional characteristics**

A nearly equal proportion of men (49.5%) and women (50.6%) participated with the mean age of 37.6±9.5 years. The proportion of women was higher (87.8%) among SSNs, whereas there were more men (85.3%) among the PHPs. Although maximum participants were under 40 years old, nearly half of the PHPs were 30–39 years old and one-third of the SSNs were 40–49 years. Most of the participants had diplomas (87.6%) which was the highest educational qualification. The mean duration of their employment was 13.8±9.5 years, and on average, they served 36.8±26.8 patients per day (Table 1).

**Prevalence of behavioural risk factors of NCD**

Table 2 shows the distribution of behavioural risk factors for NCDs among the participants. Among the behavioural risk factors, low physical activity (86.9%), inadequate fruits and/or vegetable intake (56.3%) and added salt intake (35.6%) were most prevalent. The prevalence of physical inactivity, and added salt intake were higher among SSNs (92% and 39.9%, respectively) compared with PHPs. Regarding inadequate fruits and/or vegetable intake, more than half of the participants (56.3%) did not follow the WHO recommendation, and no job-specific difference was detected among them. Current tobacco usage and alcohol consumption were higher among PHPs than among SSNs (Table 2).

Here, most of the behavioural risk factors were significantly associated with the professional categories (SSNs and PHPs).

**DISCUSSION**

Although health professionals are the role models for the general people and a locus of their trust, we observed a greater prevalence of different NCD risk factors among SSNs and PHPs of Bangladesh. The study also explored their profession, which was found to be significantly associated with the distribution of various NCD risk factors.

Three behavioural risk factors, namely physical inactivity, inadequate fruit and/or vegetable intake, and added salt intake, were highly distributed among the study population. About 87% of the health professionals were physically inactive, which was about twice the national rate (45.7%) of work-related physical inactivity. In comparison to the global data of work-related physical inactivity, it is also higher than HCPs of the other countries. The possibilities of such variation in reporting the prevalence of physical inactivity might be due to methods of physical activity assessment (subjective/objective) and the settings in which the healthcare providers used to work. HCPs working in low-resource settings such as Bangladesh, with an understaffed and underequipped condition, are mostly overburdened to provide more time to manage their patients and have to sit for longer periods that forces them to be physically inactive. In this study, SSNs were mostly sedentary compared with the PHPs. This is supported by a Nigerian study among HCPs. We believe this physical inactivity among SSNs is typical as women are the main workforce in this profession in Bangladesh (88% in the current study) and high prevalence of physical inactivity among women has been previously reported by two other studies among the general population (53.6%) and postmenopausal women (58.1%), respectively.
About the impact of dietary habits on the development of NCDs, a recent systematic analysis that included 195 countries reported that unhealthy dietary habits (too much salt and fewer fruits/vegetables) kill more people than smoking.23 In accordance with this report,23 high added salt intake and less fruit and/or vegetable intake were also detected among Bangladeshi SSNs and PHPs. Similar findings are also observed among HCPs of South Africa,24 Pakistan,25 India,7 Nigeria26 and Mexico.27 A Bangladeshi study found that highly qualified academicians and clinicians involved in teaching, training and patient management were sufficiently aware of the health impacts of dietary salt intake but about 29% of them used to take added salt with their meals, 31.6% used a salty sauce in their meals, 52.8% used a salty sauce in cooking and 41.8% consumed processed food with high salt content.28 The aforementioned study28 showed that there was a gap between knowledge and practice which might result from several apparent barriers. In this regard, an integrative review reported different barriers related to healthy dietary choices among HCPs such as institutional barriers (long work schedules, changing shifts, heavy workload, insufficient staff and short, infrequent breaks), societal barriers (eating habits of peers), workplace barriers (limited access to healthy foods in the canteens or vending machines, inadequate food preparation and conservation facilities, lower cost and higher availability of junk food compared with healthy foods) and personal barriers (lack of self-efficacy and motivation and inadequate knowledge about nutrition).27 29 All of these make it more difficult for health professionals to engage in healthy dietary behaviours, although they are highly knowledgeable on the issue.

