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Identification of Responsible Variables for Obesity Hypertension among Bangladeshi Adults

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Abstract

The results presented here were derived using the data collected from 960 adults of Bangladesh. These adults were of ages 18 years and above and they were the residents of both urban and rural localities. Out of 960 respondents, 86 were found obese and hypertensive. The objective of the study was to detect the influencing socioeconomic factors for obesity and hypertension and to identify the most responsible variable for this health hazard. It was evident that sex, occupation, sedentary activity and marital differential, were the significant social determinants for the prevalence of obesity and hypertension simultaneously. The problem of this health hazard was more likely to develop in subjects like non-Muslim, female, adult of ages 40 -50 years, illiterate , rich, higher expenditure group of families, and physically inactive compared to subjects with other levels of these socioeconomic variables. Factor analysis was done to identify the most responsible variables for the prevalence of obesity hypertension in adults. The analysis indicated that sedentary activity was the most responsible factor for this health problem followed by age, duration of disease, being married and physical inactivity.

Keywords : *Obesity, Hypertension, Association, Coefficient of association, Odds ratio (O.R.), Standard error of ln (O.R.), Factor analysis.*

Introduction

Obesity is one of the most risk factors for the development of hypertension and both these health hazard are recognized as public health challenges [1, 2]. This problem is in increasing trend worldwide. The number of adults with hypertension will be increasing by approximately 60% to a total of 1.56 billion in 2025 in comparison with 2000 [1]. Again, obesity is the risk factor not only for hypertension but also for diabetes [2]. Hypertension prevailed in around 30 % patients of type 1 diabetes and 50 – 60% patients of type 2 diabetes [3]. In separate studies, it was reported that diabetes had a role in the development of hypertension, specially type 2 diabetes around 2.5 times likely to develop in patients with hypertension compared to subjects having normal blood pressure [4,5].

Simultaneous occurrence of obesity and hypertension in the same individual doubles the risk of cardiovascular deaths [6]. Obesity and its associated cardiovascular and renal disorders are major threat to global health [7]. The problem is nearly doubled since 1980 and tripled since 1975 [8].

The prevalence of obesity was increasing in many countries, specially in developing countries due to socio-demographic upward mobility despite continuing nutritional deficiencies [7,8]. In developed countries the problem of obesity has been increasing rapidly [7–11]. In 2016, the reported overweight adults of age 18 years and above were 1.9 billon and obese adults were 650 million [12]. The burden of obesity was shifting towards lower socioeconomic group of people.

The above information indicates that the epidemic of obesity and obesity related hypertension is paralleled by an alarming increase in the incidence of cardiovascular disease, renal disease and kidney disease. Some socioeconomic variables were found associated with these diseases as was observed in both home and abroad [13 - 24]. Thus, it was decided to investigate the association of prevalence of obesity hypertension with different socioeconomic variables and to identify the more responsible variables for this health hazard.

Methodology

The sample adults were investigated by quota sampling plan to cover 70% diabetic patients

[13] so that sufficient number of obese and hypertensive adults would be included in the sample. During investigation data were recorded from 66.9% diabetic and 33.1% normal subjects to a total of 960 adults of ages 18 years and above. They were investigated by some doctors and nurses from and nearby their working places during the academic session 2017 – 18 by direct interview. Data were recorded from respondents through a pre-designed and pre-tested questionnaire. Maximum questions in the questionnaire were related to different socioeconomic variables of the respondents and of the families. Except two information, viz. monthly family income and monthly family expenditure, all other questions were related to different socioeconomic variables of the respondents and of their personal habit, viz. food habit, working habit, physical activity, utilization of time, etc. For diabetic patients there were questions related to duration of disease, disease related health hazard, i.e. eye problem, kidney problem, heart problem, blood pressure, blood sugar, treatment stage of disease, admission into hospital, etc. The value of each of the variable was noted in nominal scale. The data of weight

(in kg) divided by Height (in metre^2) was used to measure the value of body mass index (BMI) to identify obese adults(if BMI ≥ 30).

