

Factors Responsible for Obesity Heart Diseases Among Bangladeshi Adults

KC Bhuyan

Department of Statistics, Jahangirnagar University, Dhaka, Bangladesh

*Correspondence to: KC Bhuyan, Department of Statistics, Jahangirnagar University, Dhaka, Bangladesh

E-mail: kcbhuyan2002@yahoo.com

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Abstract

The aim of this paper was to observe the influencing socioeconomic variables in enhancing the obesity and heart disease simultaneously among Bangladeshi adults of 18 years and above. The adults were interviewed from different urban and semi-urban diagnostic clinics by some nurses with the help of medical assistants working in the clinics when the adults were visiting the clinics for suggested blood test. The number of investigated adults was 995, out of which 51.1% were males. The percentage of obese adults was 30.2 and heart problem was prevailed among 21.7% of them. These latter groups of adults were classified by levels of different socioeconomic variables to observe the association of the variables with the prevalence of obesity-heart disease. The risk ratio for this prevalence for a particular level of socioeconomic variable was calculated along with confidence interval of risk ratio. The influencing variable for the prevalence of obesity-heart problem was detected by logistic regression analysis. The responsible variables were residence, gender, age, family income, smoking habit, sedentary activities and blood pressure. However, non-involvement in physical labour, habit of taking process food and family expenditure were significantly associated with prevalence of obesity-heart disease. The higher risk of prevalence of obesity-heart disease was noted among urban residents, housewives, adults of ages 40-60 years, smokers, process food consumers and among hypertensive adults.

Keywords: Obesity, Heart disease, Responsible variable for obesity-heart problem, Risk ratio, Logistic regression.

Abbreviation: B.P. = Blood Pressure; BMI=Body Mass Index; C.I. = Confidence Interval; R.R. = Risk Ratio.

Introduction

Overweight and Obesity are the risk factors for many chronic non-communicable diseases, specially, diabetes, elevated blood pressure, high cholesterol, and many other poor health conditions [1-2]. The prevalence of overweight and obesity has increased rapidly over the last decades especially in developed countries [3-5]. Again, prevalence of obesity is the risk factor for cardiovascular diseases [heart attack, stroke, etc.]. Obesity related health-risk factors were studied in both home and abroad [6]. The prevalence of obesity was increasing in many countries due to upward social mobility and the problem was shifting towards lower socio economic group of people [7]. The problem of obesity was also in increasing trend in developed countries [8-9]. In 2016, WHO reported that the overweight adults were 1.9 billion and obese adults were 650 million throughout the world [10]. Simultaneous occurrence of obesity and hypertension in the same individual doubles the risk of cardiovascular deaths [11]. Obesity and its associated cardiovascular and renal disorders are major threat to global health [12-13]. The problem is nearly doubled since 1980 and tripled since 1975.

Thus, World Health Organization considers this health

hazard as an epidemic worldwide and it needs public health intervention to control those factors which are associated with obesity and hence with diabetes [14]. It had been observed in some studies, both in home and abroad, that socioeconomic characteristics, like financial solvency, change of food habit towards fast food and can food; physical inactivity, sedentary activity like excessive use of mobile phone and television, etc. were the responsible factors for obesity and diabetes [15-18]. Beside these, some other socioeconomic factors like illiteracy, gender variation, residential origin, occupation, marital status, were also associated with obesity and hence with obesity related diseases [19-22].

From the above discussion it is clear that the epidemic of obesity and obesity related non-communicable diseases are alarmingly increasing among different groups of people, specially, among adults. Thus, it was decided to identify some responsible variables for simultaneous prevalence of obesity heart disease among Bangladeshi adults.

