



ORIGINAL RESEARCH ARTICLE

Assessment of Type 2 Diabetes Mellitus Burden and Associated Determinants Among Adult Patients in a Tertiary Care Setting

Tameem Fazil mukhtar Ahmad*

¹Assistant professor ,Dept of
Genral medicine , Sri
Venkateshwaraa Medical College
Hospital & Research Centre -
Puducherry

Abstract

Background: Type 2 diabetes mellitus (T2DM) is a major public health concern with rising prevalence in both urban and rural populations. Identifying the burden and associated risk factors in hospital-based populations helps guide preventive strategies.

Objectives: To determine the prevalence of T2DM and to study the age, gender, and risk factor distribution among adult patients attending the general medicine outpatient department of a tertiary care hospital.

Methods: A cross-sectional observational study was conducted among 210 adult patients. Data on demographic characteristics, anthropometry, and known risk factors were recorded and analysed.

Results: The majority of patients with T2DM belonged to the 50–59 year age group (31.0%), followed by the 60–69 year group (27.6%). Sedentary lifestyle (24.8%), obesity (21.4%), and family history (18.1%) were the most common associated risk factors.

Conclusion: T2DM burden increases progressively with age and is strongly associated with modifiable lifestyle risk factors, underscoring the need for community-based screening and lifestyle-modification programmes.

Keywords: Type 2 diabetes mellitus, prevalence, risk factors, cross-sectional study, general medicine.

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1 | INTRODUCTION

Diabetes mellitus is a chronic metabolic disorder characterised by hyperglycaemia resulting from defects in insulin secretion, insulin action, or both. Type 2 diabetes mellitus (T2DM)

accounts for over 90% of all diabetes cases globally and its prevalence has risen sharply over the past few decades, driven largely by urbanisation, sedentary lifestyles, and rising obesity rates.

Globally, the number of people living with diabetes was estimated to rise substantially between 2000 and

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2030, with the greatest relative increases expected in developing countries. India, in particular, carries one of the largest burdens of diabetes worldwide, a phenomenon often referred to in the literature as the country transitioning toward becoming the 'diabetes capital of the world.'

The natural history of T2DM is characterised by a prolonged asymptomatic phase during which progressive beta-cell dysfunction and peripheral insulin resistance occur, often years before clinical diagnosis. This latent period allows for the silent development of microvascular and macrovascular complications, which are frequently present at the time of diagnosis in a substantial proportion of patients. Consequently, diabetes imposes a considerable burden not only on affected individuals through reduced quality of life and increased mortality, but also on healthcare systems through the cost of managing chronic complications such as diabetic nephropathy, retinopathy, neuropathy, and accelerated atherosclerotic disease.

Numerous modifiable and non-modifiable risk factors have been implicated in the pathogenesis of T2DM. Non-modifiable factors include advancing age, family history, and ethnicity, with South Asian populations demonstrating a particular predisposition to insulin resistance at lower body mass indices compared with Western populations—a phenomenon sometimes termed the 'Asian Indian phenotype.' Modifiable risk factors, including obesity (particularly central adiposity), sedentary behaviour, unhealthy dietary patterns, and coexisting hypertension or dyslipidaemia, offer avenues for prevention and early intervention if identified in a timely manner.

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Corresponding Author: *Tameem Fazil mukhtar Ahmad*

Assistant professor ,Dept of Genral medicine , Sri Venkateshwaraa Medical College Hospital & Research Centre - Puducherry

Given the significant morbidity associated with uncontrolled diabetes, understanding local prevalence patterns and risk factor profiles is essential for designing targeted screening and prevention programmes. This study was undertaken to assess the prevalence, demographic distribution, and risk factor profile of T2DM among adults attending the general medicine department of a tertiary care hospital, and to examine the relationship between disease duration and the development of microvascular complications.

2 | REVIEW OF LITERATURE

Several large-scale epidemiological studies have documented the escalating burden of T2DM worldwide. Early global projections estimated that the number of adults living with diabetes would nearly double between 2000 and 2030, with the most pronounced increases occurring in developing regions undergoing rapid urbanisation and nutritional transition. Subsequent revised estimates confirmed that this trajectory was, if anything, being exceeded in several countries, particularly in South Asia and the Western Pacific region.

