



Mini Review

Copyright© Atika Farzana Urmi

Risk Factors for Prevalence of Hypertension in Diabetic- Disabled Adults in Bangladesh

Mohammad Asifur Rahman¹, Atika Farzana Urmi^{2*} and K C Bhuiyan³

¹Department of Information Technology, University of Cumberlands, USA

²Department of Biostatistics, Virginia Commonwealth University, USA

³Professor of Statistics [Retired], Jahangirnagar University, Dhaka

*Corresponding author: Atika Farzana Urmi, Department of Biostatistics, Virginia Commonwealth University, USA.

To Cite This Article: Mohammad Asifur Rahman, Atika Farzana Urmi* and K C Bhuiyan. Risk Factors for Prevalence of Hypertension in Diabetic- Disabled Adults in Bangladesh. *Am J Biomed Sci & Res.* 2024 23(4) AJBSR.MS.ID.003104, DOI: [10.34297/AJBSR.2024.23.003104](https://doi.org/10.34297/AJBSR.2024.23.003104)

Received: 📅 August 03, 2024; **Published:** 📅 August 09, 2024

Abstract

The study was based on data collected from 995 adults of ages 18 years and above residing in both rural and urban areas of Bangladesh. The respondents were interviewed by some nurses and medical assistants working in some diagnostic centres located in urban and semi-urban areas when the adults were visiting the centres. Among the respondents 0.9% were suffering simultaneously from diabetes, disability, and hypertension; the corresponding percentage was 0.6 in females, where females were 49.9% in the sample. This percentage was 1.2 in males indicating 100% more risk of prevalence in them compared to the risk of prevalence in females. The rural adults were 53.4%, the prevalence rate in them was 0.13 against the same rate 0.40 in urban people. The rural people had around two times more risk compared to the risk prevailed in urban people. Elderly people of age 50 years and above had 8.21 times risk of prevalence; illiterate people had 309% more risk of prevalence. The risk of prevalence in people of higher economic status, in smokers, among people involved in sedentary activity, among diabetic patients suffering for 10 to 15 years, and among processed food consumers had higher risk of prevalence more than 100%. But all the above- mentioned variables were not significantly associated with prevalence of hypertension in diabetic-disabled persons. The most responsible variable for the prevalence was longer duration of diabetes followed by old age, higher economic conditions, etc. This was observed when logistic regression model was fitted.

Keywords: Diabetes, Disability, Hypertension, Socioeconomic Variables, Risk Ratio, Logistic Regression

Introduction

The blood pressure of a man when exceeds 140/90 (mmHg), he/she is considered as hypertensive person. If the same person suffers simultaneously from diabetes and disability, he / she is a patient of hypertension in addition to diabetic disability [1-12]. In different studies, hypertension was noted in obese, diabetic and heart patients [13-18].

Prevalence of obesity and its impacts was studied in both home and abroad. The major consequences of obesity are diabetes, hypertension, and their related diseases [19-24]. Again, causes of hypertension are diabetes, kidney disease, nerve damage. The problem of hypertension is noted more in elderly people worldwide and by 2025 it will be seriously affecting the developing nations [25,26]. Again, it was noted that type II diabetes was one of the causes of hy

pertension, especially in adults [27] and simultaneous prevalence of diabetes-hypertension double the risk of cardiovascular diseases compared to the risk of non-diabetic hypertensive people [28,29].

It was reported, both in home and abroad, that the lifestyle characteristics, physical inactivity, involvement in sedentary activity, food habit, and age were the responsible factors for simultaneous prevalence of obesity- diabetes [20,30-33]. It was also reported that physical disability was more prevalent among obese-diabetic people [34-37]. For Bangladeshi people the noted responsible variables for hypertension in obese, diabetic, and disable persons were age, educational level, body mass index, smoking habit, involvement in sedentary activity, etc [34,38]. The present work was to identify the risk factors for hypertension among diabetic disabled adults.

Methodology

The results presented in this paper was based on data collected from 995 adults of ages 18 years and above when they were visiting some diagnostic centres located in both urban and semi-urban areas of Bangladesh. These adults were interviewed by some nurses and medical assistants working in the diagnostic centres. The investigating units comprised of males and females in the ratio 50.1:49.9. This sex ratio coincided with the sex ratio of the country during the study period 2018-19 [39].

