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RESEARCH ARTICLE

Prevalence of Hypertension and Associated Risk Factors Among Women in a Rural Community in Bangladesh: A Cross-Sectional Study

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Abstract

The purpose of this cross-sectional quantitative study was to identify the prevalence and associated risk factors of hypertension among rural women. Data collection was carried out between March to June 2019 among 380 women in Kumarkhali Upazila, Kushtia, Bangladesh. Participants were interviewed with a structured questionnaire including background characteristics, anthropometric measurements, prevalence, and risk factors of hypertension. IBM SPSS version 25 was used for analyzing the data. The prevalence of hypertension and prehypertension among the total participants was 21.3% and 17.1%, respectively. The mean systolic and diastolic blood pressure was 126.65 (±19.31) mmHg and 77.21 (±12.51) mmHg. Association was found between the prevalence of hypertension and participant's age, marital status, educational level, body mass index, intake of raw salt, secondary smoking, stress, and diabetes ($p<0.05$). Among the diabetic women, prehypertension and hypertension prevailed as 26.3% and 55.3% respectively. The lowest risk of hypertension was found with limited raw salt (aOR: 1.42) and red meat (aOR: 0.05) consumption. Hypertension was more likely to affect overweight (aOR: 3.98) and women aged 55 to 64 years (aOR: 13.44). Thus, effective and integrated intervention agendas are required for women, which can improve the rate of diagnosis and prevent uncontrolled hypertension in Bangladesh.

***Keywords*:** Prevalence, hypertension, women, blood pressure, risk factor, Bangladesh

1. Introduction

Globally, the prevalence of hypertension among adults is a tremendous burden for public health which is significantly attributable to a huge burden of stroke, cardiovascular disease (CVD), injury, disability, renal failure, and unanticipated death (Neupane et al., 2014). Nearly 1.13 billion people around the world have hypertension, whereas one in five women are facing hypertensive problems (World Health Organization, 2019). According to the prognostication of researchers, there might be a relative surge of 24% in the prevalence of hypertension in

developed countries between 2000 and 2025 (Tu et al., 2008). In Bangladesh, the overall prevalence of hypertension was 24.4% in 2011 which is still alarming (Rahman et al., 2015). The mounting prevalence of hypertension, concurrent with its inadequate treatment and insufficient awareness about its prevention and control, has driven to the induction in adverse consequences of this health problem (Olsen et al., 2016; Kleef & Spiering 2017). Hence, appropriate screening and timely treatment of hypertension are very important in the vivid progression of its management among people; regrettably, only 47% of the total population in the world are aware of having high blood pressure (Mills et al., 2016; Kleef & Spiering, 2017). Moreover, this disease can be minimized by the implementation of appropriate preventive measures. For example, easy and cost-efficient approaches can be beneficial for its prevention (Gebrihet et al., 2017).

Cardiovascular diseases are no longer regarded as man's diseases, although men are affected more than women by those diseases (Gudmundsdottir et al., 2012). However, during post-menopause, cardiovascular problems become more eminent in women as they are more vulnerable than men in terms of controlling hypertension in older age (Barton and Meyer 2009). Previous studies found that Body Mass Index (BMI) and mean blood pressure range were substantially higher among women than in men after 30 years of age (Malhotra et al., 1999). The prevalence of hypertension was higher among women in rural areas (28.4%) than in urban areas (23.9%) ($p<0.05$) (Daştan et al., 2017). Similar findings were also found in another study where the prevalence rate of hypertension in rural areas was 27.1% whereas in urban areas it was 23.5% (Solomon et al., 2017). Again, the incidence of pre-diagnosed cases of hypertension was found more apparent among women than men in another study from India as well (Singh et al., 2017).

Unlike the epidemics of obesity and diabetes, the incidence of hypertension in women is gradually swelling (Geraci & Geraci, 2013). Furthermore, cardiovascular diseases in women are under-diagnosed and under-treated (Maas & Appelman, 2010). A common perception that prevails regarding women is that they are at a substantial lower risk of hypertension than men, which can tend to the poorer screening and treatment outcome for this disease among them (Gudmundsdottir et al., 2012). Moreover, rural women are usually not accustomed to comprehensive management for high blood pressure, and they suffer poor health outcomes compared with men in the long run (Gahagan et al., 2015). Furthermore, women who are at the highest risk of heart disease have a lower chance of improvement (Mosca et al., 2004). Some previous studies have found older age, marital status, consumption of smokeless tobacco, high waist circumference, low physical activity level, overweight, obesity, and diabetes as the risk factors of hypertension among rural women (Chowdhury et al., 2020; Khanam et al., 2019; Msemo et al., 2018; Sharma et al., 2018). The particular risk factors that are unique for women need to be recognized since they will help to lessen the number of hypertension-related events, i.e. the extent of the problem, identifying high-risk factors among women (Gudmundsdottir et al., 2012). Hence, the objective of the current study was to examine the prevalence of hypertension and associated risk factors among rural women.

