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Prevalence of prehypertension and undiagnosed hypertension among urban bankers of Bangladesh: A cross-sectional study

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Abstract

Background: Bankers live a sedentary and highly stressful life that often leads to developing noncommunicable diseases (NCDs) such as hypertension, diabetes, mental disorders, etc. The study aims to assess the prevalence of undiagnosed hypertension and prehypertension among urban bankers in Bangladesh.

Design and methods: Data from 365 bankers from five public and private banks in Bangladesh were collected using a pretested semistructured questionnaire. The Seventh Joint National Committee on Hypertension (JNC 7) guideline was followed to define prehypertension and undiagnosed hypertension. Multivariable logistic regression models were created to investigate the associated factors.

Results: The prevalence of undiagnosed hypertension and prehypertension were 22.5% and 55.3%, respectively. Most of the bankers were males and 35–44 years of age. The risk of hypertension and prehypertension was significantly higher among males (Odds ratio [OR], 16.6; OR, 6.4), longer service duration (F, 3.6), prolonged working hours (OR, 3.8; OR, 3.1), smoking (OR, 6.2; OR, 3.4), overweight (OR, 6.8; OR, 2.4) and obese (OR, 8.9; OR, 3.4) bankers, respectively. After controlling for confounders, the predictors of hypertension were males (Adjusted odds ratio [aOR], 12.8; 95%CI, 2.7–60), current smokers (aOR, 2.9; 95%CI, 1–8), overweight (aOR, 5.1; 95%CI, 1.5–17.9), and obesity (aOR, 9.6; 95%CI, 2.4–38.2). For prehypertension, males (aOR, 9.7; 95%CI, 3.1–30.9) and obesity (aOR, 3.9; 95%CI, 1.5–10.3) were found as predictors.

Conclusion: More than three-fourths of bankers in Bangladesh have either prehypertension or undiagnosed hypertension. Although this study included only urban banks, a large-scale study is recommended to understand the overall NCD risk factors burden among this professional group- bankers in Bangladesh.

Keywords

prehypertension, undiagnosed hypertension, noncommunicable diseases, bankers, urban, occupational health, Bangladesh

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Introduction

Noncommunicable diseases (NCDs) contribute to 75% of annual deaths globally; of all NCD deaths, 73% were in low-middle-income countries. Cardiovascular diseases account for 17.9 million deaths annually.[1] Hypertension, defined as a systolic blood pressure (SBP) of ≥140 mmHg and/or diastolic blood pressure (DBP) of ≥90 mmHg, is attributable to more than 9.4 million deaths annually due

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to cardiovascular diseases, the leading cause of mortality worldwide. The World Health Organization has declared hypertension as a "Silent Killer-Global Public Health Crisis."[2] Prehypertension, characterized by an SBP of 120–139 mmHg and/or a DBP of 80–89 mmHg, is recognized as a precursor of clinical hypertension, contributing to half of the cardiovascular disease burden.[3] Studies indicate that individuals with prehypertension have a significant risk of progressing to hypertension, with an estimated conversion rate of 30% within 2–4 years.[3,4] It serves as a label to identify individuals at an elevated risk of developing hypertension, aims to raise awareness, and prompts timely intervention to prevent or delay the onset of hypertension.[5] A lack of awareness regarding prehypertension and hypertension hinders the adoption of preventive measures and proper medication use, ultimately resulting in a gradual decline in health.

The most recent estimates suggest that the prevalence of prehypertension in adults ranges from 17.9% to 22.2%, with significant variation in rural and urban residences,[6] and undiagnosed hypertension was 15.8%[7] among the Bangladeshi population. A recent systematic review[8] and STEPS 2018 survey[9] revealed that the overall prevalence of hypertension was 20% and 21% in Bangladesh. Over the years, several risk factors for prehypertension and hypertension have been identified. These factors can be classified as nonmodifiable factors, such as age, sex, family history, etc., and modifiable factors, such as physical activity, tobacco use, alcohol and caffeinated drink intake, table salt and saturated fat intake, nutritional status, etc.[3,10]

Raised blood pressure (BP) is one of the most common self-reported occupational health problems and is found to be significantly higher among several professional working groups such as bankers, teachers, industrial workers, traffic polices, etc.[11–14] Several studies in different geographical locations also support the epidemiological link between a sedentary lifestyle and the risk of prehypertension and conversion to hypertension.[15,16] A study conducted among white-collar workers reported that factors such as sedentary lifestyle, belonging to a higher socioeconomic class, rise of urbanization, nuclearization of families, high prevalence of working couples, mental stress, and workplace environments were contributing to increasing the risk of hypertension.[17] Mental stress has been associated with abnormal activation of the sympathetic nervous system, leading to hormonal cascades that not only disrupt BP regulation but also contribute to the risk of several cerebrovascular events.[18] However, more occupation-wise data on the prevalence of prehypertension, hypertension, and associated risk factors among professional working groups is required for targeted interventions and health initiatives related to their occupational demands to prevent them.

Work stress includes both physical and emotional responses resulting from an imbalance between job demands, the worker's capabilities, needs, and available resources.[19] White-collar professionals, particularly bank employees, typically lead inherently sedentary lifestyles and face elevated levels of mental stress, often due to the expectation of maintaining professionalism and the demands of customer service, including handling client requests and complaints.[20] These place them at a heightened risk of developing raised BP relative to other professionals beyond their economic status. The combination of reduced physical activity, uncontrolled workload, performance pressure, strict deadlines, regulatory compliances, and work overtime substantially amplifies the risk despite having higher wages and stable jobs than others. Furthermore, unhealthy dietary habits such as oily, fatty, and junk food intake during office hours, smoking, alcohol intake, physical inactivity, prolonged sitting posture, and a highly stressful working environment result in prehypertension and hypertension.[17] In India, the reported prevalence of prehypertension among bankers ranged from 23% to 42%, and hypertension was 31% to 50%.[14,21,22] Data from other low socioeconomic countries (Nigeria and Republic of Congo)[13,23] and a higher socioeconomic country (Belgium)[24] also showed a similar prevalence rate of prehypertension and hypertension among bankers. Additionally, a recent study among Bangladeshi bankers reported the prevalence of prehypertension and hypertension was 32.2% and 24.4%, respectively, highlighting the significant burden of these conditions within this professional group.[25]