The information related to the health conditions and socioeconomic condition of the respondents were noted through a pre-designed and pre-tested questionnaire. The characteristics recorded were related to demography including economic condition of the family, the duration of the suffering from the diseases, progress of treatment under registered medical practitioner working in registered medical centres or by any medical assistants, the lifestyle of the respondents. Most of the collected information were qualitative in nature and hence for analytical purpose the qualitative data were noted in nominal scale. The economic condition of any of the family was decided as lower (if monthly income of a family was < Tk.50 thousand and expenditure was < Tk. 40 thousand), medium (if income was Tk. 50-100 thousand and expenditure was between Tk.40-< 80 thousand), upper medium (if income was 50-100 thousand taka and expenditure was between Tk. 80-< 100 thousand taka) and Higher (if income was Tk. 150 thousand and above. The body mass index (BMI) was measured by weight in kg divided by height in meter². Accordingly, the respondents were identified as underweight (if BMI < 18.5), normal (if 18.5 < BMI < 23.0), overweight (if 23.0 < BMI < 27.5) and obese (if BMI ≥ 27.5) [20,40]. The blood pressure of each investigating unit was noted [BP mmHg]. Accordingly, the respondents were divided into 4 groups. The first group was of optimal blood pressure (BP < 120/80), the second group was of normal blood pressure (BP < 130/85), the third group was of high normal blood pressure (BP < 140/90), and the fourth group was of hypertensive blood pressure (BP ≥ 140/90 [1,2].

The important study variable was prevalence of hypertension in diabetic-disabled patients. The association of this variable with other socioeconomic variables were studied and the risk ratio of any level of a variable for which the prevalence rate of the study variable was found higher. Finally, the logistic regression model of study variable on other socioeconomic variables was fitted to identify the responsible variables for the prevalence of hypertension in diabetic- disabled adults [41,42-44].

Result

The responses of 995 adults of both urban and rural areas were analysed to fulfil the objective of the study. The respondents were males and females in the ratio 50.1: 49.9. Among male respondents 1.2% were patients of hypertension-diabetes-disability against 0.9% affected sample adults under consideration. These males had 100.0% more risk of affecting simultaneously from the above mentioned 3 diseases compared to the risk of females [R.R.=2.00; C.I. (0.43, 7.95)], though rate of female patients (0.6) was not significantly

different from the rate of affected male patients [= 1.003, p-value=0.317]. The sample rural people were 53.4%; 1.3% of them were suffering from the above mentioned 3 non-communicable diseases. The corresponding percentage among urban people was only 0.4%, this differentials in prevalence was not significant [=2.175, p-value=0.140]. The risk of prevalence in rural people was more than three times compared to the risk of urban people [R.R.=3.06, C.I. (0.64, 14.65)]. All 9 affected adults were Muslims; non-Muslim adults were 14.2% in the sample, none of them was patient of hypertension-diabetes-disability. Similar was the case in prevalence rate in single adults, where only 6.9% people were single adults. The sample elderly people were 19.6% (age 50 years and above); the prevalence rate in them was 3.1%. This rate was significantly higher than it was in other adults [= 13.991, p-value=0.000]. The risk of prevalence in them was 8.21 times [R.R.=8.21, C.I. (2.07, 32.56)]. The prevalence rates in adults of different levels of education were statistically similar [=5.063, p-value= 0.167]. However, among 6.5% illiterate people in the sample the prevalence rate of the disease was 3.1% and for them the risk of prevalence was 4.09 times compared to the risk of other adults [R.R.= 4.09, C.I. (0.87, 19.87)]. The prevalence rates of the disease among adults of different levels of education were statistically similar though highest rate (1.7%) was noted in housewives and they had 166% more risk of prevalence [=4.252, p-value=0.373; R.R.=2.66, C.I. (0.72,9.83)]. There were 12.6% sample adults who belonged to families of higher economic conditions. The prevalence rate in them was 3.2% and this rate was significantly higher than the rates prevailed in adults of families of other economic conditions [= 10.098, p-value= 0.018]. The risk of prevalence for this group of adults was 5.57 times compared to the risk of other adults [R.R.= 5.57, C.I. (1.52,20.47)]. The sample smoker adults were 33.1% and prevalence rate in them was 0.3% which was lower than that in non-smokers (1.2%). But this differential was not statistically lower [= 1.978, p-value=0.160], though non-smokers had around four times risk of prevalence [R.R.=3.95, C.I. (0.49, 31.54)]. The percentage of adults involved in sedentary activities was 44.4; prevalence rate in them was 1.8%. For them the risk of prevalence was 10.01 times compared to the risk of others [R.R.=10.01, C.I. (1.25, 79.93)]. Prevalence was significantly associated with involvement in sedentary activity [=7.274, p-value=0.007]. Process food consumers had 118% more risk of prevalence [R.R.=2.18, C.I. (0.59, 8.08)], though the rates for consumers (1.4%) and non-consumers (0.6%) were statistically similar [=1.426, p-value=0.230]. The percentage of process food consumers was 36.5. Percentage of physically inactive adults were 51.7 and 1.0% of them were patients of hypertension including diabetes disability. The percentage of physically active adults were 48.3; the prevalence rate in them was 0.2%. These two prevalence rates were statistically similar [= 0.055, p-value=0.814]. The risks of prevalence for both the groups were almost similar [R.R.=1.17, C.I. (0.32, 2.48)].

