Risk Factors for Developing Diabetes Mellitus amongst Diabetic Patients Attending at the Chittagong Diabetes Hospital Complex

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Abstract

A total of five hundred and twelve diabetic patients attending at Chittagong Diabetes Hospital Complex (CDHC) were chosen randomly to identify the risk factors involved in Diabetes Mellitus (DM) in Chittagong. The patients were grouped based on age, sex, Body Mass Index (BMI), family history, blood pressure, socioeconomic class and living area. Higher percentages of female diabetics were observed than male in all age groups. In the subjects studied, 74.61% had BMI >22.0. Higher percentage (60.74%) of diabetics was found to be associated with previous family history of DM. Some 64.06% of diabetic subjects were from rich socio-economic class, whereas 22.77% and 13.67% were from middle and poor class respectively. Urban subjects were higher (77.14%) than rural (22.86%) in all age groups irrespective of sex. About 51.37% of diabetics had diastolic blood pressure >90 mmHg which is higher than those having dBP <70 mmHg (18.16%), 70-90 mmHg (30.47%). Higher percentage (56.25%) of diabetics had systolic blood pressure (sBP) > 140 mmHg as compared to those having sBP 121-140 mmHg (32.21%) and <120 mmHg (10.55%). Diabetics was highest (61.32%) in both sexes in age group 31-50 yrs compared to the age group <30 yrs (7.42%) and >50 yrs (31.25%).Thus, it was concluded that high BMI, positive family history, high blood pressure, increased age and rich socio-economic class were the prevalent risk factors for developing DM in the study subjects.

Key Words: Diabetes Mellitus, Risk Factors, BMI, Family History, Population of Chittagong.

INTRODUCTION

Diabetes mellitus describes a metabolic disorder of multiple aetiology characterized by chronic hyperglycaemia with disturbance of carbohydrates, fat and protein

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metabolism resulting from defects in insulin secretion, insulin action, or both. The effects of diabetes mellitus include long-term damage, dysfunction and failure of various organs. Diabetes mellitus may be present with characteristics symptoms such as thirst, polyuria, blurring of vision, and may develop and lead to stupor, coma and, in absence of effective treatment, death[1]. The WHO report on diabetes prevalence alarmed that diabetes has posed a serious threat to developing countries in respect of their existing healthcare services[2]. Further, the prevalence of diabetes is predicted to increase dramatically within 2025. Diabetes Mellitus (DM) particularly type 2 diabetes is now recognized as a major chronic public health problem of Bangladesh and throughout the world[3]. Diabetes mellitus will be the 7th leading cause of death in the world within 2030 whereas it was 12th in 2004 [4].

The prevalence of diabetes has been increasing worldwide and is now epidemic in nature [3, 5]. This increase in the prevalence of diabetes is associated with various risk factors. These include modifiable or environmental factors, such as physical inactivity and obesity or high BMI (Body Mass Index), and non-modifiable or biological factors, such as genetic factors, old age, race/ethnicity, and family history [5]. Several other risk factors are involved in diabetes mellitus which lead to causing the disease; they are high blood pressure [6], socioeconomic status [7-8], living area [9], alcohol[10], and smoking[11], lack of exercise[12] and sedentary lifestyle [13].

The prevalence and causes of diabetes mellitus varies between countries and between different ethnic groups within individual country [14]. Several studies have been conducted in Dhaka city and in different regions of Bangladesh to identify risk factors involved for the development of this disease. No similar study has been conducted in Chittagong. This study was carried out to determine the risk factors for developing diabetes mellitus amongst diabetic patients attending at Chittagong Diabetic Hospital Complex. If risk factors are determined, it would be easy to reduce the rate of increased risk for development of diabetes mellitus in the population of this city and will be helpful to plan effective preventive strategies.

SUBJECTS AND METHODS

The study included five hundred and twelve diabetic subjects comprising 233 male and 279 female, the percentage being found to be 45.51% and 54.49% respectively. This survey was carried out during the period January, 2003-January, 2004 in the Chittagong Diabetic Hospital Complex (CDHC). The study populations were selected randomly and data was recorded according to questionnaire.

A questionnaire was developed and translated into Bengali language. The questionnaire comprises four parts:

General Parameters: It included the information of age, sex, family history of DM, socio-economic status and living area of the patients.

Anthropometrical Parameters: It included measurements of height and weight. In taking height and weight only light clothing's with no shoes were allowed. The subjects were positioned erect keeping heel, back and occiput in the same vertical line alongside a graduated wooden scale fixed to a wall and looking straight ahead

in the same horizontal line at an object fixed to the opposite wall. Weight was measured by spring balance. The performance of the balance was regularly checked.

Biophysical Parameter: It included measurement of blood pressure. Blood pressure was taken after ensuring 15 minutes rest of taking height and weight.

