IDENTIFICATION OF SOCIOECONOMIC VARIABLES RESPONSIBLE FOR HYPERTENSIVE KIDNEY DISEASE AMONG BANGLADESHI ADULTS

K.C.Bhuyan

Professor (Retired) of Statistics, Jahangirnagar University, Bangladesh

ABSTRACT

The study was conducted to identify some socioeconomic variables responsible for the prevalence of hypertensive kidney disease among Bangladeshi adults of 18 years and above. For this, 498 males and 497 females, totalling 995 adults of both urban and rural localities were investigated. In the sample there were 17.6% hypertensive adults and 18.9% of them were suffering from hypertension and kidney disease simultaneously. Beside other percentages of respondents, there were 19.6% elderly people of ages 50 years and above, 30.2% obese adults, 67.0% diabetic patients, 44.4% involved in sedentary activity and 33.1% smokers. The overall percentage of hypertensive kidney patients was 3.3. These group of patients were discriminated from the remaining 96.7% adults. During discrimination duration of diabetes was identified as most responsible variable followed by age, body mass index, sedentary activity, smoking habit, etc. The risk of prevalence of hypertensive kidney disease was 12.25 times in diabetic patients suffering for 15 years and above compared to the risk of prevalence in other adults. The risk was 8.43 times in elderly people, 16.80 times in obese adults, 2.50 times in adults involved in sedentary activity, and 1.91 times in smoker adults. Higher risk rate was also observed in adults of lower economic group of families.

KEYWORDS

Hypertension, kidney disease, Obesity, Diabetes, Discriminant analysis, Risk ratio.

1. INTRODUCTION

Obesity, diabetes and hypertension are three inter related health problems and are the risk factors of many non-communicable diseases including kidney diseases [1 – 12]. Kidney failure and chronic kidney disease are associated with obesity, pre-diabetes, diabetes and hypertension [13 – 18]. Hypertensive kidney disease is a medical condition referring to damage of kidney due to chronic high blood pressure [19]. Hypertension creates severe health complications worldwide [20, 21]. It increases the risk of heart disease, stroke, and sometimes the risk of death [22 - 27]. The problem is recognized as modifiable risk factor for cardiovascular disease and at an end stage renal disease [23]. But, it is the major cause of premature death worldwide [24]. Number of adults with hypertension increased from 594 million in 1975 to 1.13 billion in 2015. The increase was noted largely in low-and middle-income countries. Around 7.5 million deaths or 12.8% of the total of all deaths worldwide occur due to high blood pressure [28]. It is predicted to be increased to 1.56 billion adults with hypertension in 2025[29]. The risk factor of hypertension is cardiovascular and its related diseases. Again, heart failure is highly prevalent in patients of chronic kidney disease and end stage renal disease and this problem leads to mortality [30 – 32].

The risk factors for hypertensive kidney disease is poor health management including lower control of high blood pressure and other kidney disorders [19]. The problem is also associated

with some socioeconomic characteristics including older age, gender variation [33]. In this paper, an attempt was made to identify some socioeconomic variables responsible for the prevalence of hypertensive kidney disease among Bangladeshi adults.

2. METHODOLOGY

The present analysis was done using the data collected from 995 urban and rural adults of 18 years and above. The data were recorded on investigation during the session 2018 – 19 by some nurses and medical assistants working in some objectively selected diagnostic centres located in both urban and semi-urban areas of Bangladesh. Some of the respondents were male and some were females; the number males and females were 498 and 497, respectively. The ratio of males and females were50.1:49.9 which is the national sex ratio of Bangladesh [34]. The investigate adults were from both urban and rural areas and among them 67% were suffering from diabetes.

The data on different socioeconomic variables were recorded from each investigated adult through a pre-designed and pre-tested questionnaire containing different questions related to residence, religion, gender, marital status, age, education, occupation, family income, family expenditure. Beside these demographic data, the information on life-style, viz. involvement in physical work, smoking habit, consumption of restaurant food, and utilization of time by the respondents were recorded. The information of prevalence of any of the non-communicable diseases, duration of diabetes, and the stages of treatment of the disease and the cost of treatment of the disease were also recorded. The collected data were recorded in both interval and nominal scales, but for ease of analysis all data were expressed 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 $\geq$ 27.5; underweight ,if BMI< 18.5; normal, if 18.5 $\leq$BMI< 23.0; overweight, if 23.0 $\leq$ BMI< 27.5) [35,36]. The hypertensive adult was identified if blood pressure(B.P) level (mmHg) of any one was $\geq$ 140/90 [37, 38].

