Original Article

Evaluation of the Clinical Characteristics and Associated Factors of Adult Early-Onset Type 2 Diabetes Mellitus Patients in Tertiary Care Hospitals

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Abstract

Background: *Adult early-onset type 2 diabetes mellitus (T2DM), is increasing worldwide, including Bangladesh. The clinical characteristics and patterns of complications differ significantly between adult early-onset (<40 years) and usual-onset (≥40 years) type 2 DM.*

Objectives: *This study aimed to describe the clinical characteristics of adult early-onset T2DM in Bangladeshi patients and to identify associated risk factors.*

Materials and Methods: *This cross-sectional study was carried out including 185 T2DM patients in an outpatient settings. Clinical characteristics, probable risk factors, and laboratory findings were collected from patients' history and medical records. Participants were categorized into early-onset (<40 years) and usual-onset (≥40 years) groups. Data were analyzed using percentages, mean ± standard deviation, independent sample t-test, Chi-square test, and multivariate regression analysis where appropriate.*

Results: *Early-onset T2DM accounted for 41.6% of cases, while 58.4% were usual-onset. The mean age at diagnosis of DM in the early-onset group was 33.66 ± 4.08 years. Higher educational status, longer duration of diabetes, poor glycemic control (HbA1c ≥ 8%), and higher fasting blood glucose levels were significantly more common among early-onset patients. Early-onset DM was significantly associated with increasing HbA1c categories. Family history of diabetes, obesity, and hyper triglyceridemia were more frequent in the early-onset group. Most vascular complications were more prevalent in the usual-onset group, except peripheral neuropathy, which was more common in early-onset patients.*

Conclusion: *Type 2 diabetes is emerging as a significant health concern among young adults in Bangladesh. Early diagnosis and effective glycemic control are crucial to reduce long-term complications and disease burden.*

Key words: *Early-onset type 2 diabetes, Adult-onset type 2 diabetes, Risk factors, Complications.*

Date of received: *10.04.2025*

Date of acceptance: *30.06.2025*

DOI: https://doi.org/10.3329/kyamcj.v16i02.82201

KYAMC Journal. 2025; 16(02): 64-74.

Introduction

In the past, type-2 diabetes was regarded as a chronic disease most commonly affecting the elderly population, but the age of diagnosis is falling and it is now increasingly diagnosed in young adults globally and also in Bangladesh.[1-3] Different cut-offs for age at diagnosis are used to define adult early-onset type 2 diabetes.[1,4-7] According to ADA the adult early-onset group is 18-44 years and usual onset group is ≥45 years. On the other hand, as defined by the National Institute for Health and Care Excellence (NICE 2015) guideline for type 2 diabetes and Joint British Societies-2 guideline (2005), adult early and later onset type 2 diabetes refer to those whose diabetes was diagnosed 19-<40 and ≥40 years, respectively.[8-9] IDA in 2006 stratified the diabetic patients as 20–39, 40–59, and 60–79 years for estimating the prevalence of diabetes mellitus in the world,

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this criteria was also adopted in the previous studies on young-onset type 2 diabetes.[10-11]

From 2003 to 2006, among all patients with type 2 diabetes in England, patients with type 2 diabetes aged <30 years increased from 5% to 12% and patients with type 2 diabetes aged <40 years accounted for about 24%.[11-12] Another study performed in the Mexicans showed that the prevalence of diabetes diagnosed at less than 40 years of age was 14%.[13] A higher proportion of adult early-onset diabetes was observed more frequently in Asian countries than in Western countries.[14,15]
In Bangladesh, nationwide data on diabetes is still suboptimal, especially for those aged 18 years and older. In the 2017-18 BDHS survey (Bangladesh Demographic and Health Survey 2017-18), different age groups were stratified for calculating prevalence of type 2 DM. They showed that 23.62% was the highest prevalence of type 2 DM which was in age group 18-34 years and 11.73% was in age group 35-39 years.[16] A population based national survey in Bangladesh recently reported a prevalence of hyperglycemia 9.8% among urban adults for those aged 18 years and older.[17] Another study reported that 15% of patients with diabetes were 40 years or below.[3] These findings are alarming youth engagement with type 2 diabetes in our country. Most other reports for this age group are fragmented and done on a smaller scale in scattered places.

