

Impacts of Socioeconomic Variables on Prevalence and Duration of Diabetes in Bangladeshi Adults

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Abstract

The analysis presented here was to identify some responsible variables for the prevalence of diabetes for different duration in Bangladeshi adults. For this, 995 adults of ages 18 years and above whom visited different diagnostic centres in both urban and semi-urban areas were interviewed. Out of 995 respondents, 67.0% were diabetic patients and they were suffering for, on an average, 6.59 years with standard deviation of 4.06 years. The percentage of adults suffering for minimum 10 years was 17.1. The corresponding percentage was significantly higher for males (23.5%), single adults (27.5%), elderly people (63.1%), farmers (22.1%) and business persons (20.1%), adults of families having medium income (17.9%), smokers (25.5%), adults involved in sedentary activity (23.3%), obese adults (30.3%) and hypertensive adults (64.4%). The risk of prevalence of diabetes for males was 14% more as it was for females. Similar higher risk was observed for single persons (43%), elderly people (36%), literate people (19%), businessmen (11%), obese adults (13%), smokers (10%), adults involved in sedentary activity (16%) and hypertensive adults (26%). The binary logistic regression analysis indicated that gender variation, marital status, age, occupation, body mass index, and blood pressure were the responsible variables for the prevalence of diabetes.

Keywords: Duration of diabetes, socioeconomic variables, Risk ratio, Logistic regression.

Introduction

Diabetes is one of the 4 groups of non-communicable diseases identified by WHO and it is the major risk factor for cardiovascular disease, vascular disorders including retinopathy, and nephropathy, peripheral vascular disease, stroke, and coronary artery disease [1-4]. Diabetes kills 1.6 million people annually and the figure will be increasing gradually [5-6]. The number of diabetic population is in increasing trend since 1980. At that time it was 108 million and it arose to 122 million in 2014. The figure will be increased up to 700 million in 2045 [7]. Sixty per cent of world diabetic population are from Asian countries [8]. The prevalence of diabetes among adults of ages 18 years and above in the world has arisen from 4.7% in 1980 to 8.5% in 2014. The upward trend of rate of increase is noted in low and middle income countries. Bangladesh is an Asian country and is moving towards middle income countries. It was reported that the prevalence of diabetes in Bangladeshi adults of ages 20-79 years was 7.4% [9-10]. The prevalence will be 13% by 2030 [11-12]. In a separate study, the prevalence rate of diabetes among adults of some affluent families of Bangladesh was noted 43.9%. In another study conducted among some patients of urban and semi-urban areas of Bangladesh during 2016-17 27.7% diabetic

patients were recorded [13]. In other studies also upward trend in rate of prevalence of diabetes was noted [14-16].

From the above discussion it is clear that diabetes is the major risk factor for different health hazards for people. Thus, obesity and diabetes are considered by WHO as epidemic worldwide [17]. In one study the biological risk factors of diabetes were discussed in detail [18]. The other risk factors were also reported in different studies in both home and abroad [19-25]. However, the problem of diabetes cannot be avoided, but its prevalence rate can be reduced if proper action plan is taken to improve the socioeconomic condition of the people. It was documented, both in home and abroad, that gender variation, family income and family expenditure, lower level of education, physical inactivity, dietary habit, sedentary activity, non-adherence in controlling high sugar level, etc. were the risk factors for obesity and hence for diabetes [26-31]. The present work was an attempt to identify some socioeconomic variables responsible for the prevalence of diabetes in Bangladeshi adults.

