

A Study on Identification of Socioeconomic Variables Associated with Non-Communicable Diseases Among Bangladeshi Adults

Md. Mortuza Ahmmed¹, K. C. Bhuyan², Jannatul Fardus¹

¹Department of Mathematics, American International University (AIUB), Dhaka, Bangladesh

²Department of Public Health, American International University (AIUB), Dhaka, Bangladesh

Email address

mortuza123034@gmail.com (Md. M. Ahmmed), kcbhuiyan@aiub.edu (K. C. Bhuyan), jannatrinky.du@gmail.com (J. Fardus)

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Abstract: Although half of annual mortality and almost half of the burden of disease in Bangladesh are for NCDs, less evidences are available to identify the factors responsible for NCDs. The aim of the present work is to identify the factors associated with NCDs in a representative sample of families of students of American International University - Bangladesh (AIUB). The study is based on 785 adult respondents from families of 2% randomly selected students. The students themselves collected the information through a pre-designed and pre-tested questionnaire. The collected information is of residence, sex, age, height, weight, education, occupation, marital status, physical work, monthly income, family size, smoking habit and food habit along with suffering of any non-communicable disease and its treatment. Body Mass Index (BMI) is calculated from the collected data. The association of NCDs with social factors and BMI are observed using Chi-square test and hence identified the associated factors with NCDs. Logistic regression is performed to identify the most important factors responsible for NCDs. The prevalence of NCDs is observed among 49.4% respondents and 85.3% of them are exclusively diabetic. Another 4% are suffering from diabetes and heart disease. Among the NCDs affected respondents 91.2% belong to obese and overweight group of respondents. The odd ratio indicates that the prevalence of diabetes is 1.76 times higher among obese and overweight group of respondents compared to other groups.

Keywords: NCDs, Socioeconomic Factors, Logistic Regression

1. Introduction

Non-communicable disease (NCD) is a medical condition or disease that is non-infectious or non-transmissible. NCDs can refer to chronic diseases which last for long periods of time and progress slowly. Sometimes, NCDs result in rapid deaths such as autoimmune diseases, heart diseases, stroke, cancer, diabetes, chronic kidney disease, osteoporosis, Alzheimer's disease, cataracts and others. These diseases are the major health burden in the industrialized countries and are increasing rapidly in the developing countries owing to demographic transitions and changing lifestyles among the people. More than 36 million people die annually from NCDs (63% of global deaths), including 14 million people who die too young before the age of 70 years [1]. More than 90% of these premature deaths from NCDs occur in low- and middle-

income countries [2]. Like many low-income countries around the world, Bangladesh is in the middle of an epidemiologic transition where the burden of disease is shifting from a disease profile dominated by infectious diseases, under-nutrition and conditions of child birth to one increasingly characterized by NCDs. The NCDs are responsible for half of annual mortality (51%) and almost half of the burden of disease (41%). Recent estimate observed in 2006 indicate that NCDs represent 68% of total death as against only 11% of total deaths due to communicable diseases [3].

Diabetes is one of the major components of NCDs. It is associated with prolonged ill health and death due to vascular diseases [4, 5]. Around 415 million people have diabetes in the world and 78 million people are in South-east Asia region; by 2040 this will rise to 140 million. Bangladesh is one of the 6 countries of South-east Asia. There were 7.1 million cases of

diabetes in Bangladesh in 2015. The prevalence of diabetes in adults (20-79 years of age) is 7.4% in Bangladesh [6, 7]. The risk factors for cardiovascular disease are glucose and lipid abnormalities and the prevalence of this disease is a major factor due to diabetes in both developed and developing countries. Diabetes is prevalent among 10% people of Bangladesh and according to the International Diabetes Federation, the prevalence will be 13% by 2030 [8, 9].