The occurrence of adult early-onset type 2 diabetes may be associated with complex interaction between genes and environment. Previous studies have found that obesity, sedentary lifestyle and family history of diabetes mellitus are the major reasons for the increasing early-onset type 2 diabetes.[18,19] This is supported by the observation of an inverse relationship between obesity and age of diagnosis of type 2 diabetes.[20] Of concern is the fact that obesity has increased by 70% in adults aged between 30 and 39 years, thus, making young adults the fastest growing group for obesity and type 2 diabetes.[2] ADA in 2020 described that in youth-onset type 2 diabetes, the major modifiable risk factors are obesity and lifestyle habits of excess nutritional intake, low physical activity, and increased sedentary behaviors with decreased energy expenditure, resulting in the surplus of energy being stored as body fat.[7] Other potentially modifiable risk factors for them include chronic stress and/or depressed mood and sleep disorders.[21-25] Studies in hospital settings in Asia had shown that early-onset diabetes patients had more extensive family history of diabetes, and higher body mass index (BMI), hemoglobin A1c (HbA1c), and low-density lipoprotein cholesterol (LDL- C) level, although there are disputes regarding the significance of these differences.[26-28] On the other hand hospital based studies among populations suggested early-onset diabetes participants had lower systolic blood pressure (SBP), lower LDL-C, higher HbA1c and similar triglyceride levels and BMI compared with late-onset diabetes participants.[6,29,30] The duration of diabetes is directly associated with its complications. In their study Hillier and Pedula confirmed that patients with early-onset type 2 diabetes present a higher risk of cardiovascular disease compared with patients with normal onset type 2 diabetes (age at diagnosis ≥45 years).[20] Also some recent studies demonstrated that adult early-onset type 2 diabetes is a more progressive disease from a cardiovascular standpoint than late-onset type 2 diabetes.[2,31,32] These patients lose up to 15 years of life expectancy, which is two-fold greater than the number of years lost by patients with late-onset diabetes.[33] In contrast to late-onset diabetes, early-onset diabetes is associated with a higher risk of developing microvascular complications often at an earlier stage.[6,34,35] Other studies showed younger people diagnosed with type 2 diabetes (<40 years in this study) have a higher risk of early mortality, cardiovascular disease, chronic kidney disease and retinopathy than older adults diagnosed with type 2 diabetes or people with type 1 diabetes at a similar age.[6,36,37] A large number of early-onset diabetes patients receive inadequate anti-glycaemic treatment and suboptimal cardio-protective treatment, which may be partially attributed to the lack of knowledge regarding the harm of early-onset diabetes in daily clinical practice.[6,38] Diabetes and it's vascular complications have profound effects on individuals and their families and also on the health care system. The detection of the characteristics and associated factors for early-onset diabetes is fundamental to the development of effective policies and intervention strategies to address the growing epidemic of adult early onset type 2 diabetes and it's vascular complications.

