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Research Article

Socioeconomic Variables Enhancing Prevalence of Diabetes Disability in Bangladeshi Adults of High Normal and Hypertensive Blood Pressure

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Abstract

The present analysis was based on data collected from rural and urban Bangladeshi 995 adults of 18 years and above. The investigation was done to observe the prevalence of diabetes-disability in respondents of high normal and hypertensive blood pressure. Prevalence was noted in 9 such adults; among them 7 were males and 2 were females. The sample contained males and females in the ratio 50.1: 49.9. The respondents were interviewed during their visit in some diagnostic centres of urban and semi-urban areas. The sample diabetic adults were 67%. Among them who were suffering for 10 – 15 years the percentage of diabetic disable adults of higher blood pressure were 5.1%. For this group the risk of prevalence was 11.31 times. Higher risk was also noted among elderly adults and adults of high economic status. The most responsible variable which enhanced diabetes disability was duration of diabetes. The other enhancing variables were age, body mass index, and sedentary activity. These were identified on the basis of significant correlation coefficient of the variables and discriminant function score. However, rural people, males, illiterate people, housewives, adults of high economic status, had higher risk of prevalence. These were identified from the values of risk ratios. Beside these, the other responsible variables for enhancing the prevalence of the disease were habit of taking process food, and physical inactivity.

Keywords: diabetes; hypertensive blood pressure; risk ratio

Introduction

Many physically disable persons cannot perform their daily routine work, even they cannot walk and maintain their physical balance without any support. The problem increases among obese and diabetic patients when these two are beyond control or are untreated. In the long run the complications in mobility conditions, in hearing capacity and in visual impairment, including cardiovascular disease (CVD) and peripheral neuropathy arises among diabetic patients [1, 2, 3, 4]. Again, diabetes is a prime risk factor for cardiovascular diseases as diabetes and CVD are the two of the four groups of non-communicable diseases [5]. Diabetic patients suffering for longer duration without control of high blood glucose may face the heart problem as high blood glucose can damage the blood vessels and the nerves that control heart. Thus, reduction of CVD risk in diabetic patients is very important and it can be done by treating dyslipidaemia and hypertension [6]. In that sense hypertension, high normal blood pressure, diabetes and disability are interrelated non-communicable diseases.

Due to upward social mobility the rates of incidence of obese and diabetic patients are increasing day by day, specially the rate of type II diabetic patients in elderly people [7] and in course of time the rate of disable adults will be increased. It was reported that the adults in home and abroad are in risk of diabetes [8 – 16]. The disability among elderly diabetic patients is expected to be increased by 2025 in developed countries since older people will comprise two-thirds of the diabetic patients in those countries [17,18]. In one paper it was reported that the risk of disability might be increased 67% due to diabetes [19]. Researches indicated that neuropathy is a common physical disorder among elderly diabetic patients [1, 19]. In one research it was found that 90% diabetic patients of Bangladesh were disable [10]. The rate of prevalence of diabetes-disability was 4.3% in 2006 in India compared to 1 to 2 per cent in western world [20]. Disability increases the chance of sleep apnoea, lower limb amputation, morbidity and it creates a great economic burden [20 - 27]. This health hazard is predominant among females, elderly people and diabetic patients of longer duration [28, 29]. As more disable persons are observed among diabetic patients and, some influencing factors of

diabetes viz. old age, female, illiteracy, physical inactivity, lifestyle, sedentary activity, food habit, family history etc. may be the causes of disability [21, 30 – 34]. Again, diabetes and hypertension are two associated non-communicable diseases. This was reported in separate studies [35 – 39].

Hence it was decided to observe the influence of the socioeconomic variables for simultaneous prevalence of diabetes disability in Bangladeshi adults of high normal and hypertensive blood pressure.

Methodology

The study was done using the data collected from 995 adults of 18 years and above. These adults were interviewed by some nurses and medical assistants working in some purposively pre-selected diagnostic centres of urban and semi-urban areas of Bangladesh. The male and female units were interviewed to maintain the national sex ratio of 50.1: 49.9 in the population of Bangladesh during investigation in the session 2018 – 2019 [40] . The investigated males and females were 498 and 497, respectively. These respondents were interviewed when they were visiting the diagnostic centres; as a result we had information from adults mostly suffering from diabetes (67%).