The Indian Council of Medical Research–India Diabetes (ICMR–INDIAB) study, conducted across multiple states, provided robust nationally representative data confirming wide variation in diabetes prevalence across different regions of India, with generally higher prevalence in urban compared to rural areas, though the gap has been narrowing over time. Earlier work from the National Urban Diabetes Survey similarly demonstrated a high prevalence of diabetes and impaired glucose tolerance in urban Indian populations, findings that were later corroborated by community-based surveys from southern and western India.

With regard to risk factors, multiple studies have consistently identified obesity, particularly abdominal obesity, and physical inactivity as the dominant modifiable contributors to T2DM risk in Indian populations. The concept of the 'thin-fat Indian phenotype'—characterised by relatively low body mass index but high percentage body fat and visceral

adiposity—has been proposed to explain the disproportionately high diabetes risk observed in South Asians compared with other ethnic groups at similar BMI levels. Family history has also been repeatedly shown to confer significantly elevated risk, consistent with a strong genetic and epigenetic component to disease susceptibility.

The landmark UK Prospective Diabetes Study demonstrated that intensive glycaemic control significantly reduces the risk of microvascular complications, establishing the principle that early diagnosis and tight metabolic control are critical to preventing long-term morbidity. This body of evidence underscores the importance of hospital- and community-based studies, such as the present one, in characterising local disease patterns to inform screening priorities and resource allocation.

3 | MATERIALS AND METHODS

3.1 | Study Design and Setting

This was a hospital-based, cross-sectional observational study conducted in the Department of General Medicine of a tertiary care teaching hospital over a period of twelve months.

3.2 | Study Population

A total of 210 adult patients (aged 30 years and above) diagnosed with T2DM as per American Diabetes Association criteria (fasting plasma glucose ≥ 126 mg/dL or 2-hour plasma glucose ≥ 200 mg/dL during an oral glucose tolerance test, or HbA1c $\geq 6.5\%$) were enrolled after obtaining informed consent.

3.3 | Sample Size

The sample size was calculated based on an expected prevalence of diabetes-related risk factors of approximately 25% in the outpatient population, with 95% confidence and an absolute precision of 6%, yielding a minimum required sample size of approximately 200 patients. A total of 210 patients were enrolled to account for possible incomplete records.

3.4 | Inclusion Criteria

Adults aged 30 years and above with a confirmed diagnosis of Type 2 diabetes mellitus who provided informed consent to participate were included.

3.5 | Exclusion Criteria

Patients with Type 1 diabetes mellitus, gestational diabetes, secondary diabetes (e.g., due to pancreatic disease or steroid use), and those unwilling to provide consent were excluded from the study.

3.6 | Data Collection

A structured proforma was used to record demographic details, anthropometric measurements (height, weight, BMI, waist circumference), blood pressure, family history of diabetes, smoking status, physical activity levels, lipid profile, duration of diabetes, and presence of microvascular complications (assessed clinically and through relevant investigations including nerve conduction studies, fundus examination, and renal function tests where indicated).

3.7 | Operational Definitions

Obesity was defined as a body mass index of 25 kg/m² or greater, in accordance with Asian-specific BMI cut-offs recommended for South Asian populations. Sedentary lifestyle was defined as engaging in less than 150 minutes of moderate physical activity per week. Glycaemic control was categorised as good (HbA1c < 7%), fair (HbA1c 7–8.5%), or poor (HbA1c > 8.5%), based on standard clinical practice thresholds.

3.8 | Ethical Considerations

The study was conducted after obtaining approval from the Institutional Ethics Committee. Written informed consent was obtained from all participants prior to enrolment, and confidentiality of patient data was maintained throughout the study.

3.9 | Statistical Analysis

Data were entered into a spreadsheet and analysed using descriptive statistics. Categorical variables were expressed as frequencies and percentages, while continuous variables were expressed as means with standard deviation where applicable. Results were tabulated and represented graphically to facilitate interpretation.

4 | RESULTS

Of the 210 patients studied, 117 (55.7%) were male and 93 (44.3%) were female. The age and gender-wise distribution is summarised in Table 1.