Tobacco smoking is another component of NCDs. It is widely used addictive substance with an estimated 1.3 billion smokers worldwide and a global projected tobacco-induced death at over 6 million annually [10]. A household survey in Bangladesh estimated that tobacco-related illness was responsible for 16% of all deaths in the country [11]. It is observed from studies that some socioeconomic characteristics are responsible to enhance the diabetes [12, 13] and diseases related to tobacco smoking. In this paper, our attempt is to identify socioeconomic characteristics responsible for NCDs.

2. Materials and Methods

The present analysis was conducted in the American International University - Bangladesh (AIUB) using the data collected from 785 respondents. The respondents are the family members of age 18 years and above of the randomly selected students of the university. Out of 10344 students during Fall 2015-16 semester, 2% (207) were selected at random and were asked to collect information from their family members of age 18 years and above through a pre-designed questionnaire. Among the respondents, 388 (49.4%) are suffering from at least one of the non-communicable diseases. The questionnaire contains questions related to socio-demographic characteristics of each person. It also contains questions related to type of disease, duration of suffering from the disease and information related to treatment. Some of the variables are qualitative in nature. For analytical purpose, all the variables are measured in nominal scores. In some studies, it is mentioned that Body Mass Index [BMI = Weight (in kg) / Height (in cm²)] and obesity is associated with NCDs. Accordingly, we have tried to relate BMI with NCDs. The association of BMI with NCDs is studied by chi-square test. Association of BMI and diabetes are also studied here. A logistic regression model was fitted using presence or absence of non-communicable disease as dependent variable and some of the socioeconomic characteristics as independent variable. All data were analyzed using SPSS version 20.

3. Results and Discussion

Among the 785 respondents 388 (49.4%) have been suffering from one or more of NCDs. The investigated units are classified by BMI and by other socioeconomic characteristics. The classification is also done by the presence of NCD and by other socioeconomic characteristics. The classified results are used to test the independence of any two characters.

As shown in Table 1, 86.6% respondents are from urban area and among them the prevalence rate of NCDs is 47.8% against the overall prevalence rate of NCDs 49.4%. The differentials in prevalence of NCDs and residence are significant. Among the respondents 68.8% are males and 47.2% of them are suffering from NCDs. The percentage of female respondents (54.3) who are suffering from NCDs is more. However, the differentials in proportions of male and female patients of NCDs are statistically insignificant. Among the respondents 49.3% are married. The prevalence rate of NCDs among them is 60.2%. The prevalence is also higher among widow and divorced respondents. The differentials in prevalence rate by marital status of the respondents are significant.

As usual most respondents (89.6%) are Muslims but the prevalence rate (49.1%) among them is not higher compared to the prevalence rate (54.1%) among the Hindus. However, the differentials in prevalence rate by religion are not statistically significant. Most of the respondents (39.4%) are in the age group 20 years and above but less than 25 years and among them prevalence rate of NCDs is 40.1%. A big group (32.2%) of respondents is of age 45 years and above and 66% of them have experienced any of the NCDs. The differentials in prevalence rate by age of the respondents are significant.

Among the respondents 61.1% are graduates and the prevalence rate of NCDs among them is 45%. Among illiterate and primary educated people, the prevalence rates are higher and the differentials in prevalence rate according to level of education are significant [5]. Among the respondents 45% are students followed by service persons (22.8%). The prevalence rate of NCDs among students is 40.2% and 45.8% among service persons. The worst affected group by NCDs is housewives followed by business persons and retired persons.

In a separate study, the prevalence of diabetes is observed in higher rates among the similar three groups [5]. In the present analysis, it is seen that diabetes is the main cause of NCDs (Table 2) and prevalence of diabetes is observed in higher rates among these three groups of respondents mentioned above. The differentials in prevalence rate by occupation of the respondents are significant.

Table 1. Distribution of respondents by prevalence of NCDs and socioeconomic factors.