| Table 2  | Behavioural risk factors of NCDs among the study population, n=1912 |
|----------|---------------------------------------------------------------|
| Risk factors                  | Total (n=1942) | SSNs (n=938) | PHPs (n=974) | P value |
| Current tobacco use*          |               |              |              |         |
| Smoking                        | 48 (7.7)      | 10 (1.1)     | 138 (14.2)   | <0.001  |
| Smokeless                      | 53 (2.3)      | 26 (2.8)     | 27 (2.8)     | 1.000   |
| Past tobacco use               |               |              |              |         |
| Smoking                        | 115 (6.5)     | 15 (1.6)     | 100 (11.9)   | <0.001  |
| Smokeless                      | 33 (1.8)      | 6 (0.7)      | 27 (2.9)     | <0.001  |
| Alcohol intake                 |               |              |              |         |
| At least once in life          | 194 (10.1)    | 37 (3.9)     | 157 (16.1)   | <0.001  |
| Current user (last 30 days)   | 30 (1.6)      | 9 (1.0)      | 21 (2.2)     | 0.035   |
| Fruits and vegetable intake (mean±SD) |       |              |              |         |
| Weekly fruit intake (days)    | 3.8±1.6       | 4±1.6        | 3.6±1.6      |         |
| Daily fruit servings           | 2±1.1         | 1.9±1.0      | 2±1.1        |         |
| Weekly vegetable intake (days)| 5.7±1.5       | 5.8±1.5      | 5.5±1.6      |         |
| Daily vegetable servings       | 2.6±1.3       | 2.7±1.3      | 2.6±1.3      |         |
| Inadequate intake†            | 1076 (56.3)   | 542 (57.8)   | 534 (54.8)   | 0.193   |
| Dietary salt intake           |               |              |              |         |
| Regular                       | 199 (29.3)    | 100 (26.7)   | 99 (32.4)    | 27.2 to 37.6 |
| Often                         | 75 (11.0)     | 48 (12.8)    | 27 (8.8)     | 5.6 to 12.0  |
| Sometimes                     | 252 (37.1)    | 143 (38.2)   | 109 (35.6)   | 30.2 to 41.0  |
| Rarely                        | 154 (22.6)    | 83 (22.2)    | 71 (23.2)    | 18.5 to 28.0  |
| Added salt intake‡            | 680 (35.6)    | 374 (39.9)   | 306 (31.4)   | 28.5 to 34.3  |
| Physical activity (MET min/week) |           |              |              |         |
| Highly active                 | 51 (2.7)      | 16 (1.7)     | 35 (3.6)     | 2.4 to 4.8   |
| Moderately active             | 199 (10.4)    | 59 (6.3)     | 140 (14.4)   | 12.2 to 16.6  |
| Low active§                   | 1662 (86.9)   | 863 (92.0)   | 799 (82.0)   | 79.6 to 84.4  |

Bold values indicated that the findings are significant.
*Tobacco use in the past 30 days.
†WHO recommendation of fruits and/or vegetable intake >5 servings per day.
‡Participants who used to take dietary salt during eating meal.
§Physical activity ≤600 MET min/week.
¶Χ² test was run between risk factors and health profession categories (SSNs, PHPs), statistical significance p<0.05.
MET, metabolic equivalent of tasks; NCD, non-communicable diseases; PHPs, para-health professionals; SSN, senior stuff nurse.;
Among the metabolic risk factors, the toll of central obesity (83.5%) and overweight (42.6%) was greater than other risk factors. The prevalence of these two was four times higher than the national prevalence of central obesity (21%) and overweight (10.8%) among the general population of Bangladesh. This proportion was also much higher than found in other global studies conducted in different parts of the world for central obesity and overweight, respectively.

However, our finding is supported by two other studies conducted among HCPs, one in Bangladesh and another in India. A comparison among the professional categories revealed that SSNs were more centrally obese than PHPs. This finding is also supported by two other studies, one from South Africa and one from England, which reported a higher burden of central obesity among nurses than other health professionals.

Several etiological explanations have been postulated as underlying the high prevalence of central obesity among nurses. These include the nature of the work nurses do (rotating and night shift duties), unhealthy dietary patterns and lack of physical activity. Interestingly, although the proportion of central obesity was higher among SSNs, overweight was not prevalent among them. The reason could be that we used two different parameters to level them as overweight and obese: overweight was levelled on the BMI while central obesity on the waist-to-hip ratio.

Besides the body composition (overweight and obesity), two key metabolic risk factors (raised blood glucose and raised BP) of NCD were highly distributed among SSNs and PHPs. However, previous reports regarding these three risk factors among HCPs are mixed. A higher prevalence than the current study has been reported by several studies for raised BP and raised blood glucose, whereas some other studies reported a low prevalence of raised blood glucose among the HCPs. Although the results are mixed, the development of these risk factors takes time with a long latency, which indicates that HCPs might ignore or are unaware of these risk factors due to insufficient knowledge on chronic disease development. Similar to our findings, a study mentioned that chronic illness among health professionals are underreported as they hold idealistic views of their role in treating illness and fighting diseases, and may not think that self-care is a priority.

