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Socio-Demographic and Biomedical Factors were Associated with Control of Diabetes among Diabetic People Attended at Rajshahi Diabetes Hospital, Rajshahi, Bangladesh

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Abstract: *Diabetic people remain concern about their increased blood glucose level. The control of blood glucose is associated with several social, demographical, behavioral and biomedical factors. The aim of the study was to determine the factors influencing the control of diabetes. A cross-sectional survey was performed to select 300 diabetic patients using systematic random sampling methodology in Rajshahi city of Bangladesh. Chi-square test and stepwise logistic regression analysis were used to find out the associations of diabetes controlled and selected factors for this study. In this study, around 82.0% patients could control diabetes. Using chi-square test, sex, education, monthly family income, regular intake of drug, regular treatment receive, vertigo and HBP were associated with diabetes control. Multivariable logistic regression model suggested that sex, duration of carrying diabetes, regular intake of drugs, regular treatment receives, regular physical, vertigo and HBP activity had significant effect on diabetes. It can be concluded that socio-demographic, socio-behavioral and biomedical factors have significant influence on diabetes control. Diabetes is now a major public concerning issues in Bangladesh so Government of Bangladesh should give top priority in its health agenda.*

Keywords:*Diabetes control, socio-demographic, socio-behavioral, biomedical, chi-square, stepwise logistic regression*

I. Introduction

Diabetes is a global public health concern (Khan, et al. 2014). It is one of the most prevalent and devastating chronic metabolic disorders resulting from inadequate production of insulin or ineffective use of insulin by an inner body organ, islets of Langerhans of the pancreas. The type-2 diabetes (also called Non-Insulin Dependent Diabetes Mellitus (NIDDM), in which the body produces insulin but cannot use it properly, typically appears in adulthood and is the commonest form which account for nearly 90-95% of the diabetic population Khongbuh et al. 2005). Although diabetes was initially a disease of Western and affluent societies (Hu, 2011), now most of diabetic population are living in developing countries (Shaw, et al. 2010). Asia is an emerging epicenter of diabetes, which accounts for more than 60% of the world's diabetic population (Ramachandran, et al. 2012). Consequently, Bangladesh is observing the rising prevalence of diabetes and could be one of the top 10 countries worldwide (Khan, et al. 2014) with 11.1 million estimated cases of diabetes in 2030 (IDF, 2012) from 5.7 million in 2010 (Shaw, et al. 2010). Such an increase in diabetes could be attributed to the ongoing socioeconomic, demographic and epidemiologic changes manifested by the indicators of increasing life expectancy due to ageing, economic expansion and rising per capita income, rapid urbanization and modernization, increasing obesity and sedentary lifestyles, and increasing habit of fast and fatty food consumptions (Khan, et al. 2014).

Diabetes is a lifelong and lifestyle disease that cannot be cured completely but a diabetic patient can maintain a normal life by controlling this disease through e.g., using planned and proper diets, taking recommended drugs, performing regular physical activity and monitoring blood sugar regularly (Jermendy, et al. 2008, Mier, et al. 2008). If diabetes is uncontrolled or poorly managed, it can lead to various long-term complications such as cardiovascular disease, stroke, diabetic retinopathy, blindness, kidney damage and subsequent renal failure (Khan, et al. 2014, Abueleinen, et al. 2011, Jermendy, et al. 2008, Mier, et al. 2008). Diabetes is a self-managed disease and 99% of the treatment regimen is self-care behavior but a number of social, economical and demographical factors have also been taken into account as tools of risk assessment for the poor management of high blood sugar level among the diabetic people (Jayesh, et al. 2012 Huang, et al. 2010). Many authors already have conducted studies in Bangladesh (Ahasan, et al. 2011, Hussain, et al. 2006) as

well as other developed and developing countries in the world on the administration of blood sugar level among the diabetic people ((Reach, et al. 2011, Sanal, et al. 2011, Sasak, et al. 2011, Veghari, et al. 2010, Alba, et al. 2009, Bachmann, et al. 2003).