Methodology

The adults were interviewed by quota sampling plan to cover males and females in the ratio 50.1: 49.9 as this ratio is prevailed in the national

level of population [23]. The data were collected during the academic session 2018-19 by some nurses with the help of medical assistants working in some diagnostic centres in some purposively selected urban and semi-urban areas of Bangladesh. The sample respondents were of ages 18 years and above and were the residents of both urban and rural localities. The data were recorded through a pre-designed and pre-tested questionnaire which contains different questions on demographic characteristics and life-style of the respondents. Data on family income and family expenditure were also recorded from each respondent. The total investigated adults were 995, out of which 508 were males and 487 were females.

Some of the variables were qualitative 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) [24-25]. They were also divided into 4 groups according to their blood pressure (B.P) level (mmHg). The 4 groups were identified as optimal (if BP < 120/80), normal (if BP < 130/85), high normal (if BP < 140/90) and hypertensive (if BP \geq 140/90) [26].

According to the objective of the study, the association of each

of socioeconomic variable with simultaneous prevalence of obesity heart disease was investigated, where significant association was decided if p-value of any Chi-square statistic was less than or equal to 0.05. Irrespective of significant or insignificant association, the risk ratio was calculated for adults for whom prevalence of obesity-heart problem was noted in higher rate for a particular level of a socioeconomic variable. Finally, logistic regression analysis was performed to identify the significant impact of a variable on prevalence of obesity-heart disease. All the calculations were done using SPSS Version 25.

Results

The number of investigated adults was 995, out of which 30.2% were obese, 12.7% were suffering from heart disease. Among obese adults 21.7 had heart problem. The percentage of adults of heart problem was increasing when the level of body mass index exceeded normal level. Health problem was significantly associated with level of obesity as was observed by Chi-square test [$\chi^2 = 275.875$, p -value = 0.000, Table 1]. It was seen that prevalence of obesity-heart problem was observed among 65 (6.5%) respondents and 930 were free of these health problems [Table 2]. According to objective of the study the impacts of different levels of socioeconomic characteristics of these 65 respondents were studied.

Table 1: Distribution of adults according to the level of obesity and prevalence of the health problem

Health problem	Level of obesity (%)								Total	
	Underweight		Normal		Overweight		Obesity		Number	(%)
	Number	%	Number	%	Number	%	Number	%		
None	33	86.8	181	77.7	324	76.4	68	22.7	606	60.9
Heart	3	7.9	16	6.9	42	9.9	65	21.7	126	12.7
Eye	1	2.6	22	9.4	25	5.9	75	25.0	123	12.4
Kidney	1	2.6	10	4.3	19	4.5	62	20.7	92	9.2
Others	0	0.0	4	1.7	14	3.3	30	10.0	48	4.8
Total	38	3.8	233	23.4	424	42.6	300	30.2	995	100.0

Among the respondents 46.6% were from urban areas and 7.5% of them were the patients of obesity- heart problem. This proportion was higher than the overall proportion of obese and heart patients in the sample. However, there was no significant difference in the proportions of obese-heart patients in rural and urban localities [$\chi^2 = 1.454$, p-value = 0.228]. But the chance to be affected by obesity-heart problem by urban residents was 1.34 times than it was among rural adults [R.R. = 1.34, C.I. {0.836, 2.149}]. The female respondents were 49.9% and 6.6% of them were suffering from obesity heart problem. But gender variation was not significantly associated with this health problem. But females had slightly more chance to be affected by this problem. [$\chi^2 = 0.019$, p -value = 0.891; R.R. = 1.03, C.I. {0.644, 1.649}]. The percentage of non-Muslim respondents was only 14.8, but higher proportion of them (7.5%) was affected by obesity-

heart problem. There was no significant difference between Muslim and non-Muslim obese-heart patients [$\chi^2 = 0.255$, p value = 0.613]. But non-Muslim adults had more chance to be affected by the disease [R.R. = 1.18, C.I. {0.631, 2.205}]. The percentage of married adults was 93.1 and 6.6% of them were suffering from obesity-heart disease. The chance of prevalence of obesity-heart problem was 1.14 times than it was among currently single adults [R.R. = 1.14, C.I. {0.427, 3.043}]. But prevalence of the problem was not significantly associated with marital status of the adults [$\chi^2 = 0.066$, p-value = 0.798].