The data of different socioeconomic variables were recorded from each selected respondent using a pre-designed and pre-tested questionnaire. The questionnaire contained different questions related to socio-demographic characteristics of the respondents. The information of life-style,and the information of suffering from any of the non-communicable diseases including period of suffering, the stages of treatment and the information of cost of treatment were also noted. The variables under investigation were mostly qualitative and a few were quantitative, but the values of all the variables were recorded in nominal scale so that data analysis would be easy. The value of body mass index (BMI) of each respondent was found out from the result of his/her weight (in kg) divided by height (in metre2) . The adults were classified in to 4 classes on the basis of value of BMI. Obese adults were identified if BMI ≥ 27.5. The other 3 groups were underweight group,if BMI< 18.5; normal group, if 18.5 ≤BMI< 23.0; and overweight group, if 23.0 <BMI< 27.5) [41, 42]. According to the level of blood pressure (B.P. mmHg) the respondents were also divided into 4 groups . These 4 groups were adults of(i) optimum blood pressure (if B.P. < 120/80), (ii) normal blood pressure (if B.P. < 130/85), (III) high normal blood pressure (if B.P.< 140/ 90), and (iv) hypertensive (if B.P.> 140/90) [43, 44]. The respondents were also classified into 4 classes on the basis of their monthly family income and family expenditure. These classes were (i) lower (if income < 50 thousand taka, expenditure < 40 thousand taka), (ii) medium (if 50 ≤income < 100, 40 ≤ expenditure < 80 thousand taka), (iii) Upper medium (if 100 ≤ income < 150, 80 ≤ expenditure < 120 thousand taka) (iv) Higher (if income ≥ 150, expenditure ≥ 120 thousand taka).

To fulfil the objective of the study, association of each of the socioeconomic variable with simultaneous prevalence of diabetes disability in Bangladeshi adults of high normal and hypertensive blood pressure was studied. Significant association was decided using the value of Chi-square and its p-value. A variable was considered as significantly associated if p-value of any ≤ 0.05. The risk ratio and its confidence interval was calculated for a group of adults for whom rate of prevalence of the diseases was noted higher for a level of the socioeconomic variable. Finally, the diabetic- disable group of adults of high normal and hypertensive blood pressure was discriminated from other adults by performing discriminant analysis. The analysis helped in identifying the socioeconomic variable(s) responsible for discrimination. The most responsible variable was one for which the absolute value of correlation coefficient of the variable and discriminant function score was highest [45, 46, 47, 48, 49]. For analysis SPSS Version 25 was utilized.

Result

There were 9 patients who were suffering simultaneously from either high normal or hypertensive blood pressure and diabetes disability. The remaining 986 respondents were free of simultaneous prevalence of these health problems. Total respondents were classified by the prevalence of high normal and hypertensive blood pressure and prevalence of diabetes-disability. The classified results were presented in Table 1.

Prevalence of high normal and hypertensive blood pressure [B.P.≥ 130/85]		Prevalence of diabetes-disability		Total
		Yes	No	
Yes	Number	9	166	175
	%	5.1	94.9	17.6
No	Number	34	786	820
	%	4.1	95.9	82.4
Total	Number	43	952	995
	%	4.3	95.7	100.0

Table 1: Adults classified by prevalence of Diabetes-disability and high normal and hypertensive blood pressure

In the sample there were 17.6% adults of high normal and hypertensive blood pressure, among them 5.1% were diabetic disable. The corresponding percentage in adults of lower blood pressure was 4.1%. These two percentages were statistically similar [=0.032, p –value=1.000]. Still adults of higher blood pressure had 24% more risk of prevalence [R.R.=1.24, C.I. (0.61, 2.54)]. The sample rural adults were 53.4% and 1.3% of them were of higher blood pressure and at the same time diabetic disable against the percentage (0.9%) of diabetic disable patients of lower and normal blood pressure in the sample [Table 2]. For the rural adults the risk of this health hazard was 3.06 times compared to the risk of urban adults [R.R.=3.06; C.I.(0.64, 14.65)].But prevalence rates did not vary significantly with the variation of residence [=2.175, , p –value= 0140 ; Table 2]. All diabetic-disable adults of higher blood pressure was Muslim. The Muslim adults in the sample were 85.2%. The study indicated that religion was independent of prevalence of diabetes-disability in adults of higher blood pressure. The sample males were 50.1% and 1.2% of them were of higher blood pressure and suffering simultaneously from diabetes and disability. The risk of prevalence of the disease was 2 times compared to the risk of females [R.R.= 2.00, C.I.{ 0.50,7.95}]. But prevalence rates in males and females were homogenous [=1.003, p –value=0.0.317]. All 9 diabetic-disable patients among higher normal blood pressure were currently married. though marital status was not significantly associated with prevalence of this health hazard [= 0.677, p-value=0.411]. Younger adults (age < 25 years) were 19.7% in the sample. None of them were the patients of the diseases under study. Except in younger adults the prevalence rate was in increasing trend with the increase in ages of the respondents and prevalence of the disease was highest among elderly adults. These adults were 19.6% in the sample, prevalence rate in them was 3.1%. For them the risk of prevalence was 8.21 times as it was for others [R.R.=8.21; C.I.(2.07,32.50)]. There were

