

## ORIGINAL ARTICLE

## SOCIODEMOGRAPHIC AND CLINICAL CHARACTERISTICS OF NEWLY DIAGNOSED TYPE 2 DIABETICS —A CROSS-SECTIONAL STUDY

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**Background:** Five-hundred-thirty-six million adults are living with diabetes worldwide, 33 million in Pakistan ranking 3<sup>rd</sup> in position globally. We aimed to see the sociodemographic, baseline clinical and metabolic profile of newly diagnosed patients of Type 2 Diabetes Mellitus (T2DM). **Methods:** Sociodemographic data of 98 patients aged  $\geq 18$  years presenting to Endocrinology Department of CDA Hospital Islamabad was collected on a self-developed questionnaire. The inclusion criteria were newly diagnosed T2DM patients, seeking medical advice to initiate therapy. Baseline clinical and metabolic profiles were recorded. Patients already on therapy were excluded. The data was analysed using SPSS-25. **Results:** Mean age of the patients was  $48.92 \pm 12.46$  years with female predominance (54, 55.1%). Mean Body Mass Index (BMI) was  $29.15 \pm 4.99$  Kg/m<sup>2</sup>, waist circumference  $102.69 \pm 10.19$  Cm, and HbA1c was  $9.62 \pm 2.19\%$ . Eighty-one (82.7%) patients belonged to families with monthly income PKR 30,000–40,000 (lower socio-economic status), 59 patients had  $< 7$  years of schooling (60.2%), 51 patients had a negative family history of T2DM (52%), 79 patients were diagnosed within the last 6 months (80.6%), and 44 patients did not have co-morbidities (44.9%). Osmotic symptoms were present in 77 (77.8%) of patients at presentation. Complications of T2DM were present in 18 (18.4%) patients at baseline. **Conclusion:** T2DM is more prevalent in middle aged, overweight, female patients belonging to low socioeconomic status and have osmotic symptoms as main presenting complaint, HbA1c of 9.62%, and 52% patients had a negative family history of T2DM. The complications of T2DM were seen only in 18% at presentation.

**Keywords:** Diabetes mellitus, Newly diagnosed, Socio-demography, Dyslipidemia, HbA1c

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## INTRODUCTION

Diabetes mellitus (DM), a complex metabolic disorder that affects millions of people worldwide is characterized by hyperglycaemia, remains a significant global health challenge with a rapidly increasing prevalence.<sup>1</sup> Diabetes mellitus complications increase morbidity and mortality, and consequently decrease the health-related quality of life (HRQOL). It leads to a number of health complications, including heart disease, stroke, blindness, and kidney failure. The complications affect physical and mental functioning and patients' wellbeing, as well as healthcare costs of each country.<sup>1-4</sup> It has substantial implications for individual health, healthcare systems, and economies.<sup>5</sup>

Diabetes mellitus encompasses a group of chronic diseases with distinct aetiologies, including type 1 diabetes (T1D), type 2 diabetes (T2D), and gestational diabetes mellitus (GDM).<sup>1</sup> T2D accounts for majority of diabetes cases and is closely associated with lifestyle factors, obesity, and sedentary behaviours.<sup>1,6,7</sup> The prevalence of both T1D and T2D has been steadily rising in recent decades, presenting significant public health challenges globally. The World Health Organization (WHO) estimates that the global number of diabetic patients will grow up to 366 million by year 2030. Pakistan has more than 5.0 million DM patients

that is projected to rise up to 13.9% in 2030.<sup>8</sup> In recent years, there has been a growing body of research on the trends in mortality and incidence of diabetes.<sup>2,9</sup> A study showed that the burden due to premature mortality associated with diabetes is decreasing in developed countries on the individual as well as on the population level due to a number of factors, including improvements in diabetes management and treatment, and a decrease in the incidence of diabetes. However, these trends are not guaranteed to continue.<sup>9</sup> The future burden of diabetes will depend on future improvements in excess mortality associated with diabetes and future incidence of diabetes.<sup>9</sup>

Sociodemographic factors play an important role in the development and progression of T2D. The sociodemographic characteristics of persons with diabetes play a significant role in shaping the course of the disease and influencing healthcare outcomes.<sup>1</sup> Several studies have highlighted the association between sociodemographic factors and prevalence of diabetes, yet the available literature often lacks a comprehensive analysis that considers a broad range of sociodemographic characteristics, such as age, gender, race/ethnicity, education level, income, and geographical location.<sup>2,5,7</sup> Understanding the sociodemographic characteristics of persons with

diabetes is crucial in not only proving targeted intervention and improving diabetes management but also in healthcare planning, education and public health research.<sup>5,10</sup> This study aimed to shed light on the sociodemographic profile of newly diagnosed patients of T2DM at the time of their presentation for initiation of pharmacological therapy.

