Original Research Article

Lifestyle and Demographic Risk Factors of Diabetes Mellitus in India

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Abstract:

Background: Diabetes mellitus (DM) is a major non-communicable disease characterized by chronic Hyperglycemia, with type 2 diabetes forming the majority of cases. Its burden is rising rapidly worldwide, particularly in India, due to demographic transition, sedentary lifestyle, obesity, and genetic predisposition. Identifying demographic and lifestyle factors associated with diabetes is critical for prevention and management.

Methods: This cross-sectional observational study was conducted on 200 clinically and biochemically diagnosed diabetic patients. Data were collected on demographic characteristics, family history, body mass index (BMI), and lifestyle activity levels using a structured questionnaire. BMI was categorized according to WHO criteria, and lifestyle activity was classified as sedentary, mild, moderate, or vigorous. Descriptive statistics were applied to analyze the frequency distribution of risk factors.

Results: The prevalence of diabetes increased progressively with age, with the majority of cases observed in patients above 60 years. Sedentary lifestyle was the most common activity level (33%), followed by moderate (26.5%), mild (21.5%), and vigorous (19%). Family history of diabetes was present in 76% of patients. Regarding BMI, 37% were obese, 29% overweight, 15.5% normal, and 18.5% underweight, with two-thirds of patients falling in the overweight/obese category. The findings demonstrate strong associations of diabetes with advancing age, sedentary lifestyle, positive family history, and higher BMI.

Conclusion: Diabetes in this population was predominantly associated with modifiable factors such as sedentary lifestyle and obesity, along with non-modifiable determinants like age and family history. Preventive strategies focusing on lifestyle modification, weight management, and early screening of high-risk individuals are essential to reduce the growing diabetes burden in India.

Keywords: Diabetes mellitus; Age, Family history; Risk factors.

Introduction

Diabetes mellitus (DM) is one of the most significant Non-communicable diseases (NCDs) affecting global health. It is characterized by persistent hyperglycemia resulting from either inadequate insulin secretion, impaired insulin action, or both. The disease is broadly classified into type 1 diabetes, type 2 diabetes, gestational diabetes, and other specific types. Among these, type 2 diabetes accounts for more than 90% of cases and is strongly associated with modifiable lifestyle factors such as obesity, physical inactivity, and unhealthy diet, along with genetic predisposition [1].

The global burden of diabetes has risen dramatically in the last two decades. According to the International Diabetes Federation (IDF), there were an estimated 537 million adults with diabetes in 2021, and this number is projected to increase to 783 million by 2045, with the steepest increase occurring in low- and middle-income countries [2]. India is currently at the forefront of this epidemic, often referred to as the "diabetes capital of the world," with an estimated 77 million individuals affected in 2019, a number expected to rise significantly due to demographic and lifestyle transitions [3]. Rapid urbanization, increasing life expectancy, dietary changes, sedentary behavior, and the obesity epidemic are the primary drivers behind this rising prevalence in South Asia [4].

Age is an important determinant of diabetes prevalence. Several studies have demonstrated that the risk of developing diabetes increases progressively after the age of 40 years, with the highest prevalence observed in individuals above 60 years [5]. Similarly, genetic predisposition plays a significant role, with studies such as the

Framingham Offspring Study showing that individuals with a first-degree relative with diabetes have a two- to four-fold higher risk compared to those without a family history [6]. Body mass index (BMI) is another strong predictor of diabetes, with obesity contributing to insulin resistance through complex mechanisms involving increased free fatty acids, adipokine dysregulation, and chronic low-grade inflammation [7].

According to the World Health Organization (WHO), overweight is defined as a BMI of 25–29.9 kg/m² and obesity as BMI ≥30 kg/m², both associated with markedly higher risk of type 2 diabetes [8].

The National Urban Diabetes Survey in India highlighted that nearly 75% of urban diabetics were either overweight or obese, underscoring the role of BMI in the Indian context [9]. Lifestyle factors such as physical inactivity and poor dietary habits are equally important. Evidence suggests that sedentary behaviors, including prolonged television watching and reduced physical activity, independently increase the risk of diabetes, regardless of BMI status [10]. On the other hand, regular physical activity reduces insulin resistance, improves glucose uptake, and delays or prevents the onset of type 2 diabetes. Thus, lifestyle modification is one of the most effective preventive measures [11].