Despite bankers being a high-risk group because of their job-related stress and sedentary lifestyle, there is a notable lack of research available on the prevalence of prehypertension and undiagnosed hypertension within this profession in Bangladesh. This study aims to fill that gap by estimating the prevalence of prehypertension, undiagnosed hypertension, and their associated risk factors among urban bankers in Bangladesh. Our findings can serve as a foundation and highlight the need to prioritize similar research among other professional groups to identify high-risk populations, specifically focusing on these health parameters. These insights could be pivotal in informing policymakers when implementing targeted preventive strategies for high-risk professionals based on their unique occupational challenges and health needs.

Design and methods

Study design, sampling technique, and eligibility criteria

This cross-sectional study was conducted in two public and three private banks, selected conveniently, in the capital of Bangladesh from 1st January to 31st December 2018. The sample size was estimated using the following formula: $\mathbf{n = z^2p(1\text{-}p)/d^2}$, where z is 1.96 at a 95% confidence level, p is the prevalence of prehypertension among bankers, which was estimated as 34.5% from a previous

study,[22] and *d* (margin of error) was 5%. Considering these statistics, the calculated sample size was 365 for the present study. A simple random sampling technique was used for recruiting the participants.

The inclusion criteria were bankers who worked for ≥6 months, were designated as an officer or above the rank, and were willing to participate in the study. To focus only on estimating the prevalence of undiagnosed hypertension and prehypertension, diagnosed cases of hypertension and/or previous history of cardiovascular diseases, cancer, and women with current pregnancy were refrained from inclusion. Individuals with a prior hypertension diagnosis were excluded, as they may be on antihypertensive medication, which could influence BP readings and obscure the identification of undiagnosed cases. Similarly, individuals with a history of cardiovascular diseases were excluded to avoid confounding effects, as their condition often necessitates medical interventions, lifestyle modifications, and regular BP monitoring, all of which could impact their BP levels. Pregnant women were excluded due to physiological changes in BP during pregnancy and the risk of pregnancy-induced hypertension or pre-eclampsia, which differ from chronic hypertension and prehypertension.

Data collection

Data were collected using a pretested semistructured questionnaire, which included key risk factors for hypertensive disorders, encompassing gender, age, family history of hypertension, physical activity, smoking, alcohol consumption, additional salt intake with food, dietary history, nutritional status, as well as job-related factors such as mental stress, duration of service, working in sitting posture, work overtime, and more.[6,14,26] This approach was taken to obtain a comprehensive understanding of hypertensive risk factors among bankers. The International Physical Activity Questionnaire (IPAQ)[27] and the Effort Reward Imbalance (ERI)[28] scale were used to assess physical activity and stress, respectively. All the scales were included within the questionnaire, translated into Bengali (the native language of participants), and then back-translated to English by different experts to assess validity. The most widely used standardized procedure was used for validation, previously used in Bangladesh.[29] Pretesting was done on 30 subjects to validate the questionnaire, and that data was not included in the main study. Informed written consent was obtained before the enrollment of the participants. Data was collected through a face-to-face interview, which lasted approximately 30 min (Supplemental Material).

Measurement of variables

- **Blood pressure (BP):** BP was measured using an aneroid sphygmomanometer and Littman classic III stethoscope. Before measuring BP, every banker was asked to sit in a relaxed position for at least 5 min in a chair, feet on the floor, back supported, legs uncrossed, and arms supported on the table at heart level. The cuff was placed on encircling 80% or more of the upper left arm, ensuring no tight clothing constricted the arm. Then, BP was recorded. Another BP reading was taken after 5 min on the right arm. If there was a 10 mm Hg or more difference between the two readings, a third reading was taken. It was also ensured that the respondent did not drink tea or coffee, smoke cigarettes, or do any physical exercise 30 min before measuring BP. The average of the two measurements was recorded as SBP and DBP. The Seventh Joint National Committee on Hypertension (JNC 7) guideline was followed for measurement and defining prehypertension and hypertension.[5] Prehypertension was defined as an SBP of 120–139 mmHg and/or a DBP of 80–89 mmHg. The participant who didn't take any medication for raised BP and having SBP ≥140 mmHg and/or DBP ≥90 mmHg was defined as having undiagnosed hypertension.
- **Anthropometric measurements:** The investigator measured height using a wall-mounted stadiometer and weight using a digital weighing machine. The waist and hip circumferences were measured with a measuring tape. For BMI (Body mass index), the WHO cut-off points for Asians were >22.9 kg/m^2 for overweight and ≥27.5 for obesity.[30] For measuring central obesity, the WHO cut-off points for South Asians were used. For waist circumference (WC) was ≥90 cm (men) and ≥80 cm (women), and waist-hip ratio (WHR) was ≥0.90 cm (men) and ≥0.85 cm (women).[31]
- **Physical activity:** Physical activity was measured by the short version of IPAQ and classified by computing MET (metabolic equivalent of task) minutes. Three categories were inactive (no activity or some activity but not enough to be minimally active or HEPA active), minimally active (5 or more days of any combination of walking, moderate or vigorous intensity activities achieving a minimum of at least 600 MET minutes/week) and HEPA (health-enhancing physical activity) active (vigorous-intensity activity on at least 3 days and accumulating at least 1500 MET minutes/week or seven or more days of any combination of walking, moderate or vigorous intensity activities achieving a minimum of at least 3000 MET minutes/week).[27]
- **Work stress:** The ERI scale was used for measuring stress in original English and classified by computing the effort-reward (ER) ratio. An ER ratio ≤1 was defined as low stress, and >1 was defined as high stress.[28]