Residence	Prevalence of NCDs				Total	
	Yes		No		n	%
	N	%	N	%		
Rural	63	60.0	42	40.0	105	13.4
Urban	325	47.8	355	52.2	680	86.6
Total	388	49.4	397	50.6	785	100.0
Sex						
Male	255	47.2	285	52.8	540	68.8
Female	133	54.3	112	45.7	245	31.2

Residence	Prevalence of NCDs				Total	
	Yes		No		n	%
	N	%	N	%		
Total	388	49.4	245	50.6	785	100.0
Marital Status						
Married	233	60.2	154	39.8	387	49.3
Unmarried	146	38.0	238	62.0	384	48.9
Widow & Divorced	9	64.3	5	30.8	14	1.8
Total	388	49.4	397	50.6	785	100.0
Religion						
Muslim	345	49.1	358	50.1	703	89.6
Hindu	40	54.1	34	45.9	74	9.4
Others	3	37.5	5	62.5	8	1.0
Total	388	49.4	397	50.6	785	100.0
Age groups (in years)						
< 20	15	48.4	16	51.6	31	3.9
20 – 25	124	40.1	185	59.9	309	39.4
25 – 30	18	30.0	42	70.0	60	7.5
30 – 45	64	48.5	68	51.5	132	16.9
45 +	167	66.0	86	34.0	253	32.3
Total	388	49.4	397	50.6	785	100.0
Level of education						
Illiterate	15	68.2	7	31.8	22	2.8
Primary	33	66.0	17	34.0	50	6.4
Secondary	65	56.0	51	44.0	116	14.8
Graduate	216	45.0	264	55.0	480	61.1
Post – graduate	59	50.4	58	49.6	117	14.9
Total	388	49.4	397	50.6	785	100.0
Occupation						
Agriculture	8	40.0	12	60.0	20	2.5
Business	44	62.9	26	37.1	70	8.9
Service	82	45.8	97	54.2	179	22.8
Retired	25	61.0	16	39.0	41	5.2
Housewife	76	75.2	25	24.8	101	12.9
Students	142	40.2	211	59.8	353	45.0
Others	11	52.4	10	47.6	21	2.7
Total	388	49.9	397	50.6	785	100.0
Monthly family income (in thousands)						
< 10	30	36.1	53	63.9	83	10.6
10 – 20	37	45.1	42	54.9	82	10.4
20 – 30	27	43.5	35	56.5	62	7.9
30 – 40	32	60.8	19	39.2	51	6.5
40 – 50	27	69.2	12	30.8	39	5.0
60 +	36	55.4	29	44.6	65	8.3
No income	200	49.6	203	50.4	403	51.3
Total	388	49.4	397	50.6	785	100.0
Smoking habit						
Yes	61	48.8	64	51.2	125	15.9
No	320	49.4	328	50.6	648	82.5
Not Applicable	7	58.3	5	41.7	12	1.5
Total	388	49.4	397	50.6	785	100.0
Physical labour						
Yes	194	47.2	217	52.8	411	52.4
No	194	51.9	180	48.1	374	47.6
Total	388	49.4	397	50.6	785	100.0
Habit of taking processed food						
Yes	191	45.0	233	55.0	424	54.0
No	197	54.6	164	45.4	361	46.0
Total	388	49.4	397	50.6	785	100.0
Level of BMI						
< 20	6	23.1	20	76.9	26	3.3
20 – 25	28	34.6	53	65.4	81	10.3
25 – 30	191	48.0	207	52.0	398	50.7
30 +	163	58.2	117	41.8	280	35.7
Total	388	49.4	397	50.6	785	100.0