Materials and Methods

This was a cross-sectional observational study conducted on 185 type 2 diabetic patients under follow-up in the out-patient department of medicine in Shaheed M. Monsur Ali Medical College, Sirajganj and 250 Bed Bongamata Sheikh Fazilatunnesa Mujib General Hospital, Sirajganj and out patient department of medicine, Khwaja Yunus Ali Medical College and Hospital (KYAMCH), Sirajganj. The study period was from march 2022 to september 2022. The study enrolled type 2 diabetic patients diagnosed in accordance with the World Health Organization (WHO) criteria. We included diagnosed type 2 diabetic patients both male and female with age group 19 -70 years. We excluded the patients with other chronic illnesses like chronic hepatic diseases, chronic arthritis, coeliac disease, terminal illness etc. those may interfere with the blood glucose levels. We also excluded diagnosed cases of gestational diabetes mellitus (GDM), type 1 diabetics, latent auto-immune diabetes in adult (LADA), maturity onset diabetes in young (MODY), pancreatitis, pancreatectomy, pancreatopathy and other endocrine diseases like thyrotoxicosis, Cushing's syndrome, acromegaly etc. Patients taking steroid, thiazide diuretics, phenytoin etc. are also excluded. According to inclusion criteria 185 patients were interviewed as per the study protocol after receiving their informed consent. The information of the patients were availed either from their diabetic guide book or other medical records. Those medical records contained all baseline information of the diabetic patients and necessary advice of diabetes management for subsequent follow-up visit. In this study a structured questionnaire was filled up for each patient to collect data about age, sex, family history of diabetes, socio-demographic factors, educational status, occupation, physical activity etc. In this study we categorized the study participants into 2 groups according to the time of onset of diabetes on the basis of different established guidelines.[8-9] These were adult early-onset type 2 DM (diabetes diagnosed at age 19-<40 years) and adult usual-onset type 2 DM (diabetes diagnosed at age ≥40years). The age of onset and duration of diabetes were also recorded. The selected patients

were evaluated for the presence of vascular complications (retinopathy, nephropathy, peripheral neuropathy, CVD, stroke and PVD)7 through the review of physicians' notes which were recorded in their diabetic guide books or prescriptions. History of oral antidiabetic drugs, insulin, antihypertensive drugs and antilipid drugs of the patients were recorded. Height and weight were recorded. Body mass index (BMI) was calculated as weight in kilograms divided by height in meters squared. Hypertension was diagnosed if systolic pressure was ≥140 mmHg or diastolic pressure ≥ 90 mmHg or if the patient was on antihypertensive drugs.[39] Dyslipidemia was diagnosed by standard guidelines.[40] All the required investigations for each patient were collected from the investigations done by them within last 3 months. The study was approved by Ethical Committee of Shaheed M. Monsur Ali Medical College, Sirajganj and Khwaja Yunus Ali Medical College and Hospital (KYAMCH), Sirajganj. The frequency rates of adult early-onset and usual-onset type 2 diabetes were determined by simple percentages. Continuous data were expressed as mean and standard deviation (SD), while categorical data were expressed as absolute subject number and percentage. Comparisons of the mean values of continuous variables between the two groups were analyzed by using the independent sample t-test. For comparison of qualitative or categorical variables Chi-square test was used. Multivariate logistic regression analysis were performed to estimate the casual effect of predisposing factors on response variable i.e. development of early-onset type 2 DM. Odds ratio (OR) with 95% confidence interval (CI) were provided. All statistical tests were considered significant at a level of $p < 0.05$. SPSS software, version 21 was used for the statistical analysis.

Results

The total study subjects in this cross-sectional study were 185 type 2 diabetic patients with male and female accounted for 54.6% (101) and 45.4% (84), respectively, with a higher ratio of men. During the study time 40.5% (75) of the patients were <40 years and 59.5% (110) were ≥40 years. The mean age of the study participants at that time was 50.84 ± 9.437 years and at the time of detection of diabetes was 42.76 ± 9.690 years. Adult early-onset diabetes was 41.6% (77) and usual-onset was 58.4% (108). The mean duration of diabetes was 8.51 ± 6.405 years.

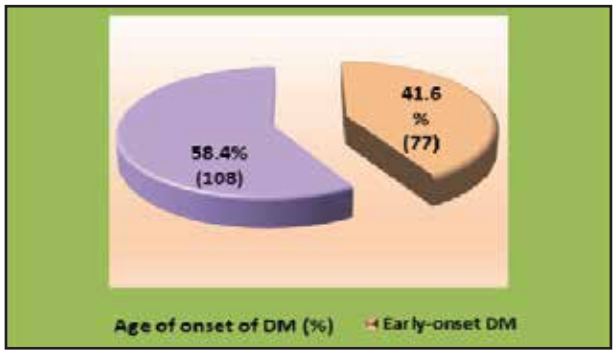

Figure 1: Frequency distribution of the study participants according to age of onset of DM

As shown in Figure 1, the frequency of adult early-onset type 2 DM subjects was quite high 41.6% (77) beyond our expectation, whereas adult usual-onset type 2 DM subjects was 58.4% (108) among the study participants.