- **Extra table salt intake with foods:** To measure this, participants were asked whether they added extra table salt to their food, excluding the salt used for cooking that was previously used.[32]
- **Alcohol consumption:** Participants were asked whether they consumed an alcoholic drink, such as beer, wine, fermented cider, etc., in the last 12 months. Those providing affirmative responses were subsequently asked about the frequency of their consumption and grouped as self-reported alcohol consumers, which were previously used.[33]

Statistical analysis

Statistical analyses were performed using SPSS 24 software. Frequency and percentage were used to express categorical variables, whereas mean and standard deviation were used to describe continuous, discrete variables. A chi-square test and one-way ANOVA were performed wherever applicable. A multinomial logit model (an arbitrary p-value < 0.05 to include variables) was created to identify risk factors for prehypertension and undiagnosed hypertension among bankers after controlling for all confounders. The odds ratio (OR) and adjusted odds ratio (aOR) were calculated to assess the risk factors. Statistical significance was set at $p < 0.05$ in a 95% confidence interval (CI).

Results

Characteristics of bankers

A mixture of employees from private (51.5%) and public (48.5%) banks were included in the present study, wherein the majority were male (79%). The mean age was 37 (Standard deviation [SD], 7.5) years. The average duration of service in banking was 11.2 (SD, 7.8) years. Almost half of the bankers worked excess hours (47%), had inadequate sleep (65%), and were physically inactive (47%). Among lifestyle-related factors, 29% were tobacco users, 11% were alcohol consumers, and 22% included extra table salt with foods. Furthermore, a large number of bankers were found overweight (57%) and obese (28%) by BMI. About 71% and 88.5% of bankers were centrally obese, considering WC and WHR, respectively (Table 1).

Table 1. Characteristics of the bankers according to sociodemographic, banking work, and lifestyle-related factors ($N = 365$).

Characteristics	Frequency (n)	Percentage (%)
Gender		
Male	289	79.2
Female	76	20.8
Type of bank		
Government bank	177	48.5
Private bank	188	51.5
Transport used by the bankers for commuting to work		
Public transport	187	51.2
2 and 3-wheelers	32	8.8
Rickshaw	63	17.3
Car	46	12.6
Walking	37	10.1
Working years in the present bank	Mean (±SD)	8.3 (±7.5) in years
Duration of service in banking	Mean (±SD)	11.2 (±7.9) in hours
Work overtime		
Never	107	29.3
Sometimes	172	47.1
Always	86	23.6
Work related stress score [ER ratio= (effort score/reward score) × (7/3)]		
Low stress (ER ratio ≤ 1)	208	57
High stress (ER ratio > 1)	157	43
Sleep duration in hours (h)		
Less than 7 h	237	64.9
7–9 h	126	34.5
More than 9 h	2	0.5
Physical activity		
Inactive	172	47.1
Minimally active	156	42.7
HEPA active	37	10.1
Tobacco users	103	28.2
Alcohol consumers	43	11.2
Non-alcoholics	322	88.8
Extra table salt intake with foods		
Never	285	78.1
Sometimes	36	9.8
Always	44	12.1
Pre-existing diabetes	27	7.4
OCP use by female married bankers ($n = 66$)	3	0.8
Nutritional status by BMI		
Overweight	209	57.3
Obese	103	28.2
Centrally obese by WC	259	71
Centrally obese by WHR	323	88.5

Prevalence of undiagnosed hypertension and prehypertension

Among bank employees, approximately 22.5% were identified with undiagnosed hypertension, while 55.3% presented with prehypertension. When analyzing BP components separately, undiagnosed hypertension and prehypertension were detected in 5% and 45% of employees, respectively, based on systolic measurements. Conversely, diastolic BP assessments revealed undiagnosed hypertension in 22% of employees, with prehypertension observed in 55% (Figure 1).

