REAL-world evidence of risk factors and comorbidities in YOUNG Indian adults with type 2 diabetes mellitus: A REAL YOUNG (diabetes) study

Banshi Saboo1, Sanjay Agarwal2, Sunil Gupta3, Brij Makkar4, A Panneerselvam5, Abhay Kumar Sahoo6, G. D. Ramchandani7, Sambit Das8, Suhas Erande9, Yogesh Kadam10, Mahesh V. Abhyankar11, Santosh Revankar11

1Department of Diabetology, Diabetes Care and Hormone Clinic, Ambawadi, Ahmedabad, Gujarat, 2Department of Internal Medicine, Dr. Sanjay Agarwal’s Aegle Clinic, City, Pune, Maharashtra, 3Department of Diabetology, Sunil’s Diabetes Care Research Centre, Nagpur, Maharashtra, 4Department of Diabetology, Dr. Makkar’s Diabetes and Obesity Centre, Delhi, 5Department of Diabetology, Aruna Diabetes Centre, Chennai, Tamil Nadu, 6Department of Endocrinology, IMS and SUM Hospital, Bhubaneswar, Odisha, 7Ramachandani Diabetes Care and Research Centre, Kota, Rajasthan, 8Department of Endocrinology, Endoavour Clinics, Bhubaneswar, Odisha, 9Department of Diabetology, Akshay Hospital and Diabetic Speciality Centre and Insulin Pump Centre, Pune, Maharashtra, 10Department of Diabetology, Poona Diabetes Centre, Pune, Maharashtra, 11Department of Scientific Services, Scientific Services, USV Private Limited, Mumbai, Maharashtra, India

ABSTRACT

Objective: To assess the clinical characteristics, risk factors, and comorbidities associated with type 2 diabetes mellitus (T2DM) in young adult patients. Methods: This is a retrospective, multicentric real-world study that included young adults (18–45 years) with T2DM. Primary information including demographics, medical and family history, biochemical measures (pre-and post-prandial blood glucose levels, glycosylated hemoglobin [HbA1c] and blood pressure, and lipid parameters) smoking and drinking habits were collected retrospectively from the medical records of the respective hospitals/clinics. Data were analyzed using descriptive and appropriate comparative statistics. Results: A total of 22,921 patients from 623 sites were included. The median age was 37.0 years and the majority were men (61.6%). The proportion of patients from the age group >35–≤45 years was 62.7%. Among all patients, 46.9% had only T2DM; however, 53.1% of patients had T2DM with other comorbidities (T2DM with hypertension, dyslipidemia, and both). The majority of patients had elevated body mass index (BMI) (overweight, 46.6%; and obese, 22.9%). Family history of T2DM (68.1%) was most common in overall population. Sedentary lifestyle (63.1%), alcohol consumption (38.9%), and regular smoking (23.1%) were the most common associations in patients with T2DM with dyslipidemia and hypertension. Uncontrolled HbA1c level (≥7%) were observed in 79.2% of patients. The level of HbA1c was significantly increased with the duration of T2DM and sedentary lifestyle (p < 0.001). Conclusion: Higher BMI, family history of T2DM, sedentary lifestyle, alcohol consumption, and smoking were the most common risk factors, while hypertension and dyslipidemia were the most prevalent comorbidities associated with T2DM in young Indian adults.

Keywords: Diabetes, hypertension, risk factors, sedentary lifestyle, young

Address for correspondence: Dr. Mahesh V. Abhyankar, Vice President, Scientific Services, USV Pvt Ltd, Mumbai, Maharashtra, India. E-mail: dr.mabhyankar@gmail.com

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Introduction

Diabetes mellitus (DM) is one of the most prevalent noncommunicable diseases that lead to significant morbidity and mortality. The pandemic of DM had affected 9.3% of global population in 2019 and is projected to increase to more than 10% by 2030. In India, the estimated number of people living with diabetes was 77 million in 2019 and it will reach 101 and 134 million by 2030 and 2045, respectively.[1]

The Indian Council of Medical Research–India Diabetes (ICMR-INDIAB) study reported that around 51% of the adult population (with mean age ranging from 35.8 to 43.9 years) from 15 states of India have diabetes or prediabetes.[2] This study also highlighted that the take-off point for diabetes was in the age group of 25–34 years in both urban and rural areas of India indicating the early onset of diabetes from the young age.[3] Indian patients present a high rate of progression from prediabetes to diabetes mainly due to the aggressive nature of the disease.[4] Evidence suggests an early onset of type 2 diabetes mellitus (T2DM) in Indians as compared to Western populations.[5-7] Several studies have revealed a high prevalence of T2DM in young population.[6,7] Therefore, it is of paramount importance to screen the young Indian population for early diagnosis of prediabetes to prevent progression to T2DM and the risk of associated comorbidities.