According to the objective of the study, association of any of the socioeconomic characteristics with prevalence of obesity hypertension was examined. The prevalence of obesity hypertension of any respondent was decided if diastolic blood pressure ≥ 85 mmHg and BMI ≥ 30 for him/her. Significant association was decided if probability of any Chi-square test statistic used for observing association ≤ 0.05. Irrespective of significant or insignificant association, the odds ratio [O.R] in favour of a higher group (in percentage) of obese and hypertensive adults along with standard error of ln(O.R) was calculated. Finally, factor analysis [25 - 27] was done to identify the most responsible variable for the prevalence of obesity hypertension among adults. The most responsible variable was detected according to the value of highest factor loading. All the statistical results were calculated using SPSS [Version 25].

Results

The prevalence of obesity hypertension was observed among 86(9%) adults out of 960 respondents. Total obese and hypertensive adults were 92 (9.6%) and 145 (15.1%), respectively in the sample. Among obese adults

Table 1. *Distribution of adults according to prevalence of obesity and hypertension.*

Prevalence of Obesity	Prevalence of hypertension		Total
	Yes	No	
Yes	86	6	92
No	59	809	868
Total	145	815	960

93.5% were hypertensive as against 6.8% non-obese hypertensive. This differentials in the distribution of adults of different categories were highly significant [χ^2=48.42, p-value=0.000].

Percentage of urban adults was 56.5 and 9.0% of them were obese and hypertensive at the same time against 8.9 % of the same group from rural area. This differential in percentages of obese hypertensive adults in urban and rural localities was not significant [χ^2=0.010, p-value=0.919]. Rural and urban adults were similarly exposed to this health hazard [O.R.=1.02; s.e(lnO.R.)= 0.23]. Obesity hypertension was 2.5 times [O.R.=2.5; s.e.(lnO.R.)=0.24] likely to develop in female (44.8%) subjects as in male subjects (55.2%). The problem prevailed among 13% female subjects as against 5.7% male subjects. The gender variation of obesity hypertension was significant [χ^2 =15.780,p-value = 0.000]. The coefficient of association between gender and prevalence of obesity hypertension was 0.127.There was no significant association between religion and prevalence of obesity hypertension

Table2. *Distribution of adults according to prevalence of obesity hypertension and socioeconomic variables*

Socioeconomic variables	Prevalence of obesity hypertension				Total	
	Yes		No			
	n	%	n	%	n	%
Residence						

Rural	37	8.9	381	91.1	418	43.5
Urban	49	9.0	493	91.0	542	56.5
Total	86	9.0	874	91.0	960	100.0
Gender						
Male	30	5.7	500	94.3	530	55.2
Female	56	13.0	374	87.0	430	44.8
Religion						
Muslim	68	8.6	725	91.4	793	82.6
Non-Muslim	18	10.8	149	89.2	167	17.4
Marital status						
Currently married	68	10.1	602	89.9	670	69.8
Currently single	18	6.2	272	93.8	290	30.2
Age (in years)						
< 20	3	10.7	25	89.3	28	2.9
20 – 30	10	6.2	152	93.8	162	16.9
30 – 40	16	6.4	234	93.6	250	26.0
40 – 50	34	12.9	230	87.1	264	27.5
50^{+}	23	9.0	223	91.0	256	26.7
Education						
Illiterate	7	13.0	47	87.0	54	5.6
Primary	6	5.2	109	94.8	115	12.0
Secondary	23	10.0	206	90.0	229	23.9
Higher	50	8.9	512	91.1	562	58.5
Occupation						
Agriculture and unskilled labor	16	6.3	239	93.7	255	26.6
Business and skilled labor	15	9.3	146	90.7	161	16.8
Service	14	6.6	199	93.4	213	22.2
Housewives,students and unemployed	41	12.4	290	87.6	331	34.5
Income (in 000 taka)						
< 40	27	8.7	284	91.3	311	32.4
40 – 60	12	6.3	177	93.7	189	19.7
60 – 80	16	8.5	172	91.5	188	19.6
80 – 100	14	8.8	146	91.2	160	16.7
100^{+}	17	15.2	95	84.8	112	11.7
Smoking habit						
Yes	25	6.7	348	93.3	373	38.9
No	61	10.4	526	89.6	587	61.1
Family expenditure (in 000 taka)						
< 30	11	9.5	105	90.5	116	12.1
30 – 50	22	7.5	273	92.5	295	30.7
50 – 70	18	8.7	190	91.3	208	21.7
70 – 90	17	9.6	160	90.4	177	18.4
90^{+}	18	11.0	146	89.0	164	17.1
Taking restaurant food						
Yes	52	10.5	441	89.5	493	51.4