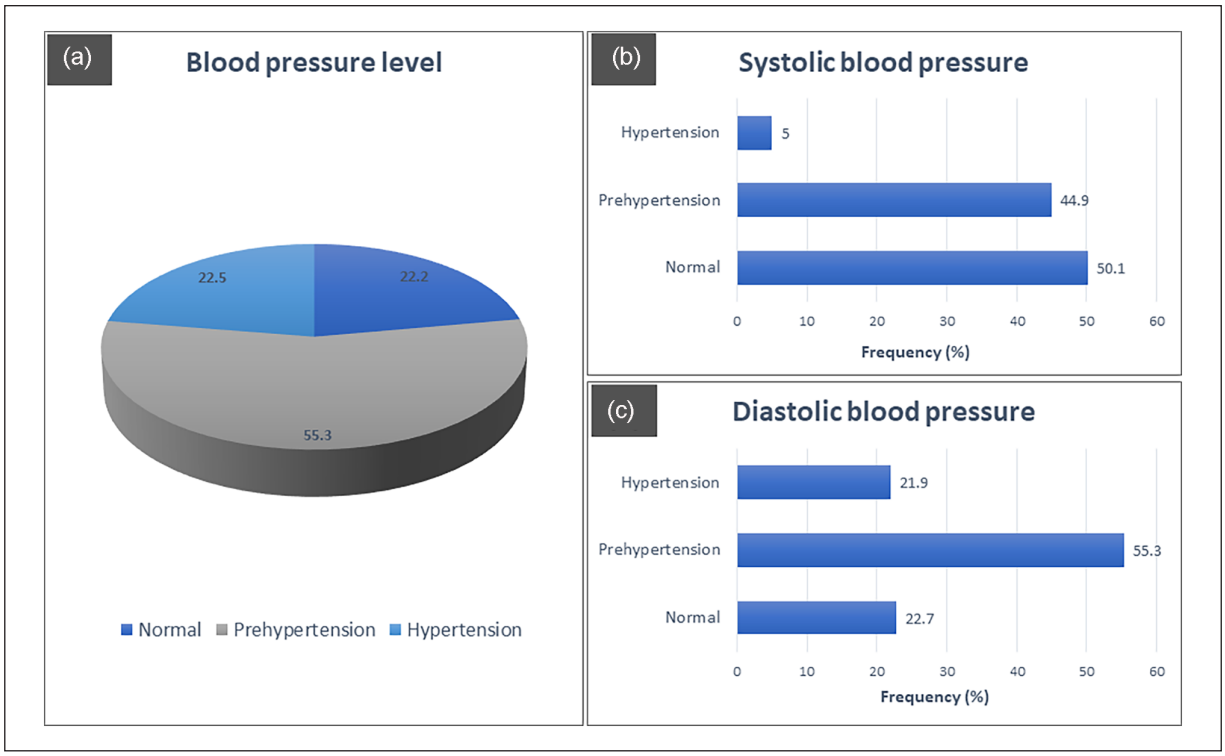

Figure 1. Proportion of blood pressure level among bankers, (a) distribution considering both blood pressure, (b) distribution considering systolic blood pressure, and (c) distribution considering diastolic blood pressure.

Factors associated with undiagnosed hypertension and prehypertension

Approximately 26.6% of male bankers and 6.6% of female bankers were hypertensive, and 59.9% of male bankers and 38.2% of female bankers were prehypertensive ($p < 0.001$). Among the banking work-related factors, work overtime ($p < 0.01$) and longer duration of service in banking ($p < 0.05$) were associated with both undiagnosed hypertension and prehypertension. Approximately 59.2% obese, 55% overweight ($p < 0.01$) by BMI, and 55.7% centrally obese ($p < 0.05$) by WHR were prehypertensive. For undiagnosed hypertension, 25.2% were obese, 24.9% were overweight ($p < 0.01$) by BMI, and 25.1% & 24.1% were centrally obese ($p < 0.05$) by WC and WHR, respectively (Table 2).

Among lifestyle-related factors, being physically inactive and minimally active ($p < 0.01$), tobacco users ($p < 0.001$), current smokers ($p < 001$), weekly exposure to secondhand smoking ($p < 0.05$), and always consuming extra table salt with cooked foods ($p < 0.05$) were associated with undiagnosed hypertension and prehypertension. Although positive family history of hypertension, alcohol consumption, regular intake of caffeinated drinks, and salty and oily fast foods intake were not associated with them (Table 3).

A multivariable logistic regression model was created to predict the factors of undiagnosed hypertension and prehypertension, including the variables found to be significant in the Chi-square test and one-way ANOVA test. After running the multicollinearity test, tobacco product users and exposure to second-hand smoke in indoor and outdoor places were excluded from the model. We found that males (12.8 times more than females), overweight (5.1 times more than normal weight), obese (9.6 times more than normal weight), and current smokers (2.9 times more than never smokers) were significantly associated with undiagnosed hypertension among bankers. Additionally, males (9.7 times more than females) and obesity (3.9 times more than normal weight) were significantly associated with prehypertension among bankers after controlling for confounders (Table 4).

Discussion

This cross-sectional study determined the proportion of bankers with prehypertension and undiagnosed hypertension and the factors associated with them. Among bankers, the proportions of prehypertension and undiagnosed hypertension were 55.3% and 22.5%, respectively. We also found that male gender, smoking, and obesity remained correlated with undiagnosed hypertension and prehypertension after controlling for confounders.

The prevalence of prehypertension and hypertension in an affluent urban area of Dhaka was 19% and 23.7%,[34] among the general population of Bangladesh was 43% and

Table 2. Association of sociodemographic, banking work-related factors, and anthropometric measurements with blood pressure level ($N = 365$).

Characteristics	Categories	Normal BP *n* (%)	Prehypertension *n* (%)	Undiagnosed hypertension *n* (%)	*p*
Age	25–34 years	45 (28.7)	85 (54.1)	27 (17.2)	0.093
	35–44 years	27 (18.4)	82 (55.8)	38 (25.9)	
	45–54 years	6 (13.3)	28 (62.2)	11 (24.4)	
	≥ 55 years	3 (18.8)	7 (43.8)	6 (24.4)	
Sex	Male	39 (13.5)	173 (59.9)	77 (26.6)	<0.001
	Female	42 (55.3)	29 (38.2)	5 (6.6)	
Educational status	Graduate	9 (40.9)	10 (45.5)	3 (13.6)	<0.05
	Postgraduate	46 (18.3)	150 (59.5)	56 (22.2)	
	Professional (Engineering)	26 (28.6)	42 (46.2)	23 (25.3)	
Type of bank	Govt. bank	47 (26.6)	88 (49.7)	42 (23.7)	0.076
	Private bank	34 (18.1)	114 (60.6)	40 (21.3)	
Transport used for commuting to work	Public transport	44 (23.5)	98 (52.4)	45 (24.1)	0.268
	2 and 3-wheelers	17 (17.9)	57 (60)	21 (22.1)	
	Car	15 (32.6)	25 (54.3)	6 (13)	
	Walking	5 (13.5)	22 (59.5)	10 (27)	
Work overtime	Never	32 (29.9)	59 (55.1)	16 (15)	<0.01
	Sometimes	39 (22.7)	86 (50)	47 (27.3)	
	Always	10 (11.6)	57 (66.3)	19 (22.1)	
Work-related stress	Low stress	48 (23.1)	114 (54.8)	46 (22.1)	0.895
	High stress	33 (21))	88 (56.1)	36 (22.9)	
Duration of service [Mean (±SD)]		7 (±7.9)	8.9 (±7.8)	9.4 (±7.9)	<0.05
Daily working hours in sitting posture [Mean (±SD)]		6.7 (±1.6)	6.8 (±1.7)	6.7 (±1.6)	0.913
Nutritional status by BMI	Underweight	1 (50)	1 (50)	0 (0)	<0.01
	Normal	22 (43.1)	25 (49)	4 (7.8)	
	Overweight	42 (20.1)	115 (55)	52 (24.9)	
	Obese	16 (15.5)	61 (59.2)	26 (25.2)	
Central obesity (WC)	Not obese	26 (24.5)	63 (59.4)	17 (16)	0.168
	Obese	55 (21.2)	139 (53.7)	65 (25.1)	
Central obesity (WHR)	Not obese	16 (38.1)	22 (52.4)	4 (9.5)	<0.05
	Obese	65 (20.1)	180 (55.7)	78 (24.1)	