In this study, we found that the distribution of different NCD risk factors was significantly associated with categories of health professions. Globally, data regarding the distribution of NCD risk factors among different categories of health professions is scanty and inconsistent. Moreover, studies on the association among the prevalence of

| Risk factors | Total (n=1912) | SSNs (n=938) | PHPs (n=974) | P value** |
|--------------|---------------|--------------|--------------|-----------|
|              | n (%) 95% CI  | n (%) 95% CI | n (%) 95% CI |           |
| Raised blood pressure (BP)* | | | | |
| Yes | 244 (12.8) 11.3 to 14.4 | 99 (10.6) 8.6 to 12.6 | 145 (14.9) 12.7 to 17.1 | 0.005 |
| No | 1688 (87.2) 85.7 to 88.7 | 839 (89.4) 87.4 to 91.4 | 829 (85.1) 82.9 to 87.3 | |
| Overweight† | | | | |
| Yes | 815 (42.6) 40.4 to 44.8 | 371 (39.6) 36.5 to 42.7 | 444 (45.6) 42.5 to 48.7 | 0.008 |
| No | 1097 (57.4) 55.2 to 59.6 | 567 (60.4) 57.3 to 63.5 | 530 (54.4) 51.3 to 57.5 | |
| Generalised obesity‡ | | | | |
| Yes | 151 (7.9) 6.7 to 9.1 | 90 (9.6) 7.7 to 11.5 | 61 (6.3) 4.8 to 7.8 | 0.007 |
| No | 1761 (92.1) 90.9 to 93.3 | 848 (90.4) 88.5 to 92.3 | 913 (93.7) 92.2 to 95.2 | |
| Central obesity§ | | | | |
| Yes | 1596 (83.5) 81.8 to 85.2 | 791 (84.3) 82 to 86.6 | 805 (82.6) 80.2 to 85 | 0.323 |
| No | 316 (16.5) 14.8 to 18.2 | 147 (15.7) 13.4 to 18 | 169 (17.4) 15 to 19.8 | |
| Raised blood glucose¶ | | | | |
| Yes | 368 (19.2) 17.4 to 21 | 182 (19.4) 16.7 to 21.9 | 186 (19.1) 16.6 to 21.6 | 0.865 |
| No | 1544 (80.8) 79 to 82.6 | 756 (80.6) 78.1 to 83.1 | 788 (80.9) 79.4 to 83.4 | |

Bold values indicated that the findings are significant.

*Raised BP, systolic ≥140 mm Hg and/or diastolic ≥90 mm Hg and/or treatment for raised BP.
†Overweight, body mass index 25–29.9 kg/m².
‡Generalised obesity, body mass index ≥30 kg/m².
§Central obesity, waist-hip ratio >0.90 for men and >0.85 for women.
¶Raised capillary blood glucose ≥7.0 mmol/L and/or treatment for raised blood glucose.

**χ² test was run between risk factors and health profession categories (SSNs, PHPs), statistical significance p<0.05 and presented as bold values.

PHPs, para-health professionals; SSN, senior stuff nurse.
risk factors and the categories of health professions are also lacking. Thus it is difficult to compare our findings with other studies in detail. However, one study conducted in Taiwan showed a significant association of different NCD risk factors with different categories of health professions. The exact cause of the development of NCD risk factors among health workers based on their profession category is not known. We believe that although they are from the healthcare sector, their knowledge, attitude and practice do not converge. Here, SSNs were associated with indoor patient care, and Subassistant community medical officer (SACMO) were provided treatment in primary care settings as a helping hand of qualified doctors. In some instances, SACMO was independently involved in patient management and played a key role. On the other hand, medical technicians (MTs) and the sanitary inspector had a very limited role in direct patient management. So, it is clear that SSNs, SACMO, MTs and sanitary inspectors have different roles in the healthcare system and as a result different workloads. We have already discussed that intensity of the workload, stress, night shifts, rotating duties, limited access to healthy foods at the workplace and knowledge about nutrition and personal motivations are the possible determinants of acquired NCD risk factors among nurses and the para-health workforce of Bangladesh. However, this finding is inconclusive and demands further studies on this issue to clarify the current finding more precisely.