Bangladesh is one of the dense populous under-developed countries with high burden of diabetes (Hoque, et al. 2012). Being an underdeveloped country, Bangladesh is facing numerous challenges over health and fighting against economy, environment and several socio-economic aspects due to high prevalence of diabetes disease. Risk factors for rising diabetes complications among Bangladeshis make it imperative that the country undertakes appropriate measures to address this problem. The role of socio-demographic factors on diabetes management among Bangladeshis diabetic people as well as South Asian population has not been well studies.

Considering the rising prevalence of diabetes and its long-term of economic, social and health consequences, this cross-sectional study aimed to identify some socio-demographic, behavioral and bio-medical factors that are significantly associated with diabetes control among diabetic patients in Rajshahi city. Since such type of studies are still scarce in Bangladesh particularly for Rajshahi city, the study findings in one hand can contribute to the current knowledge of diabetes control and on the other hand help policymakers, program managers and other stakeholders to create more effective control strategies in Bangladesh.

II. Materials And Methods

2.1 Study Area and Sample

A cross-sectional study was conducted in Rajshahi Diabetes Hospital (RDH), Bangladesh during the period of October 1 to October 31, 2014. Rajshahi city is the third largest city in Bangladesh after the megacity Dhaka and the 2nd largest city of Chittagong (Hoque, et al. 2012). Rajshahi City Corporation Area consists of four thanas and the Rajshahi city is surrounded by 9 upazillas. Upazilas cover over 1853 villages (Bangladesh Population Census, 2011). Over 0.8 mollion people live in urban areas and more than 1.4 million people live in rural areas (Bangladesh Population Census, 2011). People from all parts (inside and outside adjacent to Rajshahi city) of Rajshahi city come to the RDH for seeking diabetes treatment. The RDH operates its activities for diabetic people in Rajshahi through Bangladesh Diabetic Association (BDA). Each of the registered patients attended at the RDH for treatment received a unique identification number during his/her visit. Patients were called according to the serial numbers for delivering diabetes checkup.

Patients were than informed test results, such as, blood glucose level, blood pressure etc, in a book, called, Diabetic Guide Book, provided by the BDA. From the registered diabetic people, 313 study subjects aged 30 years and above were selected systematically for interview. Among the selected patients, 300 were found credible for analysis. The study was permitted by the authority of RDA but received no specific grant from any source.

Inform consent was obtained from each subject before enrollment. To do this, each of the selected subjects was verbally informed about the purpose of the study. About 98% of the selected patients gave their consents and participated in the study. The respondents were asked to report their socio-demographic, socio-behavioral and bio-medical (health problems) factors. A pre-tested semi-structured questionnaire composed of both pre-coded and open-ended questions was used for interview. Only patients with Type-2 diabetes were included in this study.

2.2 Explanatory Variables

The three groups of explanatory variables, namely socio-demographic, socio-behavioral and bio-medical factors (health related problems) were chosen for analysis. These variables theoretically and empirically are related to diabetes control. The selected socio-demographic variables were sex (male and female), age (40 years and > 40 years), education in years (illiterate (0 year), primary (1-5 years), secondary (6-10 years) and higher (> 10 years); type of work (extremely active, lightly active, moderately active and intellectual work), monthly family income (5000 BDT, 5001-15000 BDT, 15001-25000 BDT, 25001-35000 BDT and 35001 BDT), residence (rural and urban) and duration of carrying diabetes (1-2 years, 3-4 years, 5-6 years and > 6 years).

Four behavioral factors were regular intake of medicine, regular treatment received, regular physical activity (more than half an hour) and undergoing other health problems with dichotomous answers (yes and no). Finally, the bio-medical factors with binary categories (yes and no) namely, chest pain, breathlessness, vertigo, eye problem and high blood pressure (HBP) (considered diastolic BP > 90 and systolic BP> 140 mmHg) were included.

2.3 Measuring Control of Diabetes

The study subjects were divided into two groups based on the status of diabetes control. One group represented the control group, who maintained the normal blood glucose (human body's main energy source) level. Blood Glucose Test (random and fasting) is a popular method in Bangladesh along with Urine Test for Glucose and Ketones that are used to determine whether someone has diabetes or not as well as it is under control or not.