The most common age group affected was 50–59 years (31.0%), followed by 60–69 years (27.6%), consistent with the known age-related rise in T2DM prevalence.

Sedentary lifestyle (24.8%) was the most prevalent modifiable risk factor, followed by obesity (21.4%) and family history of diabetes (18.1%). Coexisting hypertension was noted in 15.7% of patients, highlighting the overlap between metabolic risk factors.

A clear trend was observed between duration of diabetes and the prevalence of microvascular complications. Among patients with disease duration exceeding 10 years, neuropathy was present in 45.5%, retinopathy in 36.4%, and nephropathy in 26.0% of cases, compared to substantially lower rates among those with disease duration under 5 years. This finding reinforces the well-established relationship between cumulative hyperglycaemic exposure and end-organ damage.

Only 25.7% of patients achieved good glycaemic control ($\text{HbA1c} < 7\%$), while nearly a third (31.9%) had poor control ($\text{HbA1c} > 8.5\%$). This finding highlights significant gaps in diabetes management within the study population, which may be attributable to poor treatment adherence, inadequate patient education, or delayed treatment intensification.

5 | DISCUSSION

The present study demonstrates a peak prevalence of T2DM in the 50–59 year age group, which is in agreement with earlier population-based studies showing a progressive rise in diabetes prevalence with advancing age, likely related to declining beta-cell function and cumulative exposure to risk factors over time. This pattern has been consistently reported across multiple Indian and international cohorts, reinforcing the idea that age-related screening thresholds are appropriate for early detection strategies.

The predominance of sedentary lifestyle and obesity as risk factors in this study mirrors findings from other Indian studies, which have consistently identified urbanisation-related lifestyle changes as major drivers of the diabetes epidemic in the sub-continent. The relatively high prevalence of family history (18.1%) also underscores the genetic predisposition to T2DM among Indian populations, a finding echoed in large multi-state surveys such as the ICMR–INDIAB study. Taken together, these findings support the 'thin-fat Indian phenotype' hypothesis, wherein South Asian populations demonstrate heightened metabolic vulnerability even at relatively modest degrees of adiposity.

The overlap between diabetes and hypertension observed in this study is consistent with the concept of the metabolic syndrome, wherein insulin resistance contributes to a clustering of cardiovascular risk factors, including dyslipidaemia, hypertension, and central obesity. This has important implications for comprehensive cardiometabolic risk assessment in patients presenting with either condition, as the presence of one component should prompt screening for the others.

The observed relationship between disease duration and microvascular complications in this study is consistent with the pathophysiological understanding that chronic hyperglycaemia leads to progressive microvascular injury through mechanisms including advanced glycation end-product formation, oxidative stress, and activation of the polyol pathway. The landmark UK Prospective Diabetes Study demonstrated that intensive glycaemic control from the time of diagnosis substantially reduces the long-term

TABLE 1: Age and Gender-wise Distribution of Study Subjects (n = 210)

Age Group (years)	Male (n)	Female (n)	Total (n)	Percentage (%)
30–39	10	8	18	8.6
40–49	24	18	42	20.0
50–59	36	29	65	31.0
60–69	32	26	58	27.6
70 and above	15	12	27	12.8
Total	117	93	210	100.0

Figure 1: Age-wise Distribution of Type 2 Diabetes Mellitus Cases (n=210)