Major risk factors associated with T2DM are obesity, family history, sedentary lifestyle, and comorbidities.[8] Consumption of energy-dense foods with reduced physical activity is the key contributor to obesity among young people. Family history is another factor associated with the development of T2DM in offsprings. Consequently, the offspring of a parent with T2DM has high chances of having T2DM in adulthood and the risk is even higher when both the parents have T2DM.[9] Insulin resistance is a common key mechanism in the pathogenesis of T2DM and other comorbid conditions include hypertension, dyslipidemia, polycystic ovary syndrome, and rheumatoid arthritis. These risk factors predominantly affect the young population which could lead to longer disease exposure and increased chronic complications.[10-12] Hence, the early identification of risk factors is necessary to avoid further complications and comorbidities.

With the view of limited real-world evidence about the prevalence of various risk factors and associated comorbidities among the young adult populations from India, the present real-world study was aimed to determine the patterns of T2DM, risk factors, and comorbidities in young Indian adults.

Materials and Methods

This is a retrospective, multicentric, and real-world study conducted across 623 sites in India. The study protocol was approved by an Independent Ethics Committee. The study was conducted in accordance with the ethical principles that are outlined in the Declaration of Helsinki.

Study population

The present study included young adults of either sex, age within the range of 18 to 45 years who were diagnosed with T2DM. Demographic details (age, sex, weight, height, and sedentary lifestyle), medical and family history, biochemical measures (pre-and post-prandial blood glucose levels, HbA1c, blood pressure, and lipid parameters), smoking and alcohol habits were extracted from hospital/clinical records and a single dataset was created.

Definitions

According to the Standards of Medical Care in Diabetes by the American Diabetes Association (ADA) 2020, optimal glycemic control in nonpregnant adults was defined as HbA1c <7%, while uncontrolled diabetes was defined as HbA1c ≥7%; fasting blood glucose (FBG) was defined as >130 mg/dL, and postprandial blood glucose (PPG) was defined as ≥200 mg/dL.[13]

Obesity: Generalized obesity was defined as BMI ≥25 kg/m²; overweight as BMI 23–25 kg/m², and abdominal obesity was defined as waist ≥90 cm (males) and ≥80 cm (females).[14]

Statistical analysis

Data were analyzed using the Statistical Package for Social Sciences (SPSS) software, version 23.0. Data were presented as number and percentages or median (interquartile range). Normal distribution of quantitative data was assessed by Shapiro–Wilk test. The comparison of quantitative and qualitative variables between the groups was done using the Mann–Whitney U test and Chi-square test, respectively. A P value < 0.05 was considered statistically significant.

Results

A total of 22,921 patients with a median (IQR) age of 37.0 (33.0–39.0) years were included in this study. The proportion of men (61.6%) was higher than women (38.4%). A total of 46.6% of the patients were categorized as overweight, 22.9% of patients were obese, 28.9% were normal weight, and 1.5% were underweight. Among the patients, 46.9% had only T2DM, while the incidence of patients diagnosed with T2DM and hypertension was 27.8% followed by T2DM with dyslipidemia and hypertension (13.5%), and T2DM with dyslipidemia (11.7%).

Family history of T2DM was present in 15,368 (68.1%) patients. The median levels of HbA1c, fasting plasma glucose (FPG), and postprandial plasma glucose (PPG) were 7.8%, 140.0 mg/dL, and 215.0 mg/dL across all the population, respectively [Table 1]. The correlation coefficient of FPG level was found to be significantly positive with the PPG level (r² = 0.5463) [Figure 1a]

Age group-wise observations

The majority of patients belonged to the age group of >35 to ≤45 years (n = 14376). The proportion of patients diagnosed
with T2DM only was significantly higher in the youngest age group (≥18 to ≤25 years, 62.1%), while the proportion of patients having T2DM with hypertension was significantly higher in the age group of >35 to ≤45 years (67.8%) (p < 0.001). The incidence of risk factors showed an increasing trend from the ≥18 to ≤25 years age group to the >35 to ≤45 years age group. The median waist circumference was significantly higher in the patients of age group >35 to ≤45 years (90 cm) as compared to the other two age groups (≥18–≤25 years: 87 cm; and >25–≤35 years: 89 cm) (p < 0.001) [Table 2].