In this study, authors considered less than 7.0 millimoles per liter (mmol/l) [< 126 milligrams per deciliter (mg/dl)] for Fasting Plasma Blood Glucose Test to measure diabetes control, though there are differencing opinions about the ideal blood glucose level range. Hypoglycemia (defined as a condition characterized by an abnormally low level of blood sugar/glucose) is one of the common hazard factors linked with diabetes but this factor was not considered to measure control of diabetes in the present study.

1.4 Statistical Analysis

Descriptive statistics was calculated for selected variables. Chi-square (2) test was used to test the associations between the diabetes control and selected factors on the basis of classification of factors. Stepwise (backward LR) logistic (binary) regression analysis was used to find out the most influential variables (socio-demographic, socio-behavioral and biomedical factors) for diabetes control. The underlying binary logistic regression model corresponding to each variable is:

$$Y = \log[\frac{p}{(1-p)}] = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots + \beta_n X_n$$

Where, P = the probability to control diabetes (coded 1)

1-P = the probability not to control diabetes (coded 0)

β_0 is the intercept term and β_i's are logistic regression coefficients (i = 1, 2, 3, ……, n).

X_i's are the independent variables (socio-demographic, socio-behavioral and bio-medical factors).

The parameter β_i refers to the effect of X_i on the log odds such that Y = 1, controlling the other X_i's. In stepwise logistic regression analysis, the backward LR method computes the final step by subsequently taking away variables. The backward elimination procedure starts with the full equation and successively drops one variable at a time. The variables are excluded from the equation based on the reduction of error sum of squares.The contribution of individual variable for each step was checked by the Wald statistic. Based on the significant Wald test values are significant, the full set of variables is retained in the final step. Statistical significance was accepted at $P< 0.05$.

Predictive ability of the logistic regression model was measured through receiver operating characteristic (ROC) curve plot where the proportion of incorrectly predicted outcomes (1-Specificity) exists on the x-axis and the proportion of correctly predicted outcomes (Sensitivity) at a given cutoff point (1 = coded for can control diabetes) exists on the y-axis (Figure 1). ROC curves provide a graphical display that represented the predictive accuracy of a logistic regression model. The area under a ROC curve which ranges from zero to one provides a measure of the model's ability to distinguish between those subjects who experience the outcome of interest versus those who did not. The value between 0.71 – 0.9 elucidates very good distinguishing ability (Stevenson, 2008). All statistical analyses were carried out using SPSS software (version 20.0).

III. Results

Table 1 summarized the background profile of diabetes people. Among 300 diabetic people, more than half of them were females (53.7%). Most of the patients (85.0%) were over 40 years of age. Most of the patients (31.0%) were recorded, carrying diabetes for more than six year. Regular drug (medicine/insulin), regular treatment and regular physical activity were received by 93.7%, 78.0% and 34.3% patients respectively. Around 88.0%, 67.3% and 33.7% patients were found to have chest pain, eye problem and high blood pressure respectively.

Table 1. Socio-demographic, socio-behavioral and bio-medical factors of diabetes patients (cont.)

Status	Factors	Frequency	Percent (%)
Socio-demographic factors	**Sex**		
	Male	139	46.3%
	Female	161	53.7%
	Age		
	$\leq$ 40 years	45	15.0%
	> 40 Years	255	85.0%
	Education		
	Illiterate	77	25.7%
	Primary	78	26.0%
	Secondary	56	18.7%
	Higher	89	29.7%
	Work status		
	Extremely inactive	73	24.3%
	Lightly active	181	60.3%
	Moderately active	35	11.7%
	Intellectual work	11	3.7%

Table 1. Socio-demographic, socio-behavioral and bio-medical factors of diabetes patients (cont.)