## PATIENTS AND METHODS

This cross-sectional observational study was carried out at Capital Development Authority Hospital, Islamabad, from Aug 2022 to Mar 2023. All newly diagnosed T2DM patients who met the inclusion criteria were invited to participate in the study. Informed consent was obtained from those who agreed to participate after being provided with a participant information sheet. The study included adult individuals (aged 18 years and above) newly diagnosed with T2DM. Patients with previous history of diabetes or diagnosed with T1D were excluded from the study. The study protocol was approved from the Institutional Review Board (IRB) of Capital Development Authority Hospital, Islamabad.

All participants underwent a comprehensive medical examination to assess macrovascular and microvascular complications such as diabetic foot, peripheral neuropathy and nephropathy. For nephropathy assessment, laboratory tests including albuminuria or microalbuminuria and renal function, were conducted. Peripheral neuropathy was assessed using a 10 g monofilament test and vibration sense with a tuning fork (128 Hz) and proprioception. The presence of peripheral neuropathy was defined as an abnormal monofilament test (absence of feeling in 5 or more sites).

Waist circumference was measured using a non-stretchable measuring tape at the midpoint between the inferior margin of the last rib and the top of the iliac crest in a horizontal plane.<sup>11</sup> Height was measured using the same tape and weight was measured at a digital weighing machine. Body Mass Index (BMI) was calculated using mathematical formula [BMI= weight in Kg/(height in meters)<sup>2</sup>]. Systolic and diastolic blood pressure (SBP and DBP) were measured in sitting position.

Structured interviews were conducted at the time of recruitment to collect sociodemographic data factors (age, household income, and occupation), lifestyle characteristics, and comorbidities, and to assess depression status using Patient Health Questionnaire-9 (PHQ-9).<sup>12</sup> Clinical parameters assessment, including weight, height, waist circumference, blood pressure, and foot examinations, were performed during subsequent follow-up appointments scheduled by the treating physician. Laboratory investigations, such as glycated haemoglobin (HbA1c), fasting serum lipid levels (including low-density lipoprotein cholesterol (LDL), high-density lipoprotein cholesterol (HDL), and

triglycerides (TG), urine albumin, microalbuminuria, and renal profile, were also recorded.

Data were entered and analysed using SPSS-25. Categorical data were presented as frequencies and percentages. The association between dependent and independent variables was examined using Chi-square test, and  $p \leq 0.05$  was considered statistically significant.

## RESULTS

Table-1 describes the demographic and clinical characteristics of the newly diagnosed patients of T2DM at the time of their presentation to the endocrinology department for starting treatment. Majority of the patients were female 54 (55.1%), belonged to families with monthly household income of less than PKR 30,000–40,000 (lower socio-economic status) and so had less than 7 years of schooling (60.2%), had a negative family history of T2DM (52%), were diagnosed within the last 6 months (80.6%) and did not have comorbidities (44.9%). The mean age of the patients was  $48.9 \pm 12.5$  years, mean BMI  $29.15 \pm 4.99$  Kg/m<sup>2</sup>, mean waist circumference  $102.69 \pm 10.19$  Cm, and mean HbA1c  $9.62 \pm 2.19\%$ . Osmotic symptoms were present in 18 (78.8%) patients at presentation.

Table-2 presents the presence of complications in patients at the time of initiation of therapy cross-tabulated with gender. Macrovascular complications were noted in 4 (4.0%), microvascular complications and nephropathy in 18 (18.4%) each, and neuropathy in 13 (13.3%) patients at their presentation to the endocrinology clinic.

Segregation on the basis of age at onset of diabetes was done for the complications. Macrovascular complications were present only in patients whose age at onset of diabetes was above 40 years as well as most of the patients with microvascular complications too belonged to that group. No significant difference was seen in the onset of microvascular or macrovascular complications in the groups. (Table-3).