2. Methods

2.1. Study Design

During the period from 1 March to 30 June 2019, a descriptive cross-sectional study was conducted among women in a rural community. A quantitative approach was used as the study method since it can enhance the statistical outcome and generalizability to address a larger population (Polit & Beck, 2010). For the data collection, a closed-ended questionnaire was used which was pre-tested among 20 women before the data collection, and they were not included in the actual study population. By this process, it was ensured that the questionnaire would work as intended and became understandable by those individuals who were likely to respond to them (Ruel et al., 2016).

2.2. Study Area and Population

The survey was undertaken among rural women who lived in Kumarkhali Upazilla at Kushtia district, Bangladesh. According to Bangladesh Census, 2011 Kumarkhali is constituted of 328,457 population; of which 49.77% are men and 50.23% are women respectively (Bangladesh Bureau of Statistics, 2015). During the selection of the participants, the inclusion criteria were women between 25 and 85 years of age who had given their agreement to partake in the study; and the exclusion criteria were pregnant women, men, women under 25 years of age, and those who did not show their interest to participate in the study.

2.3. Sample size

The estimation of the sample size was made using the equation: $n = z^2pq/d^2$; where n = sample size, z = standard normal variate, p = prevalence of hypertensive people, q = 1-p (proportion of normotensive people) and d = standard error (Charan and Biswas 2013). Using this formula, the desired sample size was 380 women at a 95% confidence interval (z = 1.96), with a predicted prevalence of hypertension (p) of 45% and 5% standard error.

2.4. Sampling Technique

The multistage stratified sampling method was used as a sampling technique in this study. Kumarkhali Upazilla consists of a total of 11 unions; of which four unions were selected randomly. These unions consist of around 11955 to 17160 women population in each of them (Banglapedia, 2014). Ten villages were randomly selected from those four unions. The sample was assigned proportionately to each village based on the total number of the household. The method of systematic random sampling was used to pick 30 to 40 residents of about 500 households across each village. Following a study by Dhungana et al. (2016), we randomly picked one household from the initial ten dwellings by dint of a random number table, and afterwards systematically approached every 10^{th} house from the very first households up to the attainment of estimated sample size (Dhungana et al., 2016). The study areas were visited before the sampling process, and the feasibility of data collection was ensured.

2.5. Data Collection Tools

A structured questionnaire was administered in English. However, for the ease of data gathering, it was subsequently converted into Bengali. Participant's socio-demographic details

and clinical examinations were comprehended in the first section of the survey question. The Independent variable was the prevalence of hypertension among participants, whereas their age, marital status, educational level, occupation, BMI etc. were considered as dependent variables in the study. Another part of the questionnaire dealt with the risk factors for hypertension among interviewees, such as physical activity, intake of salt, use of tobacco, diet, diabetes, mental stress, etc. For anthropometric measurements, a steel tape and digital weight machine were used. Both the aneroid sphygmomanometer and the digital sphygmomanometer (named Omron, jpn 2) were used to measure blood pressure.

2.6. Data collection Procedure

The author conducted a face-to-face interview to collect data. Before starting the data collection, participants were asked to partake in the study voluntarily. They were made ensured about the confidentiality of their information and individual identity as well. Data collection started following the ratification of an informed consent form for the study participation. Then, information related to the participant's background characteristics, hypertension, and risk factors were gathered. However, participants were asked about having been spotted with hypertension previously; and whether they have taken anti-hypertensive medicine, prescribed by the health care provider so that, the data validity and reliability can be ensured. With the presence of the first author, two female health care providers (CHCP) carried out the anthropometric measurements and clinical exams, who have efficiency and several years of experience in this case.

2.7. Anthropometric Measurement

After taking off their shoes, participants were requested not to bring any heavy clothes or ornaments with them. They were also told to stand erect with their arms on their backs, staring straight at a distant point at the same level as their eyes (Kattan et al., 2018). Their bodyweight and height were determined at the nearest 0.1 kg and 1 cm respectively (Chilima and Ismail 1998). BMI was measured by using the given equations: BMI = weight (kg)/height $(m)^2$ (Singh et al., 2017).