Given the interplay of these risk factors, early identification of high-risk individuals is vital. Understanding the association of diabetes with age, family history, BMI, and lifestyle changes not only helps in risk stratification but also provides a framework for public health interventions. Against this background, the present study was undertaken to analyze the demographic and lifestyle characteristics of diabetic patients and to evaluate the association of family history, BMI, and physical activity patterns with diabetes prevalence in a hospital-based population.

Methodology:

This cross-sectional observational study was carried out on 200 patients clinically and biochemically diagnosed with diabetes mellitus. Patients attending outpatient departments were included using convenient sampling. After obtaining informed consent, demographic details, age distribution, family history of diabetes, lifestyle activity levels, and BMI were recorded using a pre-structured questionnaire.

Lifestyle activity was categorized into sedentary, mild, moderate, and vigorous activity levels based on self-reported occupation and daily habits.

BMI was calculated using the standard formula (weight in kilograms divided by height in meters squared) and classified according to WHO criteria into underweight (≤18.5 kg/m²), normal (18.5–24.9 kg/m²), overweight (25–29.9 kg/m²), and obesity (≥30 kg/m²). Data were tabulated and analyzed using descriptive statistics to assess the frequency distribution and associations of risk factors in the diabetic population.

Results:

Table 1: Age-wise Distribution of Diabetic Patients

Age (Years)	No. Of Patients
31-40	18
41-50	29
51-60	48
61-70	52
≥70	53
	Total=200

A total of 200 diabetic patients were analyzed in this study. The age distribution revealed that the prevalence of diabetes increased with advancing age. The largest proportion was observed in patients aged 70 years and above, accounting for 53 individuals (26.5%), followed by 52 individuals (26%) in the 61–70 year group and 48 individuals (24%) in the 51–60 year group.

The 41–50 year age group comprised 29 patients (14.5%), while the smallest group was 31–40 years with 18 patients (9%). These findings demonstrate a progressive increase in diabetes prevalence with age, particularly after the fifth decade. This trend is consistent with global evidence, where the risk of type 2 diabetes increases steadily with aging due to reduced pancreatic beta-cell reserve, decreased insulin sensitivity, and accumulation of comorbidities.

The World Health Organization (WHO) and the American Diabetes Association (ADA) both identify age above 45 years as a significant risk factor warranting routine screening for diabetes, which is reflected in the clustering of cases among older patients in this study. (Table 1)

Table 2: Distribution of Diabetic Patients According to Lifestyle Activity Levels

Lifestyle Changes/Activity	No. Of Patients
Sedentary	66
Mild	43
Moderate	53
Vigorous	38

When lifestyle activity was assessed, the majority of patients were found to be either sedentary or engaged in only light daily work. Sedentary lifestyle, defined as little or no physical activity beyond essential daily movements such as prolonged sitting, minimal walking, or absence of structured exercise, was reported in 66 patients (33%). This group represents individuals at particularly high risk, as inactivity is strongly associated with insulin resistance and impaired glucose utilization in skeletal muscle. Mild activity was observed in 43 patients (21.5%) and included light-intensity tasks such as short household chores or infrequent walking, which remain below WHO recommendations for physical activity. Moderate activity was reported in 53 patients (26.5%), representing individuals who engaged in walking, cycling, or equivalent activity for at least 30 minutes on most days of the week. Although this activity level corresponds more closely to WHO guidelines of 150 minutes of moderate-intensity activity per week, these patients still developed diabetes, suggesting the role of additional factors such as genetic predisposition and obesity. Vigorous activity, defined as at least 75 minutes of intense exercise or physical work per week, was reported in 38 patients (19%). Despite being the most active group, nearly one-fifth of the diabetic patients fell into this category, which highlights that although exercise reduces risk, it does not completely offset the influence of age and metabolic risk factors. Taken together, more than half of the patients (54.5%) were sedentary or mildly active, underscoring the inadequacy of physical activity levels in this diabetic population. (Table 2)