Status	Factors	Frequency	Percent (%)
Socio-demographic factors	**Monthly family income (BDT)**		

	≤ 5000	41	13.7%
	5001-15000	173	57.7%
	15001-25000	52	17.3%
	25001-35000	23	7.7%
	≥ 35001	11	3.7%
	Residence		
	Rural	174	58.0%
	Urban	126	42.0%
	Duration of carrying diabetes		
	1-2 years	103	34.3%
	3-4 years	61	20.3%
	5-6 years	43	14.3%
	> 6 years	93	31.0%
	Diabetes control		
	No	54	18.0%
	Yes	246	82.0%
Socio-behavioral factors	**Regular intake of drugs**		
	No	19	6.3%
	Yes	281	93.7%
	Regular treatment receive		
	No	66	22.0%
	Yes	234	78.0%
	Regular physical activity		
	No	197	65.7%
	Yes	103	34.3%
	Undergoing other health problems		
	No	110	36.7%
	Yes	190	63.3%
Bio-medical factors	**Chest pain**		
	No	36	12.0%
	Yes	264	88.0%
	Breathlessness		
	No	275	91.7%
	Yes	25	8.3%
	Vertigo		
	No	271	90.3%
	Yes	29	9.7%
	Eye problem		
	No	98	32.7%
	Yes	202	67.3%
	High blood pressure		
	No	199	66.3%
	Yes	101	33.7%
	Total	300	100.0%

Associations of socio-demographic, socio-behavioral and biomedical factors with diabetes control were presented in Table 2. Sex, education, monthly family income, regular intake of drug and regular treatment receive showed significant proportional difference between uncontrolled and controlled group. In this study, around 82.0% patients were recorded to control diabetes. Among diabetic people, 88.8% of all females can control diabetes.

The prevalence was also higher among primary educated people (89.3%) and people of 15001-25000 income level (94.2%). Among the socio-behavioral factors, the percentages were higher for control of diabetes among those who received drug (83.3%) and treatment (83.3%) regularly. Association of biomedical factors with diabetes control was highlighted in Table 2. In this section, vertigo and HBP were found significant. Around 65.5% patients with vertigo and 76.2% patients with high blood pressure could control diabetes.

Table 2. Associations between diabetes control and socio-demographic and socio-behavioral factors

Factors	**Diabetes**		**P values**
	Uncontrolled	**Controlled**	
Sex			

Male	36 (25.9%)	103 (74.1%)	
Female	18 (11.2%)	143 (88.8%)	0.001
Age			
≤ 40 years	7 (15.6%)	38 (84.4%)	
> 40 Years	47 (18.4%	208 (81.6%)	0.643
Education			
Illiterate	14 (18.2%)	63 (81.8%)	
Primary	6 (10.7%)	50 (89.3%)	
Secondary	22 (28.2%)	56 (71.8%)	0.033
Higher	12 (13.5%)	77 (86.5%)	
Work status			
Extremely inactive	15 (20.5%)	58 (79.5%)	
Lightly active	29 (16.0%)	152 (84.0%)	
Moderately active	9 (25.7%)	26 (74.3%)	0.423
Intellectual work	1 (9.1%)	10 (90.9%)	
Monthly family income (BDT)			
≤ 5000	6 (14.6%)	35 (85.4%)	
5001-15000	40 (23.1%)	133 (76.9%)	
15001-25000	3 (5.8%)	49 (94.2%)	0.047
25001-35000	3 (13.0%)	20 (87.0%)	
≥ 35001	2 (18.2%)	9 (81.8%)	
Residence			
Rural	36 (20.7%)	138 (79.3%)	
Urban	18 (14.3%)	108 (85.7%)	0.154
Duration of carrying diabetes			
1-2 years	23 (22.3%)	80 (77.7%)	
3-4 years	7 (11.5%)	54 (88.5%)	
5-6 years	9 (20.9%)	34 (79.1%)	0.316
> 6 years	15 (16.1%)	78 (83.9%)	
Regular intake of drugs			
No	7 (36.8%)	12 (63.2%)	
Yes	47 (16.7%)	234 (83.3%)	0.027
Regular treatment receive			
No	22 (33.3%)	44 (66.7%)	
Yes	32 (13.7%)	202 (86.3%)	< 0.001
Regular physical activity			
No	39 (19.8%)	158 (80.2%)	
Yes	15 (14.6%)	88 (85.4%)	0.263
Undergoing other health problems			
No	16 (14.5%)	94 (85.5%)	
Yes	38 (20.0%)	152 (80.0%)	0.236
Chest pain			
No	6 (16.7%)	30 (83.3%)	
Yes	48 (18.2%)	216 (81.8%)	0.824
Breathlessness			
No	50 (18.2%)	225 (81.8%)	
Yes	4 (16.0%)	21 (84.0%)	0.786
Vertigo			
No	44 (16.2%)	227 (83.8%)	
Yes	10 (34.5%)	19 (65.5%)	0.015
Eye problem			
No	14 (14.3%)	84 (85.7%)	
Yes	40 (19.8%)	162 (80.2%)	0.243
High blood pressure			
No	30 (15.1%)	169 (84.9%)	
Yes	24 (23.8%)	77 (76.2%)	0.046
Total	54 (18.0%)	246 (82.0%)	