Table I: Association of sociodemographic characteristics with the age of onset of DM. (n= 185)

Variables	Total participants (n=185)		p value
	Early- onset DM (n=77)	Usual -onset DM (n=108)	
Age during study time (years)	43.88 ± 7.611	55.81 ± 7.231	**.000**
Age of onset of DM (years)	33.66 ± 4.083	49.24 ± 6.905	**.000**
Gender			
Male	37 (48.1%)	64 (59.3%)	.131
Female	40 (51.9%)	44 (40.7%)	
Residence			
Urban	13 (16.9%)	18 (16.7%)	.969
Rural	64 (83.1%)	90 (83.3%)	
Educational Status			
No education	18 (23.4%)	41 (38.0%)	**.025**
Primary	11 (14.3%)	19 (17.6%)	
SSC	12 (15.6%)	4 (3.7%)	
HSC	10 (13.0%)	14 (13.0%)	
Graduation and above	26 (33.8%)	30 (27.8%)	
Income (Taka)			
<30000	40 (51.9%)	65 (60.2%)	.502
30000 - 50000	28 (36.4%)	31 (28.7%)	
>50000	9 (11.7%)	12 (11.1%)	
Family History o Diabetes			
Yes	51 (66.2%)	60 (55.6%)	.144
No	26 (33.8%)	48 (44.4%)	
Exercise done by patients			
Yes	6 (7.8%)	6 (5.6%)	.543
No	71 (92.2%)	102 (94.4%)	
Type of physical activity			
Light intensity	72 (93.5%)	104 (96.3%)	.434
Moderate intensity	4 (5.2%)	4 (3.7%)	
Vigorous intensity	1 (1.3%)	0 (0.0%)	

Table II: Association of clinical characteristics with the age of onset of DM (n= 185)

Variables	Early - onset DM (n=77)	Usual - onset DM (n=108)	p value
Duration of diabetes (years)	10.40 ± 7.342	7.17 ± 5.278	**.001**
<10 years	38 (49.4%)	70 (64.8%)	
10 - 20 years	29 (37.7%)	33 (30.6%)	**.041**
>20 years	10 (13.0%)	5 (4.6%)	
BMI (kg/m^2)	26.73 ± 4.13	26.33 ± 3.65	.489
Normal 18.5 - 24.9	28 (36.4 %)	36 (33.3%)	
Overweight 25 - 29.9	29 (37.7 %)	53 (49.1%)	.230
Obesity ≥ 30	20 (26.0%)	19 (17.6%)	
HbA 1c (%)	9.9484 ± 2.3266	9.3506 ± 2.2504	.081
<6.5	5 (6.5%)	6 (5.6%)	
6.5 - 7.9	8 (10.4%)	29 (26.9%)	**.022**
≥8	64 (83.1%)	73(67.6%)	
Fasting blood glucose (mmol/L)	10.26 ± 4.62	8.86 ± 3.57	**.021**
2 hours ABF (mmol/L)	14.62 ± 5.58	13.69 ± 5.36	.254
Systolic blood pressure (mmHg)	121.23 ± 17.54	125.26 ± 17.19	.121
Diastolic blood pressure (mmHg)	70.49 ± 10.17	72.17 ± 9.68	.258
Presence of hypertension			
Yes	39 (50.6%)	72 (66.7%)	**.028**
No	38 (49.4%)	36 (33.3%)	
Total cholesterol (mmol/L)	5.15 ± 1.56	4.85 ± 1.55	.197
Triglyceride (mmol/L)	3.17 ± 2.61	2.63 ± 2.18	.130
LDL (mmol/L)	3.40 ± 1.22	3.18 ± 1.10	.184
HDL (mmol/L)	1.17 ± 0.49	1.07 ± 0.31	.114
Dyslipidaemia			
Yes	61 (79.2%)	84 (77.8%)	.814
No	16 (20.8%)	24 (22.2%)	

