Epidemiology of type 1 and type 2 diabetes in newly diabetic hospital going people and their associated risk factors in Chittagong metropolitan area, Bangladesh

Ahmad M[1*], Sultana P[1], Matin A[2], Haque M.M[3], Akter F[5], Hoque M.M[4], Rahman M.M[5]

[1]Department of Applied Chemistry and Chemical Technology,
[2]Department of Food Processing and Engineering,
[3]Department of Applied Food Science and Nutrition,
[4]Department of Pathology and Parasitology,
[5]Department of Physical and Mathematical Sciences, Chittagong Veterinary and Animal Sciences University
Khulshi, Chittagong-4225, Bangladesh

Corresponding Author: Monsur Ahmad, Department of Applied Chemistry and Chemical Technology, Chittagong Veterinary and Animal Sciences University, Khulshi, Chittagong-4225, Bangladesh; E-mail: ahmadmonsurfst@gmail.com

Abstract - Type 1 and type 2 diabetes are becoming a pandemic disease and it is a leading cause of death and disability in worldwide. To identify the prevalence of both diabetes types 1 and 2 in diabetes hospital going people, a cross-sectional survey based study was conducted from March to July 2017 in different hospitals in Chittagong metropolitan area of Bangladesh. About 3000 participates both male and female of different age groups were including in this study. Capillary blood glucose concentration was measured in two way as fasting blood glucose (FBG) levels and 2-hour after 75 g oral glucose load (OGTT). Height, weight, waist and hip circumferences and blood pressure, mode of diagnosis, educational status and family history were considered. The prevalence of diabetes was found to be 34.37% (1031). Among them type 2 diabetes was 99.61% and type 1 was only 0.39%. Women showed higher prevalence (51.6%) compare to men (48.01%) from total diabetic patients. Increasing age, higher BMI, obesity and hypertension were not significantly risk for type 1 and type 2 diabetes.

Keywords: FBG, CDGH, BMI, type 1 & type 2 diabetes.

I. INTRODUCTION

1.1 General

Diabetes is one of the fastest growing, most common chronic and deadliest diseases especially in the developed and developing countries like Bangladesh. About 415 million people had diabetes in the world and number will be rise to 642 million in 2040. Globally, 1 per 11 adults has diabetes and a whopping 12% of global health expenditure is spent on diabetes (**IDF, 2015**). Both type I and type 2 diabetes are increasing worldwide in people, especially youth (**Lipton, 2007**). So it is one of the major public health problem. It causes several other diseases, many complications, increases mortality and finally affects the quality of life.

1.2 What is diabetes?

Diabetes is a metabolic disorder in which blood glucose or blood sugar levels are too high due to the deficiency of insulin. It is the most prevalent and devastating chronic non-communicable diseases having serious health, economic and social consequences.

1.3 What is type 1 diabetes?

Type 1 or insulin dependent diabetes is a heterogeneous disorder characterized by complete or partial destruction of pancreatic beta cells, culminating in absolute insulin deficiency. The majority of cases are attributable to an autoimmune-mediated destruction of beta cells (type 1a) while a small minority of cases results from an idiopathic destruction or failure of beta cells (type 1b). Type 1 diabetes accounts for 5–10% of the total cases of diabetes (**Van Belle et al., 2011**).

1.3 What is type 2 diabetes?

Type 2 or non-insulin-dependent diabetes is frequent in developed and developing countries and type 2 diabetes pose a major health threat among these countries (**Wild et al., 2004**). Diabetes mellitus or type 2 diabetes is a clinical syndrome characterized by a disorder in the metabolism of carbohydrates, lipids, and amino acids, either as a result of decreased insulin secretion or due to progressive decline in β-cell function and chronic insulin resistance (**Kudva and Butler, 1997**). Epidemiological studies has said that about 90% to 95% of all diagnosed diabetes cases are type 2 diabetes and genetic factors obesity, age and sex are major contributing factors of this clinical

syndrome (**Niti et al., 2015**; **Hossain et al., 2006**). Environmental factors like high calorie intake and low physical activity are also responsible.

1.4 Purposes of the study

The basic differences of type 1 and type 2 diabetes are- in type 1 diabetes, insulin production is almost absent and it is diagnosed in childhood and adolescent, in type 2 diabetes, insulin production is deficient and diagnosed usually after 30 years (**Dabelea et al., 2007**). A few population based studies conducted among hospital going people to identify the prevalence of type 1 and type 2 diabetes. This study has been conducted to observe the increased prevalence of type 2 and type 1 diabetes at Chittagong metropolitan area Bangladesh.