The percentage of sample respondents of ages 25 to less than 40 years was 40.3 and they were the largest group of adults and 6.5% of them were the patients of obesity-heart disease. The next higher group (20.4%) of adults was in the age group 40 to less than 50 years

and 10.8% of them were affected by this health hazard. Biggest affected group (12.3%) of adults were of ages 50 to less than 60 years. It was seen that with the increase in ages there was an increasing trend of affected adults from the obesity heart problem except in case of adults of 60 years and above. Significant differences in the proportions of prevalence of obesity-heart problem were noted for adults of different ages [$\chi^2 = 11.593$, p -value= 0.021]. The chance of prevalence was 1.82 times among adults of ages 40 to less than 60 years compared to that of others [R.R. =1.82, C.I. {1.139, 2.907}]. Most of the adults (81.3%) were at least secondary level educated and 7.4% of them were the patients of obesity- heart problem and the chance of prevalence of this health hazard in them was 2.76 times as it was in others [R.R.= 2.76, C.I.{ 1.125, 6.773 }]. But the prevalence of obesity-heart problem was not significantly different for adults of different levels of education [$\chi^2 = 6.136$, p -value= 0.105]. Only secondary level educated respondents were 23.8% and the prevalence of this health hazard was noted among 8.4% of them. The chance of prevalence of obesity-heart problem among them was 1.42 times compared to the chance in others [R.R. =1.42, C.I. {0.856, 2.355}]. Majority of the respondents were service persons and skilled labours (30.7%) but lowest proportion (4.9%) of them was affected by this health hazard. Highest proportion of affected respondents (8.3%) was noted among housewives. They were 23.1% in the sample and 37% more exposed to this health problem compared to the affected persons of other professions [R.R. = 1.37, C.I. {0.821, 2.289}]. However, significant variation in the proportions of affected adults of different occupation was not observed [$\chi^2=3.168$,

p -value=0.530].

The sample respondents were classified into four groups according to their family income. In highest income (taka 150 thousand and above) group there were 12.6% respondents and 13.6% of them were the patients of obesity- heart. The chance of prevalence of obesity heart problem among them was 2.46 times as it was in other respondents [R.R. =2.46, C.I. {1.463, 4.152}]. The next highest affected group of respondents (11.5%) belonged to the families having income taka 100 thousand to taka less than 150 thousand. There was an increasing trend in the proportions of affected persons with the increase in family income. The prevalence of this health problem was significantly associated with family income [$\chi^2 =19.164$, p -value=0.000]. Similar increasing trend in proportions of affected persons was observed in respondents of families having increasing level of expenditure. Highest affected adults (11.2%) belonged to families spending taka 80 thousand and above. The respondents of this group of families were 13.5%. These group of respondents was 93% more exposed to this health problem compared to that of others [R.R. =1.93, C.I. {0.985, 4.438}]. The percentage of adults of families spending taka 60 thousand and above but less than taka 80 thousand was 14.4 and 10.5 % of them were the patients of obesity heart disease. The less affected adults (in percentage) were noted in families spending less than taka 60 thousand as family expenditure. Significant association between prevalence of obesity heart problem and family expenditure was observed [$\chi^2 =13.832$, p -value = 0.003].

Table 2: Distribution of adults according to socioeconomic characteristics and prevalence of obesity heart disease

Socioeconomic Characteristics	Prevalence of obesity heart disease				Total	
	Yes		No		Number	(%)
	Number	%	Number	%		
Residence						
Rural	30	5.6	501	94.4	531	53.4
Urban	35	7.5	429	92.5	464	46.6
Total	65	6.5	930	93.5	995	100.0
Gender						
Male	32	6.4	466	93.6	498	50.1
Female	33	6.6	464	93.4	497	49.9
Religion						
Muslim	54	6.4	794	93.6	848	85.2
Non-Muslim	11	6.6	136	93.4	147	14.8
Marital status						
Currently married	61	6.6	865	93.4	926	93.1
Currently single	4	5.8	65	94.2	69	6.9
Age (in years)						
< 25	5	2.6	191	97.4	196	19.7
25 - 40	26	6.5	375	93.5	401	40.3
40 - 50	22	10.8	181	89.2	203	20.4
50 - 60	8	12.3	107	87.7	115	11.6