Table II shows that duration of diabetes was significantly differ between the patients of early-onset and usual-onset DM (10.40 ± 7.342 vs 7.17 ± 5.278, p = .001). Duration of diabetes 10-20 years and >20 years were significantly associated with early-onset DM (37.7% vs 30.6%; 13.0% vs 4.6%, p = .041). We compared BMI categories with age of onset of DM but did not get any significant results. But one interesting thing, we did not get any single patient of underweight according to BMI classification. HbA1c was 9.948 ± 2.326 in early-onset group and 9.350 ± 2.250 in usual-onset group. We found that increasing HbA1c categories had a higher frequency of early-onset DM compared with the lower category of HbA1c. Early-onset DM was significantly associated (6.5%vs 10.4% vs 83.1%, p = .022) with increasing HbA1c categories. HbA1c was also significantly higher in early-onset group than in usual-onset group (83.1% vs 67.6%, p = .022). Fasting blood glucose (10.26 ± 4.62 vs 8.86 ± 3.57, p = .021) was significantly high in early-onset group than usual-onset group. We found hypertension was significantly high in usual-onset DM than early-onset DM (66.7% vs 50.6%, p = .028). Blood glucose 2 hours after breakfast, systolic blood pressure and diastolic blood pressure did not show any significant difference. We observed dyslipidemia in both groups with higher level in early-onset group than usual-onset group.

Table III: Multivariate logistic regression analysis of risk factors for early-onset DM (n=185)

Variables	Odds Ratio (95% CI)	*P* - value
Gender		
Male	1.0	
Female	4.383 (1.757 - 10.936)	**.002**
Residence		
Urban	1.0	
Rural	.989 (.409 - 2.395)	.981
Educational status		
No education	1.0	
Primary	1.505 (.539 - 4.201)	.435
SSC	16.064 (3.637 - 70.956)	**.000**
HSC	4.114 (1.158 - 14.620)	**.029**
Graduation and above	5.145 (1.788 - 14.805)	**.002**
Exercise done by patients		
Yes	1.0	
No	.812 (.198 - 4.602)	.772
Family history of diabetes		
No	1.0	
Yes	1.211 (.607 - 2.416)	.586
History of hypertension		
No	1.0	
Yes	.497 (.254 - .972)	**.041**
History of dyslipidemia		
No	1.0	
Yes	1.287 (.570 - 2.909)	.544
BMI		
Normal (18.5 - 24.9)	1.0	
Overweight (25 - 29.9)	.529 (.248 - 1.130)	.100
Obesity (≥30)	.890 (.351 - 2.254)	.806

On multivariate logistic regression analysis after adjusting potential confounding factors (gender, residence, educational status, physical exercise, family history of diabetes, history of hypertension, dyslipidemia and BMI) we observed that females are in risk of developing early-onset of DM by 4.383 times (OR = 4.383; 95% CI: 1.757-10.936) than their male counterpart. SSC level (OR = 16.064; 95% CI: 3.637-70.956), HSC level (OR = 4.114; 95% CI: 1.158-14.620), graduation and above (OR = 5.145; 95% CI: 1.788-14.805) and positive history of hypertension (OR = 1.211; 95% CI: .607-2.416) are important risk factors for early-onset DM (Table III).

We tried to see the association between micro- and macro-vascular complications with groups of age of onset of DM in Table IV. We found that micro-vascular complications were more frequent in early-onset group (50.6%, 39) than usual-onset group (44.4%, 48). On the other hand, macro-vascular complications were more frequent in usual-onset group (19.4%, 21) than early-onset group (13.0%, 10). But we did not get any significant difference. When we compared all the vascular complications individually in both groups we found that all the vascular complications were more in usual-onset group except peripheral neuropathy. Peripheral neuropathy was higher in early-onset group (37.7%) than usual-onset group (32.4%).