The relationships between gender of the patient, age at onset of T2DM and various continuous variables like age, BMI, waist circumference etc. were examined using *t*-tests. SBP was higher in female newly diagnosed patients of T2DM ( $136.04 \pm 20.00$  mmHg) as compared to men ( $128.20 \pm 14.67$  mmHg). LDL cholesterol level was significantly higher in patients who were diagnosed at age  $\leq 40$  years ( $204.36 \pm 49.50$  mg/dL) as compared to patients diagnosed at age above 40 years ( $185.30 \pm 31.10$  mg/dL). No significant difference was found in age of onset between individuals, male ( $50.18 \pm 13.98$  Years) and female patients ( $47.89 \pm 11.09$  Years) ( $p = 0.368$ ). There was no significant difference of BMI between male and female patients, waist circumference, HbA1c and the other studied parameters. (Table-4, 5).

**Table-1: Characteristics of the newly diagnosed patients of T2DM**

Categorical Parameters		Frequency (%)
Gender	Male	44 (44.9)
	Female	54 (55.1)
Age at onset of T2DM	Age ≤40 years (early onset)	27 (27.6)
	Age >40 years (late onset)	71 (72.4)
Family History	Negative	51 (52.0)
	Positive	13 (13.3)
	Missing data	34 (34.7)
Duration of Diabetes	1–6 months	79 (80.6)
	6–12 Months	7 (7.1)
	1–2 years	1 (1.0)
	Missing data	11 (11.2)
Co-morbidities	Not present	44 (44.9)
	Present	16 (16.3)
	Missing data	38 (38.7)
Monthly Income	10,000–20,000	7 (7.1)
	20,000–30,000	71 (72.5)
	30,000–40,000	3 (3.1)
	40,000–50,000	2 (2.1)
	50,000 and above	4 (4.1)
	Missing data	11 (11.1)
Educational Status	Illiterate	3 (3.1)
	Primary	56 (57.1)
	Middle	21 (21.4)
	Graduate	10 (10.2)
	Missing data	8 (8.2)
Physical Activity	Nil	18 (18.4)
	Light walk up to 30 minutes	28 (28.6)
	Light walk up to 60 minutes	11 (11.2)
	Brisk walk >30 minutes	4 (4.1)
	Only household chores	7 (7.1)
	Missing data	30 (30.6)
Occupation	Housewife	43 (43.9)
	Working Person	31 (31.6)
	Hotel Worker	3 (3.1)
	Farmer	2 (2.0)
	Sedentary Worker	9 (9.2)
	Retired	4 (4.1)
Depression	Present	6 (6.1)
	Not present	10 (10.2)
Osmotic Symptoms	Present	88 (89.8)
	Not Present	77 (78.6)
Continuous Parameters	Age (Years)	Mean±SD
	LDL (mg/dL)	48.9±12.5
	Triglycerides (mg/dL)	190.6±37.8
	HDL (mg/dL)	198.7±1.13
	Systolic BP (mmHg)	37.1±4.81
	Diastolic BP (mmHg)	132.52±18.15
	Pulse (bpm)	85.70±10.09
	BMI (Kg/m <sup>2</sup> )	77.46±11.62
	Waist circumference (Cm)	29.15±4.99
	HbA1c (%)	102.69±10.19
	9.62±2.19	

**Table-2: Gender distribution of complications of T2DM at the time of initiation of therapy**

Complications	Male (n=44)	Female (n=54)	p
Macrovascular	2 (4.5)	2 (3.7)	0.834
Microvascular	6 (13.6)	12 (22.2)	0.275
Nephropathy	2 (4.5)	3 (5.5)	0.821
Neuropathy	4 (9.1)	9 (16.6)	0.271

**Table-3: Distribution of complications of T2DM based on age at onset of the disease**

Complications	Early Onset (n=27)	Late Onset (n=71)	p
Macrovascular	0 (0)	4 (5.6)	0.208
Microvascular	4 (14.8)	14 (19.7)	0.575
Nephropathy	1 (3.7)	4 (5.6)	0.698
Neuropathy	3 (11.1)	10 (14.1)	0.698