Only 5% respondents have income above Taka 40 to 50 thousand and higher proportion of this group of respondents is affected by NCDs. The next higher affected group is observed among the respondents having income Taka 30 to 40 thousand (60.8%). The proportions of affected groups of respondents having different levels of income are significantly different. The heart diseases are associated with smoking habit and heart diseases are components of NCDs. In our study, it is observed that among the smokers the prevalence rate of NCDs is 48.8%. This proportion is higher (58.3%) among the respondents for whom there was no question of smoking. However, the proportions of prevalence of NCDs among smokers and non-smokers are not significantly different. In many studies, it is reported that diabetes is significantly related to non-involvement of physical labour and the disease is an important cause of NCDs. In the present analysis, it is seen that 52.4% respondents are involved in physical labour and prevalence rate of NCDs among this group of people is 47.2%. The corresponding figure for other group of people is 51.9%. This proportion of prevalence of NCDs among the respondents

who do not do any physical labour is slightly higher. But the differentials in proportions are not statistically significant.

Most of the respondents (54%) are habituated in taking canned or processed food from the market. The prevalence rate among them is 45%. The corresponding figure among the respondents who are not habituated with canned or processed food is 54.6%. This difference in proportions is significant. The result does not indicate that processed food is responsible for NCDs as the prevalence of it is less among the respondents who are habituated with processed food. Obesity (BMI \geq 30) is generally associated to a significantly higher risk of arterial hypertension, diabetes, hepatic steatosis and other diseases of NCDs. In our present analysis, we observe that the level of BMI is significantly associated with the prevalence of NCDs. Among the NCDs patients 85.3% (Table 2) are suffering from diabetes. This percentage is higher as most of the respondents are from urban area. It indicates that urban people are more diabetic. This finding is similar with the finding observed at national level and in other sample study, where more urban people are diabetic patients [14].

Table 2. Distribution of respondents according to their residence and types of disease.

Types of disease	Residence				Total	
	Rural		Urban		n	%
	n	%	n	%		
Diabetes	46	13.9	285	86.1	331	85.3
Heart disease	10	29.4	24	70.6	34	8.8
Diabetes and Heart disease	5	35.7	9	64.3	14	3.6
Hypertension	1	16.7	5	83.3	6	1.5
Others	1	33.3	2	67.7	3	0.5
Total	63	16.2	325	83.8	388	100.0

The odds ratio (1.65) indicates that the prevalence of diabetes among the respondents of age greater than or equal to 45 years is 1.65 times than that of other age groups. The lowest prevalence of diabetes (30%) is observed among the agriculturists. The highest prevalence rate (47.1%) is observed among the business persons. The differences in proportions of prevalence of diabetes according to different levels of profession are statistically significant. The result of odds ratio (1.25) indicates that the prevalence of diabetes is 1.25 times more among business persons compared to

persons of other professions. The 95% confidence interval for OR is 0.76 to 2.04. This study also indicates that diabetic is one of the biggest causes of NCDs. The differentials in types of disease by residence is significant. It is seen that higher rates of prevalence are observed among over weight (BMI 25 to less than 30) and obese group of people. The prevalence of NCDs among these two groups is 52.2%. The prevalence rate is 2.52 times more among these two groups compared to other two groups.

Table 3. Distribution of respondents according to level of BMI and prevalence of diabetes.

Level of BMI	Prevalence of diabetes				Total	
	Yes		No		N	%
	N	%	n	%		
< 20	6	23.1	20	76.9	26	3.3
20 – 25	27	33.3	54	66.7	81	10.3
25 – 30	166	41.7	232	58.3	398	50.7
30 +	132	47.1	148	52.9	280	35.7
Total	331	43.7	454	56.3	785	100.0

The present analysis also signifies that diabetes is the main factor of NCDs (85.3% are exclusively diabetic). Among the diabetic patients overweight and obese group of respondents is higher in proportion.

Table 4. Distribution of respondents by prevalence of diabetes and demographic factors.

