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Factors Responsible for Elevated Blood Pressure Among Bangladeshi Adults

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ABSTRACT

The objective of the present work was to identify the socioeconomic variables responsible for elevated blood pressure among Bangladeshi urban and rural adults of 18 years and above. Accordingly, 900 respondents were interviewed by some doctors and nurses from and nearby their working places and analysis was done using the data collected from those adults. During investigation, the blood pressure (mmHg) of the respondents were recorded and found that 2.9% adults had elevated blood pressure [B.P.≥ 140/90]. This group was more likely among rural, non-Muslim, single, aged, illiterate, rich and diabetic people. The problem was also more likely in retired persons and process food consumers. The most responsible variable for elevated blood pressure was occupation followed by smoking habit, sedentary activity, gender, and family expenditure. These variables were identified by factor analysis.

Keywords: Elevated Blood Pressure; Socioeconomic Variables; Association; Risk Ratio; Confidence Interval of Risk Ratio; Factor Analysis; Factor Loading

Introduction

Elevated blood pressure creates severe health complications worldwide leading to the risk of heart disease, cardiovascular disease, renal problem, and sometimes premature death though the risk is modifiable [1-11]. Number of adults with hypertension increased from 594 million in 1975 to 1.13 billion in 2015. The increase was noted largely in low- middle and high-income countries [3]. Around 7.5 million deaths or 12.8% of total of all deaths worldwide occur due to high blood pressure [12]. It is predicted to be increased to 1.56 billion adults with hypertension in 2025 [13]. The causes of elevated blood pressure or hypertension are obesity, diabetes, kidney diseases, nerve damage, overactive thyroid gland, sleep apnea, and pregnancy, etc. [4,9,10, 14-16]. The prevalence rate of hypertension was 28.6% among adults of age 18 years and above [16]. Prevalence rate was increased greatly with age, ranging from 6.8% among individuals aged 18 – 39 years, to 30.4% in subjects aged 40 to 59 years and to 66.7% among adults aged 60 years and above [16]. The other responsible factors for elevated blood pressure are residence, ethnicity, sex, sedentary lifestyle, consumption of alcohol, tobacco smoking, intake of salt rich food and high fat food, and physical inactivity, etc. [1,2,9,17-21].

The findings mentioned above were noted in hypertensive adults. Predictors for Bangladeshi adults were also mentioned [19]. The noted predictors may or may not be true for pre-hypertensive group of individuals. It was reported that eldest age group was a risk factor for hypertension [9]. But, regular physical activity, change of lifestyle towards healthy and controlled food and proper medication can reduce the body weight and ultimately can control the elevated blood pressure [22]. In almost all studies mentioned above some socioeconomic variables were identified as the risk factors for hypertension. But, all levels of a particular variable may not be equally responsible in enhancing the blood pressure to a co-morbidity state. In this paper, an attempt was made to identify some socioeconomic variables including a particular level of the variables responsible for elevated blood pressure among Bangladeshi adults.

Methodology

The present study was based on data collected from 900 adults of ages 18 years and above residing in both urban and rural areas of Bangladesh by some doctors and nurses during the academic session 2016-17 when they were doing their M.P.H. degree. The

respondents were interviewed from and near by the working places of the investigators according to a convenient sampling plan. Data were collected through a pre-designed and pre-tested questionnaire. The information collected were on residence, religion, gender, age, body weight, height, marital status, education, occupation, family income and expenditure of the respondents. Beside these, the other information were on physical working condition of the respondents, their food habit, smoking habit, blood pressure level and any prevalence of the diseases including the different aspects of the treatment if they were suffering from any kind of diseases. Some of the variables were qualitative in nature and some were quantitative. But for ease of analysis all the variables were measured in nominal scale. The analysis was done using the SPSS Version 25.

The data of weight (in kg) divided by Height (in metre2) was used to measure the value of body mass index (BMI). The investigated subjects were classified into 4 classes, viz. underweight (if BMI < 18.5), normal(if 18.5 ≤ BMI< 23), overweight (if 23 ≤ BMI < 27.5) and obese (if BMI ≥ 27.5) [23,24]. They were also divided into 2 groups according to their blood pressure level (mmHg). One group was identified as respondents of non-elevated blood pressure and another group had elevated blood pressure (BP ≥ 140/90) [18,25]. The grouping was done according to the objective of the study. For the study, association of any of the socioeconomic characteristics with level of blood pressure was examined. Significant association was decided if probability of any Chi-square test statistic used for observing association ≤ 0.05. Irrespective of significant or insignificant association, the risk ratio [R.R] in favor of a higher group (in percentage) of adults of elevated blood pressure or non-elevated blood pressure was computed along with 95% confidence interval of R.R. The identification of responsible variable for elevated blood pressure was done by factor analysis, where the most responsible variable was detected by the highest absolute value of the factor loading [26-28].