A family history of T2DM was reported in more than 60% of the patients across all the age groups (≥18 to ≤25 years, 61.1%; >25 to ≤35 years, 66.7%; and >35 to ≤45 years, 69.2%) [Figure 1a]. Regular smoking and alcohol consumption were more common in patients of the age group >35 to ≤45 years (p < 0.001), while a sedentary lifestyle was observed in over 45% of the population across all the age groups. The mean BMI showed a significantly increasing trend from the youngest age group to the oldest group (p < 0.001) [Figure 1b]. A significantly higher level of mean FPG was observed in patients of the age group >35 to ≤45 years (142.0 mg/dL) compared to the other age groups [Figure 2a, P < 0.001]. The mean PPG and HbA1c concentrations were significantly higher in the patients of age group >35 to ≤45 years (216 mg/dL and 7.8%, respectively) as compared to patients of the age group >25–≤35 years (p < 0.001) [Figure 2b and 2c].

Table 1: Demographic characteristics of study population

| Parameters                          | Number of patients (n=22921) |
|-------------------------------------|-----------------------------|
| **Age (years)**                     | 37.0 (33.0-39.0)            |
| **Age group (years), n (%)**        |                             |
| ≥18-≤25                             | 881 (3.8)                   |
| >25-≤35                             | 7664 (33.4)                 |
| >35-≤45                             | 14376 (62.7)                |
| **Sex, n (%)**                      |                             |
| Men                                 | 14129 (61.6)                |
| Women                               | 8792 (38.4)                 |
| **Anthropometric parameters**       |                             |
| Height (cm) [n=22327]               | 164.0 (158.0-170.0)         |
| Weight (kg) [n=22748]               | 72.0 (65.0-80.0)            |
| BMI, (kg/m²) [n=22303]              | 26.8 (24.3-29.6)            |
| Underweight                         | 336 (1.5)                   |
| Normal weight                       | 6453 (28.9)                 |
| Overweight                          | 10396 (46.6)                |
| Obese                               | 5118 (22.9)                 |
| Waist circumference (cm) [n=16272]  | 90.0 (74.0-198.0)           |
| **Diagnosed with n (%)**            |                             |
| T2DM                                | 10760 (46.9)                |
| T2DM with dyslipidemia              | 2691 (11.7)                 |
| T2DM with HTN                       | 6369 (27.8)                 |
| T2DM with HTN and dyslipidemia      | 3101 (13.5)                 |
| **Family history, n (%) [n=22581]** |                             |
| T2DM                                | 15368 (68.1)                |
| T2DM with HTN                       | 7578 (33.1)                 |
| T2DM with dyslipidemia              | 4294 (19.2)                 |
| T2DM with HTN and dyslipidemia      | 3451 (15.1)                 |
| **Smoking habits, n (%) [n=21831]**  |                             |
| Former                              | 1123 (5.1)                  |
| Occasional                          | 3470 (15.9)                 |
| Regular                             | 3800 (17.4)                 |
| No                                  | 13438 (61.6)                |
| **Alcohol consumption, n (%) [n=22139]** | 6380 (28.8)           |
| Sedentary lifestyle, n (%) [n=21817] | 11348 (52.0)               |
| Duration (days) [n=21275]           | 600.0 (180-1080)            |
| **Biochemical parameters**          |                             |
| FPG (mg/dL) [n=21272]               | 140.0 (120.0-170.0)         |
| PPG (mg/dL) [n=21517]               | 215.0 (180.0-265.0)         |
| HbA1c (%) [n=17404]                 | 7.8 (7.0-8.6)               |
| SBP (mm Hg) [n=9065]                | 142.0 (130.0-158.0)         |
| DBP (mm Hg) [n=9034]                | 90.0 (83.0-98.0)            |