All the 9 affected adults (0.9%) were obese. This result indicated that obesity and hypertension-diabetes-disability were significantly associated [= 21.040, p-value = 0.000]. Duration of diabetes

was also associated with the prevalence of the above said diseases [= 27.542, p-value=0.000]. The prevalence rate in adults suffering for 10-15 years was 5.1%. This group of adults were 9.9% and for them the risk was 11.31 times compared to the risk of other adults [R.R.= 11.31, C.I. (3.09-41.40)].

Results of Logistic Regression Analysis

It was noted that old age, higher economy, sedentary activity, obesity, and longer duration of diabetes were significantly associated with prevalence of hypertension-diabetes-disability. These variables enhanced the risk of prevalence of the diseases under consideration. This was observed in fitting the logistic regression model

(Table 1,2). Impact of smoking [2.884, p-value = 0.027] was significant and it created the higher risk of prevalence of the diseases [Exp (B)= 17.882]. Though not significant impacts of the variables economic condition, occupation, sedentary activity, age, and duration of diabetes on prevalence of hypertension-diabetes-disability, higher risks of suffering were noted for smoker adults [Exp(B) = 17.882], followed by involvement in sedentary activities [Exp(B)= 3.265], higher economic condition [Exp(B)= 1.997], worked as housewife [Exp(B)= 1.927], old age [Exp(B) = 1.708], and duration of diabetes [Exp(B)=1.623] . The other important result is Nagelkerke R²= 0.595.

Table 1: Distribution of adults according to prevalence of hypertension-diabetes-disability and other socioeconomic characteristics.

Socioeconomic characteristics	Prevalence of hypertension-diabetes-disability				Total	
	Yes		No			
	Number	%	Number	%	Number	%
Residence						
Rural	7	1.3	524	98.7	531	53.4
Urban	2	0.4	462	99.6	464	46.6
Total	9	0.9	986	99.1	995	100.0
Religion						
Muslim	9	1.1	839	98.9	848	85.2
Non-Muslim	0	0.0	147	100.0	147	14.8
Gender						
Male	6	1.2	492	98.8	498	50.1
Female	3	0.6	494	99.4	497	49.9
Marital status						
Married	9	1.0	917	99.0	926	93.1
Single	0	0.0	69	100.0	69	6.9
Age (in years)						
< 25	0	0.0	196	100.0	196	19.7
25 – 40	1	0.2	400	99.8	401	40.3
40 – 50	2	1.0	201	99.0	203	20.4
50+	6	3.1	189	96.9	195	19.6
Education						
Illiterate	2	3.1	63	96.9	65	6.5
Primary	2	1.7	119	98.3	121	12.2
Secondary	1	0.4	236	99.6	237	23.8
Higher	4	0.7	568	99.3	572	57.5
Occupation						
Farming	1	1.0	103	99.0	104	10.5
Business	1	0.4	233	99.6	234	23.5
Service	1	0.3	304	99.7	305	30.7
Retire	2	1.6	120	98.4	122	12.3
Housewife	4	1.7	226	98.3	230	23.1
Economic condition						
Low	4	1.0	381	99.9	385	38.7
Medium	1	0.2	423	99.8	424	42.6
Upper medium	0	0.0	61	100.0	61	6.1