Table 3: Distribution of Diabetic Patients Based on Family History of Diabetes

Family History Of Diabetes	No. Of Patients
Yes	152
No	48

Family history was another prominent finding, with 152 patients (76%) reporting at least one first-degree relative with diabetes. Only 48 patients (24%) reported no family history. This high proportion indicates a strong hereditary influence on the development of the disease. The results are consistent with large cohort studies such as the Framingham Offspring Study, which showed that individuals with a diabetic parent or sibling have up to a four-fold increased risk of developing diabetes. Family history reflects both genetic susceptibility and shared lifestyle practices, including diet and activity patterns, which together contribute to disease onset. The clustering observed in this study mirrors Indian reports where 65–80% of diabetic patients had a positive family history, emphasizing the need for early screening and targeted preventive strategies among high-risk families. (Table 3)

Table 4: Distribution of Diabetic Patients According to Body Mass Index (WHO Criteria)

Bmi	No. Of Patients
Underweight ≤ 18.5	37
Normal 18.5-24.9	31
Overweight 25-29.9	58
Obesity ≥30	74

Assessment of body mass index (BMI) showed that 74 patients (37%) were obese with a BMI ≥30 kg/m², 58 patients (29%) were overweight with a BMI of 25–29.9 kg/m², 31 patients (15.5%) had normal BMI within the range of 18.5–24.9 kg/m², and 37 patients (18.5%) were underweight with BMI ≤18.5 kg/m². The combined prevalence of overweight and obesity was 66%, significantly higher than the underweight and normal group, which comprised only 34%. Obesity is well recognized as one of the strongest modifiable risk factors for type 2 diabetes, mediated through mechanisms such as increased free fatty acid flux, ectopic fat accumulation in liver and muscle, altered adipokine secretion, and chronic low-grade inflammation, all of which impair insulin signalling and glucose homeostasis. In the Indian population, even individuals with lower BMI compared to Western populations are at disproportionately higher risk due to central obesity and increased visceral adiposity, a phenomenon described as the "Asian Indian phenotype." The findings of the

present study, showing that two-thirds of diabetic patients were either overweight or obese, are consistent with earlier national surveys, including the National Urban Diabetes Survey, which reported obesity in over 70% of diabetic cases. This confirms the central role of BMI in diabetes risk and highlights weight management as a critical target for intervention. (Table 4) Overall, the results of this study show that diabetes prevalence is highest in older age groups, more common in patients with sedentary or low levels of physical activity, strongly associated with family history, and significantly influenced by overweight and obesity.

Discussion

The findings of this study highlight the significant role of age, family history, BMI, and physical inactivity in the development of diabetes. The majority of cases were concentrated in older age groups, with 76.5% of patients aged above 50 years. This aligns with global data, where advancing age has been consistently linked to increased diabetes prevalence due to progressive decline in pancreatic beta-cell function and increased insulin resistance [5,12].

Lifestyle inactivity was also found to be highly prevalent, with one-third of patients classified as sedentary. This is consistent with large epidemiological studies demonstrating that sedentary behavior independently increases the risk of diabetes, even after adjusting for BMI [10]. Hu et al. showed that individuals with higher sedentary behavior, such as prolonged sitting or television viewing, had a significantly greater risk of type 2 diabetes, irrespective of physical activity levels [10]. Promoting regular exercise, particularly moderate-to-vigorous intensity physical activity, can reduce insulin resistance and improve glucose metabolism [13].

Family history of diabetes was present in 76% of patients, indicating a strong genetic contribution. Studies such as the Framingham Offspring Study [6] and others from India have similarly reported that individuals with a diabetic parent or sibling are at substantially increased risk [14]. Genetic predisposition, when combined with environmental and lifestyle risk factors, accelerates the onset of diabetes.

Obesity emerged as one of the strongest modifiable risk factors, with 37% obese and 29% overweight patients in our study. The combined prevalence of overweight and obesity (66%) parallels findings from the National Urban Diabetes Survey in India, where more than 70% of diabetics were overweight or obese [9]. The mechanism linking obesity to diabetes involves adipose tissue dysfunction, leading to increased free fatty acid flux, ectopic fat deposition, altered adipokine secretion, and chronic inflammation that promotes insulin resistance [7,15].