20.1%,[6] and among bankers of Dhaka was 32.2% and 24.4%,[25] respectively. The nationwide prevalence of hypertension and undiagnosed hypertension was 12.2% and 21%, respectively, generated from Bangladesh Demographic and Health Survey Data.[7] The overall prevalence of prehypertension and hypertension among bankers of several provinces in India was 34%–42% and 30%–45%.[14,35,36] Our findings suggested that the prevalence of prehypertension among bankers was higher than in the general population of urban and rural areas in Bangladesh and Indian bankers. However, regarding undiagnosed hypertension, bankers and the general population of Bangladesh had almost the same level, and Indian bankers had a higher level.

We found that the proportion of prehypertension and undiagnosed hypertension was higher in males. However, no association was found with increasing age. Several studies showed a significant association between sex and age and BP levels in Bangladeshi,[6,37] Indian,[33] Japanese,[38] and Iranian[39] adult populations and bankers. Sex and age are the two major predictors of major hypertensive disorders.[40] In our studies, we could not find a significant association with age; perhaps the absence of age uniformity among bankers is a reason for this. The proportion of undiagnosed hypertension and prehypertension was higher in bankers with long years of schooling, corresponding with Bangladeshi[6] and Indian studies.[41]

Among banking work-related factors, we found that prolonged working hours and long duration of service in banking had a significant association with both levels, which corresponded with some study findings. Several studies have shown that work stress with prolonged working hours is associated with hypertension and prehypertension among professional working groups.[14,42–44] However, our study revealed no discernible connection between work stress and the prevalence of prehypertension and

Table 3. Association of lifestyle-related factors with blood pressure level ($N = 365$).

Characteristics	Categories	Normal BP *n* (%)	Prehypertension *n* (%)	Undiagnosed hypertension *n* (%)	*p*
Family history of HTN	No	33 (25.4)	70 (53.8)	27 (20.8)	0.530
	Yes	48 (20.4)	132 (56.2)	55 (23.4)	
Pre-existing diabetes	No	77 (22.8)	188 (55.6)	73 (21.6)	0.315
	Yes	4 (14.8)	14 (51.9)	9 (33.3)	
Sleep duration	<7 h	54 (22.8)	134 (56.5)	49 (20.7)	0.649
	7 to 9 h	27 (21.4)	66 (52.4)	33 (26.2)	
	>9 h	0 (0)	2 (100)	0 (0)	
Physical activity	Inactive	38 (22.1)	90 (52.3)	44 (25.6)	<0.01
	Min. active	27 (17.3)	93 (59.6)	36 (23.1)	
	HEPA active	16 (43.2)	19 (51.4)	2 (5.4)	
Tobacco use	Nonusers	71 (27.1)	145 (55.3)	46 (17.6)	<0.001
	Users	10 (9.7)	57 (55.3)	36 (23.1)	
Smoking status	Never	71 (27.1)	145 (55.3)	46 (17.6)	<0.001
	Former	3 (15.8)	8 (42.1)	8 (42.1)	
	Current	7 (11.6)	49 (58.3)	28 (33.3)	
Second-hand smoking ($N = 262$)	Not exposed	29 (26.6)	61 (56)	19 (17.4)	0.984
	Exposed	42 (27.5)	84 (54.9)	27 (17.60	
Exposure to second-hand smoke in both outdoor and indoor places (times/week) [Mean (±SD)] ($N = 153$)		2.5 (±7.5)	3.9 (±5.5)	3.6 (±4.4)	<0.05
Alcohol consumption	No	74 (23)	178 (55.3)	70 (21.7)	0.494
	Yes	7 (16.3)	24 (55.8)	12 (27.9)	
Caffeinated drinks intake	No	11 (18.3)	39 (65)	10 (16.7)	0.498
	Tea	68 (23.3)	156 (53.4)	68 (23.3)	
	Coffee	2 (16.4)	7 (53.4)	4 (30.8)	
Excess table salt intake with cooked foods	Never	57 (20)	157 (55.1)	71 (24.9)	<0.05
	Sometimes	15 (41.7)	15 (41.7)	6 (16.7)	
	Always	9 (20.5)	30 (68.2)	5 (11.4)	
Salty food (dry fish, pickles, chips, etc.) intake	No	61 (23.5)	142 (54.6)	57 (21.9)	0.650
	Yes	20 (19)	60 (57.1)	25 (23.8)	
Oily fast foods (burgers, pizzas, fries, singara, samucha) intake	No	41 (23)	93 (52.2)	44 (24.7)	0.473
	Yes	40 (21.4)	109 (58.3)	38 (20.3)	
Weekly fruits and vegetable intake (servings/week), [Mean (±SD)]		31.2 (±12.2)	28.4 (±12.2)	26.6 (±11.5)	0.05

hypertension among bankers. The absence of correlation may be attributed, in part, to factors like the deliberate withholding of information from the professional standpoint, and the unique stressors associated with banking roles might not be adequately captured in our assessment.

Among several anthropometric measurements, we found a significant association with BMI, prehypertension, and hypertension levels among bankers. These findings are similar to the finding that overweight and obesity are the strongest predictors of the higher prevalence of prehypertension and hypertension among Bangladeshi,[6] Indian,[33] Iranian,[39] Jamaican,[45] and Japanese[38] adult populations. Central obesity measured by WC showed no association, and WHR was significantly associated with prehypertension and hypertension among bankers. However, some studies showed a significant association with WC, WHR, and BP levels.[45]

In this study, lifestyle-related factors associated with prehypertension and hypertension were explored. Many studies suggest that family history plays a significant role in developing hypertension in adults.[38] We found that more physical activity was inversely associated with prehypertension and hypertension, corresponding with several studies' findings among the general population[33] and bankers.[36] Among bankers, tobacco product users and current smokers were at an increased risk of developing prehypertension and hypertension. These findings corresponded with the results of several studies among the general population[33,41] and bankers.[14] The average weekly exposure to second-hand smoking (times/week) in both places (indoor

Table 4. Comparison of factors for prehypertension and undiagnosed hypertension (both vs normal BP) groups after controlling for confounders ($N = 365$).