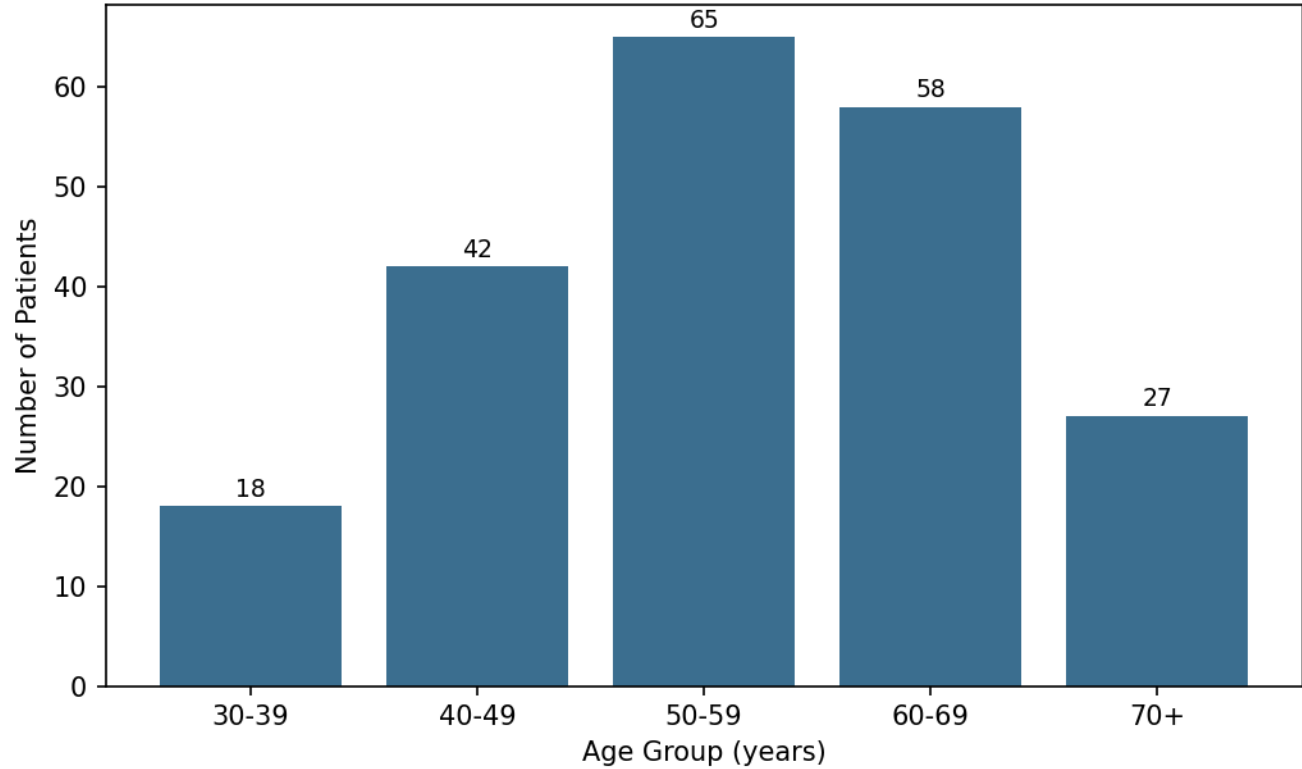


FIGURE 1:

TABLE 2: Distribution of Risk Factors Among Study Subjects

undefined	undefined	undefined
Family history of diabetes	38	18.1
Obesity (BMI ≥ 25 kg/m ²)	45	21.4
Sedentary lifestyle	52	24.8
Coexisting hypertension	33	15.7
Current smoking	19	9.0
Dyslipidemia	28	13.3