Limitations
This study has several limitations. First, the participants were not selected randomly for this study; rather, they were called to attend the training sessions by the NCDC cell of DGHS, Bangladesh. Second, self-reported information of behavioural risk factors might be associated with recalled bias. Third, we diagnosed new diabetes cases based on fasting capillary blood glucose (not by oral glucose tolerance test) that might have overestimated or underestimated the real prevalence of diabetes among the study population. Finally, this study did not include qualified physicians who maintain a direct relationship with patients. Hence, the results could not be generalised for all HCPs in Bangladesh.

Strengths
Other than these limitations, this is the first study in Bangladesh that is conducted on a large sample of health workers to evaluate the prevalence of NCD risk factors and which explored their association with the categories of health profession. This is also important as there is no health policy in force for the health workers of Bangladesh to protect them from any chronic illness. Lack of data on this issue makes it more difficult for policymakers to take an effective initiative. In this regard, this study is important as it provided baseline data that will help in conducting a large-scale study among the HCPs of Bangladesh.

CONCLUSION
High prevalence of NCD risk factors among SSNs and PHPs demand the immediate attention of the HCPs as well as policymakers to take appropriate preventive measures. A comprehensive risk reduction strategy should be developed for Bangladeshi HCPs including health awareness creation and screening of risk factors. Further studies on physicians working in various healthcare settings of Bangladesh are also recommended to explore the real scenario. Quality healthcare services can be ensured by ensuring the good health of healthcare providers.

Author affiliations
1Department of Noncommunicable Diseases, Bangladesh University of Health Sciences, Dhaka, Bangladesh
2Department of Applied Laboratory Sciences, Bangladesh University of Health Sciences, Dhaka, Bangladesh
3Noncommunicable Disease Control Program, Directorate General of Health Services, Ministry of Health & Family Welfare, Government of the People’s Republic of Bangladesh, Dhaka, Bangladesh
4Department of Epidemiology, Bangladesh University of Health Sciences, Dhaka, Bangladesh
5Department of Biochemistry and Cell Biology, Bangladesh University of Health Sciences, Dhaka, Bangladesh

Twitter Palash Chandra Banik @PalashChandraB7

Acknowledgements The authors would like to acknowledge the Noncommunicable Disease Control Program, Directorate General of Health Services, Ministry of Health & Family Welfare, Government of the People’s Republic of Bangladesh, for their kind cooperation to conduct the study.

Contributors Conceptualisation: MF, LB, PCB, SS, AA, PKSG and LA; data curation: PCB, SS and AB; data analysis: LB, AB, MF and PKSG; interpretation: MF, LB, PCB, AA, PKSG and LA; writing: original draft, LB and MF; writing—review and editing: MF, LB, AA, PKSG and LA; All authors read and approved the final manuscript.

Funding The authors have not declared a specific grant for this research from any funding agency in the public, commercial or not-for-profit sectors.

Competing interests None declared.

Patient consent for publication Not required.

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement All data relevant to the study are included in the article or uploaded as supplemental information.

Supplemental material This content has been supplied by the author(s). It has not been vetted by BMJ Publishing Group Limited (BMJ) and may not have been peer-reviewed. Any opinions or recommendations discussed are solely those of the author(s) and are not endorsed by BMJ. BMJ disclaims all liability and responsibility arising from any reliance placed on the content. Where the content includes any translated material, BMJ does not warrant the accuracy and reliability of the translations (including but not limited to local regulations, clinical guidelines, terminology, drug names and drug dosages), and is not responsible for any error and/or omissions arising from translation and adaptation or otherwise.

Open access This is an open access article distributed in accordance with the Creative Commons Attribution Non Commercial (CC BY-NC 4.0) license, which permits others to distribute, remix, adapt, build upon this work non-commercially, and license their derivative works on different terms, provided the original work is properly cited, appropriate credit is given, any changes made indicated, and the use is non-commercial. See: http://creativecommons.org/licenses/by-nc/4.0/.