Methodology

To fulfil the objective of the study the analysis was done using the data collected from 498 males and 497 females of 18 years and

above, totalling 995 respondents. These adults were investigated by some nurses and medical assistants working in some objectively selected diagnostic centres located in both urban and semi-urban areas of Bangladesh. The respondents of this study maintained the national sex ratio 50.1: 49.9 of male and female population of Bangladesh [32]. The sample also covered 464 urban and 531 rural people. The data were recorded during the session 2018-19. The data on different socioeconomic variables of each investigated respondent were recorded through a pre-designed and pre-tested questionnaire containing different questions related to residence, religion, gender, marital status, age, education, occupation, family income, and family expenditure. Beside these demographic data, other information were on life-style, viz. physical work, smoking habit, consumption of process food, and involvement in sedentary activity. The information of prevalence of any of the non-communicable diseases, duration of diabetes, and the stages of treatment of the disease including cost of treatment were also recorded. Some of the socioeconomic variables were qualitative and some were quantitative in nature, but all the variables were noted in nominal scale for ease of analysis. The data of weight (in kg) divided by height (in m²) was used to measure the value of body mass index (BMI) to identify obese adults (if BMI \geq 27.5; underweight, if BMI < 18.5; normal, if 18.5 \leq BMI < 23.0; overweight, if 23.0 < BMI < 27.5) [33]. They were also divided into 4 groups according to their blood pressure level (BP, mmHg). One group is of optimal (BP < 120/80), one is normal (BP < 130/85), another is high normal (BP < 140/90) and last one is hypertensive (BP \geq 140/90) adults [34-35].

To identify the influence of the variables on prevalence of diabetes the risk ratio for diabetic patients of higher rate for a

particular level of a socioeconomic variable was calculated. The association of socioeconomic variable with prevalence of different duration of diabetes was calculated. The significant association was decided if p-value of any Chi-square statistic \leq 0.05 [$P(\chi^2) \leq 0.05$]. Finally, binary logistic model was fitted to identify the influencing variable for prevalence of diabetes. All the statistical calculations were performed using SPSS version 25.

Result

The percentage of sample diabetic respondents was 67.0; 29.2% were suffering for less than 5 years, 20.7% were suffering for 5 to less than 10 years and another 17.1% were the diabetic patients for 10 years and above [Table 1]. The average duration of suffering was 6.59 years with standard deviation of 4.06 years. The corresponding percentages of patients among rural people (53.4%) were 52.6, 53.4 and 55.3, respectively. These percentages were not significantly different as was observed by Chi-square test, where $\chi^2 = 0.340$ with p -value = 0.952. The prevalence risk for urban and rural adults was similar [R.R. = 1.01, C.I. (0.85, 1.21)]. The sample male respondents were 50.1% and 71.5% of them were diabetic patients. Among the males 27.9% were suffering for less than 5 years, 20.1% were suffering for 5 to less than 10 years and 23.5% were suffering for 10 years and above. The corresponding percentage among females was 30.6, 21.3 and 10.7, where 62.4% were female diabetic patients. The rates of prevalence of diabetes for different duration among males and females were significantly different [$\chi^2 = 30.751$, p -value = 0.000]. The prevalence risk for males was 14% more [R.R. = 1.14, C.I. (1.04, 1.25)]. Muslim adults were 85.2% and 66.7% of them were diabetic patients as against 71.4% non-Muslim diabetic patients.

Table 1: Distribution of adults according to prevalence and duration of diabetes and socioeconomic variables

Socioeconomic variables	Prevalence of diabetes including duration (in years)								Total	
	None		< 5		5 - 10		10 ⁺		N	%
	N	%	N	%	N	%	N	%		
Residence										
Rural	174	32.8	153	28.8	110	20.7	94	17.7	531	53.4
Urban	154	33.2	138	29.7	96	20.7	76	16.4	464	46.6
Total	328	33.0	291	29.2	206	20.7	170	17.1	995	100.0
Religion										
Muslim	286	33.7	249	29.4	174	20.5	139	16.4	848	85.2
Non-Muslim	42	28.6	42	28.6	32	21.8	31	21.1	147	14.8
Gender										
Male	142	28.5	139	27.9	100	20.1	117	23.5	498	50.1
Female	186	37.4	152	30.6	106	21.3	53	10.7	497	49.9
Marital status										
Married	292	31.5	285	30.8	198	21.4	151	16.3	926	93.1
Single	36	52.2	6	8.7	8	11.6	19	27.5	69	6.9
Age (in years)										
< 25	115	58.7	75	38.3	6	3.1	0	0.0	196	19.7
25 - 40	133	33.2	169	42.1	88	21.9	11	2.7	401	40.3