60+	4	5.0	76	95.0	80	8.0
Education						
Illiterate	2	3.1	63	96.9	65	6.5
Primary	3	2.5	118	97.5	121	12.2
Secondary	20	8.4	217	91.6	237	23.8
Higher	40	7.0	532	93.0	572	57.5
Occupation						
Agriculture and unemployed	6	5.8	98	94.8	104	10.5
Business	18	7.7	139	86.3	234	23.5
Service and skilled labor	15	4.9	185	86.9	305	30.7
Housewives	19	8.3	284	85.8	230	23.1
Retire	7	5.7	115	94.3	122	12.3
Income (000 taka)						
< 50	13	3.3	376	96.7	389	39.1
50 - 100	28	6.7	392	93.3	420	42.2
100 - 150	7	11.5	54	88.5	61	6.1
150+	17	13.6	108	86.4	125	12.6
Family expenditure (in 000 taka)						
< 40	15	3.6	401	96.4	416	41.4
40 - 60	20	6.6	282	93.4	302	30.4
60 - 80	15	10.5	128	89.5	143	14.4
80+	15	11.2	119	88.5	134	13.5
Blood pressure (mmHg)	Number	%	Number	%	Number	%
Optimal	7	1.3	533	98.7	540	54.3
Normal	17	6.1	263	93.9	280	28.1
High normal	25	21.6	91	78.5	116	11.7
Hypertensive	16	27.1	43	72.9	59	5.9
Smoking habit						
Yes	53	16.1	276	83.9	329	33.1
No	12	1.8	654	98.2	666	66.9
Habit of taking process food						
Yes	32	8.8	331	91.2	363	36.5
No	33	5.2	599	94.8	632	63.5
Physical work						
Yes	19	4.0	462	96.0	481	48.3
No	46	8.9	468	91.1	514	51.7
Involved in sedentary activity						
Yes	52	11.8	390	88.2	442	44.4
No	13	2.4	540	97.6	553	55.6
Prevalence of diabetes						
Yes	50	7.5	617	92.5	667	67.0
No	15	4.6	313	95.4	328	33.0
Total	65	6.5	930	93.5	995	100.0

The percentage of adults habituated in taking process food was 36.5 and 8.8% of them were the patients of obesity heart problem. The chance for them to be affected by this health hazard was 1.85 times as it was in others [R.R. = 1.85, C.I. {1.158, 3.159}]. Significant association between prevalence of obesity heart problem and habit of taking process food was observed [$\chi^2 = 4.877$, p-value = 0.027]. Among the adults 33.1% were smokers and 16.1% of them were affected by obesity hypertension. The chance of prevalence of this health problem in them was 8.94 times as it was in non-smokers [R.R. =8.94, C.I. {4.841, 16.511}]. The smoking habit was significantly associated with prevalence of obesity heart disease [$\chi^2 = 73.830$, p-value=0.000]. The percentage of adults who did not do any physical work was 51.7 and 8.9% of them were the patients of obesity heart disease. These groups of respondents were at risk of 2.27 times compared to the risk of adults doing any type of physical work. Physical work and prevalence of this health hazard was significantly associated [$\chi^2 = 10.171$, p-value = 0.001; R.R. = 2.27, C.C. {1.350, 3.416}]. Among the respondents 44.4% were involved in sedentary activities and 11.8% of them were obese and heart patients simultaneously. The chance of prevalence of this health problem in them was 5.20 times as it was in others. This prevalence of health hazard was significantly associated with utilization of time by the respondents [$\chi^2 = 35.654$, p-value=0.000; R.R. =5.20, C.I. {2.871, 9.444}].