Note: Chi-square P values significant at 5% level

3.1Effects of Selected Factors on Diabetes Control

Effects of selected socio-demographic and socio-behavioral factors on diabetes control were estimated in Table 3 using stepwise logistic regression analysis. In stepwise logistic regression analysis, all variables are included in the first step. In first step, the least significant variable based on Wald statistics was age and the

corresponding change in -2LR was also insignificant. Hence, age is the variable which was excluded from the model in the second step.
In the second step, working status was least significant and the change in -2LR was also insignificant; therefore this variable was excluded from the model in the third step. The other variables, i.e. monthly family income and residence were excluded from the model by repeating the same procedure.
The final step included the most influential variables: sex, education, duration of carrying diabetes, intake of drugs, regular treatment receive, regular physical activity and undergoing other health problems which were statistically significant.

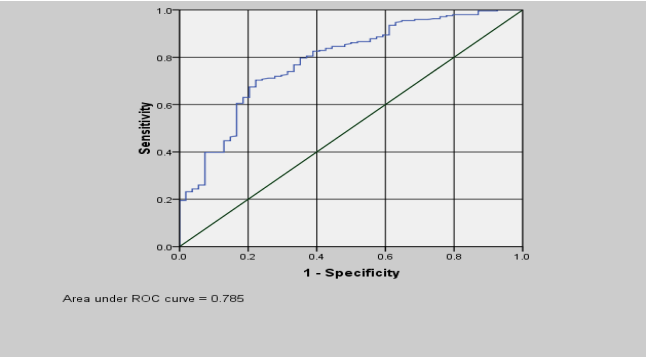
Table 3. Summary of stepwise logistic regression analysis

Factors	Unadjusted OR (95% CI)	P values	Adjusted OR (95% CI)	P values	Change in -2 LR
Sex					
Male	1.00		1.00		
Female	2.77 (1.49-5.16)	0.001	3.52 (1.65-7.54)	0.001	11.155*
Education					
Illiterate	1.00		1.00		
Primary	1.85 (0.66-5.17)	0.239	1.46 (0.47-4.54)	0.516	
Secondary	0.57 (0.26-1.21)	0.142	0.47 (0.19-1.13)	0.092	10.431*
Higher	1.43 (0.62-3.30)	0.408	1.73 (0.66-4.55)	0.266	
Duration of carrying diabetes					
1-2 years	1.00		1.00		
3-4 years	2.22 (0.89-5.53)	0.088	3.28 (1.18-9.06)	0.022	
5-6 years	1.09 (0.46-2.59)	0.852	1.31 (0.41-3.50)	0.589	6.764*
> 6 years	1.50 (0.73-3.08)	0.275	2.07 (0.91-4.72)	0.084	
Regular intake of drugs					
No	1.00		1.00		
Yes	2.90 (1.09-7.77)	0.034	4.20 (1.28-13.80)	0.018	5.279*
Regular treatment receive					
No	1.00		1.00		
Yes	3.16 (1.68-5.95)	<0.001	2.70 (1.28-5.69)	0.009	6.697*
Regular physical activity					
No	1.00		1.00		
Yes	1.45 (0.76-2.77)	0.264	2.16 (1.21-4.03)	0.049	3.756*
Undergoing other health problems					
No	1.00		1.00		
Yes	0.68 (0.36-1.29)	0.238	0.50 (0.24-1.05)	0.047	3.518*