40 – 50	51	25.1	40	19.7	76	37.4	36	17.7	203	20.4
50*	29	14.9	7	3.6	36	18.5	123	63.1	195	19.6
Education										
Illiterate	28	43.1	11	16.9	13	20.0	13	20.0	65	6.5
Primary & above	300	32.3	280	30.1	193	20.8	157	16.9	930	93.5
Occupation										
Agriculture & unskilled labor	43	41.3	18	17.3	20	19.2	23	22.1	104	10.5
Business	64	27.4	80	34.2	43	18.4	47	20.1	234	23.5
Service	115	37.7	98	32.1	60	19.7	32	10.5	305	30.7
Housewife & Retired persons	106	30.1	95	27.0	83	23.6	68	19.3	352	35.4
Income (in 000 taka)										
< 50	115	29.6	126	32.4	80	20.6	68	17.5	389	39.1
50 – 100	147	35.0	126	30.0	72	17.1	75	17.9	420	42.2
100*	66	35.5	39	21.0	54	29.0	27	14.5	186	18.7
Expenditure (in 000 taka)										
< 40	119	28.6	135	32.5	84	20.2	78	18.8	416	41.8
40 – 60	107	35.4	91	30.1	58	19.2	46	15.2	302	30.4
60*	102	36.8	65	23.5	64	23.1	46	16.6	277	27.8
Smoking habit										
Yes	94	28.6	75	22.8	76	23.1	84	25.5	329	33.1
No	134	35.1	216	32.4	130	19.5	86	12.9	666	66.9
Consumption of process food										
Yes	124	34.2	90	24.8	78	21.5	71	19.6	363	36.5
No	204	32.3	201	31.8	128	20.3	99	15.7	632	63.5
Sedentary activity										
Yes	121	27.4	112	25.3	106	24.0	103	23.3	442	44.4
No	207	37.4	179	32.4	100	18.1	67	12.1	553	55.6
Physical labor										
Yes	136	28.3	162	33.7	93	19.3	90	18.7	481	48.3
No	192	37.4	129	25.1	113	22.0	80	15.6	514	51.7
Body mass index										
Underweight	19	50.0	12	31.6	4	10.5	3	7.9	38	3.8
Normal	93	39.9	99	42.5	25	10.7	16	6.9	233	23.4
Overweight	135	31.8	133	31.4	96	22.6	60	14.2	424	42.6
Obese	81	27.0	47	15.7	81	27.0	91	30.3	300	30.2
Blood pressure										
Optimal	224	41.5	203	37.6	89	16.5	24	4.4	540	54.3
Normal	72	27.1	76	27.1	77	27.5	55	19.6	280	28.1
High normal	22	19.0	8	6.9	33	28.4	53	45.7	116	11.7
Hypertensive	10	16.9	4	6.8	7	11.9	38	64.4	59	5.9

The proportions of Muslim and non-Muslim adults suffering for different periods were insignificant [$\chi^2 = 2.741$, p -value=0.432]. Non-Muslim respondents had only 8% more risk of prevalence [R.R. =1.08, C.I. (0.96, 1.21)]. The percentage of married diabetic persons (93.1%) was 68.5 and that for single adults was 47.8. Percentages of married persons suffering for less than 5 years, 5 to less than 10 years and 10 years and above were 30.8, 21.4, and 16.3, respectively. The corresponding percentages for single adults

were 8.7, 11.6 and 27.5. These differentials in proportions were significant [$\chi^2=26.716$, p -value=0.000]. Married adults had 14% more risk of prevalence [R.R. =1.14, C.I. (1.11, 1.83)]. The percentage of elderly (ages 50 years and above) diabetic patients was 85.1. The prevalence rate of diabetes was in increasing trend with the increase in age. This rate among elderly people was sharply increasing with the increase in duration diabetes. The differentials in proportions of diabetic patients of different durations were in

