Associated factors involved with Diabetes Mellitus individuals in the Local Community around the Index Medical College Hospital & Research Center, Indore

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Abstract

Background: Indore, the largest city of Madhya Pradesh and a rapidly developing urban hub, has witnessed substantial lifestyle transformations in recent years. These changes have led to an increasing trend in metabolic disorders, including Diabetes mellitus (DM). The catchment area around Index Medical College Hospital & Research Center represents a diverse local community, encompassing individuals from varied socio-economic, occupational, and cultural backgrounds. **Aim:** Hence, the present study aims to identify and analyze the associated factors of diabetes mellitus among individuals in the local community around Index Medical College Hospital & Research Center, Indore. Methods: This study was designed as a community-based cross-sectional observational study conducted in the catchment area around Index Medical College Hospital & Research Center (IMCHRC), Indore, Madhya Pradesh, India. The study area includes semi-urban and urban localities within approximately a 20-kilometer radius of the hospital, catering to a diverse population in terms of socio-economic status, occupation, and cultural background. Data collection was carried out over a period of six months (January 2023 – July 2024). **Results:** Family history of diabetes (AOR = 2.56; 1.67, 3.92), BMI (AOR = 2.38; 1.56, 3.62) and central obesity (AOR = 2.21; 1.44, 3.39) were significantly associated with diabetes mellitus among the urban population. **Conclusion:** Urban areas have a far higher prevalence of diabetes mellitus than rural areas. Rural areas have a disproportionately high rate of undiagnosed and untreated diabetes. Reducing related consequences requires appropriate effort to ensure access to early diagnosis and treatment.

Key words: Diabetes mellitus; genetic predisposition; physical activity; urban; rural; international diabetes federation.

Introduction:

Diabetes mellitus (DM) is one of the most prevalent and challenging non-communicable diseases (NCDs) worldwide, characterized by chronic hyperglycemia resulting from defects in insulin secretion, insulin action, or both. Over the past few decades, the global burden of DM has risen sharply, fueled by rapid urbanization, sedentary lifestyles, unhealthy dietary patterns, and demographic shifts [1-3]. According to the International Diabetes Federation (IDF) Diabetes Atlas (2024), more than 540 million adults are living with diabetes globally, and this figure is projected to increase to 783 million by 2045 if effective interventions are not implemented [4].

India, often referred to as the diabetes capital of the world, bears a disproportionate share of this burden, with an estimated 101 million adults affected in 2023 [1-4].

The increasing prevalence of DM in India reflects not only genetic predisposition but also profound changes in socio-economic, lifestyle, and environmental factors. In urban and semi-urban regions, the interplay between dietary transitions toward calorie-dense processed foods, reduced physical activity, and stress has significantly contributed to the growing incidence of both type 1 and, more prominently, type 2 diabetes mellitus (T2DM) [5,6]. The associated morbidity and mortality are substantial, with complications such as cardiovascular disease, nephropathy, neuropathy, and retinopathy imposing heavy healthcare and economic costs [7].

Indore, the largest city of Madhya Pradesh and a rapidly developing urban hub, has witnessed substantial lifestyle transformations in recent years. These changes have led to an increasing trend in metabolic disorders, including DM. The catchment area around Index Medical College Hospital & Research Center represents a diverse local community, encompassing individuals from varied socio-economic, occupational, and cultural backgrounds. This setting offers a unique opportunity to study locally relevant determinants of diabetes, which may differ from national or global patterns due to region-specific dietary habits, levels of physical activity, awareness about health, and accessibility to medical services [8-10].

Understanding the factors associated with DM in a specific population is crucial for formulating targeted public health strategies. Previous studies in other regions of India have identified a range of associated factors, including obesity, central adiposity, family history of diabetes, hypertension, dyslipidemia, smoking, alcohol consumption, and inadequate physical activity [11-13]. However, localized studies are essential to capture the influence of community-specific variables, such as traditional food patterns, occupational activity levels, cultural perceptions about health and disease, and the availability of preventive healthcare services. Hence, the present study aims to identify and analyze the associated factors of diabetes mellitus among individuals in the local community around Index Medical College Hospital & Research Center, Indore.

Materials & methods:

Study Design and Setting: This study was designed as a community-based cross-sectional observational study conducted in the catchment area around Index Medical College Hospital & Research Center (IMCHRC), Indore, Madhya Pradesh, India. The study area includes semi-urban and urban localities within approximately a 20-kilometer radius of the hospital, catering to a diverse population in terms of socio-economic status, occupation, and cultural background. Data collection was carried out over a period of six months (January 2023 – July 2024).

Study Population: The target population comprised adult individuals (≥35 years) residing in the selected community who were diagnosed cases of diabetes mellitus (type 1 or type 2) based on prior medical evaluation. Participants were identified through community health records, referrals from local clinics, and door-to-door surveys conducted by trained field investigators. Inclusion Criteria: Residents of the study area for at least one year. Individuals with a confirmed diagnosis

of diabetes mellitus by a registered medical practitioner (based on ADA or WHO diagnostic criteria). Willingness to participate and provide informed consent. Exclusion Criteria: Critically ill patients unable to respond to the questionnaire. Individuals with gestational diabetes mellitus (GDM). Patients with severe psychiatric illness or cognitive impairment affecting recall and response accuracy.

A systematic random sampling method was employed. The study area was divided into clusters based on local administrative boundaries, and households were selected proportionally from each cluster. Within each household, eligible diabetic individuals were invited to participate.