		Prehypertension vs normal BP		Undiagnosed hypertension vs normal BP	
Characteristics	Categories	aOR (95% CI)	*p*	aOR (95% CI)	*p*
Duration of service		1 (0.9–1.1)	0.371	1 (0.9–1.1)	0.236
Sex	Female	Reference category			
	Male	9.7 (3.1–30.9)	<0.001	12.8 (2.7–60)	<0.001
Educational status	Graduate	Reference category			
	Postgraduate	1 (0.3–4.2)	0.971	2.6 (0.5–14.4)	0.285
	Professional	2.9 (0.8–1.7)	0.95	1.2 (0.2–7.6)	0.843
Work overtime	Never	Reference category			
	Sometimes	0.6 (0.3–1.3)	0.223	1.2 (0.5–2.8)	0.754
	Always	1.2 (0.5–3.2)	0.699	1.2 (0.4–3.9)	0.715
Physical activity	Inactive	Reference category			
	Min. active	1.3 (0.7–2.5)	0.503	0.9 (0.5–2.1)	0.93
	HEPA active	1.6 (0.6–4.5)	0.361	0.5 (0.08–2.7)	0.40
Smoking status	Never	Reference category			
	Former	0.5 (0.1–2.4)	0.419	1.6 (0.4–7.3)	0.526
	Current	1.6 (0.6–4.3)	0.309	2.9 (1–8)	<0.05
Excess table salt use	Never	Reference category			
	Sometimes	0.5 (0.2–1.3)	0.148	0.5 (0.2–1.6)	0.247
	Always	1.6 (0.6–4.1)	0.319	0.7 (0.2–2.5)	0.553
Nutritional status by BMI	Normal	Reference category			
	Underweight	0.7 (0–18.3)	0.802	Not valid	
	Overweight	1.8 (0.8–4.1)	0.150	5.1 (1.5–17.9)	<0.05
	Obese	3.9 (1.5–10.3)	<0.01	9.6 (2.4–38.2)	<0.001
Central obesity by WHR	Not obese	Reference category			
	Obese	1.4 (0.6–3.6)	0.481	2.2 (0.6–8.4)	0.257

and outdoor) was higher in bankers with prehypertension and hypertension, which corresponded with the remarkable acute effect of second-hand smoking on BP levels. Many studies on the adult population showed that heavy alcohol consumption increased BP levels.[33,38,41] Although the present study showed a small number of participants as alcohol consumers and no association with BP level. In Bangladesh, the overall alcohol consumption level is relatively low for religious reasons or the social customs, consistent with our study findings.[46] The proportion of prehypertension was higher in 68.2% of bankers who always took extra table salt with cooked foods, which corresponded with excess table salt intake with foods, increasing BP levels and the risk of CVDs.[47] A study in India showed that consuming high-energy food such as salty, oily junk food increased BP levels.[41] However, this study showed no association. Another study in India among bankers showed that a low intake of fruits and vegetables increased hypertension levels.[14] However, this study showed no significant association.

The main strengths of this study lie in its investigation into the prevalence of undiagnosed hypertension and prehypertension among Bangladeshi bankers, adding evidence to the limited existing research on this occupational group in the country. The comprehensive analysis also identifies associated factors contributing to these conditions. The major risk factors behind hypertensive disorders are male gender, increasing age, high job stress, physical inactivity, high BMI, smoking, alcohol consumption, additional salt intake with food, unhygienic diet, etc. Individuals in certain professions, such as bankers, industrial workers, teachers, etc., are noted to be at higher risk. This is attributed to their sedentary lifestyle, the stress associated with their jobs, longer working hours in a sitting posture, lack of physical activity, etc. The findings emphasize the necessity of addressing both lifestyle and work-related factors in the prevention and management of prehypertension and hypertension, particularly among high-risk occupational groups. The high prevalence of prehypertension and undiagnosed among urban bankers found in this study recognizes the need for further research that encompasses a more diverse and representative sample, including both urban and rural banking communities. The research advocates for national-scale surveys to evaluate the burden of NCD risk factors among white-collar professionals. This underscores the urgency of adopting comprehensive strategies to safeguard the health of individuals in high-stress and sedentary occupations. As a preliminary study, our

focus was solely on bankers as the targeted population and estimated their cardiovascular health risks. In the future, research should expand to include other professionals to create a comprehensive understanding of occupational health challenges in Bangladesh. These efforts are important for informing the development of occupational health hazards guidelines, shaping the national health agenda, and facilitating policy implementation to improve the quality of people's lives.

Limitations

One notable weakness of this study lies in the non-representative nature of the banking community, as it exclusively focused on urban banks due to limited scope, resources, and fund availability. These raise concerns about the generalizability and geographical diversity of the findings to the entire banking population in Bangladesh. The absence of representation from rural banks introduces a potential bias, as the dynamics and risk factors may vary between urban and rural banking environments. This points out that a comparison analysis between urban-rural bankers could be a potential scope of future research endeavors. Also, due to the limited number of female bankers available to participate, the national male-female ratio could not be maintained in this study.

Another limitation is the exclusion of individuals with a prior hypertension diagnosis, as this subgroup may include those with uncontrolled or resistant hypertension. This decision limits our ability to assess the overall burden of hypertension, including those on antihypertensive medication who might still have uncontrolled BP. This study did not include certain comorbidities relating to mental health conditions and the use of specific medications known to influence BP levels due to feasibility constraints, limited resources, and the challenge of documenting medication usage, which was beyond the study's scope. Future studies should consider including this subgroup and comorbidities to provide a more comprehensive understanding of hypertension control, risk assessments, and treatment gaps within this occupational group.