According to the objective of the study, the association of each of the socioeconomic variable with the prevalence of hypertensive kidney disease was investigated, where significant association was decided if p-value of any Chi-square statistic $\leq$ 0.05 [P(χ^2) $\leq$0.05]. Irrespective of significant or insignificant association, the risk ratio and its confidence interval was calculated for adults for whom prevalence of hypertensive kidney disease was noted in higher rate for a particular level of a socioeconomic variable. Finally, discriminant analysis was done to select the most responsible variable for the simultaneous prevalence of hypertensive-kidney disease. The most responsible variable was identified depending on the highest absolute value of correlation coefficient of socioeconomic variable with discriminant function score [39, 40, 41]. As a mode of statistical analysis SPSS Version 25 was used. .

3. RESULTS

The percentage of hypertensive adults in the sample was 17.6 and that of kidney patients was 9.2. Among the hypertensive adults 18.9% were kidney patients also [Table 1]. The different health problem was significantly associated with prevalence of hypertension [χ^2 = 105.383, p – value=0.000]. The sample hypertensive kidney patients were 3.3%. They were classified into different classes according to different levels of socioeconomic variables. The classified results were presented in Table 2.

Table 1: Distribution of adults according to prevalence of hypertension and health other health hazard

Prevalence of health other health hazard	Prevalence of hypertension				Total	
	Yes		No			
	Number	%	Number	%	Number	%
None	60	34.3	546	66.6	606	60.9
Heart	55	31.4	71	8.7	126	12.7
Eye	19	10.9	104	12.7	123	12.4
Kidney	33	18.9	59	7.2	92	9.2
Disability	8	4.6	40	4.9	48	4.8
Total	175	17.6	820	82.4	995	100.0

Table 2: Distribution of adults according to prevalence of hypertensive kidney disease and socioeconomic variables

Socioeconomic variables	Prevalence of hypertensive kidney disease				Total	
	Yes		No			
	Number	%	Number	%	Number	%
Residence						
Rural	18	3.4	513	96.6	531	53.4
Urban	15	3.2	449	96.8	464	46.6
Total	33	3.3	962	96.7	995	100.0
Gender						
Male	19	3.8	479	96.2	498	50.1
Female	14	2.8	483	97.2	497	49.9
Religion						
Muslim	27	3.2	821	96.8	848	85.2
Non-Muslim	6	4.1	141	95.9	147	14.8
Marital status						
Currently married	30	3.2	896	96.8	926	93.1
Currently single	3	4.3	66	95.7	69	6.9
Age (in years)						
< 25	1	0.5	195	99.5	196	19.7
25 – 40	2	0.5	399	99.5	401	40.3
40 – 50	3	1.5	200	98.5	203	20.4
50 – 60	13	11.3	102	88.7	115	11.6
60^{+}	14	17.5	66	82.5	80	8.0
Education						
Illiterate	2	3.1	63	96.9	65	6.5
Primary	9	7.4	112	92.6	121	12.2
Secondary	5	2.1	232	97.9	237	23.8
Higher	17	3.0	555	97.0	572	57.5
Occupation						
Agriculture and unskilled labor	5	4.8	99	95.2	104	10.5
Business	10	4.3	224	95.7	234	23.5
Service and skilled labor	6	2.0	299	98.0	305	30.7
Retire	5	4.1	117	95.9	122	12.3
Housewife	7	3.0	223	97.0	230	23.1
Income (000 taka)						
< 50	18	4.8	371	95.2	389	39.1
50 – 100	12	2.9	408	97.1	420	42.2