decreasing trend for the younger adults. Significant differences were observed in proportions of diabetic patients of different durations [$\chi^2=521.854$, p -value=0.000]. The risk of prevalence of diabetes in elderly people was 36% more compared to the risk of others [R.R. =1.36, C.I. (1.25, 1.47)]. The sample illiterate persons were only 6.5%. The prevalence of diabetes among them was 56.9% as against 67.0% overall diabetic patients in the sample. The risk of prevalence for literate adults was 19% higher compared to that of illiterate persons [R.R. =1.19, C.I. (0.96, 1.48)]. The proportion of diabetic illiterate adults suffering for 10 years and above was higher than the corresponding proportion among literate group. But literate and illiterate people suffering from diabetes for different periods were alike [$\chi^2 = 6.131$, p -value=0.105]. The sample businessmen were 23.6% and 72.6% of them were diabetic patients. A big group (20.1%) of them were suffering for 10 years and above. The chance of prevalence in businessmen was 11% more as it was in others [R.R. =1.11, C.I. (1.01, 1.22)]. The diabetic patients among farmers and unskilled labours were 58.7%. But this percentage was higher (22.1%) for patients suffering for 10 years and above. The differentials in proportions of diabetic patients for adults of different professions suffering for different periods were significantly heterogeneous [$\chi^2 =28.749$, p -value=0.000]. Physical inactivity was not the risk factor for prevalence of diabetes as higher proportion (71.7%) of adults not involved in physical activity were diabetic patients against 62.6% diabetic adults not involved in physical activity. This difference in proportions was significant [$\chi^2 =14.755$, p -value=0.002]. This study indicated that those who were involved in physical activity they had higher risk of prevalence of diabetes [R.R. =1.14, C.I. (1.05, 1.24)]. Sedentary activity was the risk factor for prevalence of diabetes [R.R. =1.16, C.I. (1.06, 1.26)]. Among the adults 44.4% were involved in sedentary activity and 72.6% of them were diabetic patients and a big group (23.3%) of them were suffering for 10 years and above. The study indicated that sedentary activity was significantly associated with prevalence of diabetes of different durations [$\chi^2 =33.811$, p -value=0.000].

The percentage of adults from families of lowest income was 39.1 and 70.4% of them were diabetic patients. Lowest (64.5%) group of diabetic adults were found in families of highest income and lowest proportions (14.5%) of them were suffering for 10 years and above. There were significant differences in the proportions of diabetic patients of different durations among adults of families of different income levels [$\chi^2 =17.715$, p -value=0.007]. Lowest income was the risk factor for prevalence of diabetes [R.R. =1.09, C.I.(1.00, 1.19)]. Similarly, adults belonged to families of lowest expenditure had 12% more risk of prevalence of diabetes [R.R. =1.12, C.I. (1.04, 1.21)].

Table 2: Results of Logistic Regression

Variables	Coefficient B	S.E.(B)	Wald statistic	P - value	Exp(B)
Residence	-0.097	0.158	0.376	0.539	0.908
Religion	-0.247	0.213	1.343	0.246	0.781
Gender	0.047	0.187	6.318	0.012	1.599
Marital status	1.188	0.286	17.214	0.000	3.279

The prevalence rate among this group of adults was 71.4%. The prevalence rate was in decreasing trend with the increase in family expenditure. But the differences in rates of prevalence were not significant [$\chi^2=11.384$, p -value=0.077].

Smoking habit was a risk factor for prevalence of diabetes [R.R. =1.10, C.I. (0.93, 1.30)]. Diabetes prevailed in 71.4% smoker adults and 25.5% of them were suffering for 10 years and above. Smoking habit and prevalence of diabetes of different durations were significantly associated [$\chi^2 =31.758$, p -value=0.000]. The rate of prevalence of diabetes among process food consumers was 65.8% and this rate among patients suffering for 10 years and above was 19.6%. But process food consumption was independent of prevalence of diabetes of different durations and consumers and non-consumers were at similar risk of the disease [$\chi^2 =6.339$, p -value=0.096; R.R. =1.03, C.I.(0.94, 1.13)].