**Table-4: Characteristics of patients segregated for gender (t-test)**

Parameters	Male (n=44)	Female (n=54)	p
Age (Years)	50.18±13.98	47.89±11.09	0.368
LDL (mg/dL)	189.74±30.86	191.21±42.90	0.849
Triglycerides (mg/dL)	194.98±72.23	201.76±64.19	0.624
HDL (mg/dL)	36.90±5.73	37.27±3.96	0.709
Systolic BP (mmHg)	128.20±14.67	136.04±20.00	<b>0.033</b>
Diastolic BP (mmHg)	85.02±8.14	86.26±11.49	0.549
Pulse (bpm)	78.25±11.88	76.82±11.47	0.547
BMI (Kg/m <sup>2</sup> )	30.37±9.94	33.61±20.08	0.331
Waist circumference (Cm)	100.11±13.14	101.14±15.74	0.730
HbA1c (%)	9.74±2.31	9.52±2.10	0.618

**Table-5: Characteristics of patients segregated for age at onset of T2DM (t-test)**

Parameters	Early Onset (n=27)	Late Onset (n=71)	p
Age (Years)	34.33±4.48	54.46±9.71	<b>0.000</b>
LDL (mg/dL)	204.36±49.50	185.30±31.10	<b>0.025</b>
Triglycerides (mg/dL)	205.84±90.36	196.01±57.28	0.602
HDL (mg/dL)	37.87±5.84	38.81±4.37	0.330
Systolic BP (mmHg)	135.18±22.51	131.51±16.26	0.373
Diastolic BP (mmHg)	86.56±10.26	85.38±10.08	0.609
Pulse (bpm)	77.18±11.88	77.57±11.41	0.884
BMI (Kg/m <sup>2</sup> )	31.56±12.37	32.38±17.65	0.826
Waist circumference (Cm)	100.96±10.94	100.56±15.79	0.904
HbA1c (%)	9.28±1.97	9.75±2.26	0.343

## DISCUSSION

Type 2 Diabetes Mellitus is a widespread metabolic disorder with significant health implications. As the prevalence of T2DM continues to rise, understanding the sociodemographic and baseline clinical characteristics of newly diagnosed patients becomes crucial for developing targeted intervention strategies and improving patient outcomes as this knowledge offers valuable insights into the distribution and risk factors associated with the disease. T2DM tends to be more prevalent in patients possessing certain sociodemographic characteristics.<sup>7,13,14</sup> Nearly the same characteristic features including mean age, female to male ratio, poor socioeconomic status, low level of education, presence of comorbidities, sedentary lifestyle, old age and underemployment, were observed in our patients.

The 1989 survey of US civilians showed that most of the diabetic patients were unemployed, especially the women. Only 21% diabetic patients included in the analysis had completed college compared to 40.3% non-diabetic patients, with majority diabetics belonging to poor families compared with the nondiabetics.<sup>10</sup> They concluded that diabetic patients in the United States were more likely to be older, female,

members of an ethnic minority, less educated, and have lower incomes, compared with people without diabetes.<sup>10</sup> The reason could be either the older age of most of the diabetic patients, lower education leading to reduced chances of getting employment and women preferring to be housewives. Many other studies have reported similar sociodemographic characteristics of diabetic patients.<sup>5,7,13</sup> A study found that adults with diabetes are more likely to be black or Hispanic and unemployed or underemployed than adults without diabetes.<sup>5</sup> A study of 300 Pakistani patients with T2DM done in Peshawar reported mean age of  $45.3 \pm 11.6$  years, 52.0% females, and 49% illiterate with only 23.4% of the participant having attained 12 years or more education.<sup>13</sup> Majority (80.3%) of their patients were diagnosed with T2DM within the last 6 months, and majority (83%) did limited exercise. Mild to moderate depression was more prevalent in their patients (45.3%) compared to ours where depression was diagnosed only in 10.1% patients.

Studies on the predictors of quality of life of diabetic patients have reported that age, rural residence, low level of education, retirement, and poor economic status are predictors of lower quality of life in diabetic patients.<sup>2,15</sup> It was therefore suggested that health practitioners should be aware not only of the clinical parameters of diabetic patients, but also of their educational level and employment status. Another study demonstrated that majority of the T2DM patients had moderate to severe depressive disorders and thus a deteriorated quality of life.<sup>15</sup>

Examining the baseline clinical profile of newly diagnosed T2DM patients involves a thorough assessment of clinical parameters and comorbidities. Key clinical indicators include BMI, waist circumference, blood pressure, fasting blood glucose levels, lipid profile, and HbA1c. Understanding the prevalence of obesity, hypertension, dyslipidemia, and other associated conditions can aid in predicting disease progression and potential complications.