Additionally, there might be some measurement bias, as BP was measured in a single setting. The presence of some potential risk factors was objectively measured based on memory, leading to recall bias. There was also some social desirability bias due to hiding information from the bankers' professional point of view.

Conclusions

This study suggests that bankers are highly vulnerable professionals to hypertension and prehypertension. Almost half were prehypertensive, and nearly one-fourth were unaware of their hypertensive condition. Male gender, overweight or obese, and smoking increase the risk of hypertension and prehypertension. To alleviate the burden of hypertensive diseases and major NCDs in the population, it is crucial to identify high-risk professional groups and implement targeted preventive strategies. This study underscored the necessity of considering the unique risk profile of professionals when designing the national health policy, integrating preventive measures to mitigate the high burden of these NCDs and cardiovascular diseases.

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Ethical considerations

Formal ethical clearance for the protocol of the study was obtained from the Institutional Review Board (IRB) of NIPSOM (Memo no: NIPSOM/IRB/2018/471). Informed written consent was ensured from each participant before participation in the study. The study was confirmed by the ethical guidelines of the current Declaration of Helsinki.

Author contributions

SJM and MIK planned the study, data analysis, and statistics. SJM collected data, analyzed it, and wrote the first draft of the manuscript. SJM, MJH, MAR, and SS revised the manuscript and provided final edits. All authors read and approved the final manuscript.

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Declaration of conflicting interests

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Guidance and recommendations

Bankers identified with elevated BP during the screening were informed of their readings and advised to seek medical evaluation. While the study did not have the capacity to provide direct medical treatment, participants were encouraged to consult healthcare professionals for further assessment and necessary

interventions. Additionally, they received general health information on hypertension, including its risks and recommended lifestyle modifications.

Data availability statement

The data collection process is described in the method section of this article. All data and details from the analysis can be obtained from the corresponding author upon request.

Supplemental material

Supplemental material for this article is available online.

References

1. World Health Organization. Newsroom-Fact sheets-Detail- Noncommunicable diseases, https://www.who.int/news-room/fact-sheets/detail/noncommunicable-diseases (2024, accessed 1 May 2025).
2. WHO. *A global brief on Hypertension: Silent killer, global public health crisis*. Geneva: WHO. Epub ahead of print 2013. DOI: 10.1136/bmj.1.4815.882-a.
3. Vasan RS, Larson MG, Leip EP, et al. Assessment of frequency of progression to hypertension in non-hypertensive participants in the Framingham Heart Study: a cohort study. *Lancet* 2001; 358: 1682–1686.
4. Li Z, Cao L, Zhou Z, et al. Factors influencing the progression from prehypertension to hypertension among Chinese middle-aged and older adults: a 2-year longitudinal study. *BMC Public Health* 2023; 23: 339.
5. Chobanian AV, Bakris GL, Black HR, et al. Seventh report of the Joint National Committee on prevention, detection, evaluation, and treatment of high blood pressure. *Hypertension* 2003; 42: 1206–1252.
6. Rahman M, Zaman MM, Islam JY, et al. Prevalence, treatment patterns, and risk factors of hypertension and prehypertension among Bangladeshi adults. *J Hum Hypertens* 2018; 32: 334–348.
7. Hossain A, Suhel SA, Chowdhury SR, et al. Hypertension and undiagnosed hypertension among Bangladeshi adults: identifying prevalence and associated factors using a nationwide survey. *Front Public Health* 2022; 10: 1066449. DOI: 10.3389/fpubh.2022.1066449
8. Chowdhury MAB, Islam M, Rahman J, et al. Changes in prevalence and risk factors of hypertension among adults in Bangladesh: an analysis of two waves of nationally representative surveys. *PLoS One* 2021; 16: 1–17.
9. Riaz BK, Islam MZ, Islam ANMS, et al. Risk factors for non-communicable diseases in Bangladesh: findings of the population-based cross-sectional national survey 2018. *BMJ Open* 2020; 10(11): 1.
10. Winegarden CR. From 'prehypertension' to hypertension? Additional evidence. *Ann Epidemiol* 2005; 15: 720–725.
11. Wallace RB (ed.). *Maxcy-Rosenau-Last, Public health & preventive medicine*. 15th ed. New York: The McGraw-Hill, 2008.
12. Fikadu G and Lemma S. Socioeconomic status and hypertension among teachers and bankers in Addis Ababa, Ethiopia. *Int J Hypertens* 2016; 2016: 4143962.
13. Salaudeen AG, Musa OI, Babatunde OA, et al. Knowledge and prevalence of risk factors for arterial hypertension and blood pressure pattern among bankers and traffic wardens in Ilorin, Nigeria. *Afr Health Sci* 2014; 14: 593–599.
14. Brahmankar TR and Prabhu PM. Prevalence and risk factors of hypertension among the bank employees of Western Maharashtra – a cross sectional study. *Int J Community Med Public Health* 2017; 4: 1267–1277.
15. Sit JW, Sijian L, Wong EM, et al. Prevalence and risk factors associated with prehypertension: identification of foci for primary prevention of hypertension. *J Cardiovasc Nurs* 2010; 25: 461–469.
16. Konradi AO, Rotar OP, Korostovtseva LS, et al. Prevalence of metabolic syndrome components in a population of bank employees from St. Petersburg, Russia. *Metab Syndr Relat Disord* 2011; 9: 337–343.
17. Momin M and Vikas D. A study on effect of life style risk factors on prevalence of hypertension among white collar job people of Surat - ISPUB. *Internet J Occup Health* 2011; 1: 1–9.
18. Hirokawa K, Ohira T, Nagayoshi M, et al. Occupational status and job stress in relation to cardiovascular stress reactivity in Japanese workers. *Prev Med Rep* 2016; 4: 61–67.
19. Nadinloyi KB, Sadeghi H and Hajloo N. Relationship between job satisfaction and employees mental health. *Procedia Soc Behav Sci* 2013; 84: 293–297.
20. Islam M, Muhammad U and Ullah S. Effect of occupational stress on personal and professional life of bank employees in Bangladesh: do coping strategies matter. *J Psychol Educ Res* 2016; 24(2): 75–100.
21. Sumalatha N, Sumalatha N, Dorle AS, et al. Study of socio-Demographic profile & prevalence of hypertension among bank employees in Bagalkot City. *Ann Commun Health* 2015; 3: 28–32.
22. Momin MH, Desai VK and Kavishwar AB. Study of sociodemographic factors affecting prevalence of hypertension among bank employees of Surat City. *Indian J Public Health* 2012; 56: 44–48.
23. Thierry G, Benjamin LM, Bertrand EM, et al. Prevalence rates and cardiometabolic determinants of diabetes mellitus and pre-diabetes with projected coronary heart disease at bank site of Brazzaville. *World J Cardiovasc Dis* 2014; 04: 77–86.
24. Shivaramakrishna HR, Wantamutte AS, Sangolli HN, et al. Risk factors of coronary heart disease among bank employees of Belgaum City - cross-sectional study. *Al Ameen J Med Sci* 2010; 3: 152–159.
25. Razibi K, Rabeya R, Islam R, et al. Prevalence and risk factors of hypertension among bank employees in Dhaka city of Bangladesh. *Cogent Public Health* 2023; 10: 2178054. DOI: 10.1080/27707571.2023.2178054
26. Mills KT, Stefanescu A and He J. The global epidemiology of hypertension. *Nat Rev Nephrol* 2020; 16: 223–237.
27. Craig CL, Marshall AL, Sjöström M, et al. International physical activity questionnaire: 12-country reliability and validity. *Med Sci Sports Exerc* 2003; 35: 1381–1395.
28. Leineweber C, Wege N, Westerlund H, et al. How valid is a short measure of effort–reward imbalance at work? A replication study from Sweden. *Occup Environ Med* 2010; 67: 526–531.