Figure 2: Distribution of Associated Risk Factors Among Study Subjects

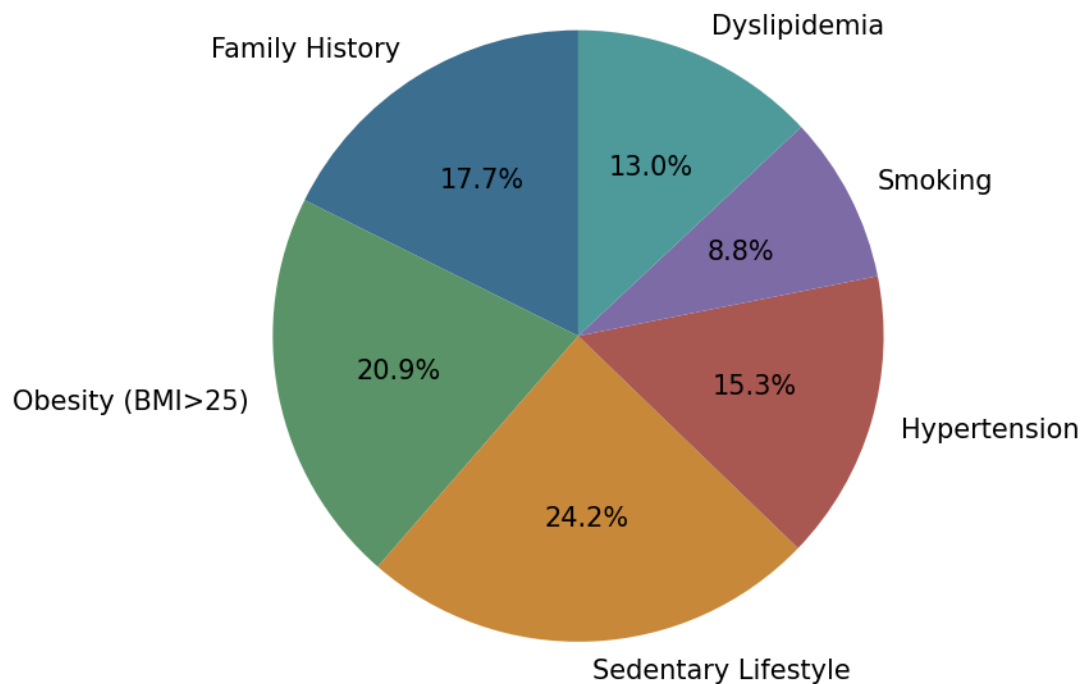


FIGURE 2:

TABLE 3: Duration of Diabetes vs Microvascular Complications

Duration of Diabetes	Neuropathy (n)	Retinopathy (n)	Nephropathy (n)	Total (n)
Less than 5 years	8	4	3	62
5–10 years	22	15	10	71
More than 10 years	35	28	20	77

TABLE 4: Glycaemic Control Status of Study Subjects

Glycaemic Control Status	Number (n)	Percentage (%)
Good control (HbA1c < 7%)	54	25.7
Fair control (HbA1c 7-8.5%)	89	42.4
Poor control (HbA1c > 8.5%)	67	31.9

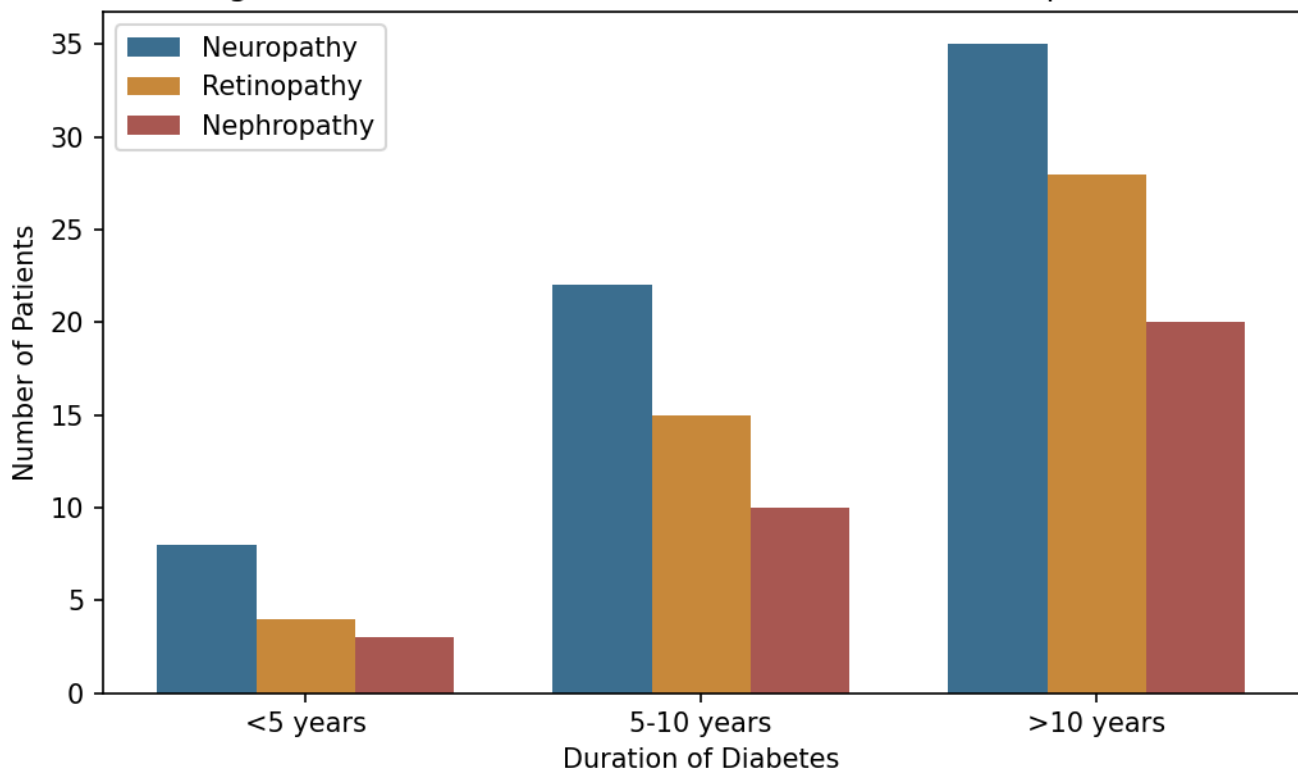
risk of such complications, a principle that remains central to modern diabetes care.