Data shown as median (IQR), unless otherwise specified. BMI, body mass index; DBP, diastolic blood pressure; T2DM, type 2 diabetes mellitus; FPG, fasting plasma glucose; HbA1c, hemoglobin A1c; HTN, hypertension; IQR, interquartile range; PPG, postprandial plasma glucose; SBP, systolic blood pressure.
**Diagnosis-wise observation**

The majority of patients belonged to the age group of >35 to ≤45 years among all the diagnosis groups (T2DM, 57.0%; T2DM with hypertension, 64.7%; T2 DM with dyslipidemia, 67.8%; and T2DM with hypertension and dyslipidemia, 70.6%). Alcohol consumption was highest in the patients diagnosed with T2DM with dyslipidemia and hypertension (p < 0.001). Regular smoking was highest in patients having T2DM with dyslipidemia and hypertension (23.1%) and T2DM with dyslipidemia (22.4%). A sedentary lifestyle was more common in patients having T2DM with hypertension and dyslipidemia (63.1%) compared to other diagnosis (p < 0.001) [Table 3]. The median PPG level was higher in the patients diagnosed with T2DM along with hypertension and dyslipidemia compared to patients with T2DM, T2DM with hypertension, and T2DM with dyslipidemia. The median HbA1c levels showed poor glycemic control across all the groups (7.6%–8.0%) [Table 3]. A family history of T2DM was reported in majority of the patients (range, 63.7%-74.6%) across all the diagnosis -wise groups. A family history of hypertension was most common in patients diagnosed with T2DM with hypertension (56.1%) and T2DM with dyslipidemia and hypertension (60.2%) (p < 0.001) [Figure 2b].

**Glycosylated hemoglobin HbA1c level-wise observation**

The majority of patients diagnosed with T2DM (n = 13796) had uncontrolled HbA1c levels (≥7%). Of patients with uncontrolled T2DM, a substantial proportion (n = 10793, 78.2%) had levels of HbA1c in the range of ≥7% to ≤9% while 3003 (21.8%) patients had HbA1c levels >9%.

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**Table 2: Age group-wise analysis**

| Parameters                           | Group A (≥18≤25 years) | Group B (>25≤35 years) | Group C (>35≤45 years) | P       |
|--------------------------------------|------------------------|------------------------|------------------------|---------|
| Age (years)                          | 24.0 (21.0-25.0)       | 32.0 (30.0-34.0)       | 39.0 (28.0-40.0)       | <0.001  |
| Sex, n (%)                           | 496 (56.3)             | 4505 (58.8)            | 9128 (63.5)            | <0.001  |
| Waist circumference (cm)             | 87.0 (79.0-95.7)       | 89.0 (80.0-96.5)       | 90.0 (80.0-98.0)       |         |
| Diagnosed with, n (%)                | 547 (62.1)             | 4083 (53.3)            | 6130 (42.6)            | <0.001  |
| Smoking habits, n (%)                | 72 (8.7)               | 404 (5.6)              | 647 (4.7)              | <0.001  |
| Alcohol consumption, n (%)           | 625 (75.2)             | 4687 (64.4)            | 8126 (59.2)            |         |
| Sedentary lifestyle, n (%)           | 388 (47.0)             | 3639 (49.6)            | 7321 (53.6)            | <0.001  |
| Duration (days)                      | 420.0 (180.0-1080.0)   | 480.0 (240.0-1020.0)   | 720.0 (360.0-1080.0)   |         |

Data shown as median (IQR), unless otherwise specified. *n=881; **n=7664; *n=14376 unless otherwise specified. a-group A vs B; b-group B vs C; c-group A vs C. T2DM, type 2 diabetes mellitus; HTN, hypertension; IQR, interquartile range.

**Figure 2:** Distribution of patients according to family history (a) and age group and (b) diagnosis. DM, diabetes mellitus; HTN, hypertension.
3608 (20.7%) patients had controlled HbA1c levels (<7%). Regression analysis showed a large variability between age and BMI with HbA1c [Figure 1b and 1c]. The levels of HbA1c were significantly increased with increasing duration of T2DM (<7%, 3540 days; ≥7 to ≤9%, 600 days; >9%, 720 days; P < 0.001) and sedentary lifestyle (<7%, 51.3%; ≥7 to ≤9%, 51.5%; >9%, 55.3%; P = 0.001).