2.8. Blood Pressure Measurement

Participants were requested to be stress-free before taking blood pressure measurements, and be seated and take rest for at least 15 minutes with flat feet on the ground and back supported. It was ensured that at least 30 minutes before the assessment, the participant emptied her bladder and avoided caffeine or exercise (Muntner et al., 2019). Measurements of systolic and diastolic blood pressure readings were taken three times on the left arm at 1-minute intervals between each reading (Outdili et al., 2019); whereas for analysis, the mean of 2^{nd} and 3^{rd} readings was considered.

2.9. Reference Ranges Used

a) The reference parameters offered by the Centers for Disease Control and Prevention (CDC) were used to identify the participants' BMI: underweight (<18.5), normal (18.5-24.9), overweight and obese (30 or >30) (Centers for Disease Control and Prevention, 2020).

b) Hypertension range was categorized as normal blood pressure (SBP<120 and DBP<90 mmHg), prehypertension (SBP= 120-139 or DBP= 80-89 mmHg), stage 1 hypertension (SBP= 140-159 or DBP= 90-99 mmHg), and stage 2 hypertension (SBP= 160 or DBP= 100 mmHg); according to the guideline provided by the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (Singh et al., 2017).

c) Isolated systolic hypertension (ISH) occurs when SBP ≥ 140 mmHg and DBP < 90 mmHg; and Isolated diastolic hypertension (IDH) occurs when SBP ≤ 140 mmHg and DBP ≥ 90 mmHg (Singh et al., 2017).

d) According to the guidelines stated in an earlier study, physical activity was graded as low, moderate and heavy, where 150-300 minutes of moderate exercise each week, or 75-150 minutes of intense physical activity per week was proposed (Yang, 2019).

2.10. Data Analysis

Statistical Package for Social Sciences (IBM SPSS, version 25.0) program was used for the statistical analysis of the data. Descriptive statistics, frequencies, and the percentage were calculated to summarize data. Logistic regression and chi-square tests were conducted in order to identify the substantial associations between variables and the hypertensive risk factors. Following the 95 % confidence interval, the level of significance was fixed as $p<0.05$.

3. Results

The study surveyed a total of 380 women. The mean age (±SD) of the participants was 44.63 (±14.44) years and nearly 51.5% were over the age of 45 years. Participants had a mean (±SD) BMI of 24.50 (±5.11). Almost half of the participants (48.94%) had normal BMI; while unitedly obese and overweight participants encompassed more than one-third of the total. Participants have had a mean (±SD) systolic and diastolic blood pressure of 126.65 (±19.31) and 77.21 (±12.51) mmHg, respectively. The majority of survey participants were married (81.31%) and housewives (77.10%). About 36.84% and 38.68% of women were *illiterate* and obtained primary education, respectively (Table 1).

Table 1

[Background Characteristics Among Participants (N=380)]

Background Characteristics	Frequency Distribution	
	Number (n)	Proportion (%)
Age group (Years)		
25-34	102	26.84
35-44	82	21.57
45-54	83	21.84
55-64	70	18.42
65 or above	43	11.3
Education		

Illiterate	140	36.84
Primary	147	38.68
Secondary	67	17.63
Higher secondary or above	26	6.84
Marital status		
Unmarried	20	5.26
Married	309	81.31
Widow	51	13.42
Occupation		
Housewife	293	77.10
Student	15	3.95
Other job holders	72	18.95
Body Mass Index		
Underweight	31	8.15
Normal	186	48.94
Overweight	129	33.94
Obese	34	8.95

The overall predominance of hypertension among total participants was 21.3%, according to the findings presented in **Table 2.** Among the 17.1%, prehypertension was prevalent. A significant association between age and women's hypertension status (p<0.001) were found. The prevalence rate was significantly high among women aged 55 to 64 years. In the following age group, about 45.7% and 25.7% of participants had cases of hypertension and prehypertension; respectively. The pre-diagnosed cases of hypertension among the total participants were 11.3%. Here, isolated systolic hypertension prevailed among 9.70%, while isolated diastolic hypertension was 8.40% of all study participants. Participant's age was significantly associated with the prevalence of isolated systolic BP (p <0.05), and isolated diastolic BP (p <0.05). About 35.10% of cases of total isolated systolic and 37.50% cases of total diastolic hypertension were prevalent respectively among the women aged 55 to 65 years.