II. MATERIALS AND METHODS

2.1 Study design and study areas

A cross sectional observational community based study was conducted among four diabetic hospitals going people, in Chittagong Metropolitan area Bangladesh from March to July 2017 among 3000 newly diabetic hospitals going participants.

2.2 Study population

About 3000 participants of different aged groups of Chittagong metropolitan and surrounding areas whose are visited to four diabetic general hospitals to diagnosis diabetes were considered for the study. All the individuals were given an identification number, including all diagnostic parameters.

2.3 Sampling design

At first all individuals communicate with a public relationship disk in which experts enquire about patients name, age, address, occupation and family history. Patients need to come to the hospital with 8 hours of empty stomach in the morning. If their symptoms match with diabetic symptoms, they are considered with patient and allowed for further a lot of chain treatment and if not matched they also performed a glucose test.

2.4 Ethical clearance

Ethical committee approval is mandatory prior to start of study from the institutional ethical committee and an informed consent was obtained from all the study subjects.

2.5 Data collection

Data were collected by using a questionnaires and performing different physical and biochemical tests. The questionnaire included socio-demographic data like- sex, age group, marital status, educational level and family history of diabetes etc. Clinical data included possible risk factor such as cardiovascular problem and obesity. Anthropometric measurement included waist circumference, hip Circumference and weight, height for BMI. Blood pressure reading of individual patient was recorded. Then fasting (for at list 8 hrs) blood glucose level was measured by glucose-oxidase-peroxidase method for each patient. After two hours, further blood glucose level was measured by feeding 75 gm of oral standard glucose by same method. For each cases 5 ml. of venous random blood was taken for blood glucose estimation. After the estimation of random blood glucose (RBS), the participants were classified into normal, impaired glucose tolerance (IGT) and diabetes based on the diagnostic criteria of WHO and American Diabetes Association. If the participants are identified as diabetes then they were referred to respective health centers and started on treatment. Repetition of test was done on a different day for the subjects whose FBS levels were in diabetic range and pre-diabetic range. For pre-diabetes, suggestions were given regarding physical activity, weight reduction, control of blood pressure and repeat FBS levels once a year. Glycated Hemoglobin (HbA1c) test also performed for some patients for proper identification of type 1 and type 2 diabetes.

Criteria of measuring of different parameters
- Obesity as defined by BMI $\geq$ 30 kg/m^2.
- Diabetes (fasting) $\geq$ 60-110 mg/dL.
- Diabetes (after feeding 75 gms. of oral glucose) $\geq$ 140 mg/dL.

2.6 Statistical analysis

Data were stored in Microsoft Excel 2007 and then exported into STATATM 11.0 (Stata Corporation, College Station, TX, USA) for statistical analysis. Descriptive analysis was performed by using percentages, mean and standard deviation for different variables. Finally, one way ANOVA was used to compare the variables. The level of significance was set $\leq$ 0.05.

III. RESULTS AND DISCUSSION

In this cross-sectional study a total 3000 newly diabetic hospital going participants of different aged groups at Chittagong Metropolitan area Bangladesh were considered. Prevalence of type 1 and type 2 and their socio-demographic characteristics are shown in table-1 and anthropometric as well as clinical characteristics of patients are shown in table-2. This study reported that the prevalence of diabetes was 34.37%. This high prevalence was mostly four times higher than previous studies in Bangladesh (**Rahman et al, 2015**). It is also higher than other countries like China 10.9% (**Wang et al, 2017**), Peru 8.4% (**Seclen et al, 2015**). High prevalence might be due to selection of study participants whose were coming to diabetic hospitals due to the presence of some signs and symptoms of diabetes. Here type 1 contributed 0.39% and type 2 contributes 99.61% and majority of the prevalent participants were affected by type 2 diabetes than type 1. This result is not similar with United Kingdom where type 1 contributes 54.2% and type 2 contributes 53.5% (**Daousi et al, 2006**). Female were more prevalent (51.60%) than male (48.01%) and middle aged (30-60 years) of both sexes were more newly affected (66.63%) by diabetes. Here, the prevalence of diabetes in male and female are nearly same this is similar with (**Rahim et al., 2009**) which is conducted in the rural community of Dhaka, Bangladesh, but not agreed by another study conducted in rural community of Gazipur, Bangladesh (**Rahman et al, 2007**). The gender difference was not significant in India (**Ramachandran et al, 1997**), but higher prevalence in women was found in Turkey (**Satman et al, 2002**) and Pakistan (**Shera et al, 1999**). The present study showed the highest prevalence of diabetes in both male and female was observed in age strata 30-60 years than older and bellow 30 years, which similar with Rahman and their colleagues (**Rahman et al., 2007**) but inconsistent with the previous study conducted in Bangladesh (**Sayeed et al. 1997**).