High	4	3.2	121	96.8	125	12.6
Smoking habit						
Yes	1	0.3	328	99.7	329	33.1
No	8	1.2	658	98.8	666	66.9
Sedentary activity						
Yes	8	1.8	434	98.2	442	44.4
No	1	0.2	552	99.8	553	55.6
Habit of taking process food						
Yes	5	1.4	358	98.6	363	36.5
No	4	0.6	628	99.4	632	63.5
Habit of doing physical work						
Yes						
	4	0.2	477	99.8	481	48.3
No	5	1.0	509	99.0	514	51.7
Body mass index						
Underweight	0	0.0	36	100.0	36	3.9
Normal	0	0.0	233	100.0	233	23.4
Overweight	0	0.0	424	100.0	424	42.6
Obese	9	3.0	291	97.0	300	30.2
Duration of diabetes (in years)						
Did not arise	0	0.0	328	100.0	328	33.0
< 5	0	0.0	291	100.0	291	29.2
5 – 10	2	1.0	204	99.0	206	20.7
10 – 15	5	5.1	94	94.9	99	9.9
15+	2	2.8	69	97.2	71	7.1
Total	9	0.9	986	99.1	995	100.0

Table 2: Results of logistic regression analysis.

Variable	B	S.E.	Wald statistic	p-value	Exp(B)
Residence	-1.927	1.125	2.937	0.087	0.146
Religion	-16.317	2272.614	0.000	0.995	0.000
Gender	-3.634	1.711	4.610	0.034	0.026
Marital status	-14.762	3268.881	0.000	0.996	0.000
Age (in years)	0.535	0.637	0.703	0.402	1.708
Education	-0.611	0.517	1.397	0.237	0.543
Occupation	0.656	0.572	1.314	0.252	1.927
Economic condition	0.692	0.552	1.568	0.211	1.997
Body mass index	16.377	904.393	0.000	0.986	12960763.11
Smoking habit	2.884	1.301	4.916	0.027	17.882
Sedentary activity	1.183	1.275	0.862	0.353	3.265
Physical activity	0.256	1.378	0.035	0.853	1.292
Habit of taking process food	-0.300	1.054	0.081	0.776	0.700
Duration of diabetes (jn years)	0.484	0.487	0.987	0.320	1.623
Constant	-40.439	5922.337	0.000	0.994	0.000

Discussion

The most common non-communicable diseases are obesity, diabetes, hypertension, heart disease, kidney diseases and these diseases are interrelated [8,13,45]. Again, hypertension is a risk factor for some non-communicable diseases, and it prevails in presence of other health hazard, specially, the problem exists in obese-diabetic adults [3,6,7,10,16,34,35,46]. Again, diabetic adults are affected by physical disability and suffer from hypertension [18,19,47-50]. It means that hypertension is a common feature in diabetic disabled adults.

The factors and risk of hypertension were mentioned by many researchers and these factors were obesity, longer duration of diabetes, older age, lower level of education, and uncontrolled lifestyle and the most common risk factor was cardiovascular diseases [50-53]. In this paper, attempt was made to identify the responsible factors for prevalence of hypertension among diabetic- disabled adults. For this reason, an analysis was done using the data collected from 995 adults of both urban and rural areas. The investigated rural adults were 53.4% and prevalence rate in them was 1.3% against the rate 0.9% in all respondents. The rural adults had more than two times risk of suffering from the diseases. Male adults were 50.1%, they had 100% more risk of prevalence. The elderly people were 19.6%; the prevalence rate in them was 3.1% with a risk of 8.21 times. There were only 6.5% illiterate adults; prevalence rate in them was 3.1% having more risk of 309%. Housewives were 23.1% having a prevalence rate of 1.7%; they had 166% more risk of prevalence. Only 12.6% adults were from high economic group of families and the prevalence rate in them was 3.2%. For these group of adults, the risk of prevalence was 5.57 times.

Smoker adults were 33.1%; the prevalence rate in them was only 0.3%, on the other hand, non-smokers had higher risk of prevalence by an amount 395%. Adults involved in sedentary activity were 44.4%; for them the risk of prevalence was 10.01 times and the prevalence rate in them was 1.8%. Process food consumers were 36.5%; prevalence rate in them was 1.4%. They had 2.18 times of risk. Physically inactive adults were 51.7% and prevalence rate in them was 1.0%. The risk of prevalence for both physically active and inactive adults were almost similar [R.R.=1.17].