Result

It was found that 2.9% adults had elevated blood pressure. This percentage among rural people (18.6%) was 3.6 and it was higher compared to the corresponding percentage (2.7) in urban adults (81.4%; Table 1). The proportions of hypertensive adults in urban and rural areas were not significantly different as was observed by Chi-square test [=0.362, p-value= 0.547]. But the chance of elevated blood pressure in rural adults was 1.32 times as it was in urban adults [R.R.=1.32, C.I{0.54,3.24}]. Among the respondents 12.9% were non-Muslim and 3.4% of them were suffering from elevated blood pressure and this group was 23% more exposed to this health problem compared to Muslim adults [R.R.=1.23, C.I. {0.43, 3.50]. However, insignificant difference in proportions of adults of elevated blood pressure due to religious difference was noted [= 0.149, p-value=0.700]. The percentage of female respondents was 41.1 and 3.0% of them had elevated blood pressure. The corresponding percentage among males was 2.8. Males and females had almost similar chance of facing the problem of elevated blood pressure. [R.R.=1.05, C.I. {0.49, 2.26; =0.016, p-value=0.900]. Only 7.4% adults were currently single but 9.0% of them were suffering from elevated blood pressure as against the overall 2.9% sufferers in the sample.

Table 1: Distribution of adults by prevalence of elevated blood pressure and some socioeconomic variables.

Socioeconomic Factors	Prevalence of Elevated Blood Pressure				Total	
	Yes		No			
	Number	%	Number	%	Number	%
Residence						
Rural	6	3.6	161	96.4	167	18.6
Urban	20	2.7	713	97.3	733	81.4
Total	26	2.9	874	97.1	900	100
Gender						
Male	15	2.8	515	97.5	530	58.9
Female	11	3	359	97	370	41.1
Marital status						
Currently married	20	2.4	813	97.6	833	92.6
Single	6	9	61	91	67	7.4
Religion						
Muslim	22	2.8	762	97.2	784	87.1
Non-Muslim	4	3.4	112	96.6	116	12.9
Age groups (in years)						
< 25	0	0	19	100	19	2.1
25 – 40	0	0	124	100	124	13.8
40 – 50	2	0.7	279	99.3	281	31.2
50+	24	5	452	95	476	52.9

Level of education						
Illiterate	4	11.1	32	88.9	36	4
Primary	4	4.8	79	93.2	83	9.2
Secondary	4	1.8	214	98.2	218	24.2
Graduate	10	2.8	352	97.2	362	40.2
Higher	4	2	197	98	201	22.4
Occupation						
Business and others	7	2.8	241	97.2	248	27.6
Service	4	2.6	150	97.4	154	17.1
Private service	4	1.9	203	98.1	207	23
Retired	6	5.4	105	94.6	111	12.3
Housewife	5	2.8	175	97.2	180	20
Type of work						
No physical labor	12	2.6	444	97.4	456	50.7
Physical labor	14	3.2	430	96.8	444	49.3
Inv**olved in sedentary activity**						
Yes	21	5.6	351	94.4	372	41.3
No	5	0.9	523	91.9	528	58.7
Prevalence of Diabetes						
Yes	23	3.6	612	96.4	635	70.6
No	3	1.1	262	98.9	265	29.4
Total	26	2.9	874	97.1	900	100

Socioeconomic Factors	**Prevalence of Elevated Blood Pressure**				**Total**	
	Yes		**No**			
	Number	**%**	**Number**	**%**	**Number**	**%**
Income (in 000 taka)						
< 30	12	3.8	305	6.2	317	35.2
30 – 50	2	1.7	117	98.3	119	13.2
50 – 70	3	1.9	154	98.1	157	17.4
70 – 90	2	1.6	127	98.4	129	14.3
90+	7	3.9	171	96.1	178	19.8
Expenditure (in 000 taka)						
< 20	15	4	358	96	373	41.4
20 – 40	2	1.1	177	98.9	179	19.9
40 – 60	2	1.1	181	98.9	183	20.3
60 – 80	5	3.8	125	96.2	130	14.4
80+	2	5.7	33	94.3	35	3.9
Habit of taking process food						
Yes	20	10.6	169	89.4	189	21
No	6	0.8	705	90.2	711	79
Smoking habit						
Yes	8	2.8	274	97.2	282	31.3
No	18	2.9	600	97.1	618	68.7
Obesity						
Under weight	3	11.1	24	88.9	27	3
Normal	6	2.8	208	97.2	214	23.8
Overweight	7	1.8	386	98.2	393	43.7
Obese	10	3.8	256	96.2	266	29.5
Total	26	2.9	874	97.1	900	100