ORCID iDs
Mithila Faruque http://orcid.org/0000-0002-4731-2624
Lingkan Barua http://orcid.org/0000-0002-9281-3839
Palash Chandra Banik http://orcid.org/0000-0003-2395-9049
REFERENCES

1. World Health Organization. Noncommunicable diseases, 2018. Available: https://www.who.int/news-room/fact-sheets/detail/noncommunicable-diseases

2. Boldyuk TJ, Templin T, Cohen M, et al. Lower-income countries that face the most rapid shift in noncommunicable disease burden are also the least prepared. Health Aff 2017;36:1866–75 https://www.ncbi.nlm.nih.gov/pubmed/29137514

3. Steyn NP, McHiza ZJ. Obesity and the nutrition transition in sub-Saharan Africa. Ann N Y Acad Sci 2014;1311:88–101

4. Schmitz C. Tsai fight against non-communicable disease in emerging economies. Nature 2018;562:S65–7.

5. World Health Organization. Noncommunicable diseases country profiles 2018. Geneva: World Health Organization, 2018. https://www.who.int/nmh/publications/ncd-profiles-2018/en/

6. Zaman MM, Ghulam MR, Karim MN. Clustering of non-communicable disease risk factors in Bangladeshi adults: an analysis of steps survey 2013. BMC Public Health 2015;15:1–9.

7. Sharma S, Anand T, Dey B, et al. Prevalence of modifiable and non-modifiable risk factors and lifestyle disorders among health care workers. Int J Occup Med Environ Health 2014;27:1178.

8. Lin C-M, Li G-Y. Prevalence of cardiovascular risk factors in Taiwanese healthcare workers. Ind Health 2009;47:411–8 https://www.ncbi.nlm.nih.gov/pubmed/19672015

9. Helfand BKJ, Mukamal KJ. Healthcare and lifestyle practices of healthcare workers: do healthcare workers practice what they preach? JAMA Intern Med 2013;173:242.

10. Sovova E, Nakladiavolov M, Kaletova M, et al. Which health professionals are most at risk for cardiovascular disease? or do not be a manager. In J Occup Med Environ Health 2014;27:71–7.

11. Owoseye O, Tomori A, Akinbo S. Pedometer-determined physical activity profile of healthcare professionals in a Nigerian tertiary hospital. Niger Med J 2016;57:99.

12. Ahmed SM, Alam BB, Anwar I. Bangladesh health system review. Philippines: Asia Pacific Observatory on Health Systems and Policies, 2015.

13. Bonita R. Surveillance of risk factors for noncommunicable diseases: the WHO stepwise approach: summary. Geneva: Noncommunicable Disease and Mental Health, World Health Organization, 2001. http://www.who.int/nhpop/en/ncdb.pdf

14. WHO. Non-Communicable disease risk factor survey Bangladesh. Geneva: WHO, 2010. https://www.who.int/nchs/surveillance/steps/2010_STEPS_Report_Bangladesh.pdf

15. World Health Organization. Body mass index - BMI. Geneva: World Health Organization, 2019. http://apps.who.int/en/health-topics/disease-prevention/nutrition/a-healthy-lifestyle/body-mass-index-bmi

16. World Health Organization. Waist circumference and waist-hip ratio: report of a WHO expert consultation, Geneva, 8-11 December 2008. Geneva: World Health Organization, 2011.

17. World Health Organization. Definition and diagnosis of diabetes mellitus and intermediate hyperglycaemia report of a WHO/IDF consultation. Geneva: World Health Organization, 2006. http://apps.who.int/iris/bitstream/10665/43589/1/0241594934_eng.pdf

18. Chobanian AV, Bakris GL, Black HR, et al. et al. The seventh report of the joint National Committee on prevention, detection, evaluation, and treatment of high blood pressure: the JNC 7 report. JAMA 2003;290:2598–608.

19. Moniruzzaman M, Mostafa Zaman M, Islam MS, et al. Physical activity levels in Bangladeshi adults: results from steps survey 2010. Public Health 2016;137:131–8.

20. Iwuala SO, Sekoni AO, Olamoyegun MA, et al. Self-Reported physical activity among health care professionals in south-west Nigeria. Niger J Clin Pract 2015;18:709.

21. Kunene SH, Tshabong NP. Level of physical activity of health professionals in a district hospital in KwaZulu-Natal, South Africa. Afr J Physiother 2015;71.

22. Barua L, Faruque M, Chandra Banik P, et al. Physical activity levels and associated cardiovascular disease risk factors among postmenopausal rural women of Bangladesh. Indian Heart J 2018;70 Suppl 3:S161–6.

23. GBD Diet Collaborators. Health effects of dietary risks in 195 countries, 1990–2017: a systematic analysis for the global burden of disease study 2017. Lancet 2019;393:1916–8.

24. Kunene SH, Tshabong NP. Dietary habits among health professionals working in a district hospital in KwaZulu-Natal, South Africa. Afr J Prim Health Care Fam Med 2017;9:e1–e5.