only 6.5% illiterate adults in the sample. Prevalence rate in them was 3.1% and it was highest compared to the rates of other educated adults. With the increase in level of education of adults the prevalence rate was in decreasing trend; lowest rate (0.4%) was observed in secondary level educated persons. But the differential rates were not statistically significant [=5.063, p-value= 0.167]. The risk of prevalence for illiterate adults was 4.09 times compared to the risk of other educated persons [R.R.= 4.09, C.I.{ 0.87, 19.28}], There were 23.1% housewives in the sample and 1.7% of them were patients of higher level of blood

Socioeconomic variables	Patients of higher blood pressure and diabetes-disability				Total	
	Yes		No			
	Number	%	Number	%	Number	%
Residence						
Rural	7	1.3	524	98.7	531	53.4
Urban	2	0.4	462	99.6	464	46.6
Total	9	0.9	986	99.1	995	100.0
Gender						
Male	6	1.2	492	98.8	498	50.1
Female	3	0.6	494	99.4	497	49.9
Religion						
Muslim	9	1.1	839	98.9	848	85.2
Non-Muslim	0	0.0	147	100.0	147	14.8
Marital status						
Currently married	9	1.0	917	99.0	926	93.1
Currently single	0	0.0	69	100.0	69	6.9
Age (in years)						
< 25	0	0.0	196	100.0	196	19.7
25 – 40	1	0.2	400	99.8	401	40.3
40 – 50	2	1.0	202	99.0	203	20.4
50+	6	3.1	189	96.9	195	19.6
Education						
Illiterate	2	3.1	63	96.9	65	6.5
Primary	2	1.7	119	98.3	121	12.2
Secondary	1	0.4	236	99.6	237	23.8
Higher	4	0.7	568	99.3	572	57.5
Occupation						
Farming	1	1.0	103	99.0	104	10.5
Business	1	0.4	233	99.6	234	23.5
Service	1	0.3	304	99.7	305	30.7
Retired	2	1.6	120	98.4	122	12.3
Housewife	4	1.7	226	98.3	230	23.1

Table 2: Adults classified by socioeconomic variables and prevalence of higher blood pressure and Diabetes-disability

pressure and diabetes disability. The risk of prevalence for them was 166% more as it was for other professionals [R.R.=2.66, C.I.(0.72, 9.83)]. The second highest prevalence rate was

1.6% noted in retired persons. However, the rates observed in adults of different occupations were statistically similar [[= 4.252, p-value=0.373].

Physical inactivity was observed in 51.7% adults. The prevalence rate in them was 1.0% which was slightly higher (0.8%) than the rate found for physically active adults. These two rates were statistically similar [=0.055, p-value=0.814]. The risk of prevalence for physically inactive adults was 66% more compared to the risk of others [R.R.=1.66, C.I(0.45, 6.15)]. The percentage of adults involved in sedentary activity was 44.4. The prevalence rate in them was 1.8%. This rate was too high compared to the rate noted in adults not involved in sedentary activity (0.2%). These two rates were significantly different [=7.274, p-value= 0.007]. The risk of prevalence in adults involved in sedentary activity was 10.01 times compared to the risk of other group. The percentage of smoker adults was 33.1%. The prevalence rate in them was 0.3%; for them the risk of prevalence was only 0.25 times [R.R.=0.25, C.I. (0.05, 1.99)]. The rates observed in smokers and in non-smokers were statistically similar [= 1.978, p-value=0.160]. The sample respondents habituated in taking process food was 36.5%. The prevalence rate in them was 1.4%. The risk of prevalence for them was 2.18 times compared to the risk of others [R.R.=2.18, C.I. (0.59, 8.07)]. But the rates prevailed in process food consumers and in non-consumers (0.6%) were not significantly different [=1.426, p-value=0.232 [.