Note: CI = confidence interval, Significant level $P < 0.05$

The coefficient and odds ratio showed that female sex was positive and significantly associated with the diabetes control and female patients were around 4 times (OR = 3.52, 95% CI = 1.65-7.54) more likely to control diabetes than males.
Being stay long time with diabetes, patients learnt how to manage diabetes. Compared to those patients who were in initial phase, the patients who carrying diabetes for 3-4 years were around 3 times (OR = 3.28, 95% CI = 1.18-9.06) more likely to control diabetes. The patients who received drugs (OR = 4.20, 95% CI = 1.28-13.80), treatment (OR = 2.70, 95% CI = 1.28-5.69) and) physical activity (OR = 2.16, 95% CI = 1.21-4.03) regularly could control diabetes.
With other health problems, patients had less chance to control diabetes (OR = 0.50, 95% CI = 0.24-1.05). Education somewhat had significant (P = 0.092) effect on diabetes control. In addition, the discrimination ability of the logistic regression model (Area under ROC curve = 0.785) was very good (figure 1).

Figure 1: ROC curve for logistic regression model in the data set (n = 300)



As indicated in Table 4, vertigo (OR = 0.33, 95% CI = 0.14-0.78) had significant effect on diabetes control which was demonstrated through binary logistic regression analysis and HBP (OR = 0.56, 95% CI = (0.30-1.03) had somewhat significant effect on diabetes control.

Table 4. Effects of biomedical factors on diabetes control

Factors	Unadjusted OR (95% CI)	P values	Adjusted OR (95% CI)	P values
Chest pain	0.90 (0.35-2.28)	0.824	0.77 (0.28-2.12)	0.607
Breathlessness	1.17 (0.38-3.55)	0.786	0.94 (0.29-3.09)	0.920
Vertigo	0.37 (0.16-0.85)	0.018	0.33 (0.14-0.78)	0.011
Eye problem	1.48 (0.76-2.88)	0.245	1.58 (0.79-3.15)	0.198
High blood pressure	0.57 (0.31-104)	0.066	0.56 (0.30-1.03)	0.063

Note: OR = Odds ratio, CI = confidence interval, Significant level at 5%

IV. Discussion

In the present study, higher percentage of female diabetes patients was recorded. The diabetes epidemic, especially among women, is growing most rapidly in developing countries particularly in South Asian countries, including India and Bangladesh (Ramachandran, et al. 2012). In this study, authors found that the percentages of patients that could control diabetes were higher among female patients, primary educated people and medium income group. Over the past three decades Bangladesh has made impressive gains in women's education and empowerment (Haque, et al. 2011). Now women are conscious about their health, food and nutrition, family planning, as well as child education. Diabetic women with diabetes management knowledge, particularly in urban, can control diabetes flawlessly than men. Education is more important in both the detection and successful management of diabetes. Education enhances patients' ability to adopt and adhere to diabetes treatments that often requires careful patient self-management on a daily basis, for example, patients must monitor their blood glucose levels, balance insulin injection doses with food intake and physical activity, and consult regularly with health care providers (Agardh, et al. 2011).

Diabetes is one of the most costly and burdensome chronic disease (Biswas, 2006) and is associated with a variety of hassles, like; patients need to check their blood glucose regularly. It may affect patients' source of income. Since, with healthcare seeking, some other issues are closely associated, for example, medicine cost, communication cost etc. A study previously done has already proved the links between diabetes and both income and education (Fletcher & Richards, 2012). It is hard to manage diabetes for people with low-income status. Poor management of diabetes occurs among rural settlers due to lack of access to information resources and inability to have access to information and communication technology. The proper management of diabetes also depends on two others healthcare seeking behavior, such as, regular intake of drug and regular treatment receive.