There were 30.2% obese adults in the sample. It was found that all 9 affected adults were obese. The percentage of diabetic patients were 67.0%; among them 14.8% were suffering for 10-15 years and prevalence rate in them was 5.1%. For them the risk of prevalence was 11.31 times.

Some of the socioeconomic variables were significantly associated with prevalence of hypertension in diabetic-disabled adults. These variables were age, economic condition, sedentary activity, body mass index and duration of diabetes. Out of these variables, old age, higher economic condition, sedentary activity and duration of diabetes for 10-15 years were higher risk generating levels for prevalence of hypertension in diabetic-disabled adults. Levels of education, residence, occupation, smoking habit, process food consumption were independent of prevalence. But these levels

were creating higher risk for prevalence of the diseases under consideration. The logistic regression analysis indicated that the risk generating factors for prevalence were higher economic condition, followed by occupation, age, duration of diabetes, and sedentary activity. However, smoking habit was a very responsible factor for prevalence.

Conclusion

The study was conducted to identify some responsible socioeconomic variables for the prevalence of hypertension in Bangladeshi diabetic-disabled adults of 18 years and above residing in both urban and rural areas. Total investigated adults were 995 and 0.9% of them were patients of hypertension-diabetes-disability. The percentages of rural, males, Muslims, married, illiterate, and housewives were 53.4, 50.1, 85.2, 93.1, 6.5 and 23.1, respectively. The prevalence rates among all the above-mentioned adults were higher, though not significantly, than the prevalence rate in all the investigated adults. The risks of prevalence of the diseases were at least 100% more than the risks of prevalence in other adults. The prevalence rates (3.1%) in elderly adults (age 50 years and above) and in adults (3.2) belonged to families of higher income group were significantly higher; the risks of prevalence in these two groups were 8.21 and 5.57 times, respectively.

The four lifestyle factors of the respondents were under consideration; these were sedentary activity, smoking habit, habit of taking process food and habit of doing physical work. Out of these 4 factors, only sedentary activity was significantly higher risk generating factor (R.R.= 10.21) for prevalence of the diseases under consideration. However, higher prevalence rate (1.4%) was noted in process food consumers (1.4%).

There were 9 patients of hypertension-diabetes-disability, and all these 9 adults were obese. The prevalence rate in diabetic patients suffering for 10-15 years was 5.1%, for them the risk of prevalence was 11.31 times compared to the risk of other diabetic patients.

Logistic regression analysis indicated that smoking habit, higher economic condition, occupation, age, and duration of diabetes were the risk factors for prevalence of hypertension in diabetic disabled adults,

In many countries, socioeconomic condition of the people is in upward direction and hence there exists increasing trend in the unhealthy lifestyle of the people. Obesity is a result of this changed lifestyle and ultimately people are affected by diabetes and its related diseases, specially, hypertension, cardiovascular diseases, and diabetic neuropathy, etc. unless proper action is not taken to avoid the health hazard. However, people can take proper steps to avoid obesity and obesity related non-communicable diseases. The steps to be taken are:

- I. Everybody should do some sort of physical work as per as possible so that body weight can be controlled.
- II. Process food, restaurant food, fast food, salty food, and fatty food should be avoided. People should depend on healthy and home-made food.

III. Everybody should try to be careful to control blood sugar level and blood pressure level. This can be done if any body can join the blood screening program whenever it is executed in any place.

Rural and urban health workers, social workers and medical assistants can motivate people to maintain healthy life.