In the sample there were 30.2% obese adults, among them 3.0% were suffering simultaneously from higher blood pressure and diabetes-disability. It was seen that all 9 patients were obese and level of body mass index was significantly associated with the prevalence of the diseases under study [=21.040, p-value=0.000]. Among the respondents 67.0% were diabetic patients of different durations and 9.9% were suffering for 10 – 15 years. The prevalence rate in this latter group was 5.1% and the risk of prevalence for this group was 11.31 times compared to the risk of other adults [R.R.= 11.31, C.I. (3.09, 41.40)]. Duration of diabetes and prevalence of higher blood pressure and diabetes-disability was significantly associated [= 27.542, p-value=0.000].

Discriminant Analysis

The results presented above indicated that variables age, economic status, involvement in sedentary activity, body mass index and duration of diabetes were significantly associated with the prevalence of diabetes disability in adults of high normal and hypertensive blood pressure. But none of the above socioeconomic variables was identified as most responsible for this prevalence. Discriminant analysis was done to identify the responsible variables for prevalence of diabetes-disability in adults of higher blood pressure. For the analysis the variables included were residence, religion, gender, age, marital status, education, occupation, economic status, smoking habit, habit of taking process food, habit of doing physical work.

Socioeconomic variables	Correlation coefficient of variable and discriminant function score, r	Discriminant function coefficient	Λ	F- statistic	p-value
Duration of diabetes	0.545	0.149	0.983	17.135	0.000
Age	0.532	0.390	0.984	16.379	0.000
Body mass index	0.496	0.464	0.986	14.188	0.000
Sedentary activity	0.356	0.220	0.993	7.313	0.007
Education	-0.234	-0.369	0.997	3.162	0.076
Economic status	0.212	0.300	0.997	2.588	0.108
Occupation	0.195	0.130	0.998	2.194	0.139
Residence	-0.194	-0.157	0.998	2.175	0.141
Smoking habit	0.185	0.465	0.998	1.978	0.160
Religion	-0.165	-0.175	0.998	1.574	0.210
Habit of taking process food	0.157	0.070	0.999	1.425	0.233
Gender	-0.132	-0.467	0.999	1.002	0.317
Marital status	-0.108	-0.120	0.999	0.676	0.411
Habit of doing physical work	-0.031	0.108	1.000	0.055	0.814

Table 3: Results found in discriminating diabetic-disable patients of higher blood pressure from other adults

body mass index, involvement in sedentary activity, and duration of diabetes. The influence of some of these variables were significantly different for two groups of adults. These variables were significantly sufficient in discriminating the patients of diabetes- disability along with higher blood pressure from other adults as was observed from the results = 0.945, =55.772 and p –value=0.000. The analytical results of the discrimination were presented in Table 3. It was seen that duration of diabetes was the most responsible variable to discriminate two groups of adults as the correlation coefficient (0.545) of this variable with discriminant function score was highest. The second, third and fourth most responsible variables were age, body mass index and involvement in sedentary activity, respectively. Though not significant, level of education also enhanced the prevalence of the diseases in patients.

Discussion

Overweight, obesity, diabetes, hypertension are interrelated non-communicable diseases and are responsible for other non-communicable diseases [11, 17, 19, 20, 42, 48, 51, 52 – 55]. Diabetes and its related non-communicable diseases were well documented in home and abroad [35 – 38, 55, 56]. Suffering from diabetes for longer duration creates many types of complications in health, specially physical disability. It was reported in some earlier studies [4, 5, 6, 8, 11]. When simultaneous prevalence of diabetes and disability is observed in a person, he/she is identified as diabetic disable patient. This type of incidence is found among elderly adults in both developed and developing countries [7, 9, 57]. Strong association between diabetes and physical disability was reported in earlier studies [1, 36, 37]. Beside diabetes, some other clinical and socioeconomic variables were found associated with disability [19, 32, 42, 51, 52]. This paper was to identify some responsible socioeconomic variables for the prevalence of diabetes disability in 995 Bangladeshi adults of high normal and hypertensive blood pressure residing in urban and rural areas. The adults were of ages 18 years and above. Data were collected from these adults when they were visiting some diagnostic centres located in some urban and semi-urban localities. Among the adults 498 were males and 497 were females. The number of diabetic disable persons having higher blood pressure was 9(0.9%). The remaining 986 (99.1%) adults were not suffering simultaneously from high normal and hypertensive blood pressure along with diabetes-disability. The main objective of the work was to discriminate these two groups of adults and to identify the socioeconomic variables responsible for the discrimination.