Table 1: Socio-demographic characteristics of the study participants –

Variables	Frequency	(%)
Diabetic positive	1031 (Total 3000)	34.37
Sex		
Male	495	48.01
Female	532	51.60
Age group		
>60	327	31.72
30-60	687	66.63
<30	17	1.65
Educational level		
Illiterate	24	2.34
Basic	57	5.53
Secondary	661	64.11
Graduate	289	28.03
Marital status		
Married	1006	97.56
Unmarried	25	2.44
Family history		
Yes	459	44.52
No	343	33.27
Don't know	229	22.21

Table 1 shows marital status, age groups and educational levels were associated with diabetes, but sex variation has a little significant. Diabetes was more prevalent among married (97.56%) compared to unmarried (2.44%). This is strongly agreed with (**Abdalla and Ahmed, 2017**). Prevalence of diabetes has increased with increasing age but aged group (30-60) is more prevalent than others. The prevalence was 1.65%, 66.63% and 31.72% for age group bellow 30, 30-60 and above 60 and this result similar with (**Ekpenyong et al, 2012; Ahasan et al, 2012**).

Data from diabetic patients were also analyzed. 224 (21.73 %) had obese and 106 (34.37%) were hypertensive. So, obesity and hypertension is not common for diabetic patients and this is also agreed by (**Daousi et al., 2006**). The present study revealed that out of 459 (44.52%) of total patients having diabetes in their family history and 343 (33.27%) having no diabetes in their family history. But 229 (22.21%) patients don't know their family history.

Table 2: Anthropometric and clinical characteristics of patients for type 1 and type 2 diabetic patients-

Variables		Number (n)	%	X^2	p-value
Type of diabetes	Type 2	1027	99.61	0.87	p<0.05
	Type 1	4.0	0.39		
Mode of diagnosis	Symptomatic	614	59.55	0.21	p<0.05
	Incidental	417	40.45		
Hypertension	Yes	106	10.28	0.11	p<0.05
	No	925	89.72		
Obesity	No obese	789	76.53	0.67	P>0.05
	Obese	224	21.73		
Blood Pressure	Normotensive	803	77.89	5.54	P<0.05
	Hypertensive	228	22.11		
Waist Hip Ratio (WHR)	Normal	864	83.80	0.91	p>0.05
	>Normal	161	15.62		
Waist Circumference	Normal	871	84.48	0.43	P<0.05
	>Normal	160	15.52		

In relation to education level the result shows that diabetes is more prevalent in middle educational level subjects. Among illiterate, basic, secondary and graduate levels the prevalence were 2.34%, 5.53%, 64.11% and 28.03%. This finding does not agreed with others studies conducted in several places in Bangladesh (**Ahasan et al, 2011**). Out of total diabetic patients, 871(84.48%) were having is normal (<102 cm) waist circumference and remaining 160 (15.52%) patients having waist circumference more than normal (>102 cm). Waist circumference and diabetes have no significant association (table 2) but this is strongly opposed by (**Bani et al, 2015**).

IV. CONCLUSION

Diabetes is a chronic, progressive disease characterized by elevated levels of blood glucose. It may experience many serious and long-term complications. Effective tools are available to prevent type 2 and type 1 diabetes and to improve management to reduce the complications and premature death that can result from all types of diabetes. People with diabetes can live long and healthy lives if their diabetes is detected and well-managed. Good management using a standardized protocol can potentially prevent complications and premature death from diabetes using, a small set of generic medicines, interventions to promote healthy lifestyles, patient education to facilitate self-care, regular screening for early detection and treatment of complications through a multidisciplinary team. Facilities for diabetes diagnosis and management should be available in primary healthcare settings, with an established referral and back-referral system.

ACKNOWLEDGEMENT

REFERENCES

[1] IDF. 2015. The Stage of Diabetes in Bangladesh, 7th edition. International Diabetes Federassion.

[2] Lipton RB. 2007. Incidence of diabetes in children and youth-Tracking a moving target. JAMA. pp: 297(24): 2760-2762.

[3] Van Belle TL, Coppieters KT, Von Herrath MG. 2011. Type 1 diabetes: etiology, immunology, and therapeutic strategies. Physiological reviews, 91(1). pp: 79-118.

[4] Wild H, Roglic G, Green A, Sicree R, King H. 2004. Globalprevalence of diabetes, estimates for the year 2000 and projections for 2030. Diabetes Care. pp: 27: 1047-53.

[5] Kudva YC, Butler PC. 1997. Insulin secretion in type-2 diabetes mellitus. In Clinical Research in Diabetes and Obesity. volume 2, Diabetes and Obesity. pp: 119–136.