Table IV: Association of micro and macrovascular complications with groups of age of onset of DM (n= 185)

Vascular complications	Early - onset DM (n=77)	Usual - onset DM (n=105)	p value
Microvascular complications	39 (50.6%)	48 (44.4%)	.405
Retinopathy	1 (1.3%)	4 (3.7%)	
Nephropathy	9 (11.7%)	16 (14.8%)	
Peripheral neuropathy	29 (37.7%)	35 (32.4%)	
Macrovascular complications	10 (13.0%)	21 (19.4%)	.246
Coronary heart disease	9 (11.7%)	16 (14.8%)	
Stroke	2 (2.6%)	7 (6.5%)	
Peripheral vascular disease	0	1 (0.9%)	

Table V: Drugs used for hypertension, dyslipidemia and glycaemic control according to age of onset of DM (n= 185)

Variables	Early - onset DM (n=77)	Usual - onset DM (n=105)	p value
Glycaemic control regimens			
Diet control	16 (20.8%)	27 (25.0%)	.173
Oral antidiabetic drugs (OAD)	34 (44.2%)	56 (51.9%)	
Insulin	2 (2.6%)	5 (4.6%)	
Insulin and OAD	25 (32.5%)	20 (18.5%)	
Antihypertensive drugs			
Yes	32 (41.6%)	50 (46.3%)	.523
No	45 (58.4%)	58 (53.7%)	
Antilipidemic drugs			
Yes	13 (16.9%)	23 (21.3%)	
No	64 (83.1%)	85 (78.7%)	.455

We can observe that among the early-onset group (35.1%, 27) the use of insulin is predominant than usual-onset group (23.1%, 25). Oral hypoglycemic medication was the predominant regimen with the both groups receiving this treatment. The most common co-morbidities in these diabetic patients were hypertension and dyslipidemia. But we did not get any significant association of these co-morbidities with age of onset of DM. The scenario of using antihypertensive and antilipid drugs are almost same in both groups (Table V).

Discussion

Prevalence of type-2 diabetes diagnosed at young ages varies according to researchers and regions. One study performed in Mexicans showed that the prevalence of diabetes diagnosed at less than 40 years of age was 14%.[13] According to a study by Hillier and Pedula, the prevalence of diabetes diagnosed at less than 45 years of age was 11.4%. In a study in Korea the prevalence of diabetes diagnosed at less than 40 years of age was 31.1%.[41-42]

South Asians in general, and Asian Indians in particular, have higher risk of type 2 diabetes compared with white Europeans, and a younger age of onset.[43] In India, studies show a wide range of prevalence from 17.2% to 39.2% of early onset DM.[44] Study conducted in Pakistan shows the high prevalence of type 2 diabetes (57.3%) among young adults (15–35 years) aligns with the Second National Diabetes Survey of Pakistan, which reported the highest provincial diabetes prevalence (32.2%) in Sindh, suggesting unique regional pathophysiological mechanisms may be at play.[45] In our study we got 41.6% adult early-onset type-2 DM patients and 58.4% usual-onset patients. One study in our country reported that 15.3% of patients with diabetes were 40 years or below.3 Another study reported that 15% of patients with diabetes were below 40 years and implies that diabetes starts at a much younger age in the Bangladeshi population compared to, e.g. European countries.[46] We got a much higher frequency of early-onset group and it is really worrying. This clearly indicates that the burden of young diabetes is rapidly increasing in our country. This result is quite

different from our expectation. This increasing prevalence of diabetes in South Asians is multifactorial – due to both biologic and lifestyle factors, with urbanization and immigration playing a large role. South Asians have increased visceral adiposity and insulin resistance, impaired β-cell function, and a genetic predisposition to diabetes which culminates in a markedly increased risk of diabetes.[47–49]

We found the mean age at the time of diagnosis of diabetes of our early-onset group was 33.66 ± 4.083 years and that for usual-onset group was 49.24 ± 6.905 years. In a Chinese study they found the mean age at diagnosis of diabetes was 32.96 ± 5.40 years, which is similar to our study.[30] In a study conducted in Korea reported the mean age of young group (they defined early-onset group as young group) was 31.80 ± 6.40 which is compatible with our study. In our study we found a slight higher ratio in female than male (51.9% vs 48.1%) in early-onset DM group, but a higher ratio in male than female (59.3% vs 40.7%) in usual-onset DM group. Logistic regression models of multivariate analysis after adjusting potential confounding factors we found that female person, higher education and positive history of hypertension are important risk factors for early-onset DM. In that Korean study, they found the rate of males was higher in the young group compared with the older group.[42]