Table 2

[Prevalence of Hypertension by Age Group of the Participants (N=380)]

Types of Hypertension	n (%)	Age Group					Chi-square (p value)
		25-34	35-44	45-54	55-64	65 or above	
Normal	234 (61.6)	86 (84.3)	57 (69.5)	47 (56.6)	20 (28.6)	24 (55.8)	
Prehypertension	65 (17.1)	13 (12.7)	15 (18.3)	14 (16.9)	18 (25.7)	5 (11.6)	
Hypertension Stage-1	28 (7.4)	2 (2.0)	7 (8.5)	6 (7.2)	8 (11.4)	5 (11.6)	89.73 (<0.001)*

Hypertension Stage-2	10 (2.6)	1 (1.0)	3 (3.7)	4 (4.8)	1 (1.4)	1 (2.3)	
History of hypertension	43 (11.3)	0 (0.0)	0 (0.0)	12 (14.5)	23 (32.9)	8 (18.6)	
Total	380 (100.0)	102 (26.8)	82 (21.6)	83 (21.8)	70 (18.4)	43 (11.3)	
Isolated systolic hypertension	37 (9.7)	7 (18.9)	2 (5.4)	6 (16.2)	13 (35.1)	9 (20.9)	18.87 (0.001)**
Isolated diastolic hypertension	32 (8.4)	2 (6.2)	6 (18.8)	5 (15.6)	12 (37.5)	7 (21.9)	16.61 (0.002)**

*p<0.001, **p<0.05

Socio-demographic and lifestyle factors influencing participant's hypertensive condition are listed in **Table 3**. In this study, a significant association was found between the prevalence of hypertensive problems with age, education, marital status, BMI, family history of hypertension, raw salt intake, secondary smoking, stress and diabetes among the participants (p<0.05). Hypertension (45.7%) and prehypertension (25.7%) were found to be more prevalent among those aged between 55-64 years. Participants' educational level was strongly associated with hypertensive symptoms (p<0.001), while the higher incidence was shown by *illiterate* participants. A larger proportion of hypertension was found more among women who are either married or widow. Being overweight and obese has been found as an important risk determinant of hypertension. It has been found that being overweight and obese is a substantial risk factor for hypertension. In this study, hypertension was prevalent among obese (29.4%), and prehypertension was found more among overweight (20.9%) women. A higher incidence of a hypertensive situation was also demonstrated among participating women with a family record of hypertension. It was also prevalent in those households where 34.9% of women were used to secondary smoking. Consumption of raw salt and red meat was momentously allied with the hypertension prevalence (p <0.05) also. Women with frequent stress experienced a high-prevalence rate of hypertension. Moreover, the prevalence of prehypertension (26.3%) and hypertension (55.3%) were found to be greater among women with diabetes.

Table 3

[**Prevalence of Hypertension by Socio-Demographic and Behavioral Factors]**

Characteristics	**N=380**	**Normotension (N=234)**	**Prehypertension (N=65)**	**Hypertension [a] (N=81)**	**Chi-square (p value)**
	n (%)	**n (%)**	**n (%)**	**n (%)**	
Age					
25-34	102(26.8)	86 (84.3)	13 (12.7)	3 (2.9)	
35-44	82 (21.6)	57 (69.5)	15 (18.3)	10 (12.2)	
45-54	83 (21.8)	47 (56.6)	14 (16.9)	22 (26.5)	69.8 (<0.001)*