There were 54.3% adults of optimal blood pressure. Only 5.9% adults were hypertensive and 27.1% of them were the patients of obesity and heart disease. The chance of this health hazard for this group was 5.18 times as it was in others [R.R. =5.180, C.I. {3.142, 8.539}]. This health hazard was significantly increasing with the increase in level of blood pressure [$\chi^2 = 108.150$, p value=0.000]. The percentage of diabetic adults was 67.0 and 7.5% of them were suffering from obesity heart disease. This diabetic group was 54% more exposed to this health problem [R.R. =1.54, C.I. {0.891, 2.656}]. However, prevalence of diabetes and prevalence of obesity heart disease was not significantly associated [$\chi^2 = 3.077$, p-value = 0.079].

Logistic Regression

Binary logistic regression model was fitted to identify the influencing variables for the prevalence of obesity heart problem among adults. The dependent variable was prevalence of the problem [y=1 for prevalence and y=0 for non-prevalence] and explanatory variables were residence, religion, gender, marital status, education, occupation, family income, family expenditure, habit of taking process food, smoking habit, utilization of time, physical work, prevalence of diabetes, and blood pressure level. The results of the regression analysis were presented in Table 3.

Table 3: Results of Logistic regression

Variable	Regression coefficient, B	S.E	Wald Statistic	p-value	Exp(B)
Residence	0.725	0.360	4.065	0.044	2.064
Religion	0.339	0.452	0.561	0.454	1.403
Gender	1.378	0.482	8.195	0.004	3.969
Marital status	0.772	0.616	1.568	0.210	2.164
Age	-0.060	0.016	13.924	0.000	0.942
Education	0.026	0.225	0.013	0.910	1.026
Occupation	-0.175	0.172	1.032	0.310	0.840
Family income	0.000	0.000	5.064	0.024	1.000
Family expenditure	0.000	0.000	0.083	0.774	1.000
Smoking habit	-3.287	0.457	51.608	0.000	0.037
Utilization of time	1.842	0.407	20.525	0.000	6.312
Prevalence of diabetes	-0.479	0.418	1.316	0.251	0.619
Taking process food	-0.678	0.422	2.585	0.108	0.508
Physical labor	0.888	0.468	3.594	0.058	8.411
Blood pressure	0.238	0.037	40.772	0.000	1.269
Constant	-19.437	3.271	35.317	0.000	-

The results of Hosmer-Lemeshow test gave $\chi^2 = 17.810$ with p-value=0.023. The value of Nagelkerke $R^2 = 0.514$

From the p-value of Wald Statistic it was seen that the variables residence, gender, age, smoking habit, utilization of time, and blood pressure were the influencing factors for the prevalence of obesity simultaneously. The values of odds ratio [Exp(B)] indicated that urban

residents, females married persons, adults involved in sedentary activity and hypertensive adults were more exposed to this health hazard.

Discussion

Body mass index is significantly associated with diabetes among Bangladeshi adults and diabetes is the major health hazard among them [27]. Directly or indirectly obesity is the cause of heart disease

and many other non-communicable diseases including hypertension [28-30]. The risk of Cardiovascular Disease (CVD) increases among adults suffering from obesity hypertension simultaneously. There are many socioeconomic factors responsible for simultaneous prevalence of obesity hypertension and hence CVD. In this paper an attempt was made to identify those factors.