The chance of elevated blood pressure in single adults was 3.73 times more than it was in currently married adults [R.R.=3.73, C.G. {1.55, 8.98}]. Marital status was significantly associated with prevalence of elevated blood pressure [= 9.496, p-value= 0.002]. In the sample 52.9% adults were of ages 50 years and above and 5% of them had elevated blood pressure. None of ages below 40 years were suffering from elevated blood pressure. The prevalence rates of this health problem among adults of different ages were significantly different [=16.866, p-value=0.001]. The chance of prevalence in elderly adults was 10.82 times more as it was in other adults [R. R=10.82, C.I. { 2.60. 45.07]. Only 4% adults were illiterate and prevalence of elevated blood pressure in them was 11.1%. The rate was in decreasing trend with the increase in level of education and this trend was significant as was observed by Chi-square test [= 11.240, p–value=0.024]. The chance of prevalence of this health hazard was 4.87% more as it was in adults of other levels of education [R.R.=4.87, C.I. {1.77, 13.39}]. The percentage of retired persons was 12.3 and prevalence rate of this health problem was 5.4% in them. The corresponding percentage in housewives, businesspersons and persons engaged in other occupation was almost half. However, the rates of prevalence were not significantly associated with level of occupation [=3.239, p-value=0.519].

Retired persons were more than two times exposed to this health hazard [R.R.=2.13, C.I. {0.87,5.19}]. In response to a separate question, 49.3% adults informed that they were doing some physical work along with their different professional activities, but 3.2% of them had the experience of elevated blood pressure. The corresponding percentage among adults not involved in physical work was 2.6. However, this differential was not statistically significant as was observed by Chi-square test [=0.22. p–value = 0.562]. The chance of prevalence of elevated blood pressure in adults irrespective of doing physical labour or not was almost similar [R.R.= 1.20, C.I. {0.56, 2.57}]. Among the respondents 41.3% were involved in sedentary activities and 5.6% of them were affected by elevated blood pressure against 2.9% affected adults in the sample. Prevalence of the disease was significantly associated with involvement in sedentary activity [=17.171, p-value=0.000]. The chance of prevalence was 5.96 times more in adults involved in sedentary activity as it was in others [R.R.=5.96, C.I. {2.27, 15.66].

The percentage of respondents from highest income group of families was only 19.8 and 3.9% of them were suffering from elevated blood pressure. This group of adults were 49% more exposed to the problem compared to that of other adults [R.R.=1.49. C.I. {0.64,3.49}]. However, prevalence of this health hazard was not significantly associated with level of family income [=3. 578.p-value=0.468]. Only 3.9% adults belonged to families spending highest amount of money as family expenditure, but 5.7% of them were affected by the disease as against the overall 2.9% affected people in the sample. The chance of prevalence of this health problem in this group of respondents was 2.00 times more as it was in other adults [R.R.=2.00, C.I. {0.49, 8.11}]. However, level of family expenditure and prevalence of elevated blood pressure were not significantly associated [= 7.233, p-value=0.124]. Among the respondents 21% were habituated in consuming can food and 10.6% of them were affected by elevated blood pressure as against 2.9% affected adults in the sample.

The chance of prevalence for them was 12.54 times more as it was in others [R.R.=12.54, C.I{5.11, 30.77}]. Habit of taking can food was significantly associated with prevalence of elevated blood pressure [=50.471, p-value=0.000]. The percentage of smoker adults was 31.3. This health hazard was prevailed among 2.8% of them. However, the chance of prevalence was almost same in both smokers and non-smokers. [R.R.= 1.03, C.I. {0.45, 2.35]. Smoking habit was not significantly associated with prevalence of elevated blood pressure [= 0.004, p-value= 0.95]. There were only 3% underweight adults, but 11.1% of them were the patients of elevated blood pressure. The next higher proportion (3.8%) of patients of this health hazard was among obese adults (29.5%). The chance of prevalence among this obese group was 1.49% more as it was among others [R.R.=1.49. C.I. {0.69, 3.24}]. The prevalence of elevated blood pressure was significantly associated with level of obesity [=8.949, p-value=0.030]. In the sample, there were 70.6% diabetic adults and prevalence rate of elevated blood pressure among them was 3.6%. This prevalence rate was significantly associated with the prevalence of diabetes [=4.132, p-value=0.042]. The chance of prevalence of this health problem was 3.20 times more in diabetic adults as it was in non-diabetic adults [R.R.=3.20, C.I. {0.97,10.56}].