No	34	7.3	433	92.7	467	48.6
Use of can food						
Yes	48	8.2	536	91.8	584	60.8
No	38	10.1	338	89.9	376	39.2
Physical work						
Yes	26	7.4	325	92.6	351	36.6
No	60	9.9	549	90.1	609	63.4
Utilization of time						
Read and use mobile phone	14	10.1	125	89.9	139	14.5
Play and use mobile phone	7	2.9	234	97.1	241	25.1
Do household work and watch T.V.	28	11.3	219	88.7	247	25.7
Read paper and use mobile phone after office work	15	6.0	234	94.0	249	25.9
Watch T.V. and use mobile phone after office work	22	26.2	62	3.8	84	8.8
Prevalence of diabetes						
Yes	40	6.2	602	93.8	642	66.8
No	46	14.5	272	85.5	318	33.2
Total	86	9.0	874	91.0	960	100.0

[χ^2=0.821 p-value= 0.365]. still, non-Muslim adults were 29% more exposed to this health hazard [O.R.=1.29, s.e.(lnO.R.)=0.28]. The coefficient of association between religion and prevalence of obesity hypertension was 0.029. Out of 69.8% married adults 10.1 % had the experience of obesity hypertension and this health hazard was 1.71 times likely to develop to married subjects as in unmarried subjects [O.R.= 1.71, s.e.(lnO.R.)=0.27]. There was significant association between marital status and prevalence of this health hazard [χ^2=3.857, p-value =0.050; coefficient of association = 0.063]. Obesity and hypertension was almost 1.83 times likely to develop in adults of ages 40 – 50 years as in adults of other ages [O.R.=1.87, s.e.(lnO.R.)=0.023]. Percentage of affected adults of this group was 12.9. The corresponding percentage was 10.7 among adults of ages less than 20 years. Though there was no significant association between age and this health hazard [χ^2=8.629, p-value=0.071; coefficient of association = 0.127].

Level of education and prevalence of obesity hypertension was not significantly associated [χ^2=3.368,p-value=0.338; coefficient of association = 0.059]. But illiterate adults were 56 % more exposed to this health problem compared to adults of other level of education [O.R.=1.56, s.e.(lnO.R.)=0.42]. Percentage of illiterate adults facing this problem was 13.0 followed by secondary level educated persons (10.0%).

Most of the adults (63.4%) were not doing any physical work and they were 37% more exposed to this health problem compared to their counterpart [O.R. = 1.37, s.e(lnO.R.)=0.28]. However, there was no significant association between prevalence of obesity hypertension and physical work [χ^2 =1.632, p-value=0.201; coefficient of association = 0.041]. Housewives, students and unemployed adults were not rendering physical labour directly [28] and they were expectedly 83% more exposed to this health hazard [O.R.=1.83, s.e(lnO.R)=0.23]. In the sample they were 34.5% and prevalence of the problem was noted among 12.4% of them. Level of occupation was significantly associated with prevalence of obesity hypertension [χ^2 =8.534, p-value = 0.036; coefficient of association = 0.094].