The present study showed that higher percentage of patients who received drugs and treatment regularly could control diabetes. Again the prevalence was higher among the diabetic control group who used to take regular physical activity. However, this indicator did not show significant association with diabetes control. Physical activity is essential for the people with diabetes. It improves the body's response to insulin, which can make lower blood glucose levels, can control blood pressure, improve cholesterol, can control weight and reduce the risk of developing diabetes complications. Thereby, getting enough regular physical activity is important for maintaining good health and ensuring good diabetes management (Sigal, et al. 2006). Poor management of diabetes increases the risk of major medical complications, such as, attack, stroke, kidney failure, blindness or losing a limb through amputation etc (Hoque, et al. 2012). The body immune system of the people with diabetes becomes weaker when other health problems stick together with diabetes. In such situation, it is difficult to control diabetes. In this study, 80.0% of those who abided other health problems could control diabetes whereas 85.5% of those who did not have any minor health problems could control diabetes. Based on

Chi-square test sex, education, monthly family income, regular intake of drug and regular treatment receive had significant association independently with diabetes control. In a study in Colombia showed that age, family function and type of treatment were significantly associated with diabetes control (Alba, et al. 2009). A study in America highlighted that diabetes controlled was not significantly associated with age and duration of diabetes which supported the present study, however gender was not associated with diabetes control (Hartz, et al. 2006).

4.1Effects of Socio-Demographic and Socio-Behavioral Factors on Diabetes Control

Stepwise logistic regression analysis revealed that females were more likely to control diabetes than males. One study in Israel found that male (OR= 1.26, 95% CI =1.193-1.346) experienced poor diabetes control and age was not significant with the diabetes control which was similar to the present study (Wilf-Miron, et al. 2010). However, the present study result have not supported the other study that focused that women with diabetes are more likely to have poor blood glucose control than that of men (Gale & Gillespie, 2001). It was found in a study in USA that age and sex were not associated with diabetes control (Hartz, et al. 2006). The present study also resulted that education was one of the factors that had significant effect on diabetes control. With the increase of level of education, the chance of proper diabetes management is possible. The present study also summarized that the duration of diabetes had significant effect on diabetes control but one study in USA found no effect existed (Hartz, et al. 2006) and no other study is available in this regard for close match.

Diabetic Association of Bangladesh has under taken some incredible initiatives to increase knowledge and awareness among the patients as well as common people, such as, patients directly educated by the diabetes educators, development of leaflet and poster, media programs, publication of awareness, materials and diabetes/health magazines, educational classes, discussion programs on prevention, management and control. The adequate education and remained long time with diabetes, the patients acquired enough preventive knowledge. Socio-demographic factors are the confounding factors for the present study and it may vary from study to study. Regular intake of drug, regular treatment receive, regular physical activity and undergoing other health problems had significant effects on diabetes control.This study confounded the factors, such as, physical activity and undergoing other health problems by showing insignificant associations through Chi-square test and significant impact using regression analysis. Authors have not found any reason against this result. There might be few reasons: the time span during physical activity was not considered here, more health problems need to be searched at the time of survey and so on. To best of our knowledge, no recent studies were available in Bangladesh that portrayed the appropriate match or deviation of the present study results. A meta-analysis carried out that mostly highlighted hypoglycemia control. Nevertheless, the present study has not considered hypoglycemia to measure control diabetes (Sanal, et al. 2011).

4.2Effects of Other Health Problems on Diabetes Control

Diabetes patients undergo some other health problems. The listed health problems in this study were chest pain, breathlessness, vertigo, eye problem and high blood pressure. These health problems have numerous health hazards, such as heart attack, disproportion blood pressure, damage to the area of the retina and central vision, blood vessel damage, stroke, heart failure, kidney failure etc (Hoque, et al. 2012, SIGN, 2010, Rhatigan, et al. 1999, UKPDS, 1998, Wang, et al. 1993). In the present study, vertigo and HBP had significant effect on diabetes control. HBP have been already proved to be the risk factors for diabetes (Hussain, et al. 2006).

In conclusion, the findings of the study highlighted that sex, education, monthly family income, duration of carrying diabetes, regular intake of drugs, regular treatment receive, regular physical activity and undergoing other health problems were the significant contributing factors for diabetes control. The findings of the study emphasized the importance of maintaining the care and control of diabetes among diabetic people and suggested having ongoing medical care, taking medicine on a regular basis, regular physical exercise, managing other health problems properly and maintain a healthy diet. In spite of our attempt to conduct the study, which provided evidence for the factors responsible for control of diabetes to some extent, we could not find this as primary objectives in many well-conducted studies. Therefore, our experience showed that this area requires more attention of diabetes researchers.

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