Factor Analysis

The variables included for factor analysis were residence, religion, gender, age, education, occupation, working habit, family income and expenditure, habit of taking can food, smoking habit, utilization of time, body mass index and prevalence of diabetes. The inclusion of these variables was satisfactory as KMO= 0.606, , =85.709 with p-value =0.000. The importance of inclusion of the variables is also decided on the basis of the value of communality of a variable. A variable was retained for the final analysis if its communality was ≥ 0.500. The final included variables explained 71.683% variation of the data set. The results of factor analysis were presented in (Table 2). From the analysis it was observed that the most responsible factor for elevated blood pressure was occupation followed by smoking habit, sedentary activity gender and family expenditure.

Table 2: Results of factor analysis.

Variable	Communality		Coefficient of Factor	
	Initial	Final	1	2
Residence	0.69	-	-	-
Religion	0.707	-	-	-
Gender	0.615	0.543	0.666	-0.315
Age	0.457	-	-	-
Marital status	0.389	-	-	-
Education	0.565	0.515	0.157	0.7
Occupation	0.702	0.732	0.854	-0.056
Family income	0.745	0.82	0.462	0.779
Family expenditure	0.836	0.895	0.524	0.788
Physical labour	0.494	-	-	-
Body mass index	0.244	-	-	-
Prevalence of diabetes	0.159	-	-	-
Habit of taking process food	0.551	-	-	-
Smoking habit	0.812	0.841	0.851	-0.421
Involved in sedentary activity	0.715	0.671	0.719	-0.393

Discussion

One of the most responsible cause of cardiovascular diseases is elevated blood pressure [4,8,15,25]. It prevails largely in adults of 18 years and above irrespective of sex and residential variation [2,3,4,7,17,19]. It is measured by the level of blood pressure and there are different guidelines for the measurement of elevated blood pressure [10,18,25]. In some studies, it was mentioned that if the blood pressure of a person is ≥ 140 / 90 mmHg, he or she is considered as a patient of elevated blood pressure or hypertension [8,10,18,19]. Studies were also conducted to identify the social determinants of it in both home and abroad [1-5,7,9,19-22]. The present study was conducted to identify some responsible variables for elevated blood pressure in Bangladeshi adults. For this, data were collected from 900 respondents of 18 years and above residing in both urban and rural areas.

The respondents were divided into two groups according to their blood pressure level. In one group there were 2.9% adults who were suffering from elevated blood pressure [18]. Non-prevalence of elevated blood pressure was noted in 97.1% respondents. These two groups were again classified according to different levels of socioeconomic characteristics. Association of prevalence of blood pressure with level of any social characteristic was investigated by Chi -square test and the chance of risk of elevated blood pressure in adults of a level of social characteristic was investigated by calculating risk ratio. According to the objective of the study the responsible socioeconomic variables were identified by factor analysis. The analysis indicated that occupation was the most responsible factor for elevated blood pressure and the chance of it was 2.13 times more among retired persons as in others. The next responsible variable was smoking habit, though the chance of prevalence of elevated blood pressure was similar among smokers and non-smokers. In earlier study, smoking habit was observed associated with hypertension [5].

The third responsible variable was sedentary activity and the chance of this health hazard was 5.96 times more in adults involved in sedentary activity as it was in others. The fourth responsible variable was gender and it was observed that females were slightly more exposed to this health hazard. The fifth responsible variable was family expenditure and chance of elevated blood pressure was 2.00 times more in adults spending highest amount of money as family expenditure as it was in others. Besides the above-mentioned variables, lower education, over age, level of body mass index, prevalence of diabetes and habit of taking process food were the risk factors for elevated blood pressure. This finding was similar as it was observed in other studies in home and abroad [3-5, 7, 9, 15, 19-23].

Conclusion

The study was conducted among 900 Bangladeshi urban and rural adults of 18 years and above with an objective of identifying some socioeconomic characteristics responsible for elevated blood pressure. Among 900 adults 2.9% were identified as patients of hypertension or elevated blood pressure [18,25]. This health hazard was observed significantly associated with age, education marital status, level of obesity, prevalence of diabetes sedentary activity and habit of taking process food. However, the risk of this health problem was more than double among currently single, diabetic, retired adults and adults of rich families. The chance of elevated blood pressure was more than four times in illiterate adults and in

adults habituated in taking process food and involved in sedentary activity.

Due to upward movement of socioeconomic characteristic, the problem of change of food habit and involvement in sedentary activity and hence obesity and diabetes cannot be avoided. But people can be made aware of the health hazard arises from obesity, diabetes, sedentary activity, and elevated blood pressure. They can be encouraged

(i) To avoid more sugar-based can and processed food and to take home made food,

(ii) To develop a habit of involvement in doing some work which needs sufficient body movement,

(iii) To avoid the increase in body weight,

(iv) To change the lifestyle favourable for healthy life,

(v) To adhere the lifelong medical therapy when any one face the problem of life long lasting non-communicable diseases.

Rural and urban social and health workers, government health service providers and medical practitioners can do a lot to encourage the people to follow the above steps.

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