References

- Jessica YI, Zaman MM, Haq SA, Ahmed S and Al Quadir Z (2018) Epidemiology of hypertension among Bangladeshi adults using the 2017 ACC/AHA, Hypertension Clinical Guidelines and National Committee 7 Guideline, *Jour Hypertension* 32(10): 668 - 680.
- Jan AS, Yan Li, Azusa H, Kel A, Ermon D et al (2017) Blood pressure measurement anno 2016, *Amer Jour Hypertension* 30(5): 453-463.
- Bikadi B, Mody PS and Ranasinghe I (2013) Most important outcomes research papers on hypertension, *Circulation, Cardiovascular Quality and Outcomes* 6(4).
- Arthur S Walters and David B Ray (2009) Review of the relationship of restless legs syndrome and periodic limb movements in sleep to hypertension, heart disease and stroke, *Sleep* 32(5): 589-597.
- Cifu AS and Davies AM (2017) Prevention, detection, evaluation and management of high blood pressure in adults *JAMA* 318: 2132-2134.
- Chowdhury MZI, Rahman M, Akter T, Ahmed A, Shovon MA et al (2020) Hypertension prevalence and its trends in Bangladesh: Evidence from a systematic review and meta-analysis, *Clinical Hypertension* 26(10).
- Chowdhury MA, Uddin MJ, Haque MR and Ibrahim B (2017): Hypertension among adults in Bangladesh: Evidence from a National Cross-sectional Study, *BMC Cardiovascular disorder* 16: 22.
- Sharma SK, Ruggerenti P and Ramuzzi G (2007) Managing hypertension in diabetic patients - focus on trandolapril / verapamil combination, *Vase Health Risk Management* 3(4): 453-465.
- Mahler RJ (1990) Diabetes and hypertension, *Horm Metab Res* 22(12): 599-607.
- Bernard MV and Chao Li (2012) Diabetes and hypertension: Is there a common metabolic pathway? *Curr Atheroscler Rep* 14(2): 160-166.
- Neilson C and Lange T (2005) Blood glucose and heart failure in diabetic patients, *Diabetic Care* 28(3): 607-661.
- Rahman M, Zaman MM, Islam JY, Chowdhury J, Ham Nazmul Ahsan (2018) Prevalence, treatment patterns and risk factors of hypertension among Bangladeshi adults, *Jour Hum Hypertension* 32(5): 334-348.
- Davy KP and Hall JE (2004) Obesity and hypertension: two epidemics or one? *ASowers Jour Physiol Regular Integer Com Physiol* 286(5): R803-R813.
- Sowers JR, Epstein M and Frohlich ED (2001) Diabetes, hypertension, and cardiovascular disease: an update, *Hypertension* 37:1053-1059.
- Landsberg L and Molitch M (2004) Diabetes and hypertension: Pathogenesis, prevention, and treatment, *Clin Exp Hypertense* 26: 621-628.
- John E Hall, Jussara M do Carmo, Alexandre A da Silva, Zhen Wang and Michael E Hall (2015) Obesity induced Hypertension: Interaction of Neurohumoral and Renal Mechanisms, *Circulation Research* 116(6): 991-1006.
- Biswas T, Islam SMS and Islam A (2016) Prevention of hypertension in Bangladesh: A review, *Jour Medicine* 17: 30-35.
- Mokdad AH, Ford ES Bowman BA, William H Dietz, Frank Vinicor, et al (2001) Prevalence of obesity, diabetes, and obesity related health factors *JAMA* 289(1): 76-79.
- Barnes SA (2011) The epidemic of obesity and diabetes: Trend and treatment, *Tex Heart Inst* 38(2): 142-144.
- Biswas T, Garnett P Sarah and Rawal B Lal (2017) The prevalence of underweight, overweight, and obesity in Bangladesh: Data from a national survey, *PLoS One* 12(5): e0177395.
- Boyras O and Saracoglu M (2010) The effect of obesity on the assessment of diabetic peripheral neuropathy: Comparison of Michigan physical assessment, *Diabetic Research and Clinical Practice* 90(3): 256-260.
- Felso DT, Anderson JJ, Naimar KA, Walker AM, Meenan RF (1998) Obesity and knee osteoarthritis: The Farmington Study, *Ann Int Med* 109(1): 18-24.
- Besen Engquist K and Chang M (2011) Obesity and cancer risk: Recent review and evidence, *Curr Oncol Rep* 13(1): 71-76.
- Bourne R, Mokhi S, Zhu N and Keresteci M (2007) Role of obesity on the risk for total hip or knee arthroplasty, *Clin Orthop Relat Res* 465: 185-188.
- WHO (2007) The challenge of obesity in the WHO European region and the strategies for response, Edited by Branca F Nikogosion H Lobstein, T Copenhagen.
- Reddy KS and Yusuf S (1998) Emerging epidemic of cardiovascular disease in developing countries, *Circulation* 97(6): 596-601.
- Bernard MV Cheung and Chao Li (2012) Diabetes and hypertension. Is there common metabolic pathway? *Curr Atheroscler Rep* 14(2): 160-166.
- Sowers JR, Epstein M and Frohlich ED (2001) Diabetes hypertension and cardiovascular disease an update *Hypertension* 37(4): 1053-1059.
- Mahler RJ (1990) Diabetes and hypertension. *Horm Metab Res* 22: 599-607.
- Mansion JE, Willet WC, Stampfer MJ, G A Colditz, D J Hunter, et al (1995) Body weight and mortality among women *N Engl J Med* 333(11): 677-685.
- Bhuyan KC (2020) Socioeconomic variables responsible for exclusively diabetes among Bangladeshi adults, *Acta Scientific Nutrition Health* 4(30): 1-6.
- Fardus J and Bhuyan KC (2016) Discriminating diabetic patients of some rural and urban areas of Bangladesh: A discriminant analysis approach, *Euromediterranean Bio Jour* 11(9): 134-142.
- Monteiro CA, Moura EC, Conde WL and Barry M Popkin (2004) Socioeconomic status and obesity in adult population of developing countries: a review, *Bull WHO* 82(12): 940-946.
- Bhuyan KC (2020) Identification of risk factors for diabetes- disability among Bangladeshi adults, *Current Research in Diabetes and Obesity Journal* 14(1): 555877.
- Edward WG, Gloria LAB, David FW, Suzzane GL, Jean AL, et al (2000) Diabetes and physical disability among older US adults, *Diabetes Care* 23(9): 1272-1277.
- (2015) American Association of Diabetes Education Diabetes and disability, Practice Paper.
- Nathan DM (1993) Long-term complications of diabetes mellitus, *N Engl Jour Med* 328(23): 1676-1685.
- Sabrina A, Mithila F, Moniruzzaman M, Roby NU, Ashraf F, et al (2022) The pattern of physical disability and determinants of activities of daily living among people with diabetes in Bangladesh, *Endocrinology, Diabetes & Metabolism* 5(5): e365.
- (2018) Bangladesh Bureau of Statistics Statistical YearBook of Bangladesh 2017 BBS Dhaka Bangladesh.
- (2004) Appropriate Body Mass Index for Asian Population and Its Implications for Policy and Intervention Strategies, WHO Expert Consultation, *Public Health Lancet* 363(9403): 157-163.