### Discussion

The present study evaluated the risk factors associated with T2DM along with comorbidities like hypertension and dyslipidemia in young Indians diagnosed with T2DM in the real-world setting. The key findings were as follows: majority of patients were men in the age group of >35 to ≤45 years; around 70% of population had elevated BMI, more than half of the patients had additional associated one or two comorbidities (hypertension, dyslipidemia or both); family history of T2DM, sedentary lifestyle, elevated BMI, alcohol consumption, and regular smoking were the common risk factors associated with T2DM; the incidence of uncontrolled HbA1c level was very common (79.2%); and the risk of elevated HbA1c increased with increasing duration of T2DM and sedentary lifestyle.

Early diagnosis of T2DM has become a fundamental step in the management and reducing the complications and mortality risk associated with T2DM. The present study showed that the incidence of T2DM was strongly associated with nonmodifiable risk factors including age and family history. Around 60% of patients in the youngest age group were diagnosed with T2DM alone. Similarly, an evidence-based STEPS study reported that the prevalence of diabetes was 51% in patients of the age group 25–44 years, suggesting that half of the population were young adults.[13] The burden of DM in India has increased with the

### Figure 3: Age group-wise analysis. (a) BMI, (b) FPG, (c) PPG, and (d) HbA1c. *Group A vs B, Group B vs C, Group A vs C, Group A, ≥18–≤25 years; Group B, >25–≤35 years; Group C, >35–≤45 years. BMI, body mass index; FPG, fasting plasma glucose; HbA1c, hemoglobin A1c; PPG, postprandial plasma glucose

### Table 3: Diagnosis-wise analysis

| Parameters                          | Group A (T2DM only) (n=10760)* | Group B (T2DM with dyslipidemia) (n=2691)** | Group C (T2DM with HTN) (n=6369)† | Group D (T2DM with Dyslipidemia and HTN) (n=3101)## | P       |
|------------------------------------|-------------------------------|---------------------------------------------|----------------------------------|-----------------------------------------------|--------|
| Age (years)                        | 36.0 (32.0-39.0)              | 38.0 (34.0-40.0)                            | 37.0 (34.0-39.0)                 | 38.0 (35.0-40.0)                              | <0.001<sup>a</sup>, 0.009<sup>b</sup> |
| Age group (years), n (%)           |                               |                                             |                                 |                                               |        |
| ≥18–<25                            | 547 (5.1)                     | 162 (2.5)                                   | 81 (3.0)                        | 91 (2.9)                                      | <0.001  |
| >25–≤35                            | 4083 (37.9)                    | 1892 (29.7)                                 | 869 (32.3)                      | 820 (26.4)                                    |        |
| >35–≤45                            | 6130 (57.0)                    | 4315 (67.8)                                 | 1741 (64.7)                     | 2190 (70.6)                                   |        |
| Sex, n (%)                         |                               |                                             |                                 |                                               | <0.001  |
| Men                                | 6393 (59.4)                    | 4012 (63.0)                                 | 1697 (63.1)                     | 2027 (65.4)                                   |        |
| Women                              | 4367 (40.6)                    | 2357 (37.0)                                 | 994 (36.9)                      | 1074 (34.6)                                   |        |
| BMI (kg/m²)                        | [n=10457]                      | [n=6182]                                    | [n=2629]                        | [n=3035]                                      | <0.001<sup>a</sup>, 0.041<sup>bc</sup> |
| Waist circumference (cm)           | 26.2 (23.8-28.9)               | 27.1 (24.8-29.8)                            | 27.4 (25.0-30.0)                | 27.8 (25.3-30.8)                              |        |
| Smoking habits, n (%)              | [n=10312]                      | [n=6127]                                    | [n=2555]                        | [n=2837]                                      | <0.001  |
| Former                             | 487 (4.7)                      | 351 (5.7)                                   | 119 (4.7)                       | 166 (5.9)                                     |        |
| Occasional                         | 1443 (14.0)                    | 1128 (18.4)                                 | 400 (15.7)                      | 499 (17.6)                                    |        |
| Regular                            | 1360 (13.2)                    | 1374 (22.4)                                 | 411 (16.1)                      | 655 (23.1)                                    |        |
| No                                 | 7022 (68.1)                    | 3274 (53.4)                                 | 1625 (63.6)                     | 1517 (53.5)                                   |        |
| Alcohol consumption, n (%)         | [n=10440]                      | [n=6209]                                    | [n=2608]                        | [n=2882]                                      | <0.001  |
| Sedentary lifestyle, n (%)         | [n=10268]                      | [n=6096]                                    | [n=2589]                        | [n=2864]                                      | <0.001  |
| FPG (mg/dL)                        | [n=9929]                       | [n=5856]                                    | [n=2573]                        | [n=2914]                                      | 0.011<sup>a</sup>, <0.001<sup>a</sup>, 0.500<sup>b</sup> |
| PPG (mg/dL)                        | [n=10055]                      | [n=5947]                                    | [n=2568]                        | [n=2947]                                      | 0.006<sup>bc</sup>, <0.001<sup>a</sup>, 0.146<sup>bc</sup> |
| HbA1c (%)                          | [n=8038]                       | [n=4624]                                    | [n=2223]                        | [n=2519]                                      | <0.001<sup>a</sup>, 0.048<sup>b</sup>, 0.006<sup>bc</sup> |