In the sample there were 53.4% rural adults, 85.2% Muslim adults, 49.9%females, 93.1% married persons, 6.5% illiterate adults, 19.6% elderly people, 36.5% adults habituated in taking process food, 23.1% housewives, 12.6% adults of high economic status, 51.7% physically inactive persons, 44.4% involved in sedentary activity, 30.2% obese adults , 67% diabetic patients and 9.9% diabetic patients suffering for 10 – 15 years. Prevalence of diabetes-disability in high normal and hypertensive adults in 1.3% rural people, 1.1% Muslim respondents, 1.2% males, 1.0% married persons, 3.2% elderly persons, 3.1% illiterate people, 1.7% housewives, 3.2% adults of high economic status, 0.3% smokers, 1.4% process food consumers, 1.8% adults involved in sedentary activity, 1.0% physically inactive adults, 3% obese adults and 5.1% adults who were suffering from diabetes for 10 – 15 years. Except the prevalence rate in smokers all the rates were higher than the rate observed in sample adults (0.9%). But the rates of prevalence in adults of higher economic status, elderly people, respondents involved in sedentary activity, obese people and diabetic patients who were suffering for 10 – 15 years were significantly higher compared to the rate prevailed in sample adults. The variables age, economic status, sedentary activity, body mass index and duration of diabetes were significantly associated with diabetes- disability observed in high normal and hypertensive adults. Discriminant analysis indicated that duration of diabetes was the most responsible variable in discriminating the patients group from other adults. The other significant responsible variables were age, body mass index and sedentary activity.

Conclusion

In this paper attempt was made to identify some socioeconomic variables which enhanced the prevalence of diabetes disability in adults of high normal and hypertensive blood pressure. For this, 995 adults of ages 18 years and above were interviewed when they visited some pre-selected

diagnostic centres located in urban and semi-urban areas of Bangladesh. The sex ratio 50.1: 49.9 of the adults was maintained as this was the sex ratio at national level during investigation.

Among the respondents 9 (0.9%) were simultaneously suffering from higher blood pressure and diabetes-disability. The prevalence rate of these diseases in rural adults was 1.3%. The risk of prevalence in these rural adults was 206% more compared to the risk of urban adults. The risk was 2.00 times for males, 4.09 times for illiterate persons, 2.66 times for housewives. The prevalence rates in the above mentioned adults were 1.2%, 3.1%, 1.7% respectively. But residence, gender, education. and occupation were independent of prevalence of the diseases under consideration. All 9 affected patients were Muslims and all were married. But religion and marital status were not associated with the prevalence of the diseases. Similar independence of prevalence of the diseases with smoking habit, habit of taking process food and habit of doing physical work was noted. Significant association of prevalence of diabetes-disability in adults of higher blood pressure with age, economic status, sedentary activity, body mass index and duration of diabetes was observed. The prevalence rate in elderly people of ages 50 years and above was 3.1% and for them the risk of prevalence was 8.21 times. Prevalence rate in adults of higher economic status was 3.3%; the risk of prevalence for them was 5.57 times. The risk was 10.01 times for patients involved in sedentary activity. For this group the prevalence rate was 1.8%. All 9 patients were obese. Prevalence rate in diabetic patients suffering for 10 – 15 years was 5.1%. For them the risk of prevalence was 11.31 times.

It was observed that old age, obesity, sedentary activity and longer duration of diabetes were the highly risky factors for enhancing the prevalence of diabetes-disability in adults of high normal and hypertensive blood pressure. The variables related to these factors discriminated well the patients group from other adults. Out of these variables, duration of diabetes was the most responsible one followed by age, body mass index and sedentary activity for discrimination.

The risk of diabetes and its related diseases is increasing day by day. To get rid of the problem there should be cautious action at planning stage by the health planners. Rural and urban health workers can do a lot to encourage the people to try for leading a healthy life. This is needed for the welfare of the people and of the society . In that case the people can take some steps for leading a healthy life. These steps are :

(i) There should be attempts to reduce body weight by doing some physical work and physical exercise.

(ii) There should be attempt to change the food habit by avoiding process food and taking more home made food as per as possible.

(iii) There should be regularity in medical check-up to avoid increased blood sugar level, blood pressure, and other diseases related to diabetes.

(iv) There should be attempt to give up the habit of smoking, habit of drinking, and habit of killing more time in sedentary activity.

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