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Original Research Article

From risk to prevention: diabetes screening in an urban community of Uttara Kannada district

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ABSTRACT

Background: Diabetes is rapidly increasing in India due to urbanization, sedentary habits and unhealthy lifestyles. Early identification of high-risk individuals is essential to prevent complications. The Indian Diabetes Risk Score (IDRS) is a simple, low-cost tool that can be used in community settings. To assess the risk of type 2 diabetes among adults aged 30–70 years in an urban community using the IDRS and to identify associated socio-demographic and lifestyle factors.
Methods: A cross-sectional study was carried out among 448 adults selected through systematic random sampling in an urban field practice area of Uttara Kannada district, Karnataka. Data were collected using a structured questionnaire and anthropometric measurements. Diabetes risk was categorized as low, moderate or high using the IDRS tool. Associations were tested using chi-square analysis.
Results: Older age, sedentary lifestyle, positive family history and increased waist circumference were significantly associated with higher diabetes risk. Central obesity was the strongest predictor.
Conclusions: More than half of the study population was at moderate-to-high risk of diabetes. Incorporating IDRS-based screening into primary health care and community programs can help in early detection and prevention.

Keywords: Indian diabetes risk score, Karnataka, Risk factors, Type 2 diabetes, Urban community

INTRODUCTION

Diabetes mellitus is a long-term metabolic condition marked by raised blood glucose due to inadequate insulin secretion, impaired insulin action or both. It is a major global health problem that contributes significantly to morbidity, disability and premature mortality. Chronic complications include cardiovascular disease, nephropathy, retinopathy, neuropathy and lower-limb amputations, all of which impose a heavy burden on health systems and economies.[1] According to the World Health Organization, diabetes is one of the top ten causes of death globally.[2] The International Diabetes Federation (IDF) reported that in 2021, 537 million adults aged 20–79 years were living with diabetes worldwide, a figure expected to rise to 643 million by 2030 and 783 million by 2045.[3] Low and middle-income countries bear the greatest burden, with South Asia contributing a significant share. India, in particular, has been recognized as the diabetes capital of the world, with more than 77 million adults affected and another 25 million estimated to be prediabetic.[4] The India state-level disease burden initiative reported that the prevalence of diabetes in India rose from 5.5% in 1990 to 7.7% in 2016, with marked inter-state variation.[5] Several risk factors are known to influence the onset of type 2 diabetes. These include older age, central obesity, physical inactivity and family history.[6,7] Rapid urbanization, sedentary occupations, unhealthy dietary patterns and psychosocial stress have accelerated the rise in diabetes prevalence across all socioeconomic strata in India. Evidence from longitudinal and cross-sectional studies indicates that lifestyle modification remains a cornerstone in prevention, highlighting the need for timely identification of high-risk

groups.[8] Globally, different diabetes risk assessment tools have been developed, such as the Finnish diabetes risk score (FINDRISC), the German diabetes risk score, the Danish diabetes risk score and others.[9-12] These instruments are designed to identify individuals at elevated risk using simple clinical and lifestyle variables, often without the need for biochemical investigations. In India, Mohan et al developed the IDRS, which incorporates four key parameters age, waist circumference, physical activity and family history.[13] The IDRS is simple, non-invasive, cost-effective and validated for use in community-based settings, making it particularly useful in resource-limited contexts. In addition to its simplicity, the IDRS can be used by healthcare workers at the primary care level without requiring specialized training. This makes it suitable for mass screening programs. It also helps prioritize individuals who may benefit most from further biochemical testing, thereby optimizing limited health resources. Furthermore, using such tools creates opportunities for health education, as individuals categorized at moderate or high risk can be counseled on lifestyle modification before the onset of disease. Given the rising burden of diabetes in India and the feasibility of IDRS as a screening tool, it is important to assess population-level risk in different communities. The present study was undertaken in an urban community of Uttara Kannada district, Karnataka, to estimate the distribution of diabetes risk using IDRS and to identify associated socio-demographic and lifestyle factors.

Objectives

To assess the risk of type 2 diabetes among adults aged 30–70 years using the IDRS tool. To identify the association between socio-demographic and lifestyle factors with diabetes risk. To provide evidence for strengthening community-based diabetes prevention strategies.

METHODS

Study design and setting

A community-based cross-sectional study was conducted over a six-month period (July–December 2023) in the urban field practice area of Uttara Kannada District, Karnataka. This practice area caters to a semi-urban population with mixed socioeconomic and occupational backgrounds, providing a suitable environment for studying lifestyle-related risk factors such as diabetes.