The finding that fewer than one-third of patients achieved good glycaemic control is of particular concern and is consistent with reports from other hospital-based Indian studies documenting suboptimal diabetes control in real-world clinical settings. Potential contributing factors include clinical inertia in treatment intensification, cost and accessibility

barriers to medication and monitoring, and gaps in structured patient education regarding diet, physical activity, and self-monitoring of blood glucose.

These findings collectively suggest that while risk factor identification is important, translating this into effective long-term glycaemic control remains a persistent challenge. Strengthening primary care-based screening, patient education, and structured follow-up systems may help bridge this gap.

Figure 3: Duration of Diabetes vs Microvascular Complications

**FIGURE 3:**

6 | SUMMARY

This cross-sectional study of 210 adults with Type 2 diabetes mellitus attending a tertiary care general medicine department found that the disease burden was highest in the 50–59 year age group, with sedentary lifestyle, obesity, and family history being the leading modifiable and non-modifiable risk factors respectively. A strong association was observed between longer disease duration and the presence of microvascular complications, particularly neuropathy. Glycaemic control was suboptimal in a substantial proportion of patients, with only about one-quarter achieving good control as defined by HbA1c targets.

7 | LIMITATIONS

This study has several limitations that merit consideration. First, its single-centre, hospital-based, cross-sectional design limits generalisability to the wider

community and precludes causal inference regarding risk factor associations. Second, the relatively modest sample size, while adequate for the primary objectives, may not have been sufficient to detect associations for less common complications or subgroup analyses. Third, some data—particularly regarding dietary intake and physical activity—relied on patient self-report, which is subject to recall and social desirability bias. Finally, the cross-sectional design did not allow assessment of temporal trends in glycaemic control or complication development over time.

8 | RECOMMENDATIONS

Based on the findings of this study, several recommendations can be made. Community-based screening programmes targeting adults over 40 years of age, particularly those with a family history of diabetes or elevated BMI, should be strengthened to enable earlier diagnosis. Structured patient education

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programmes emphasising lifestyle modification—including dietary counselling and increased physical activity—should be integrated into routine diabetes care. Given the high prevalence of complications with increasing disease duration, regular screening for neuropathy, retinopathy, and nephropathy should be incorporated into follow-up protocols from the time of diagnosis, rather than being reserved for later stages of disease. Finally, efforts to improve glycaemic control through timely treatment intensification and improved access to monitoring should be prioritised, supported by larger, multi-centric, longitudinal studies to track outcomes over time.

9 | CONCLUSION

This study highlights a substantial burden of T2DM among middle-aged and elderly adults attending a tertiary care hospital, with sedentary lifestyle, obesity, and family history as the leading associated risk factors. A clear relationship was observed between disease duration and the development of microvascular complications, while glycaemic control remained suboptimal in a large proportion of patients. These findings support the need for structured screening programmes, early complication surveillance, and sustained lifestyle-modification interventions targeted at high-risk age groups.

(1–20)

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