100 – 150	1	1.6	60	98.4	61	6.1
150^{+}	2	1.6	123	98.4	125	12.6
Family expenditure (in 000 taka)						
< 40	17	4.1	399	95.9	416	41.4
40 – 60	9	3.0	293	97.0	302	30.4
60 – 80	5	3.5	138	96.5	143	14.4
80^{+}	2	1.5	132	98.5	134	13.5
Smoking habit						
Yes	16	4.9	313	95.1	329	33.1
No	17	2.6	649	97.4	666	66.9
Habit of taking process food						
Yes	13	3.6	350	96.4	363	36.5
No	20	3.2	612	96.8	632	63.5
Physical work						
Yes	19	4.0	462	96.0	481	48.3
No	14	2.7	500	97.3	514	51.7
Utilization of time						
Sedentary activity	22	5.0	420	95.0	442	44.4
No	11	2.0	542	98.0	553	55.6
Obesity						
Underweight	0	0.0	38	100.0	38	3.8
Normal	2	0.9	231	99.1	233	23.4
Overweight	2	0.5	422	99.5	424	42.6
Hypertensive	29	9.7	271	90.3	300	30.2
Prevalence of diabetes						
Yes	28	4.2	639	95.8	667	67.0
No	5	1.5	323	98.5	328	33.0
Duration of diabetes (in years)						
Does not arise	5	1.5	323	98.5	328	33.0
< 5	2	0.7	289	99.3	291	29.2
5 – 10	4	1.9	202	98.1	206	20.7
10 – 15	6	6.1	93	93.9	99	9.9
15^{+}	16	22.5	45	77.5	71	7.1
Total	33	3.3	962	96.7	995	100.0

The rural adults were 53.4% in the sample and 3.4% of them were patients of hypertensive kidney disease as against the overall 3.3% patients of these diseases. Rural and urban people were suffering in similar rates from these to health problems [χ^2 =0.019, p –value=0.890 ; R.R.= 1.05, C.I.(0.40, 2.78)]. The investigated male adults were 50.1% and 3.8% of them were affected by this health problem. There was insignificant association between gender variation and prevalence of hypertensive kidney disease but male adults were at more risk by 35% [χ^2 = 0.773, p –value=0.379 ; R.R.=1.35, C.I.(0.69,2.66)]. The percentage of non-Muslim respondents was 14.8, but higher proportion (0.041) of them , though not significantly different from the corresponding proportion (0.032) of Muslim adults, were suffering from hypertensive kidney disease [χ^2 = 0.315, p –value=0.575]. But non-Muslim adults had higher risk of facing this problem by 28% more [R.R.=1.28, C.I.(0.54, 3.04)]. Single adults were only 6.9% in the sample, but 4.1% of them were patients of hypertensive kidney disease. For them the chance of facing this health problem was 34% more as it was for married adults [R.R.=1.34, C.I.(0.42, 3.88)]. However, prevalence of hypertensive kidney disease was independent of marital status [

χ^2=0.246, p –value=0.620]. The sample elderly people of ages 60 years and above were 8.0% and of ages 50 years and above were 19,6%. The prevalence rate among the above mentioned first group of adults was 17.5% and among the second group it was 13.8%. There was significant increasing trend of prevalence rate with the increase in ages [χ^2 = 89.956, p –value=0.000]. The eldest group of adults had risk of 8.43 times as it was for others and the risk of elderly group of adults was 18.46 times compared to others [R.R.=8.43, C.I.(4.40, 16.16); R.R.= 18.46, C.I.(7.73,44.07)}. The primary educated adults in the sample were 12.2% and 7.4% of them were patients of this health hazard as against the overall percentage 3.3 of affected adults under study. For these adults the risk of prevalence of the problem was 94% more compared to the risk of others [R.R.=1.94,C.I.(0.86, 4.38)]. The prevalence rate (3.0%) was lower among higher educated persons(57.5%). But there was no significant increasing or decreasing trend in the prevalence rate with the increase in level of education [χ^2 =7.710, p –value=0.052]. Similar insignificant rates of prevalence was noted for people of different levels of occupation [χ^2 = 3.407, p-value=0.492]. But highest rate (4.8%) was observed among agriculturists and unskilled labours (10.5%). This group was 93% more exposed to this health hazard [R.R.=1.93, C.I.(0.76, 4.89)]. Physically active persons were 48.3% ,but higher proportion (4.0%) of them were affected by this health hazard. For them the risk of the disease was 45% more as it was in others [R.R.=1.45, C.I.(0.74, 2.86)], though the prevalence was independent of physical activity [χ^2 = 1.165, p –value=0.280]. The percentage of respondents involved in sedentary activity was 44.4 and 5.0% of them were facing the problem of hypertensive kidney disease. They were at higher risk of this health hazard by 2.50 times compared to the risk of others [R.R.=2.50,C.I.(1.22, 5.10)]. The prevalence was significantly associated with utilization of time [χ^2 = 6.841, p –value=0.009].