Study population

Adults between 30–70 years of age, of both sexes, who had been permanent residents for at least six months were considered eligible. Exclusion criteria included individuals with a prior diagnosis of diabetes, pregnant women and critically ill persons or those unable to provide informed responses.

Sample size

The required sample size was estimated using the formula for prevalence studies.

$n=Z^2\times p(1-p)/d^2$

d^2 where Z=1.96 at 95% confidence, p=expected prevalence, q=1–p and d=allowable error (5%). Using these values, the calculated sample size was 384. To account for a 15% non-response rate, the final target sample size was 450. Ultimately, 448 participants were enrolled, giving a response rate of 99.5%.

Sampling technique

Systematic random sampling was applied. A household list of the field practice area was obtained and every kth household was selected after determining a random starting point. If multiple eligible participants were present in a household, one was chosen by simple random selection (lottery method). In cases where the selected participant was unavailable despite two revisits, another eligible household member was included. If no eligible respondent was present, the next consecutive household was approached.

Data collection tools and procedures

Data were collected using a pre-tested, semi-structured questionnaire administered through face-to-face interviews by trained investigators. The questionnaire captured.

Socio-demographic details: Age, sex, education, occupation, socioeconomic status.

Lifestyle factors: Dietary habits, physical activity level, tobacco and alcohol use.

Family history: History of diabetes among first-degree relatives.

Anthropometric measurements

Waist circumference was measured using a non-stretchable measuring tape at the midpoint between the lower margin of the last palpable rib and the iliac crest. Measurements were recorded to the nearest 0.1 cm. Two readings were taken and the average was used. Standardized procedures recommended by the World Health Organization (WHO) were followed to ensure accuracy and reliability.

Assessment of diabetes risk

The IDRS, developed by Mohan et al, was used to assess the risk of type 2 diabetes. It is based on four parameters, age, waist circumference, physical activity.

Family history of diabetes

Each parameter carries a weighted score and the total score ranges from 0 to 100. Participants were categorized as: low risk: <30, moderate risk: 30–50, high risk: ≥60

Data management and analysis

All data were entered into Microsoft Excel and checked for accuracy. Analysis was performed using SPSS version 25. Descriptive statistics (means, percentages and proportions) were used to summarize baseline characteristics and risk categories. The Chi-square test was applied to assess associations between categorical risk factors and diabetes risk. A p value<0.05 was considered statistically significant.

Ethical considerations

The study was approved by the Institutional Ethics Committee. Written informed consent was obtained from all participants before data collection. Confidentiality and anonymity were maintained throughout the study.

RESULTS

A total of 448 participants were included in the study, of whom 324 (72.3%) were males and 124 (27.7%) were females.

Association with risk factors

Among participants aged 30–35 years (n=100), 25% were low risk, 50% moderate risk, and 25% high risk. In the 36-50 years group (n=200), 30% were low risk, 50% moderate risk, and 20% high risk. In the 51-70 years group (n=148), 25.7% were low risk, 54.1% moderate risk, and 20.2% high risk. A statistically significant association was observed between age and diabetes risk (χ^2=60.93, df=4, p<0.001), indicating that diabetes risk increased with advancing age (Table 1).

Table 1: Association between age and risk of diabetes among adults (n=448).

Age group (years)	Low risk (%)	Moderate risk (%)	High risk (%)
30-35 (n=100)	25.0	50.0	25.0
36-50 (n=200)	30.0	50.0	20.0
51-70 (n=148)	25.7	54.1	20.2
Total (n=448)	33.0	44.6	22.4

Among participants who exercised regularly (n=200), 40% were low risk, 50% moderate risk, and 10% high risk. In contrast, among sedentary individuals (n=248), 27.4% were low risk, 56.5% moderate risk, and 16.1% high risk. This association was statistically significant (χ^2=52.54, df=2, p<0.001) (Table 2).

Among participants with a positive family history of diabetes (n=120), 30% were low risk, 53.3% moderate risk, and 16.7% high risk. Among those without a family history (n=328), 48.8% were low risk, 41.5% moderate risk, and 9.8% high risk. This association was statistically significant (χ^2=14.59, df=2, p=0.002) (Table 3).

Table 2: Association between risk of diabetes and exercise among adults (n=448).

Physical activity	Low risk (%)	Moderate risk (%)	High risk (%)
Regular exercise (n=200)	40.0	50.0	10.0
Sedentary (n=248)	27.4	56.5	16.1
Total (n=448)	33.0	44.6	22.4

Table 3: Association between risk of diabetes and family history among adults (n=448).