Biochemical Parameters: It included Fasting Blood Glucose (FBG), and blood Glucose 2 hours after drinking sugar. For this purpose, venous blood (10 ml) was taken by venipuncture with the subject sitting comfortably in a chair in a quiet room. Then the patients were given 75 gm of glucose in 250-300 ml of water and were advised to drink. Patients were advised not to smoke, not to take any food and to take rest in a chair for 2 hours. The next blood sample was taken after 2 hours of the glucose load. Serum was collected within 1 hour of blood collection by centrifugation of the blood for 10 minutes at 3000 rpm. Serum glucose was measured by Glucose Oxidase (GOD-PAP) method (Randox Laboratories Ltd., U.K) [15]. Briefly, 5μl serum sample and 500μl reagent were mixed in reaction cell and incubated at 37^0C for 10 minutes. The absorbance of the samples and the standard against the reagent blank were measured at 500 nm within 1 hour. Glucose concentration was calculated in mmol/l using the formula - absorbance of the sample/ absorbance of the standard x 5.55.

RESULTS

Among the chosen 512 diabetic subjects from Chittagong Diabetic Hospital Complex (CDHC), 233 were male and 279 were female, the percent distribution being 45.51% and 54.49% respectively.

Table-1 shows age specific distribution of the study subjects. Higher percentage (61.32%) of DM was observed in the age group of 31-50 years, where male was 27.34% and female was 33.98%. Greater difference was observed as compared to other age groups. About 31.24% (male 16.01%, female 15.23%) and 7.41% (male 2.14%, female 5.28%) diabetics were found in the age group of >50 years and <31 years respectively.

Table 1: Percent distribution of diabetic subjects by age and sex

Age group	Sex	No of diabetic patients	% of the total diabetic patients
<31 years	Male	11	2.15
	Female	27	5.27
31- 50 years	Male	140	27.34
	Female	174	33.98
>50 years	Male	82	16.02
	Female	78	15.23

Table-2 represents the percent distribution of diabetics by living area. Diabetes mellitus was found higher (77.85%) in urban population as compared to the rural population (22.85%). When comparison was made according to sex between these living areas, again there were found 55.44% female and 44.56% male among urban subjects as compared to 51.28% female and 48.72% male among rural subjects.

Table 2: Age specific distribution of diabetic subjects by area and sex

Age group	Area	Sex	No of diabetic patients	% of the total diabetic patients
<31 years	Rural	Male	5	0.98
		Female	6	1.17
	Urban	Male	6	1.17
		Female	27	4.10
31-50 years	Rural	Male	31	6.05
		Female	39	7.62
	Urban	Male	109	21.29
		Female	135	26.37
>50 years	Rural	Male	19	3.72
		Female	17	3.32
	Urban	Male	63	12.30
		Female	61	11.91

Table-3 Shows the distribution subjects by index (BMI). In the subjects under study 74.61% (male 30.08%, female 44.53%) diabetics had BMI >22.0, whereas 25.39% (male 15.43%, female 9.96%) diabetics had BMI <22.0.

Table 3: Distribution of diabetic subjects by Body Mass Index (BMI)

BMI	Sex	No of diabetic patients	% of the total diabetic patients
<22	Male	79	15.43
	Female	51	9.96
>22	Male	154	30.08
	Female	228	44.53

Table-4 Shows the distribution of subject by systolic blood pressure (SBP) and Table-5 Show ton distribution or of subjects by diastolic blood plus sure. Both Systolic Blood Pressure (sBP) and Diastolic Blood Pressure (dBP) were investigated for their association with diabetes mellitus (DM). Increased prevalence of DM was observed with increased sBP. A comparision between groups of sBP <120 mmHg, 120-140 mmHg and >140 mmHg, showed a higher prevalence in the group >140 mmHg (56.25%), as compared to the groups of <120 mmHg (10.55%) and 121-140 mmHg (33.215%). On the other hand, high dBP (>90 mmHg) showed a significant association with DM, the percentage being which was found 51.37% whereas the percentages were found to be 18.17% and 30.47% for the group of <70 mmHg and 70-90 mmHg respectively.

Table 4: Percent distribution of diabetic subjects with systolic blood pressure (sBP) in mmHg

sBP	Sex	No of diabetic patients	% of the total diabetic patients
<120	Male	21	4.10
	Female	33	6.45
120-140	Male	73	14.26
	Female	97	18.95
>140	Male	139	27.15
	Female	149	29.10

Table 5: Percent distribution of diabetic subjects with diastolic blood pressure (dBP) in mmHg

dBP	Sex	No of diabetic patients	% of the total diabetic patients
<70	Male	48	9.37
	Female	45	8.79
70-90	Male	87	16.99
	Female	69	13.48
>90	Male	98	19.14
	Female	165	32.23

Tale-6 depicts the distribution of subjects by socioeconomic class.
In this study, 64% of the total diabetic subjects were found to belong to rich socio-economic class; only 22.77% and 13.67% were found to belong to middle and poor socioeconomic class respectively. Highest prevalence of DM was observed among rich and the lowest prevalence was observed among the poor socioeconomic class.