The respondents from lowest income group of families was 39.1% and 4.8% of them were suffering from hypertension and kidney disease simultaneously. Their chance of facing the problem was 87% more as it was for others [R.R.=1.87, C.I.(0.96, 3.71)]. However, the prevalence rates in adults belonged to families of different levels of income were in declining trend with the increase in level of family income [χ^2 = 4.044, p –value=0.257]. Almost similar was the case in respect of family expenditure [χ^2 = 2.281, p –value= 0.516]. The adults from families spending lowest amount of money as family expenditure was 41.4% and prevalence rate among them was 4.1%. For them the chance of prevalence was 48% more as it was for others [R.R.=1.48,C.I.(0.76, 2.89)]. The sample process food consumers was 36.5% and prevalence rate of hypertensive kidney disease was noted among 3.6% of them. They were almost similarly exposed to this health problem compared to the same problem of non-consumers[R.R.=1.13, C.I.(0.57, 2.24)]. It indicated that prevalence was independent of consumption of process food [χ^2 =1.25, p –value= 0.724]. The smoker adults were 33.1% and 4.9% of them were suffering from both hypertension and kidney problem simultaneously. For them the risk of prevalence was 91% more as it was for non-smokers [R.R.=1.91, C.I.(0.98, 3.73)]. However , smoking habit was not significantly associated with the prevalence of hypertensive kidney disease [χ^2 = 3.667, p –value=0.056].

The percentage of obese adults was 30.2 and 9.7% of them were patients of hypertensive kidney disease. Their chance to be affected by this health problem was 16.80 times as it was for non-obese adults [R.R.=16.80, C.I.(3.88, 72.78)]. Level of obesity was significantly associated with prevalence of hypertensive kidney disease [χ^2 = 54.122, p –value=0.000]. Prevalence of diabetes was also significantly associated with prevalence of hypertensive kidney disease [χ^2 =

4.901, p –value= 0.027]. In the sample there were 67.0% diabetic patients and 4.2% of them were facing this health problem. For them the chance of prevalence was 2.75 times as it was for non-diabetic adults [R.R.=2.75,C.I.(1.07, 7.06)]. Prevalence of hypertensive kidney was significantly associated with duration of diabetes and prevalence rate was in increasing trend with the increase in duration [χ^2 =94.881, p –value=0.000]. The percentage of diabetic patients suffering for 15 years and above was 7.1. Among this group the prevalence rate was observed 22.5% . For them the chance of prevalence was 12.25 times compared to the chance of others [R.R.= 12.25, C.I.(6.47, 23.21)].

4. RESULTS OF DISCRIMINANT ANALYSIS

The sample adults were classified into two groups. In one group there were 3.3% hypertensive kidney patients. This group was significantly different from the remaining 96.7% adults of other group in respect of some socioeconomic characters. But all socioeconomic characters were not similarly responsible in discriminating two groups. The most responsible variable was identified by performing discriminant analysis. For the analysis the variables included were residence religion, gender, marital status, age, education, occupation, family income, family expenditure, utilization of time, physical work. Habit of taking process food, smoking habit, body mass index , prevalence of diabetes and duration of diabetes. Out of these variables, the impacts of age, utilization of time, body mass index, prevalence of diabetes and duration of diabetes were significantly different for two group of adults. It was observed by F-test. The results of the tests and of discriminant analysis were presented in Table 3. The discriminant analysis was satisfactory as was observed by Chi-square test, where χ^2 =117.114,p –value=0.000 [Λ = 0.888].

The analysis showed that the most responsible variable for discrimination of two groups of adults was duration of diabetes followed by age, body mass index, utilization of time, prevalence of diabetes, smoking habit, family expenditure, education, family income, etc.

Table 3 : Results related to discriminant analysis

Socioeconomic variable	Wilk's Λ	F - value	P - value	Discriminant function coefficient	Correlation coefficient of socioeconomic variable and discriminant function score
Residence	0.999	0.879	0.349	0.063	0.058
Religion	0.994	5.670	0.017	0.172	0.148
Gender	1.000	0.439	0.508	0.145	-0.041
Marital status	0.999	1.016	0.314	-0.013	0.063
Age	0.840	188.795	0.000	0.708	0.852
Education	0.998	2.125	0.145	-0.115	-0.090
Occupation	1.000	0.348	0.556	-0.035	0.037
Family Income	0.999	0.573	0.449	0.289	0.047
Family expenditure	1.000	0.209	0.648	-0.348	-0.028
Body mass index	0.991	9.290	0.002	0.059	0.189
Smoking habit	0.993	7.374	0.007	-0.121	-0.168
Utilization of time	0.982	18.449	0.000	0.168	0.267
Habit of taking process food	0.981	18.938	0.000	0.278	0.270
Physical labor	1.000	0.442	0.506	0.007	0.041
Prevalence of diabetes	0.993	7.319	0.007	0.312	-0.168
Duration of diabetes	0.915	91.861	0.000	0.409	0.594