We found that the majority participants were residing in rural areas both in early-onset and usual-onset DM group. This could be due to the fact that we conducted the study in two tertiary level hospitals, of them one is situated in rural area. The another is also situated in such an urban area that is very approachable for the nearing rural people. In our study educational status showed significant association with age groups of onset of DM. In case of early-onset group, diabetes was significantly higher in relatively educated patients (SSC passed and graduated patients) than usual-onset group. It gave a reflection that educated people come for diabetes care in hospitals in large proportion and the incidence of diabetes mellitus is increasing among the educated people in early age may be due to their lifestyle. We did not find any study result that shows the relation of age of onset of diabetes with educational status in our country, so we cannot compare our result. In this study it is observed that 66.2% in the early-onset group had a positive family history of diabetes mellitus, which was higher than usual onset group (55.6%). Another study showed a positive family history of diabetes mellitus was 61.5% in the early-onset group and 34.9% in usual-onset group.[42] This result is almost similar with us for early-onset group.

One study in India found that prevalence of DM was significantly higher among subjects who had light grade physical activity compared to moderate and heavy grade activity.[50] This finding is almost same with the present study. In this study it was observed that only 6.5% participants did regular physical exercise and 93.5% participants did not do any type of exercise. According to age of onset of DM only 7.8% participants in early-onset group and 5.6% in usual-onset group did regular physical exercise. The scenario of exercise done by the patients is really worrying. When we tried to find the relationship of type of physical activity with the onset group of diabetes, we found that majority of the participants were in light intensity group, 93.5% in early-onset group and 96.3% in usual-onset group. We observed that there was no significant difference between the two groups. Because both groups comprised almost equal unawareness and negligence about exercise and physical activity. The present study is consistent with those of previous studies that reported that changes in diet and reduced physical activity have led to a fast-growing obese population and an increase in the prevalence and incidence of diabetes in younger persons.[42, 51-53]

Duration of diabetes showed significant difference between the patients of early-onset and usual-onset DM in our study. The patients with duration of diabetes 10-20 years and >20 years were significantly associated with early-onset DM. We found the mean BMI of the study subjects was 26.49 ± 3.85 kg/m^2. One study conducted in our country also found almost same result (mean BMI 26.5 ± 4.2 kg/m^2) like us.3 According to BMI classification we did not get any patient of underweight group. When we compared BMI categories with age of onset of DM, we got most of the participants in obese group. However, we got 61.0% obese participants in early-onset group and 60.2% obese participants in usual-onset group without any significant difference. Like us Kim et al. also observed no difference in BMI according to age of onset, and the maximal BMI was higher in the young group compared with the older group.42 They stated that among persons with a positive family history of diabetes, the disease is known to occur earlier, and obesity has been reported to play a key role in its early onset. Shim et al. reported that diabetes occurred more earlier when persons had a family history of diabetes or a genetic predisposition to beta cell dysfunction along with associated insulin resistance, such as obesity.[54] These results are concordant with those of the present study, which showed that the young group had a higher rate of positive family history of diabetes, higher maximal BMI than the older group. However, we observed no difference in BMI according to age of onset.

When we analyze the age of onset with the three HbA1c categories (≥8, 6.5-7.9 and <6.5), we found that majorities of the participants were in poor glycaemic group (HbA1c ≥8%) both in early-onset group and usual-onset group. We found increasing HbA1c categories had a significant higher frequency of patients compared with the lower category of HbA1c in both early-onset (6.5% vs 10.4% vs 83.1%) and usual-onset DM groups (5.6% vs 26.9% vs 67.6%). The glycaemic control was significantly poor in early-onset group (83.1%) than in usual-onset group (67.6%). Fasting blood glucose was significantly high in early-onset group than usual-onset group in our study. Blood glucose 2 hours after breakfast, systolic blood pressure, diastolic blood pressure and lipid profile did not show any significant difference. These findings are also consistent with other studies.[30,42] We found hypertension was significantly high in usual-onset DM than early-onset DM. Dyslipidemia was present in a higher rate in both groups without significant difference. We observed hypertriglyceridemia in both groups with higher level in early-onset group than usual-onset group. Kim et al. described higher fasting and postprandial glucose levels, higher HbA1c, and higher HOMA-IR in young group compared with the older group.[42]