55-64	70 (18.4)	20 (28.6)	18 (25.7)	32 (45.7)	
65 or above	43 (11.3)	24 (55.8)	5 (11.6)	14 (32.6)	
Education					
Illiterate	140 (36.8)	63 (45.0)	27 (19.3)	50 (35.7)	
Primary	147 (38.7)	100 (68.0)	24 (16.3)	23 (15.6)	
Secondary	67 (17.6)	55 (82.1)	8 (11.9)	4 (6.0)	37.5 (<0.001)*
Higher secondary or above	26 (6.8)	16 (61.5)	6 (23.1)	4 (15.4)	
Occupation					
Housewife	293 (77.1)	173 (59.0)	51 (17.4)	69 (23.5)	
Student	15 (3.9)	12 (80.0)	2 (13.3)	1 (6.7)	5.2 (0.268)
Others	72 (18.9)	49 (68.1)	12 (16.7)	11 (15.3)	
Marital status					
Unmarried	20 (5.3)	17 (85.0)	3 (15.0)	0 (0.0)	
Married	309 (81.3)	193 (62.5)	51 (16.5)	65 (21.0)	10.9 (0.027)**
Widow	51 (13.4)	24 (47.1)	11 (21.6)	16 (31.4)	
Body Mass Index					
Underweight	31 (8.2)	25 (80.6)	4 (12.9)	2 (6.5)	
Normal	186 (48.9)	124 (66.7)	29 (15.6)	33 (17.7)	14.8 (.021)**
Overweight	129 (33.9)	66 (51.2)	27 (20.9)	36 (27.9)	
Obese	34 (8.9)	19 (55.9)	5 (14.7)	10 (29.4)	
Family history of hypertension					
Yes	211 (55.5)	100 (47.4)	39 (18.5)	72 (34.1)	52.5 (<0.001)*
No	169 (44.5)	134 (79.3)	26 (15.4)	9 (5.3)	
Raw salt consumption					
High	37 (9.7)	12 (32.4)	10 (27.0)	15 (40.5)	
Moderate	121 (31.8)	72 (59.5)	23 (19.0)	26 (21.5)	17.4 (0.002)**
Low	222 (58.4)	150 (67.6)	32 (14.4)	40 (18.0)	
Secondary Smoking					
Yes	146 (38.4)	66 (45.2)	29 (19.9)	51 (34.9)	32.0 (<0.001)*
No	234 (61.6)	168 (71.8)	36 (15.4)	30 (12.8)	
Physical activity					
Heavy	106 (27.9)	51 (48.1)	25 (23.6)	30 (28.3)	
Moderate	41 (10.8)	24 (58.5)	6 (14.6)	11 (26.8)	13.3 (.010)**
Low	233 (61.3)	159 (68.2)	34 (14.6)	40 (17.2)	
Red meat consumption					

Often	35 (9.2)	5 (14.3)	10 (28.6)	20 (57.1)	
Sometimes	100 (26.3)	46 (46.0)	19 (19.0)	35 (35.0)	70.2 (<0.001)*
Rare	245 (64.5)	183 (74.7)	36 (14.7)	26 (10.6)	
Sleeping difficulties					
Yes	136 (35.8)	83 (61.0)	27 (19.9)	26 (19.1)	1.4 (0.49)
No	244 (64.2)	151 (61.9)	38 (15.6)	55 (22.5)	
Frequent stress					
Yes	140 (36.8)	61 (43.6)	29 (20.7)	50 (35.7)	34.9 (<0.001)*
No	240 (63.2)	173 (72.1)	36 (15.0)	31 (12.9)	
Diabetes					
Yes	38 (10.0)	7 (18.4)	10 (26.3)	21 (55.3)	37.7 (<0.001)*
No	342 (90.0)	227 (66.4)	55 (16.1)	60 (17.5)	

*p<0.001, **p<0.05

[a] Including pre-diagnosed hypertension

The outcomes of the binary logistic regression model between hypertension prevalence and underlying risk factors have been illustrated in **Table 4.** Here, women aged 55 to 64 years (aOR: 13.44; 95% CI: 6.38-28.28; p<0.001) were 13.4 times more likely to have hypertension than women aged 25 to 34 years. Overweight (aOR: 3.98; 95% CI: 1.53–10.34; p = 0.005) and obese (aOR: 3.29; 95% CI: 1.07–10.07; p = 0.037) women showed greater risk to be hypertensive than the underweight. Similarly, women who used to have heavy physical activity (aOR: 1.52; 95% CI: 0.77-3.00; p = 0.226) had lower chances of hypertension in comparison. . Notably, women who had no family history of hypertension registered higher hypertensive issues than other counterparts (aOR: 4.25; 95% CI: 2.68-6.73; p < 0.001). Moreover, women who were not used to secondary smoking were less likely to be hypertensive than the women who faced it (aOR: 0.32; 95% CI: 2.68–6.73; p < 0.001). Some other drivers of the prevalence of hypertension were the eating habits of women. It was less likely to affect women who ingested minimum raw salt (aOR: 1.42; 95% CI: 0.89-2.24; p = 0.136), and those who rarely consumed red meat (aOR: 0.05; 95% CI: 0.02-0.15; p <0.001). Similarly, women who did not typically have trouble sleeping (aOR: 0.96; 95% CI: 0.63–1.48; p = 0.869) and who faced infrequent stress (aOR: 0.30; 95% CI: 0.19–0.46; p <0.001) showed lower hypertensive issues. In addition to this, non-diabetic women (aOR: 0.11; 95% CI: 0.05–0.27; p <0.001) displayed lower risk of hypertension, too.