41. Hosmer DW, Lemeshow S and Sturdivant (2013) Applied Logistic Regression.
42. Gasso G (2019) Logistic Regression.
43. Lavally MP (2008) Logistic Regression, Amer Heart Assoc 117(18): 2395-2399.
44. Nick TG and Kathleen M Campbell (2007) Logistic Regression: Topics in Biostatistics, Springer 404: 273-301.
45. Krzysztof N (2006) Obesity and hypertension- the issue is more complex than we thought, Nephrology Dialysis Transplantation 21(2): 264-267.
46. Cheung BM (2010) The hypertension- diabetes continuum, Jour Cardio. Pharmacol 55(4): 333-339.
47. Bigal ME, Lipton RB, Holland PR and Goadsby PJ (2007) Obesity, migraine, and chronic migraine: Possible mechanisms of interaction, Neurology 68(21): 1851-1861.
48. Banik PC, Barua L, Maniruzzaman M, Mondal R, Zaman F et al (2020) Risk of diabetic foot ulcer and its associated factors among Bangladeshi adults: a multicentric cross-section study BMJ Open 10(2): 1-10.
49. Mashhili F, Joachim AS, Machembe M, Chiwanga F, Addo J, et al (2019) Prospective exploration of the effect of adiposity and associated microbial factors on healing and progression of diabetic foot ulcer in Tanzania ; A study protocol of a longitudinal cohort study, BMJ open 9(12): e031896.
50. Bhuyan KC (2019) Factors responsible for prevalence of diabetic hypertension among Bangladeshi adults, Jour Dia Metabolism 28(4): 393-403.
51. Vasan RS, Beiser A, Seshadri S, Larson MG, Kannel WB et al (2002) Residual lifetime risk for developing hypertension among middle-aged women and men: The Framingham Heart Study JAMA 287(8):1003-1010.
52. Bhuyan KC (2020) Identification of responsible variables for obesity hypertension among Bangladeshi adults Arc Diab And Endo System 3(1): 27-34.
53. Jugal K, Gupta N, Kohli C and Kumar N (2016) Prevalence of hypertension and determination of its risk factors in rural Delhi, Inter Jour Hyper 7962595.