Percentage of adults from highest income group of families was 11.7 and 15.2% of them were facing this health problem. This group of respondents was almost two times exposed to this problem compared to that of other adults [O.R.=2.02, s.e (lnO.R)=0.29]. But family income was not significantly associated with prevalence of obesity hypertension[χ^2 =6.975, p-value=0.137]. Similar was the case with family

expenditure [χ^2 =1.786, p –value = 0.775; coefficient of association = 0.043].But adults (17.1%) of highest expenditure group of families was 32% more exposed to this health hazard in comparison with that of adults of other families [O.R.=1.32, s.e (lnO.R.)= 0.28].

Percentage of adults accustomed with restaurant food was 51.4 and prevalence of obesity hypertension was 1.5 times likely in them as it was in adults not taking restaurant food [O.R.= 1.50, s.e.(ln O.R.)= 0.23]. However, insignificant association between habit of taking restaurant food and prevalence of obesity hypertension was noted [χ^2 =3.139,p-value= 0.076; coefficient of association = 0.057]. A big group of adults (60.8%) were habituated in using can food , but 8.2% of them were experienced of obesity hypertension. Use of can food was not influencing factor in enhancing the rate of obesity and hypertension simultaneously in adults [χ^2 =0.999, p-value = 0.318; coefficient of association = 0.032]. Similar was the case with smoker and non-smoker respondents [χ^2 =3.653, p –value=0.056; coefficient of association = 0.062].But non-smokers were 60% more exposed to the problem [O.R. = 1.60, s.e (lnO.R)=0.25].

In the sample 34.7% adults were involved in sedentary activities, like passing their time by reading paper, watching T.V. and gossiping with friends through mobile phone after their normal duties and 11.4% of them were experienced of obesity hypertension as against 9.0% adults of this category in the sample. This health hazard was almost 4.5 times likely to develop in these adults as in adults with normal activities [O.R. = 4.56, s.e (ln O.R.) = 0.28]. Significant association between utilization of time and obesity hypertension was noted [χ^2 = 45.965, p- value = 0.000; coefficient of association = 0.057].

Factor Analysis

In investigating the association between prevalence of obesity hypertension and each of socioeconomic variables , it was observed that prevalence of obesity hypertension was dependent on each of gender variation, marital status, occupation, and utilization of time. But the study of association did not identify the most responsible variable for the prevalence. To identify one or more responsible variable(s) factor analysis [25 – 27] can be done where highest factor loading of a variable indicates the most responsible variable for the variation in the data set.

To perform the factor analysis the variables included were residence, religion, gender, marital status, age, education, occupation, family income , family expenditure, physical work, utilization of time, habit of taking restaurant and can food, duration of the disease, etc. The inclusion of these variables was satisfactory as KMO= 0.640 resulting χ^2=695.609 with p-value =0.000. During analysis some of the variables were dropped as their communalities were less than 0.40 [25 - 27] . For final analysis the included variables were all except religion, residence, education and habit of taking restaurant food. During fresh analysis the value of KMO was found 0.642 resulting χ^2 =543.775 with p –value=0.000. The analytical results were shown in Table 3.

Table 3. *Results related to factor analysis*

Variable	Communality	Coefficient of factor -1	Coefficient of factor -2
Gender	0.694	-0.130	0.823
Marital status	0.561	0.794	-0.013
Age	0.601	-0.761	-0.146
Occupation	0.793	-0.172	0.873
Income	0.500	0.507	0.494
Expenditure	0.438	0.490	0.445
Utilization of time	0.714	-0.845	-0.016
Accustomed with can food	0.248	-0.003	0.498
Physical work	0.657	0.618	-0.526

The results indicated that utilization of time was the most responsible variable for the prevalence of obesity hypertension in adult followed by marital status, age and physical work.