Age groups (in years)	Prevalence of diabetes				Total	
	Yes		No		N	%
	N	%	n	%		
< 20	15	48.4	16	51.6	31	3.9
20 – 25	123	39.8	186	60.2	309	39.4
25 – 30	45	25.0	45	75.0	60	7.6
30 – 45	50	37.9	82	62.1	132	16.8
45 +	128	50.6	125	49.4	253	32.2
Total	331	42.2	454	57.8	785	100.0
Profession						
Agriculture	6	30.0	14	70.0	20	2.5
Business	33	47.1	37	52.9	70	8.9
Service	69	38.5	110	61.5	179	22.8
Retired	15	36.6	26	63.4	41	5.2
Housewife	42	41.6	59	58.4	101	12.9
Student	141	39.9	212	60.1	353	45.0
Others	8	38.1	13	61.9	21	2.7
Total	331	42.2	454	57.8	785	100.0

The differences in proportions according to level of BMI and prevalence of diabetes are significantly different. The prevalence of diabetes among the obese and overweight group of people is 1.76 times higher compared to other groups. Confidence interval for OR is 1.14 to 2.72. Around 32% respondents are of age greater than or equal to 45 years and 50.6% of them are exclusively diabetic (Table 4). This proportion of diabetic patients is lower among the respondents of other age groups.

Logistic regression model is fitted using prevalence of

NCDs as dependent variable. This variable is significantly associated with some of the socio-demographic variables. These socio-demographic variables are used as independent variables. The variables are residence, sex, age, education, occupation, physical labour and body mass index (BMI). The logistic regression results are shown in Table 5. It is seen that the variables residence, age, education and body mass index have significant impact on prevalence of NCDs. The fitted regression is statistically significant.

Table 5. Logistic regression results.

Variables in the model	Coefficient	Standard error of coefficient	Wald Statistic	P-value
Constant	2.459	0.865	8.096	0.004
Residence	0.457	0.235	4.096	0.044
Sex	-0.047	0.170	0.077	0.781
Age	-0.028	0.006	22.387	0.000
Education	0.199	0.093	4.552	0.033
Occupation	0.035	0.061	0.325	0.569
Physical labour	-0.188	0.151	1.546	0.214
Processed food	-0.204	0.154	1.752	0.186
BMI	-0.079	0.023	11.333	0.001

4. Conclusion

The NCDs are the major health burden in both developed and developing countries [15]. Among the NCDs, diabetes is regarded as an independent risk factor for cardiovascular disease [16]. Diabetes Mellitus is perceived to be the explanation for the high prevalence of coronary artery disease. The present study group of respondents are mostly from urban area (86.6%) and among them, 47.8% are affected by at least one of the NCDs. Among the urban NCDs affected people, 86.1% are diabetics. This indicates that more urban people are diabetic patients. Similar findings are also observed at national level and in some other sample study [14]. In a separate study, it is reported that as people

become more urbanized, tobacco and alcohol use, poor diet and inactive lives will drive up deaths globally by 17% in the next ten years [17]. The present study group of respondents are mostly urbanized, and they have the similar characteristics as mentioned above.

The respondents under study are at higher risk of diabetes as obese and overweight group of them are 1.76 times compared to other two groups of respondents. For these group of people, most of the socio-economic factors are significantly associated with overweight and obesity. Similar significant association is observed in some other studies also [14, 18].

The incidence of NCDs cannot be avoided but its prevalence can be reduced by implementing appropriate action plan. The following actions are very important to

reduce the prevalence rate. These are

Halt the rise in diabetes by encouraging people to participate in blood screening programs and to encourage them to do some sorts of physical labour.

A coherent response might prioritize tobacco control and child nutrition, focus innovation on efficient community based models of care and ensure access to basic off-patent medicines.

Motivation campaign is to be conducted to reduce tobacco consumption by informing the people about the health hazard of tobacco consumption.

To motivate eligible people to join counseling campaign for drug therapy so that heart attacks can be reduced.

Sustainable, balanced economic policy can consider low rates of NCDs as a measure of success.

To act for availability of affordable basic technologies and essential medicines to treat major non-communicable diseases. Civil society has a major role to play in harnessing and effective response to NCDs.

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