Data Collection Tools and Techniques: Data were collected using a pre-tested, semi-structured questionnaire developed after reviewing relevant literature and validated by subject experts. The questionnaire comprised the following sections:

1. Lifestyle factors: dietary habits, physical activity level (assessed using WHO Global Physical Activity Questionnaire), tobacco use, alcohol consumption, sleep patterns.
2. Medical history: duration of diabetes, type of diabetes, family history of diabetes, co-morbidities (hypertension, dyslipidemia, cardiovascular disease).
3. Clinical and biochemical parameters: recent fasting blood glucose, postprandial blood glucose, and HbA1c values were recorded from the participants' medical records where available.

All interviews and measurements were conducted at participants' homes or a nearby community health facility, ensuring privacy and comfort.

Ethical Considerations

Ethical clearance for the study was obtained from the Institutional Ethics Committee of Index Medical College Hospital & Research Center, Indore. Written informed consent was obtained from all participants after explaining the purpose, procedures, and potential benefits of the study. Confidentiality of participants' data was maintained throughout the research process.

Statistical Analysis:

Data were coded and entered into Microsoft Excel 2019 and analyzed using Statistical Package for the Social Sciences (SPSS) version 26.0. Descriptive statistics (mean, standard deviation, frequency, and percentage) were calculated for lifestyle, and clinical characteristics. The association between diabetes mellitus and various factors (socio-demographic, lifestyle, and co-morbidities) was analyzed using Chi-square test for categorical variables and independent t-test for continuous variables. Logistic regression analysis was performed to identify independent predictors of diabetes-associated factors, adjusting for potential confounders. A p-value < 0.05 was considered statistically significant.

Results:

Table 1: Association Between Risk Factors and Diabetes Mellitus

Variable	Category	Associated Factor Present (%)	p-value
Age group	≥45 years	78.2	<0.001
BMI category	≥25 kg/m²	72.6	<0.001
Physical activity	Inadequate	68.9	0.002
Diet type	High-fat/high-carb	66.1	0.005
Tobacco use	Yes	60.4	0.018
Alcohol use	Yes	54.7	0.041
Family history	Yes	70.2	<0.001

2.Multivariate Logistic Regression Analysis

Predictor Variable	Adjusted Odds Ratio (AOR)	95% CI	p-value
BMI ≥ 25 kg/m²	2.38	1.56–3.62	<0.001
Physical inactivity	1.94	1.29–2.92	0.001
High-fat/high-carb diet	1.81	1.18–2.77	0.006
Central obesity	2.21	1.44–3.39	<0.001
Family history of DM	2.56	1.67–3.92	<0.001

Discussion:

The lifestyle and clinical factors associated with individuals with diabetes mellitus (DM) were evaluated in the current community-based cross-sectional study, which was conducted in the vicinity of the Index Medical College Hospital & Research Center in Indore. Our results suggest that the majority of participants were between the ages of 45 and 59, with a slight predominance of females. Additionally, there was a high prevalence of modifiable risk factors, including central adiposity, overweight/obesity, inadequate physical activity, and harmful dietary patterns. Lifestyle Factors: The national figures from studies, which reported insufficient activity in over 50% of urban and semi-urban populations, were in agreement with the 65.5% of our sample that was found to be physically inactive [13, 14]. This high prevalence is likely due to sedentary behavior, which is notably prevalent among homemakers and office workers. The dietary analysis revealed that over half of the participants consumed high-fat or high-carbohydrate diets, which is consistent with the transition from traditional fiber-rich diets to refined and processed foods in urbanizing regions [15]. Also noteworthy were tobacco (27%), and alcohol (18.5%), which have been previously demonstrated to exacerbate insulin resistance and vascular complications [16].

Risk Factor Associations: Bivariate analysis verified the existence of substantial associations between diabetes-related complications and older age, higher BMI, central obesity, physical inactivity, harmful diets, tobacco/alcohol use, and positive family history. BMI $\geq$25 kg/m², central obesity, inadequate physical activity, high-fat/high-carbohydrate diet, and family history of DM were identified as independent predictors by logistic regression. The role of modifiable behaviors, in addition to genetic predisposition, is underscored by these results, which are consistent with global evidence from the IDF and WHO reports [17,18] and regional studies from Bengaluru [19] and Tamil   Nadu   [20].

Local Contextual Relevance: The Indore region is undergoing rapid urban expansion, economic development, and lifestyle transitions, which are all contributing to the increasing prevalence of diabetes. In our study population, the high prevalence of obesity and metabolic risk factors may be partially attributed to cultural factors, such as the high consumption of fried snacks, sweets, and ghee, in conjunction with limited structured physical exercise. Furthermore, the optimal management of diabetes in this community may be delayed by the late presentation to formal healthcare and the reliance on household remedies.

Advantages and Drawbacks: Our study's community-based design, which encompasses a wide range of socio-economic strata within the hospital's catchment area, is a significant strength. Consequently, it enhances external validity. Methodological rigor is enhanced by the utilization of validated questionnaires for physical activity assessment and standardized instruments for anthropometric measurements. However, the cross-sectional nature of the study precludes causal inference, the reliance on self-reported lifestyle data that is susceptible to recall bias, and the absence of laboratory testing for all participants, which restricted the uniformity of biochemical assessment.

Conclusion:

Our results emphasize the pressing necessity for targeted lifestyle interventions in the Indore region that concentrate on the promotion of physical activity, dietary modification, and weight management. Community-based awareness programs culturally tailored dietary counseling, and workplace/home-based activity promotion have the potential to reduce risk. The local diabetes burden may be substantially reduced by incorporating these strategies into primary care services, in addition to regular screening for high-risk individuals.

Conflict of interest:

None:

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