Discussion

Obesity is associated with hypertension, diabetes and cardiovascular diseases and it is the important risk factor for hypertension. This was observed in different studies in both home and abroad [1 – 3, 29 – 33]. The identified social determinants of hypertension were elderly male ; married, diabetic, and unemployed person; and member of lower income family [34].

Almost similar results were evident from the present analysis. Prevalence of obesity hypertension was more likely to develop in non-Muslims, females, illiterate persons, married persons, persons of ages 40 – 50 years, housewives, students and others, adults of highest income and expenditure group of families, physically inactive, adults involved in sedentary activities, and persons accustomed with restaurant food . This was observed from the results of odds ratio. But the study did not identify the more responsible determinants for prevalence of obesity hypertension. The important variables for this health hazard were detected by factor analysis. Sedentary activity like paper reading, viewing television and gossiping with friends and relatives over phone outside the normal duty was the most responsible factor for obesity hypertension followed by marital status, age, and physical inactivity.

Conclusion

The results presented in this paper were observed in analysing data recorded from 960 adults of ages 18 years and above. These adults were interviewed by some doctors and nurses from and nearby their working places in both urban and rural areas.

Percentages of rural and urban adults were 43.5 and 56.5, respectively and both the groups were similarly exposed to obesity hypertension. Females were 44.8% and they were 29% more exposed to this health problem. There were 27.5% adults of ages 40 – 50 years and obesity hypertension was 1.83 times likely to prevail in them. Marital status and obesity hypertension was significantly associated and married adults (69.8%) were 71% more exposed to this health hazard. Though literacy was not significantly associated with this health problem, still illiterate adults (5.6%) were 56% more exposed to this problem. Occupation and obesity hypertension were significantly associated and adults not directly involved in physical labour

(34.5% ; housewives, students and unemployed) were 83% more exposed to this problem. Obesity hypertension was 1.37 times likely to develop in physically inactive adults compared to their counterpart. Family income and family expenditure were independent of this health hazard, but adults belonged to highest income and highest expenditure group of families had more chance to be affected by this problem.

Viewing television, reading paper and gossiping over phone outside normal working hours are sedentary activities and these activities were associated with obesity [35]. There were 34.7% adults who were involved in sedentary activities. Obesity hypertension was 4.56 times likely to develop among these group of adults as in adults of normal activities. Again, accustomed with restaurant food, junk food and smoking habit are components of unhealthy lifestyle. But, the present data did not signify any association between unhealthy lifestyle and prevalence of obesity hypertension. The chance of prevailing this health problem in adults accustomed with restaurant food was 50% more compared to that of other adults. Finally, factor analysis indicated that obesity hypertension was more prevalent among adults involved in sedentary activities, married persons and persons of ages 40 -50 years and physically inactive labours.

Due to upward social mobility in respect of literacy, economic activities and increased mechanical movement,obesity and its related health hazard cannot be avoided[36]. But, there should be attempts to reduce the prevalence rate of the diseases related to obesity and hypertension . Success of the attempts depends on implementation of appropriate health plan by the Government. For this, people can be alerted against the health hazard prevails in the society due to non-communicable diseases and they can be motivated against this health problem. People can be encouragedto take active part in implementing the Government health program. Active participation by the people should be in the following aspects:

(i) To encourage others in the society for taking healthy and homemade food,

(ii) To discourage others not to take junk food, more sugar-based food, salty and fatty food,

(iii) Everybody should be encouraged to avoid drugs , drinks an smoking,

(iv) Everybody should be encouraged to do some physical labour , physical exercise or at least try to walk whenever it is possible,

(v) Everybody should try to control the increase in body weight,

(vi) Whenever any health problem is felt, try to join the blood screening programme,

(vii) Patients of non-communicable diseases should consult the medical practitioner as a routine work.

Rural and urban health workers, social workers, and government health service providers can do a lot to encourage the people to follow the above steps. They can also provide free health service to general people to check at least blood pressure and blood sugar in a quarterly basis.

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