Most of the patients in this study had dyslipidemia. A case control study<sup>16</sup> on the burden of metabolic syndrome in newly diagnosed T2DM patients reported a significantly higher occurrence of metabolic syndrome in newly diagnosed patients when compared with the matched controls. A study from Palestine reported prevalence of hypercholesterolemia in 22.3% patients and hypertriglyceridemia in 61.9% of their sample.<sup>17</sup> A study from Bangladesh reported prevalence of dyslipidemia in 73% of men and 71% of women.<sup>18</sup> Another study on 301 diabetic Pakistani patients reported occurrence of dyslipidemia in 64.1% of their patients.<sup>19</sup> This information is critical in assessing the cardiovascular risk profile of the study population and evaluating the need for cholesterol-lowering interventions.<sup>1</sup> Other studies have reported similar findings.<sup>20</sup>

The differences in BMI, waist circumference, and HbA1c among our male and female subjects were not significant. A study has reported that younger age at diagnosis was significantly associated with higher HbA1c, total cholesterol, low-density lipoprotein cholesterol and triglycerides level as the patients diagnosed with T2DM under the age of 40 had higher body weight, BMI, waist circumference, and a more adverse lipid profile, compared to participants diagnosed at an older age.<sup>19</sup> Waist circumference is a significant measure of central obesity and together with BMI and HbA1c, it can be a predictor of cardio-metabolic risk.<sup>1</sup> A prospective cohort study<sup>7</sup> with follow-up period of 8 years found a significant interaction between BMI and waist circumference with respect to risk of T2DM.

In our study only 4.0% patients who were diagnosed with T2DM for more than 6 month duration but didn't start therapy yet, developed diabetic foot—a macrovascular complication of diabetes, and 18.4% patients developed microvascular complications such as peripheral neuropathy and nephropathy. Most of those patients were also from the age group >40 years at the time of diagnosis and had been diagnosed with T2DM for more than 6 months but had not initiated therapy yet. Many researchers have reported that increased age, uncontrolled diabetes (HbA1c  $\geq 7\%$ ), dyslipidemia, hypertension, and high BMI and waist circumferences were associated with development of complications.<sup>4,20,21</sup> A study has reported that 27.7% of their patients had developed at least one microvascular complication; the most common complication was nephropathy noted in 19.2% in their sample followed by peripheral neuropathy (8.6%) and retinopathy (6.5%).<sup>3</sup> They suggested need to develop appropriate strategies to increase the awareness and early detection of T2DM.

Understanding the sociodemographic and baseline clinical profile of newly diagnosed T2DM patients is essential for addressing the escalating global burden of this chronic metabolic disorder. An in-depth analysis of the sociodemographic and baseline clinical profile of newly diagnosed T2DM patients has several important implications for disease management and patient care. Identifying high-risk groups can aid in early detection and timely interventions, potentially preventing or delaying the onset of complications.<sup>1,3</sup> Healthcare professionals can develop more targeted interventions, improve patient outcomes, and work towards curbing the prevalence and impact of T2DM on public health.

## CONCLUSION

T2DM is more prevalent in middle aged, overweight, female population with low socioeconomic status. Such patients have osmotic symptoms as the main presenting complaint, and higher HbA1c level. Negative family



history of T2DM was seen in (52%), and complications of T2DM were seen in 18% at presentation.

## RECOMMENDATION

Community awareness campaigns regarding the symptoms of T2DM should be organised targeting the poor masses to educate them regarding preventive measures of T2DM, early recognition of symptoms, and importance of early intervention to prevent complications.

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**FQ:** Study design, data analysis, drafting of manuscript, final approval

**SM:** Study design, organizing content of article, data review and approval of final manuscript

**MFH:** Study design, Data collection, analysis and interpretation

**SQM:** Study design, Data collection, Analysis, literature review and write-up of manuscript

**HRI:** Study design, Data collection, Analysis and interpretation

**FA:** Statistical analysis, Tabulation, Literature review, Final revision of script

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