29. Rahman ME, Islam MS, Bishwas MS, et al. Physical inactivity and sedentary behaviors in the Bangladeshi population during the COVID-19 pandemic: an online cross-sectional survey. *Heliyon* 2020; 6: e05392.
30. WHO Expert Consultation. Appropriate body-mass index for Asian populations and its implications for policy and intervention strategies. *Lancet* 2004; 363(9403): 157–163.
31. WHO Expert Consultation. *Waist circumference and waist–hip ratio*. Geneva: WHO Expert Consultation, https://apps.who.int/iris/bitstream/handle/10665/44583/9789241501491_eng.pdf (2008, accessed 1 May 2025).
32. Ma H, Xue Q, Wang X, et al. Adding salt to foods and hazard of premature mortality. *Eur Heart J* 2022; 43: 2878–2888.
33. Parthaje PM, Unnikrishnan B, Thankappan KR, et al. Prevalence and correlates of prehypertension among adults in urban South India. *Asia Pac J Public Health* 2016; 28: 93S–101S.
34. Islam SMS, Mainuddin AKM, Islam MS, et al. Prevalence of risk factors for hypertension: a cross-sectional study in an urban area of Bangladesh. *Glob Cardiol Sci Pract* 2015; 2015: 43.
35. Ismail I, Kulkarni A, Kamble S, et al. Prevalence of hypertension and its risk factors among bank employees of Sullia Taluk, Karnataka. *Sahel Med J* 2013; 16: 139.
36. Ganesh KS and Sundaram ND. Prevalence and risk factors of hypertension among bank employees in urban Puducherry, India. *J Occup Environ Med* 2014; 5: 94–100.
37. Khanam MA, Lindeboom W, Razzaque A, et al. Undiagnosed and uncontrolled hypertension among the adults in rural Bangladesh: findings froma community-based study. *J Hypertens* 2015; 33: 2399–2406.
38. Ishikawa Y, Ishikawa J, Ishikawa S, et al. Prevalence and determinants of prehypertension in a Japanese general population: the Jichi Medical School cohort study. *Hypertens Res* 2008; 31: 1323–1330.
39. Rahmanian K and Shojaie M. The prevalence of pre-hypertension and its association to established cardiovascular risk factors in south of Iran. *BMC Res Notes* 2012; 5(1): 386.
40. Sarki AM, Nduka CU, Stranges S, et al. Prevalence of hypertension in low- and middle-income countries: a systematic review and meta-analysis. *Medicine* 2015; 94: 1–16.
41. Goswami T and Narayan B. Behavioural risk factors distribution of cardiovascular diseases and its association with normotension, prehypertension and hypertension amongst tea garden population in Dibrugarh district of Assam. *Clin Epidemiol Glob Health* 2015; 82: 6.
42. Yoo DH, Kang MY, Paek D, et al. Effect of lLong orking hours on self-reported ypertension among middle-aged and older wage workers. *Ann Occup Environ Med* 2014; 26(1): 25.
43. Rengganis AD, Rakhimullah AB and Garna H. The correlation between work stress and hypertension among industrial workers: a cross-sectional study. *IOP Conf Ser Earth Environ Sci* 2020; 441: 012159.
44. Gamage AU and Seneviratne Rde A. Perceived job stress and presence of hypertension among administrative officers in Sri Lanka. *Asia Pac J Public Health* 2016; 28: 41S–52S.
45. Ferguson TS, Younger NO, Tulloch-Reid MK, et al. Prevalence of prehypertension and its relationship to risk factors for cardiovascular disease in Jamaica: analysis from a cross-sectional survey. *BMC Cardiovasc Disord* 2008; 8(1): 1–9.
46. Islam JY, Zaman MM, Bhuiyan MR, et al. Alcohol consumption among adults in Bangladesh: results from STEPS 2010. *WHO South-East Asia J Public Health* 2017; 6: 67–74.
47. Grillo A, Salvi L, Coruzzi P, et al. Sodium intake and hypertension. *Nutrients* 2019; 11: 1970.