Table 6: Distribution of diabetic subjects by socioeconomic class

Socioeconomic class	Sex	No of diabetic patients	% of the total diabetic patients
Rich	Male	148	28.90
	Female	180	35.16
Middle	Male	54	10.55
	Female	60	11.72
Poor	Male	31	6.05
	Female	39	7.62

Table-7 shows comparison between positive and negative family history of the diabetics. Out of 512 subjects, 311 (60.74%) were found to have positive family history of DM, of which 29.69% was male and 31.05% was female. On the other hand 201 subjects (39.26%) were found to have negative family history of DM, of which 15.82% was male and 23.44% was female.

Table 7: Distribution of Diabetic subjects by family history

Family history	Sex	No of diabetic patients	% of the total diabetic patients
Positive	Male	152	26.69
	Female	159	31.05
Negative	Male	81	15.82
	Female	120	23.44

DISCUSSION

This study was undertaken as an exploratory investigation on risk factors of diabetes mellitus (DM) in the diabetic subjects attending at the CDHC and having different socio-economic background and living area. The investigated subjects included both male and female of all social classes. However, this study revealed the prevalence of some important risk factors of DM at Chittagong region in Bangladesh. Prevalent risk factors of DM in the population attending at Chiittagong Diabetes Hospital were determined in respect of BMI, family history, age, socioeconomic status and living area. The results of this study showed significant association with previous studies in Bangladesh and worldwide. A total of five hundred and twelve diabetic subjects were included in the study where the number of male and female was 233 (45.51%) and 279 (54.49%) respectively.

In this study, age group 31-50 years showed a higher prevalence (61.32%) of diabetes (male 27.34%, female-33.98%), while in the age group <31 years and >50 years the prevalence were 7.4% (male 2.15% and female 5.28%) and 31.24% (male 16.02%, female 15.23%) respectively (Table 1). Increased age is one of the important risk factor for diabetes mellitus [7] .Nearly 20% of the US populations aged 65-74 years has diabetes [16]. However, in the CDHC the age group >50 years age group didn't show relatively higher prevalence. In this regard it is explainable that due to various limitations people of the age group >50 years could not attend in the CDHC. They might be taking medication in the private clinic or at home. A higher prevalence of diabetes among females was observed in all age categories both in urban and rural areas as compared to the males.

Among the subjects under study urban and rural prevalence were 77.15% (male-34.38%, female-42.77%) and 22.85 % (male-11.13%, female-11.72%) respectively. Urban prevalence was higher than rural ones (Table 2). This observation is also consistent with those of previous studies [9]. Prevalence among females was found to be higher both in urban and rural areas as compared to the males [7]. This finding might be done to the fact that the urban people are mostly used to attending the CDHC; so that the percent distribution found here may vary to some extent.

In the subjects under study, higher prevalence of DM was found among those who have BMI >22.0 than those having BMI <22.0 (Table 3). Finding of previous studies have shown a higher risk for diabetes associated with higher BMI in both sexes [6]. Obesity is greatly associated with increased risk for diabetes. It hampers insulin's ability to remove sugar from the blood stream. Most people who develop type 2 diabetes are obese [17].

In this study, 56.25% of patients had sBP >140 mmHg as compared to the prevalence among patients who had sBP <120 mm Hg (10.55%) and 120-140 mmHg (33.21%) (Table 4). On the other hand, 51.37% of the patients had dBP >90 mmHg as compared to the prevalence among patients who had dBP <70 mmHg (18.16%) and 70-90 mmHg (30.47%) (Table 5). Both systolic (sBP) and diastolic (dBP) blood pressure were the prevalent risk factors for diabetes mellitus. Mollah *et. al* reported higher prevalence of DM among those who had dBP >90 mmHg and sBP >140 mmHg. It was also in agreement with the finding of previous investigations [6].

Among the three socioeconomic classes, highest prevalence (64.06%) of diabetes mellitus was observed in rich class, followed by 22.77% in middle class and the lowest (13.67%) in poor class (Table-6). Higher prevalence among rich socioeconomic class suggests that rich people are at risk of developing diabetes due to their food habit and lifestyle [7]. On the other hand, middle class and poor people appears to be at less risk of developing diabetes or the prevalence falsely appears to be low due to the fact that they are unable to attend CDHC because of their limitations, even though they are carrying the disease. Several studies conducted in the US and other developed countries revealed a higher prevalence of the disease among subjects who were less educated, of a low income, or unemployed [8].

The higher prevalence was found in the group having positive family history (60.74%), as compared to those having negative family history of DM (39.26%) (Table 7). This study showed a significantly higher association of developing DM with positive family history than with negative family history which is consistent with those of other investigations [18]. People with a family history of diabetes are at increased risk for the disease [19]. Genetic factors play important roles in both insulin-dependent and non-insulin-dependent diabetes. Much of the family aggregation of non-insulin-dependent diabetes is secondary to the aggregation of obesity; the disease probably occurs in families with an obesity sensitive genetic susceptibility to diabetes[20].

The findings suggest that high BMI, positive family history, high blood pressure, rich socio-economic class, increased age and urban living area are the most prevalent risk factors for developing DM in the subjects under present study.

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