Data shown as median [IQR], unless otherwise specified. *n=10760; **n=2691; †n=6369; ##n=3101, unless otherwise specified: group A vs B, group A vs C, group A vs D; group B vs C, group B vs D; group C vs D. BMI, body mass index; T2DM, type 2 diabetes mellitus; FPG, fasting plasma glucose; HbA1c, hemoglobin A1c; HTN, hypertension; IQR, interquartile range; PPG, postprandial plasma glucose
increasing incidences of T2DM diagnosis (from 5.5% to 7.7%) in
the adult population (20 years and older) in the last few decades.\textsuperscript{[16]}

A family history of T2DM is the most important nonmodifiable
risk factor responsible for the early occurrence of T2DM. This
study showed that more than 60% of patients across all age
groups had a family history of T2DM. Similar findings were
observed in studies done by Patel et al. in Gujarat and Geetha
et al. in Tamil Nadu which reported positive family history of
DM in around 60% of the population.\textsuperscript{[17,18]} People with a positive
family history are more prone to develop DM at the early stages
of life.\textsuperscript{[17]} This showed that family history of T2DM is highly
associated with the increasing risk of T2DM in young population.
Early screening in young population can be helpful in identifying
the people with a positive history of DM and can be made aware
of the early risk of diabetes and modify the lifestyle accordingly.
Behavioral modification including proper physical activity and
healthy diet will be advised to these patients for delaying the early
onset of this disease.

In the present study, among patients diagnosed with T2DM,
hypertension (27.8%) was the most common comorbidity
followed by dyslipidemia (11.7%) and the triad of T2DM,
dyslipidemia, and hypertension (13.5%). Dyslipidemia and
hypertension are the major risk factors associated with
macrovascular diseases and emphasizing strict glycemic control
may help in delaying or preventing macrovascular disease. The
comorbid association of T2DM and dyslipidemia was strongly
associated with the age group of young adults. Similarly, a
STEPS survey reported the prevalence of T2DM-associated
comorbidities and among patients with T2DM as 60% of them
had hypertension and 36% patients had dyslipidemia.\textsuperscript{[19]}

The present study is a large-scale study involving a large cohort
of the young Indian adults and therefore could provide the
evidence with respect to the strong correlation between these risk
factors.\textsuperscript{[10,20]} A recently published cross-sectional study evaluated
that lifestyle factors including alcoholism, smoking, obesity, and
family history were the risk factors related to diabetes.\textsuperscript{[21]} In the
present study, the prevalence of T2DM was more common
in young adult patients of age ranging from 25 to 45 years.
Further, family history of T2DM, regular smoking, and sedentary
lifestyle were the other risk factors observed in our population.
A recent meta-analysis also demonstrated supporting evidence
with respect to common risk factors associated with T2DM that
include smoking, sedentary lifestyle, and obesity.\textsuperscript{[22]}

The target level of HbA1c in patients with T2DM is usually
less than 7%.\textsuperscript{[23]} A high level of HbA1c increases the risk of
T2DM-related complications. Therefore, an early intensive
management of uncontrolled HbA1c is needed to reduce these
complications. In the current study, a majority of patients had
uncontrolled HbA1c levels (≥7%). Also, a rising trend was
observed with respect to FPG and PPG levels with the severity
of HbA1c. This is in accordance with an observational study
on patients diagnosed with T2DM who had high mean levels
of HbA1c (8.5%) with increased FPG (165.4 mg/dL) and
PPG (258.4 mg/dL).\textsuperscript{[24]} A recent TIGHT (The Investigation
of Glycosylated Hemoglobin on Therapy in Indian Diabetics)
study evaluated glycemic control in adult Indians and their
association with microvascular complications. The authors
revealed that more than half (53.1%) of the patients were young
adults (<55 years) and poor glycemic control was very common
in Indian population with T2DM (76.6%).\textsuperscript{[19]} These observations
are in concordance with the present study and together indicate
a high burden of poor glycemic control in Indian adults.