Our findings are consistent with the landmark Diabetes Prevention Program (DPP) trial, which demonstrated that lifestyle modification through diet and physical activity resulted in a 58% reduction in diabetes incidence among high-risk individuals, surpassing even metformin in effectiveness [11,16]. This underscores the importance of addressing modifiable risk factors in public health interventions. Taken together, the results reinforce the multifactorial etiology of diabetes. While age and genetic predisposition are non-modifiable, lifestyle modification and weight management represent the cornerstone of diabetes prevention. Comprehensive community-based strategies focusing on physical activity promotion, healthy diet adoption, and obesity control are crucial to curb the growing epidemic in India and globally.

Conclusion

Diabetes mellitus in the present study population was strongly associated with older age, sedentary lifestyle, family history, and high BMI. Obesity and overweight, the most common modifiable risk factors, were prevalent in two-thirds of patients, while family history was present in three-fourths, highlighting the genetic contribution. Preventive strategies aimed at weight control, active lifestyle promotion, and early screening among high-risk groups can substantially reduce the burden of diabetes. Policymakers and clinicians must prioritize community-based lifestyle interventions to effectively combat this growing public health challenge.

References

1. American Diabetes Association. Classification and Diagnosis of Diabetes. Diabetes Care. 2017;40(Suppl 1): S11–24.
2. International Diabetes Federation. IDF Diabetes Atlas, 10th edition. Brussels, Belgium: International Diabetes Federation; 2021.
3. Anjana RM, Pradeepa R, Deepa M, Datta M, Sudha V, Unnikrishnan R, et al. Prevalence of diabetes and prediabetes in urban and rural India: Phase I results of the Indian Council of Medical Research–INdia DIABetes (ICMR–INDIAB) study. Diabetologia. 2011;54(12): 3022–7.
4. Misra A, Shrivastava U. Obesity and dyslipidemia in South Asians. Nutrients. 2013;5(7):2708–33.
5. Wild S, Roglic G, Green A, Sicree R, King H. Global prevalence of diabetes: estimates for the year 2000 and projections for 2030. Diabetes Care. 2004;27(5):1047–53.
6. Meigs JB, Cupples LA, Wilson PW. Parental transmission of type 2 diabetes: the Framing-

ham Offspring Study. Diabetes. 2000;49 (12):2201–7.

7. Kahn SE, Hull RL, Utzschneider KM. Mechanisms linking obesity to insulin resistance and type 2 diabetes. Nature. 2006;444(7121):840–6.

8. World Health Organization. Obesity: Preventing and managing the global epidemic. Report of a WHO consultation. WHO Technical Report Series 894. Geneva: World Health Organization; 2000.

9. Mohan V, Deepa R, Deepa M, Somannavar S, Datta M. A simplified Indian Diabetes Risk Score for screening for undiagnosed diabetic subjects. J Assoc Physicians India. 2005;53: 759–63.

10. Hu FB, Li TY, Colditz GA, Willett WC, Manson JE. Television watching and other sedentary behaviors in relation to risk of obesity and type 2 diabetes mellitus in women. JAMA. 2003;289(14):1785–91.

11. Knowler WC, Barrett-Connor E, Fowler SE, Hamman RF, Lachin JM, Walker EA, et al. Reduction in the incidence of type 2 diabetes with lifestyle intervention or metformin. N Engl J Med. 2002;346(6):393–403.

12. Cowie CC, Rust KF, Byrd-Holt DD, Eberhardt MS, Flegal KM, Engelgau MM, et al. Prevalence of diabetes and impaired fasting glucose in adults in the U.S. population. Diabetes Care. 2006;29(6):1263–8.

13. Colberg SR, Sigal RJ, Yardley JE, Riddell MC, Dunstan DW, Dempsey PC, et al. Physical activity/exercise and diabetes: A position statement of the American Diabetes Association. Diabetes Care. 2016;39(11):2065–79.

14. Ramachandran A, Snehalatha C, Latha E, Manoharan M, Vijay V. Impact of family history of diabetes on risk factors and prevalence of NIDDM among Asian Indians. Diabetes Res Clin Pract. 1999;44(3):207–13.

15. Wellen KE, Hotamisligil GS. Inflammation, stress, and diabetes. J Clin Invest. 2005;115(5):1111–9.

16. Tuomilehto J, Lindström J, Eriksson JG, Valle TT, Hämäläinen H, Ilanne-Parikka P, et al. Prevention of type 2 diabetes mellitus by changes in lifestyle among subjects with impaired glucose tolerance. N Engl J Med. 2001;344(18):1343–50.