Table 4

[**Association Between Hypertension Prevalence and Related Risk Factors]**

	Adjusted Odds Ratio			**Unadjusted Odds Ratio**		
Characteristics	**AOR[a]**	**95% Confidence interval**	**P value**	**COR[b]**	**95% Confidence interval**	**P value**
Age						
25-34	reference			reference		

35-44	2.36	1.16 - 4.80	0.018**	0.38	0.15 - 1.01	0.053
45-54	4.12	2.07 - 8.19	<0.001*	0.78	0.30 - 1.99	0.600
55-64	13.44	6.38 - 28.28	<0.001*	1.36	0.55 - 3.36	0.510
65 or above	4.25	1.90 - 9.51	<0.001*	4.10	1.91 - 13.11	0.001**
Body Mass Index						
Underweight	reference			reference		
Normal	2.08	0.81 - 5.34	0.127	0.40	0.09 - 1.64	0.202
Overweight	3.98	1.53 - 10.34	0.005**	0.78	0.29 - 2.08	0.621
Obese	3.29	1.07 - 10.07	0.037**	1.11	0.41 - 3.02	0.834
Family history of hypertension						
Yes	reference			reference		
No	4.25	2.68 – 6.73	<0.001*	3.02	1.68 - 5.43	<0.001*
Raw salt consumption						
High	reference			reference		
Moderate	4.34	2.06 - 9.13	<0.001*	1.41	0.54 - 3.64	0.480
Low	1.42	0.89 - 2.24	0.136	1.75	0.96 - 3.18	0.065
Secondary Smoking						
Yes	reference			reference		
No	0.32	0.21 - 0.50	<0.001*	1.33	0.75 - 2.35	0.326
Physical activity						
Low	reference			reference		
Moderate	2.32	1.45 - 3.71	<0.001*	0.99	0.39 - 2.57	1.00
Heavy	1.52	0.77 - 3.00	0.226	0.74	0.40 - 1.36	0.737
Red meat consumption						
Often	reference			reference		
Sometimes	0.19	0.07 - 0.54	0.002**	10.85	3.46 - 34.04	<0.001*
Rare	0.05	0.02 - 0.15	<0.001*	1.72	0.93 - 3.19	0.083
Sleeping difficulties						
Yes	reference			reference		
No	0.96	0.63 - 1.48	0.869	1.72	.961 - 3.08	0.068
Frequent stress						
Yes	reference			reference		
No	0.30	0.19 - 0.46	<0.001*	1.44	.81 - 2.56	0.219
Diabetes						

Yes	reference			reference		
No	0.11	0.05 - 0.27	<0.001*	3.99	0.09 - 0.67	0.006**

*p<0.001, **p<0.05

[a] Adjusted Odds Ratio

[b] Crude Odds Ratio

4. Discussion

An epidemiological transition is underway in Bangladesh while increasing prevalence and risk factors for hypertension have created a greater threat to non-communicable diseases (Karar et al., 2009; Khanam et al., 2019). The present study has investigated the prevalence and associated risk factors of hypertension exclusively among women in Bangladesh. However, this is one of the initial researches in Bangladesh in this regards, since cardiovascular disease studies among women are limited in this region.