Several limitations of this study should be considered. This study
did not record the socioeconomic and educational statuses of
the patients, medications consumed by the patients which could
have added valuable data while inferring the observations.

**Conclusion**

The overall observations indicate that men from the age group
of 25–45 years were most commonly affected by T2DM. Elevated
BMI, family history of T2DM, sedentary lifestyle, alcohol
consumption, and smoking are the risk factors associated with
DM in young Indian adults. Hypertension and dyslipidemia
are the prevalent comorbidities associated with T2DM. Hence,
early diagnosis of diabetes and the associated comorbidities
and treating hyperglycemia and its comorbidities to target levels early
in the course of disease is necessary for alleviating the long-term
risk of T2DM-related complications.

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**Contributors:** Dr. A Balachandran, Dr. A K Gupta, Dr. A
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Talib, Dr. Ambairan Viswanathan, Dr. Amish V Shah, Dr. Amit
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5. A recent TIGHT (The Investigation of Glycosylated Hemoglobin on Therapy in Indian Diabetics)
   study evaluated glycemic control in adult Indians and their
   association with microvascular complications.
6. More than half (53.1%) of the patients were young
   adults (<55 years) and poor glycemic control was very common
   in Indian population with T2DM (76.6%).
7. Further, family history of T2DM, regular smoking, and sedentary
   lifestyle were the other risk factors observed in our population.
8. A high level of HbA1c increases the risk of
   T2DM-related complications. Therefore, an early intensive
   management of uncontrolled HbA1c is needed to reduce these
   complications.
9. A rising trend was observed with respect to FPG and PPG levels with the severity
   of HbA1c.
10. The target level of HbA1c in patients with T2DM is usually
    less than 7%.
11. HbA1c (8.5%) with increased FPG (165.4 mg/dL) and
    PPG (258.4 mg/dL)
12. A recent TIGHT (The Investigation of Glycosylated Hemoglobin on Therapy in Indian Diabetics)
Saboo, et al.: Diabetes in young Indian adults