The sample obese adults were 30.2% and 73% of them were diabetic patients of different durations. Higher proportion (30.3%) of obese persons was suffering for 10 years and above. The prevalence rate of diabetes of different durations was significantly increasing with the increase in level of obesity [$\chi^2 =112.453$, p -value=0.000]. Obese adults were at 13% more risk of prevalence of diabetes compared to others [R.R. =1.13, C.I. (1.03, 1.23)]. The risk of hypertensive adults (5.9%) was 26% more as it was for others [R.R. =1.26, C.I. (1.11, 1.43)]. Among them the prevalence of diabetes was 83.1% and the rate was in increasing trend with the increase in blood pressure level. A big group (64.4%) of hypertensive adults were suffering from diabetes for 10 years and above. The increasing trend of suffering for different durations was significant [$\chi^2 =272.055$, p -value=0.000].

Results of Logistic Regression

The above presented results indicated that some of the socioeconomic variables were significantly associated with prevalence of diabetes for different durations. It meant that some variables had impact on prevalence. To identify those variables binary logistic regression model was fitted using the variables residence, religion, gender, marital status, age, occupation, family income, family expenditure, smoking habit, physical activity, consumption of process food, sedentary activity, blood pressure, and body mass index as independent variables. Though not significant regression was noted [Hosmer Lemshow Test, $\chi^2 =6.315$, p -value= 0.612; Nagelkarke R-square=0.164], the variables gender, marital status, age, occupation, body mass index, and blood pressure had significant impacts on prevalence of diabetes. The results were shown in Table 2.

Age	-0.037	0.008	20.989	0.000	0.964
Education	0.015	0.091	0.029	0.865	1.016
Occupation	-0.148	0.064	5.282	0.022	0.863
Family income	0.000	0.000	3.164	0.075	1.000
Family expenditure	0.000	0.000	1.804	0.179	1.000
Body mass index	-0.040	0.016	6.578	0.010	0.960
Smoking habit	-.0084	0.187	0.218	0.641	0.919
Physical labour	-0.359	0.201	3.184	0.074	0.698
Consumption of process food	0.135	0.194	0.484	0.487	1.145
Blood pressure	-0.035	0.015	5.621	0.018	0.966
Constant	3.370	1.267	7.075	0.008	29.070

Discussion

Diabetes is one of the non-curable non-communicative diseases. It prevailed among 9.3% (463 million people, estimated) worldwide in 2019. The prevalence rate will be increased to 10.2% by 2030 and 10.8% (700 million people) by 2045 [36]. Most of the diabetic patients were in the age group 40-59 years. In another study it was reported that prevalence was higher among people of ages 61-65 years [37]. The reported risk factors for this disease are urbanization, age, illiteracy, lower economic condition, physical inactivity, smoking habit, alcoholism, obesity, and family history, etc. This study was an attempt to identify some socioeconomic variables responsible for prevalence of diabetes for different durations among adults of ages 18 years and above.

The results included in the study were the analytical information of data collected from adults residing in both urban and rural localities. The respondents were investigated from some pre-selected diagnostic centres. There were 67.0% diabetic patients, the percentages of rural and urban diabetic patients were 67.2 and 66.8, respectively. These two groups of adults were at similar risk of prevalence of diabetes. Muslim (85.2%) and non-Muslim (14.8%) adults were also at similar risk of prevalence. Similar risk of prevalence for religious groups was observed in another study also [38-40]. Higher risk of prevalence was noted for married adults (93.1%) compared to the risk of single adults. Similar result was observed in another study. The prevalence rate of diabetes was 85.1% among elderly people of ages 50 years and above. A big group (63.1%) of them were suffering for at least 10 years. Their risk of prevalence was 36% more than it was for others. Increasing trend of prevalence was noted with the increase in ages. Similar results were reported in other studies also [41]. Lower level of education including other factors was the risk factor for diabetes. But this study indicated that illiterate adults (6.5%) had lower risk of prevalence. Higher proportion (72.6%) of businessmen (23.5%) were diabetic patients and they had higher risk of prevalence. The prevalence rates for different occupational group were significantly different. This group usually did not do physical work. The different studies documented that physical inactivity is the risk factor for diabetes. However, inverse relationship between physical work and prevalence of diabetes was noted in this analysis. Family income, family expenditure, food habit, smoking habit