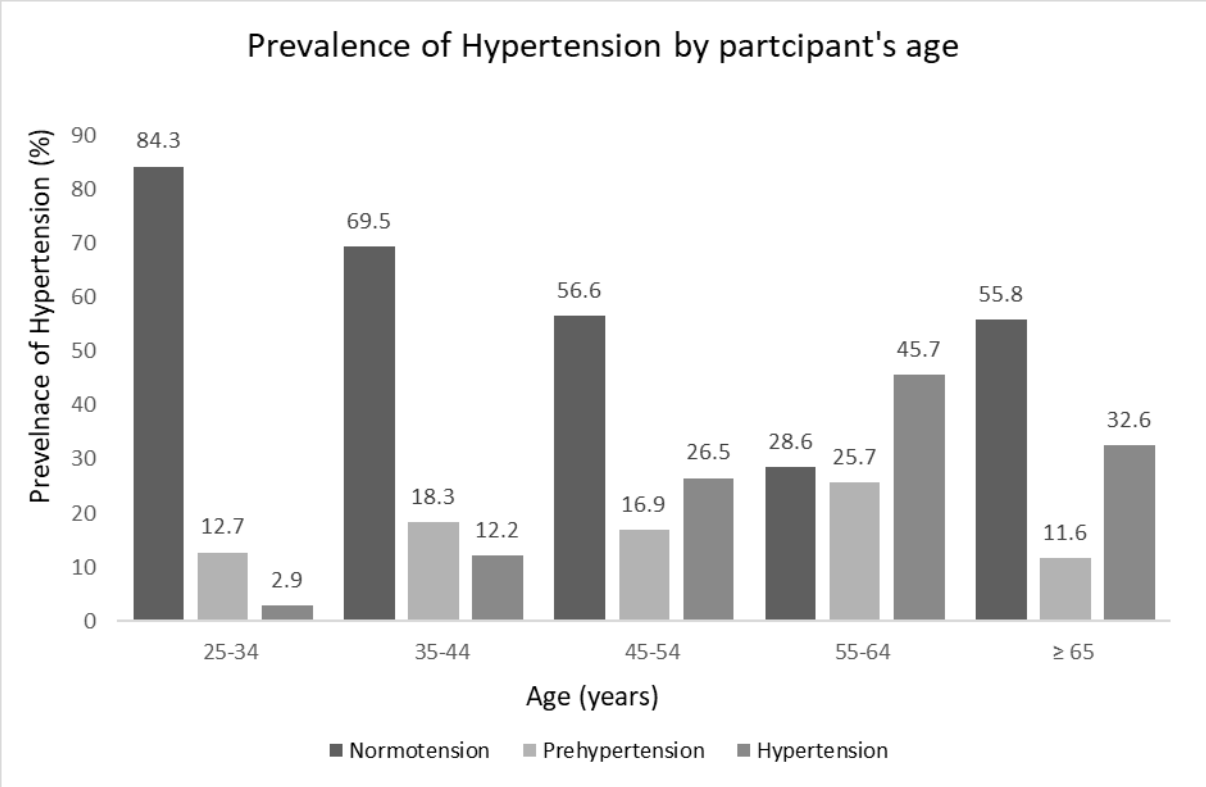
The overall prevalence of hypertension and prehypertension was 21.3% and 17.1% respectively among our study participants **(Table 2**). These percentages were remarkably comparable with a previous study conducted in urban Bangladesh where hypertension and prehypertension were prevalent among their women participants as 21.71% and 17.0% (Islam et al., 2015). Another study found a higher proportion of hypertension among women compared to men (Zaman et al., 2001). In this study, however, only 7.4% had stage 1 and 2.6% of the total participants had stage 2 hypertension during the study. Again, ISH and IDH were prevalent among 9.70% and 8.40% among study participants (**Table 2**). The chance of CVD death rates is lesser for IDH, whereas the danger of Systolic Diastolic Hypertension (SDH) is enormous for ISH (Ahmed et al., 2019). The prevalence of ISH found in the current study was consistent with another study in India, where it prevailed among 10.6% of its participant (Singh et al. 2017). In another study, SDH was more concomitant with women (OR: 18), and gender was a notable predictor of ISH (Ahmed et al., 2019).

There was a substantial link between hypertension prevalence with marital status ($p<0.05$) and educational level ($p<0.001$) of the study participants (**Table 3**). However, it was inconsistent with the results of other research, where the level of education had no significant correlation with hypertension (Song et al. 2018; Kibria et al. 2019). Again, hypertension in the poor education-level community is substantially more prevalent than in the higher education level in India (Anchala et al. 2014). Similarly, in this study, nearly 35.7% of the hypertensive women were *poorly educated* (**Table 3**). Again, no major association was found with the prevalence of hypertension with occupation in this study. Again here, a higher prevalence of hypertension was reported among older women. The proportion of prehypertension and hypertension among participants aged 55-64 years was higher than in other age sets (**Figure 1**). They have shown the highest odds (aOR: 13.44, 95% CI: 6.38–28.28) of having hypertension (**Table 4**) as well. This is far more than the value of other studies. Evidence also showed that the likelihood of high blood pressure among women increases with age (aOR: 2.3 for 45-55 years, and aOR: 3.1 for 55-64 years); especially those who aged between 55 and 64 were more presumably prehypertension (Khanam et al., 2019). Some other studies have reported that a positive family history of hypertension is also a significant factor in developing hypertension (Islam et al., 2015; Song et

al., 2018). However study results defied this since women lacking a family history of hypertension were more likely to be hypertensive by 4.25 times (**Table 4**).