Rajesh Regonda, Dr. Rajeshwar Kant Chandra Mishra, Dr. Rajeshwar Singh, Dr. Rajnish Kumar Dahuja, Dr. Rajnish Saxena, Dr. Rakesh Agarwal, Dr. Rakesh Kumar Aran, Dr. Rakesh Kumar Singh, Dr. Rakesh Prasad, Dr. Ram Kumar Bhardwaj, Dr. Raman Boddula, Dr. Ramesh Prasad Srivastava, Dr. Ranabir Bose, Dr. Ranasing D Wabale, Dr. Ranga P Prasad, Dr. Ranu Barman, Dr. Rasheed Ali, Dr. Ravi Kant Mishra, Dr. Regonda Rajesh, Dr. Ritesh Kumar Agrawala, Dr. Riyaj Umar Mujawar, Dr. Rohan V Ainchwar, Dr. Roshan M, Dr. S Azhamgam Perumal, Dr. S Chandrashekar, Dr. S D M Sekhar, Dr. S Iqbaluddin Ahmed, Dr. S Jaidev, Dr. S N Ganesha Moorthy, Dr. S Nagaraj, Dr. S P Sathish Kumar, Dr. S P Singh, Dr. S Pothisraru, Dr. S Rajkumar, Dr. S Sahubar Sadique, Dr. S Sathyanarayana Murthy, Dr. S Vanchilingam, Dr. S Velayutham, Dr. Sabeer T K, Dr. Sachin Mohan Lakade, Dr. Sailesh Lodha, Dr. Sandeep Bhatnagar, Dr. Sandeep Kumar Gupta, Dr. Sanjay Garg, Dr. Sanjay Gujrat, Dr. Sanjay Gupta, Dr. Sanjay Kumar Giri, Dr. Sanjay Kumar Jain, Dr. Sanjay Mahajan, Dr. Sanjay More, Dr. Sanjeet S More, Dr. Sanjeev R Phtat, Dr. Sanjeev Saxena, Dr. Sankalingam Azhamgam perumal, Dr. Sankar joyti Parashar, Dr. Sarat Chandra Choudhury, Dr. Sarat Chanda Mohanty, Dr. Sarat Kcot, Dr. Satish Raikar, Dr. Satish Sutradhav, Dr. Savita Agarwal, Dr. Scema A Bagri, Dr. Shah Abrar, Dr. Shahul Hameed, Dr. Shailesh Narayan Palekar, Dr. Shailesh Srivastava, Dr. Shamsudeen M, Dr. Shamsudheen S, Dr. Shankar joyti Parashar, Dr. Shantharaman D, Dr. Sharad Kumar, Dr. Sharan R Pawad shutter, Dr. Shehla Shaikh, Dr. Shivprasad C, Dr. Shrikant Shankarao Wasavade, Dr. Snehel R Tanna, Dr. Sri Krishna Mundhra, Dr. Sri Prakash Mohanty, Dr. Srinath Vittal Kasal, Dr. Stanley Ambroise, Dr. Subhish Chand Jayaram Bulleke, Dr. Subodh Banzal, Dr. Subodh Chadha, Dr. Subrata Bhattacharya, Dr. Sudha N Sathiy, Dr. Sudharshan Murthy Karkala Achutha, Dr. Sudhir Ranjan Pattinak, Dr. Sukhen Kumar Saha, Dr. Suman Kirti, Dr. Sumit Mukherjee, Dr. Sunil Bansal, Dr. Sunil Dhand, Dr. Surekha B Shetty, Dr. Suren G Chavan, Dr. Surendra Kumar Bhattar, Dr. Suresh Agrawal, Dr. Suresh Mittal, Dr. Suresh S Sowaderkar, Dr. Sushil Jhawar, Dr. Sushil Kumar, Dr. Sushil Shukla, Dr. Sushil Upadhyay, Dr. Suyog Jawahar Doshi, Dr. Swayamsidha Manjari, Dr. Syed Mohammad Razi, Dr. Syed Sultan Ibrahim, Dr. T K Sabeer, Dr. T M Venkateswara Rao, Dr. Taruni Devi N G, Dr. Tejal Shah, Dr. U Rajanikanth, Dr. Uday Pandalkay Nayak, Dr. Udaya Bhanu K S, Dr. Umesh Akkalkotkar, Dr. Umesh Masand, Dr. Umesh Singh, Dr. Usmangani I Khatri, Dr. V Channaraya, Dr. V Dineshkumar, Dr. V Mahadevan, Dr. V Manakavala Perumal, Dr. V Rajendran, Dr. V Sandeep Reddy, Dr. V Saravana, Dr. V Sathiyamoorthy, Dr. V Vigneshwaran, Dr. V Vigneshwaran Perumal, Dr. Varsha Jagtap, Dr. Venkataraman S, Dr. Vijay Gurung, Dr. Vijay Kumar Aggarwal, Dr. Vijay Narayan Tiwari, Dr. Vikas Namdeo Desale, Dr. Vikas S Patil, Dr. Vikram Jain, Dr. Vlkrant B Ghatnatti, Dr. Vinay Kumar Dhandhania, Dr. Vinay Kumar Singh, Dr. Vinay Sinha, Dr. Vinayak S Kubal, Dr. Vineet Agrawal, Dr. Vineet Sabharwal, Dr. Vipin Srivastava, Dr. Virendra C Chauhan, Dr. Virendrasinh C Chauhan, Dr. Vishal Chopra, Dr. Vishal Kastwar, Dr. Vishwanath Parsewar, Dr. Vivek Mehta, Dr. Vivek Narasinh Annachhatre, Dr. Y S Ravi Kumar, Dr. Y S Tomar, Dr. Yalamanchi Sadasiva Rao, Dr. Yash Bhalilkar, Dr. Yogesh Mehrotra, and Dr. Zia Ul Haque.

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The study protocol was approved by an Independent Ethics Committee. As this was a retrospective study, consent was not obtained.

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Dr. Mahesh V. Abhyankar and Dr. Santosh Revankar are employees of USV Pvt Ltd. All other authors have no conflicts of interest.

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