and utilization of time are the lifestyle factors and these are also influencing factors for diabetes [42]. This study indicated that adults of lowest income group of families had higher risk of prevalence of diabetes. The percentage of smokers was 33.1. They were more exposed to the problem of diabetes [R.R. =1.16]. The prevalence was independent of habit of process food consumption. But higher risk [R.R.=1.16] of prevalence was observed in adults involved in sedentary activity (44.4%). In many studies in both home and abroad it was noted that obesity and diabetes were significantly associated. This study also indicated that with the increase in level of obesity the prevalence of diabetes was increasing and more (30.3%) obese adults were suffering for longer duration. Similar was the case for hypertensive adults. They were 26.0% more exposed to the problem. The rate of prevalence of diabetes was significantly increasing with the increase in level of blood pressure. Similar findings were observed in other studies [43].

Many socioeconomic variables were found associated with prevalence of diabetes. But significant impact of each of the variables, viz. gender variation, marital status, age, occupation, body mass index, and blood pressure was noted through Logistic regression analysis.

Conclusion

The information presented here were the analytical results of data collected from 995 Bangladeshi adults of 18 years and above. The data on different socioeconomic variables were collected to identify the responsible variables for the prevalence of diabetes for different durations. In the sample there were 67.0% diabetic patients and 17.1% were suffering for 10 years and above. The percentage of diabetic patients among 46.6% urban residents was 66.8 and among 85.2% Muslims it was 71.5%. But the risk of prevalence of the disease was similar for two religious groups and for both urban and rural residents. The prevalence rate among male (50.1%) respondents was 71.5% and among married persons (93.1%) it was 68.5%. The risks of prevalence for both these groups were higher as these were for their counter parts. The prevalence rate was 85.1% among elderly people (19.6%). The rate was in increasing trend with the increase in age. The elderly people had 36% more risk of prevalence. Illiterate people (6.5%) were at lower risk of the

disease. Higher risk of prevalence was also noted for businessmen (23.5%), for adults of lowest income group of families (70.4%) and for lowest spending group of families (71.4%). But lower economy was not the cause of risk of prevalence. Smokers (33.1%) and adults involved in sedentary activity (44.4%) had higher risk of prevalence of diabetes. Higher proportion (25.5%) of smokers and adults involved in sedentary activity (23.3%) were suffering for at least 10 years. Smoking habit and sedentary activity were also the two risk factors for longer duration of diabetes. This study indicated that consumption of process food and physical inactivity were not the risk factors for prevalence. But obesity and hypertension were the risk factors for the prevalence. Longer duration of diabetes was noted among higher group of obese and hypertensive adults. The prevalence rate was increasing with the increase in level obesity and level of blood pressure. Finally, significant impact of the variable gender variation, age, marital status, occupation, body mass index, and blood pressure was observed on prevalence of diabetes.

As upward social mobility in the society and also in the country is prevailed, obesity, hypertension and diabetes cannot be avoided. These three health hazards are interrelated. These are influenced by many socioeconomic characteristics. So, attention should be focused to control the negative effects of these three health hazards. If anyone becomes successful in reducing body mass index, he or she will be successful in reducing diabetes. For this, people should be advised to maintain some norms for leading healthy life. These are:

- Avoid first food, excessive salt and high fatty food and sugar-based food, and try to develop the habit of taking home made food as per as possible
- Do any type of physical work and physical exercise
- Walk whenever it is possible
- Avoid sedentary activity as per as possible
- Consult doctor whenever it is necessary and try to adhere strictly the suggestion of the medical practitioner to maintain the body weight
- Try to maintain the blood sugar level below danger level
- Avoid smoking and drinking alcohol

Government health planners and health workers including rural social workers can do a lot to encourage the people to lead healthy life.

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