We found that micro-vascular complications were more frequent in early-onset group and macro-vascular complications were more frequent in usual-onset group. Among the complications peripheral neuropathy was the most frequent complications in both groups. Coronary heart disease and nephropathy were also highly frequent among the participants. When we compared all the vascular complications individually in both groups, we found that all the vascular complications were more in usual-onset group except peripheral neuropathy. We found that the absolute risk for diabetes complications was small among early-onset subjects with short diabetes duration as manifested by the low complication frequency. These subjects, however, have an extremely high lifetime risk of the long disease duration and exposure to the hyperglycemic environment and its associated atherogenic risk factors. Song and Hardisty demonstrated that despite the young age, early onset cohort possessed adverse cardiovascular risk profile characterized by multiple risk factor clustering (obesity, hypertension, dyslipidemia) and suboptimal glycaemic control which mirrored the findings from other studies.[11,27,55,56] In their study, vast majority (>90%) of early onset subjects with short diabetes duration were either overweight or obese. Obesity is known to accentuate the lifetime risk for CVD in diabetes. These findings are consistent with us.

We observed that about 76.7% of our total participants were on antidiabetic treatment following different regimens. Insulin was more common among the early-onset group than usual-onset group. Oral antidiabetic drug was the predominant regimen with the both groups receiving anti-diabetic treatment. In our study we observed, younger patients often faced multiple barriers to early diagnosis and effective management. Low risk perception, limited awareness of symptoms, fear or misconceptions about insulin therapy, lifestyle constraints, work and family commitments, and financial limitations contributed to delayed care, poor glycemic control, and late initiation of insulin therapy. Addressing these barriers through targeted education, patient-centered counselling, and accessible screening programs is essential to improve outcomes in younger adults. In our study although 60.0% of participants were hypertensive, only 44.3% were taking antihypertensive medications. Similarly, while 78.4% had dyslipidemia, just 19.5% received antilipid drugs. When we compared the 2 groups of age of onset of DM we found that the scenario of using antihypertensive and antilipid drugs were almost same in both groups.

Conclusions

The early onset of type 2 diabetes in our study (33.66 ± 4.083 years) and its high prevalence (41.6%) were beyond our expectations. These young patients exhibited more frequent and significant clinical characteristics, risk factors and complications than usual adult diabetic patients. We conclude that female person, positive family history of diabetes mellitus, BMI (obesity), longer duration of diabetes, lack of physical exercise, physical inactivity, HbA1c levels >7% (especially ≥8%), hypertension, and poor glycaemic control are important risk factors for early-onset diabetes. Early identification and screening of at-risk young adults is crucial. Routine screening of adults aged 19–40 years, community-based risk-awareness campaigns, and lifestyle counselling promoting healthy diet and physical activity can facilitate timely detection, improve management, and reduce the long-term burden of diabetes in this population. We hope these findings will provide evidence to guide effective strategies for enhancing diabetes care in primary healthcare settings in our country.

Acknowledgements

We would like to thank to all our colleagues and the staffs of Shaheed M. Monsur Ali Medical College, Sirajganj & 250 Bed Bongamata Sheikh Fazilatunnesa Mujib General Hospital, Sirajganj and Khwaja Yunus Ali Medical College and Hospital (KYAMCH), Sirajganj for their endless support during the study period. We appreciate the willingness and co-operation of our respondents, who were the most important part in our study.

Ethical Clearance

Ethical Clearance was taken by Ethical Committee of Shaheed M. Monsur Ali Medical College, Sirajganj and Khwaja Yunus Ali Medical College and Hospital (KYAMCH), Sirajganj.

Source of Funding

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

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