[6] Niti S, Amrit V, Gupta BP, Jasdeep S. 2015. Prevalence and Risk Factors of Diabetes Mellitus among Adults residing in practice Area of a Teaching Hospital in Punjab. Health line Journal. 6(1). pp:57-62.

[7] Hussain A, Vaaler S, Sayeed MA, Mahtab H, Ali SK, Khan AA. 2006. Type 2 diabetes and impaired fasting blood glucose in rural Bangladesh: a population-based study. The European Journal of Public Health. 17(3), pp.291-296.

[8] Diagnosis and classification of diabetes mellitus. 2009. Diabetes care.32:S62–S67Dabelea D, Bell RA, D'Agostino RB Incidence of diabetes in youth in the United States. JAMA. pp:2716–2724.

[9] Rahman MS, Akter S, Abe SK, Islam MR, Mondal MNI, Rahman JS, Rahman MM. 2015. Awareness, treatment and control of diabetes in Bangladesh: a nationwide population-based study. Plops one. pp: 10(2), 0118365.

[10] Wang L, Gao P, Zhang M, Huang Z, Zhang D, Deng Q, Li Y, Zhao Z, Qin X, Jin D, Zhou M. 2017. Prevalence and ethnic pattern of diabetes and prediabetes in China in 2013. Jama. 317(24). pp: 2515-2523.

[11] Seclen SN, Rosas ME, Arias AJ, Huayta E, Medina CA. 2015. Prevalence of diabetes and impaired fasting glucose in Peru: report from PERUDIAB, a national urban population-based longitudinal study.

[12] Daousi C, Casson IF, Gill GV, MacFarlane IA, Wilding JPH, Pinkney JH. 2006. Prevalence of obesity in type 2 diabetes in secondary care: association with cardiovascular risk factors. Post graduate medical journal. 82(966), pp: 280-284.

[13] Rahim MA, Khan AA, Ali SMK, Nahar Q, Shaheen A, Hussain A. 2009. Glucose tolerance in rural population of Bangladesh. Diabetes & Metabolic Syndrome: Clinical Research & Reviews. 3(1). pp: 24-28.

[14] Rahman MM, Rahim MA, Nahar Q. 2007. Prevalence and risk factors of type 2 diabetes in an urbanizing rural community of Bangladesh. Bangladesh Medical Research Council Bulletin. 33(2). pp: 48-54.

[15] Ramachandran A, Snehalatha C, Latha E, Vijay V, Viswanathan M. 1997. Rising prevalence of NIDDM in an urban population in India. Diabetologia. pp: 40:232–237.
[16] Satman I, Yilmaz T, Sengul A, Salman S, Salman F, Uygur S, Bastar I, Tutuncu Y, Sargin M, Dinccag N, Karsidag K, Kalaca S, Ozcan C, King H. 2002. Population-based study of diabetes and risk characteristics in Turkey: results of the Turkish Diabetes Epidemiology Study (TURDEP). Diabetes Care 25. pp: 1551–1556.

[17] Shera AS, Rafique G, Khwaja IA, Baqai S, Khan IA, King H, Ahmed KI. 1999. Pakistan National Diabetes Survey prevalence of glucose intolerance and associated factors in North West at Frontier Province (NWFP) of Pakistan. Journal of the Pakistan Medical Association. 49. pp: 206–211.

[18] Sayeed MA, Hussain MZ, Banu A, Ali L, Rumi MAK, Azad Khan AK. 1997. Effect of socio-economic risk factors on difference between rural and urban in the prevalence of diabetes in Bangladesh. Diabetes Care-7, pp: 20: 551-55.

[19] Abdalla EA, Ahmed RF. 2017. Epidemiology of diabetes among adults in Jabra area "block 14'' in Khartoum state–Sudan: community based study. International Journal Of Community Medicine And Public Health. 4(6). pp: 1863-1869.

[20] Ekpenyong CE, Akpan UP, Ibu JO, Nyebuk DE. 2012. Gender and Age Specified Prevalence and Associated Risk Factors of Type 2 Diabetes Mellitus in Uyo Metropolis, South Eastern Nigeria. pp: 41(1):17-28.

[21] Ahasan HN, Islam MZ, Alam MB, Miah MT, Nur Z, Mohammed FR, Khan MAI, Hossain HT, Mahbub MS. 2011. Prevalence and risk factors of type 2 diabetes mellitus among Secretariat employees of Bangladesh. Journal of Medicine. 12(2). pp: 125-130.

[22] Bani IA. 2015. Prevalence, Knowledge, Attitude and Practices of Diabetes Mellitus among Jazan Population, Kingdom of Saudi Arabia (KSA). Journal of Diabetes Mellitus. pp: 5:115-22.