Figure 1

[Hypertension Prevalence by Age Group Among Study Participants]



A high level of BMI has been regarded as one of the leading risk factors of hypertension (Duah et al., 2013). In the present study, overweight (aOR: 3.98) and obese women (aOR: 3.29) were mostly at risk of having hypertension (**Table 4**). Similar findings were found in other studies (Forman et al., 2009; Mengistu 2014; Do et al., 2015; Chowdhury et al., 2016; Solomon et al., 2017; Kibria et al. 2019). It was evident from the findings of the present study that physical activity influenced hypertensive issues. Here, women with heavy physical activity (aOR: 1.52) had shown a low-risk of hypertension than women with moderate physical activity (aOR: 2.32) (**Table 4**). In accordance with other studies, smoking and alcohol ingestion was found as the risk factors for hypertension (Carlsson et al., 2008; Islam et al., 2015). However, the present study's participants refrained from those habits. Alternatively, the hypertension prevalence amongst the study participants was substantially attributed to indirect smoking ($P < 0.001$). It was less likely that participants without secondary smoking (aOR: 0.32) were affected by this disease. Again, women with no sleeping complications (including sleep deprivation and sleep apnea) were also unlikely hypertensive (aOR: 0.96) (**Table 4**). Similarly, compared to those who slept seven hours per night (OR: 1.72), women who slept fewer than five hours each night had quite an elevated vulnerability be hypertensive (Calhoun & Harding, 2010). In our sample population, we saw a protective benefit of avoiding unhealthy food habits. Considering the low amount of raw salt consumption (aOR: 1.42) and limited intake of red meat (aOR: 0.05), the lowest risk of

hypertension among participants has been found (**Table 4**). These findings were consistent with related findings from other studies (Zhang et al., 2013). One of the hegemonic risk factors for hypertension was stress since women who were not accustomed to frequent stress (aOR: 0.30) were less likely to have hypertensive problems in the current study. Other studies have also found similar findings (Marshall et al., 2012; Nayeri et al., 2015). Furthermore, non-diabetic participants from this study (aOR: 0.11) showed a lower risk for hypertension than the other counterpart (**Table 4**). Another study also found a high prevalence of hypertensive problems among female diabetic patients than male diabetic patients (Kibria et al., 2019). Since some other chronic diseases can exacerbate hypertension, proactive measures are deemed necessary to prevent and control hypertension. This is attributable to the reality that, women face a heightened risk of hypertension with their burgeoning age, especially during premenopausal periods. Based on our study results, preserving normal BMI, reducing raw salt and red meat consumption, avoiding secondary smoking, regular physical exercise, controlling diabetes, and staying stress-free can be some impactful prospects for women's preventive measures against hypertension. Therefore it is important to recognize and control hypertension for women, minimize risk factors, and provide behavior change communication (BCC) for a healthier lifestyle through systematic and affordable approaches.

5. Limitation of the Study

Although efficient health workers have conducted blood pressure and anthropometric measurements with proper measurement techniques and equipment, the study results are nearly accurate with some other shortcomings. For example, its cross-sectional approach, which limits the cause-effect relationship between hypertension and associated risk factors, is one of the constraints of this research. Again, a small sample population from one specific area of Bangladesh has been covered; hence, it may not be generalizable to the population from the whole country. If the research had imparted on greater population size, those estimates could have been more measurable.

6. Conclusion

In essence, hypertension prevalence and associated risk factors among rural women have been effectively examined in the current research. The study findings have shown the magnitude of the concerning problems, which will have an influence on formulating and adapting intensive health campaigns and robust intervention programs; all of which will successfully support hypertension management among women. Because of the scarcity of such a study in Bangladesh, more in-depth studies related to this topic are warranted for the determination of the prevalence and a better understanding of gender-specific drivers of hypertension and other chronic diseases among women.

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Declaration

Conflicts of interest:

All authors certify that they have no affiliations with or involvement in any organization or entity with any financial interest or non-financial interest in the subject matter or materials discussed in this manuscript.

Ethics approval:

This study was executed in consonance with the precepts of the Helsinki Declaration. Approval was assigned by the "Biosafety, Biosecurity, & Ethical Committee" of the University of Jahangirnagar, Dhaka, Bangladesh.

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