25. Ahmad W, Taggart F, Shafique MS, et al. Diet, exercise and mental-wellbeing of healthcare professionals (doctors, dentists and nurses) in Pakistan. PeerJ 2015;3:e1250.

26. Ambakerdeeren TE, Chikezie ELI. Assessment of some traditional cardiovascular risk factors in medical doctors in southern Nigeria. Vasc Health Risk Manag 2018;14:299–309.

27. Betancourt-Nuñez A, Márquez-Sandoval F, González-Zapata LJ, et al. Unhealthy dietary patterns among healthcare professionals and students in Mexico. BMC Public Health 2018;18:1246.

28. Zaman MS, Barua L, Bushra S, et al. Salt intake behavior among the faculties and doctors of Bangladesh University of health sciences. Cardiovascular Journal 2016;8:94–8.

29. Nicholls R, Perry L, Duffield G, et al. Barriers and facilitators to healthy eating for nurses in the workplace: an integrative review. J Adv Nurs 2017;73:1051–65.

30. Dayoub E, Jena AB. Chronic disease prevalence and healthy lifestyle behaviors among US health care professionals. Mayo Clin Proc 2015;90:1659–62.

31. Lerssrimongkol C, Wisetborisut A, Angkurawaranon C, et al. Active commuting and cardiovascular risk among healthcare workers. Occup Med 2016;66:483–7.

32. Ahmed MT, Jadhav J, Sobagahal RT. Assessment of risk factors of non-communicable diseases among healthcare workers in Nelamangala: a cross sectional study. Int J Community Med Public Health 2018;5:745.

33. Toba K, Gholamelreza S, Seyedy Alireza J, et al. Prevalence of cardiovascular risk factors among nurse population in the East of Iran, 2011. Int J Travel Med Glob Health 2015;3:347–41.

34. Osei-Yeboah J, Kye-Amoah KK, Owiredu WKBA, et al. Cardiometabolic risk factors among healthcare workers: a cross-sectional study at the Serwi-Wawoso municipal Hospital, Ghana. Biomed Res Int 2016;2016:91–9.

35. Noobanar M, Razavi MR. Lifestyle and the most important risk factors of cardiovascular disease in physicians, nurses, and faculty members. Middle East J Rehabil Health 2015;2:e28882.

36. Awal A, Tarag N, Battacharjee B, et al. Prediction of 10 years and lifetime atherosclerotic cardiovascular disease (ASCVD) risk among working physician of CMCH. University Heart Journal 2018;12:68–75.

37. Monakali S, Goon DT, Seekoe E, et al. Prevalence and factors associated with abdominal obesity among primary health care professional nurses in eastern Cape, South Africa. South African Family Practice 2016;58:281–7.

38. Kyle RG, Wills J, Mahoney C, et al. Obesity prevalence among healthcare professionals in England: a cross-sectional study using the health survey for England, BMJ Open 2017;7:e018498.

39. Kyle RG, Neall RA, Atherton IM. Prevalence of overweight and obesity among nurses in Scotland: a cross-sectional study using the Scottish health survey. Int J Nurs Stud 2016;53:126–33.

40. Lee G-J, Kim K, Kim S-yeong, et al. Effects of shift work on abdominal obesity among 20–39-year-old female nurses: a 5-year retrospective longitudinal study. Ann Occup Environ Med 2016;28:1–7.

41. Peplonska B, Bukowska A, Sobala W. Association of rotating night shift work with BMI and abdominal obesity among nurses and midwives. PLoS One 2015;10:e0133761.

42. Kao L-T, Chiu Y-L, Lin H-G, et al. Prevalence of chronic diseases among physicians in Taiwan: a population-based cross-sectional study. BMJ Open 2016;6:e009954.

43. Hegde SKB, Sathiyarayanaras S, Venkateshwaran S, et al. Prevalence of diabetes, hypertension and obesity among doctors and nurses in a medical college hospital in Tamil Nadu, India. Journal of Research in Community Medicine 2015;4:235–9.

44. Jingi AM, Noubiap JJN. Cardiovascular risk factors awareness and prevalence among primary care physicians: an insight from the West region awareness initiative survey to fight cardiovascular disease (WAIT-CVD) in Cameroon. BMC Res Notes 2015;8:1–5.

45. Gautama M, MacDonald R. Helping physicians cope with their own chronic illnesses. West J Med 2001;175:336–8.