To fulfill the objective of the study 995 adults of ages 18 years and above were interviewed by some nurses with the help of some medical technologists of different diagnostic centers of urban and semi-urban areas to get information from both urban and rural people. The data were recorded from 51.1% males and 49.9% females. The sample contained 30.2% obese adults and 12.7% patients of heart disease. Among obese adults 21.7% were suffering from obesity and heart disease simultaneously. Percentage of heart disease patients were significantly increasing with the increase in level of body mass index. There were 46.6% urban adults and they were 34% more exposed to the problem of obesity heart disease compared to rural adults. The sample male and female respondents were almost same and there was no association between gender and prevalence of obesity heart problem. Non-Muslim adults were only 14.8%, but they had 1.18 times chance to be affected by this problem compared to Muslim adults. Most (93.1%) of the adults were currently married and they were more exposed to this health problem. The largest group of adults belonged to age group 25 to less than 40 years. The percentage of affected persons of this group was similar as it was in the sample. However, with the increase in ages there was a significant increase in the percentage of affected respondents and adults of ages 40 years to less than 60 years were more exposed to this health hazard. Similar findings were noted in both home and abroad [31-32]. The respondents having at least secondary level education were more exposed to obesity-heart problem. Usually, housewife does not involved in physical labour directly and they are more exposed to many non-communicable diseases [33]. In the sample 23.1% were housewives and they had 1.37 times chance to be affected by this health problem.

Some non-communicable diseases were termed as lifestyle health hazard [34]. Again lifestyle changes with the change in income and expenditure and these two variables enhance the change in food habit towards process food, can food and fatty and salty foods. Due to change in income and expenditure change in smoking habit and working habit was also noted in some studies [35-37]. The sample observations indicated that upward change in family income enhanced the rate of patients of obesity heart problem. The chance of facing this health problem by the adults belonging to families of highest income level was more compared to that of adults of lower income group of families. Similar was the case with adults belonged to families spending highest amount of money as family expenditure. The prevalence of obesity heart problem was significantly more among adults habituated in process food, and smoking. Also, prevalence was dominant among adults involved in sedentary activities.

Among obese persons diabetes and hypertension are dominant [38]. This study also indicated that prevalence of obesity

heart problem was significantly in increasing trend with the increase in blood pressure level. Hypertensive and diabetic adults were more exposed to this health hazard.

Conclusion

The objective of the present study was to identify some socioeconomic variables which enhance the obesity-heart problem simultaneously among Bangladeshi adults of 18 years and above residing in both urban and rural localities. Accordingly, 995 adults were investigated and data on different socioeconomic variables from the respondents were noted. The information presented in this paper was the analytical results of those collected data.

In the sample, number of urban and rural respondents was 464 and 531 respectively, and among them 49.9% were females. The males and females were almost similarly exposed to obesity and heart disease simultaneously. The percentage of adults having heart problem was 12.7 and that of obese adults was 30.2 in the sample. Again, 6.5% adults were suffering from both the diseases simultaneously. These groups of adults were classified by different levels of socioeconomic variables and association of prevalence of obesity heart problem with each socioeconomic variable was investigated. The particular level of a variable was identified as responsible for this health hazard if risk ratio for that level was more than one. Responsible variables were also identified by fitting binary logistic regression model.

In fitting the regression model it was noted that residence, gender variation, age, income, smoking habit, sedentary activity and blood pressure were the responsible variables for simultaneous prevalence of obesity heart problem. But from the studies of the association of variable and risk ratio, it was noted that urban adults, adults of ages 40 years and above but less years 60 years, respondents from families of highest income level, smokers, adults involved in sedentary activity and hypertensive respondents were more exposed to the prevalence of obesity heart problem. Beside these variables, housewives, adults of at least secondary level education, diabetic adults, adults habituated in taking process food and physical labour were at higher risk of facing the problem of this health hazard.

Due to upward trend in social mobility and economic activity obesity and health hazard cannot be avoided. But there should be some measures to reduce the intensity of this health problem. Government health service providers working in urban and rural areas, social workers, medical practitioners can do a lot to encourage the people so that they can be habituated in leading healthy lifestyle. For this they can be advised to follow the following:

- Do any sort of physical labour so that body weight can be controlled.
- Avoid restaurant food, process food and salty and fatty food.
- Take healthy and homemade food as per possibility.
- Join the blood screening program, whenever it is possible.

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