5. DISCUSSION

The damage of kidney due to chronic elevated blood pressure is termed as hypertensive kidney disease. The relationship between blood pressure and incident of kidney problem is evident in different studies in both home and abroad [17 - 19, 42 – 46]. The risk factors for this health problem are old age, obesity, prevalence of diabetes, physical inactivity, intake of fatty and high salted food, poorly controlled medium and high blood pressure and poor health management [18- 19, 31, 45 - 47]. Beside these variables, there may be some other factors enhancing the prevalence rate of hypertensive kidney disease. The present paper was an attempt to identify some socioeconomic variables responsible for the simultaneous prevalence of hypertension and kidney disease in adults of Bangladesh. For this, 995 urban and rural adults of 18 years and above were investigated and related data were collected and analysed.

The study of association between prevalence of hypertensive-kidney disease with any one of the socioeconomic variables indicated that the prevalence of the diseases was independent of residence, religion, gender, marital status, education, occupation, family income, and family expenditure. But the value of calculated risk ratio provided the information that non-Muslims, males, single adults, primary educated adults, agriculturists, and adults belonged to lowest economic condition had higher risk of prevalence. An inverse insignificant association between physical labour and prevalence was noted. Adults habituated in physical work had 45% more chance of prevalence of this health hazard. Age, utilization of time, obesity, prevalence of diabetes and duration of diabetes were significantly associated with prevalence of hypertensive kidney disease. Discriminant analysis identified duration of diabetes as the most responsible variable for the prevalence. In order of weight of responsibility the other variables were age, body mass index, utilization of time, prevalence of diabetes, smoking habit, etc. Elderly people of ages 50 years and above, persons involved in sedentary activity, obese adults, diabetic adults, adults

suffering from diabetes for 15 years and above had 18.46 times, 2.50 times, 16.80 times, 2.75 times, and 12.25 times, respectively risks of prevalence of the problem .

6. CONCLUSION

The present paper provided analytical results to identify some socioeconomic variables responsible for prevalence of hypertensive kidney disease in Bangladeshi adults. For the analysis, data were collected from 995 adults of 18 years and above residing in both urban and rural areas. Out of 995 adults 3.3% were hypertensive kidney patients. Higher prevalence rate, significant or insignificant, corresponding to this rate was observed in rural people (3.4), males (3.8%), non-Muslims (4.1), single persons (4.3%), elderly people(13.8%), primary educated adults (7.4%), farmers (4.8%), poorest people(4.8%), smokers (4.9%), process food consumers (3.6%), physically active adults (4.0%), adults involved in sedentary activity (5.0%), obese people (9.7%), diabetic patients suffering for 15 years and above(22.5%). However, except rural people and process food consumers, all other adults suffering from the disease in higher rate were more exposed to this health hazard. The chance of prevalence of the disease was at least 50% more among elderly people, primary educated people, farmers, adults of lower economic conditions, smokers, adults involved in sedentary activity, obese adults ,and diabetic patients suffering for longer duration. The prevalence rate was in significantly increasing trend with the increase in both age and duration of diabetes. Finally, the hypertensive kidney patients was significantly discriminated from the remaining adults . The most responsible variable for the discrimination was duration of diabetes followed by age, body mass index, utilization of time, prevalence of diabetes, smoking habit, etc.

All the responsible variables except age were lifestyle factors. Some of these cannot be avoided due to socioeconomic upward mobility in the country. But the extent of risk of prevalence due to these variables can be reduced if people can regulate their lifestyle towards healthy life. For this, they should be careful in

(i) taking process and can food instead of home made healthy food,
(ii) taking drinks and drugs,
(iii) utilizing time towards health life outside the office hours/ normal working hours,
(iv) adhering medical check up and treatment after consulting a medical practitioner,
(v) maintaining blood sugar level and blood pressure level.

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