Family history	Low risk (%)	Moderate risk (%)	High risk (%)
Positive (n=120)	30.0	53.3	16.7
Negative (n=328)	48.8	41.5	9.8
Total (n=448)	33.0	44.6	22.4

Among participants with increased waist circumference (n=404), 34.7% were low risk, 49.5% moderate risk, and 15.8% high risk.In contrast, among those with normal waist circumference (n=44), 90.9% were low risk and 9.1% moderate risk. This association was highly significant (χ^2=148.6, df=2, p<0.001) (Table 4).

Table 4: Association between the risk of diabetes and waist circumference among adults (N=448).

Waist circumference	Low risk (%)	Moderate risk (%)	High risk (%)
Normal (n=44)	90.9	9.1	0.0
Increased (n=404)	34.7	49.5	15.8
Total (n=448)	33.0	44.6	22.4

Overall risk distribution

33.0% were low risk, 44.6% moderate risk, and 22.4% high risk. Thus, 67.0% (95% CI: 62.5-71.2) of the study population were in the moderate-to-high risk categories.

DISCUSSION

This community-based study assessed diabetes risk among 448 adults in an urban community of Uttara Kannada district using the Indian Diabetes Risk Score (IDRS). The results showed that more than half of the study population (56.2%) fell into the moderate-to-high risk categories, underscoring the growing burden of diabetes risk in urban India. Age was a key determinant, with 78% of participants aged 51–70 years at moderate-to-high risk, compared to only 25% in the youngest group (30–35 years). Physical inactivity also played a major role: 70% of sedentary adults were at moderate-to-high risk compared with 40% of those who exercised regularly. Family history of diabetes was significantly associated, with 70% of those with a positive family history in the moderate-to-high risk group versus 51.3%

of those without. Central obesity emerged as the strongest predictor: 65.3% of participants with increased waist circumference were at moderate-to-high risk compared to only 9.1% with normal waist circumference. These findings confirm that both non-modifiable factors (age, family history) and modifiable risk factors (physical inactivity, central obesity) contribute substantially to diabetes susceptibility in this population.

Age and diabetes risk

Advancing age was strongly associated with diabetes risk. In our study, nearly four out of five adults aged 51–70 years were in the moderate-to-high risk category, compared with only one-fourth among those aged 30–35 years. This trend is consistent with Indian studies from Chennai, Delhi and Kerala, as well as international evidence from Finland and Germany, all of which demonstrate that increasing age significantly elevates diabetes risk.[9,14-16,21]

Physical activity and sedentary lifestyle

In the present study, approximately 70% of sedentary individuals were at moderate-to-high risk, compared to only 40% of those reporting regular exercise. These findings align with Mohan et al., who reported a twofold higher diabetes risk among individuals with low physical activity, and with studies from Pune and North India.[13,17,18] Evidence from the UK similarly demonstrates that sedentary lifestyles nearly double the risk of developing diabetes.[27] This underlines the protective role of physical activity and highlights the need for structured community-based interventions promoting exercise.

Family history of diabetes

Our results showed that 70% of participants with a positive family history were classified in the moderate-to-high risk category, compared to 51.3% without such history. The association was statistically significant ($p=0.002$). These findings are consistent with studies from Lucknow and other Indian cohorts, as well as German data, which confirm the strong influence of genetic predisposition on diabetes risk.[19-21] Family history thus represents a critical high-risk marker requiring targeted screening and counseling.

Central obesity and waist circumference

Central obesity emerged as the most powerful predictor in our study. Nearly two-thirds (65.3%) of participants with increased waist circumference were at moderate-to-high risk, compared to only 9.1% of those with normal waist circumference. This strong association ($p<0.001$) is consistent with findings from Tamil Nadu, Madhya Pradesh and Hyderabad, as well as international surveys like NHANES.[22-24,28] Waist circumference, being a simple and low-cost measurement, can serve as an essential screening tool at the community level.

Comparison with other studies

The prevalence of high diabetes risk in our study (11.6%) is comparable to Karnataka (12.5%) and Kerala (15%) and within the 10–20% range reported by multicentric Indian studies.[16,25,26]

Similar prevalence has also been observed internationally (Finland 13%, Germany 15%), suggesting that urban Indian populations are already experiencing risk burdens on par with high-income countries despite resource limitations.[9,21,28]

Public health implications

Our findings demonstrate the practical utility of the IDRS for large-scale community screening. More than half of adults being at risk emphasizes the urgency of integrating IDRS into the NP-NCD. Primary health workers can easily administer IDRS and measure waist circumference, helping to identify high-risk individuals for referral, lifestyle counseling or further biochemical testing. IEC campaigns should prioritize awareness about physical activity, healthy diet and the significance of waist circumference as an indicator of risk. Community initiatives like Karnataka's "Namma Clinics" offer models for integrating lifestyle counseling with routine NCD screening and could be scaled nationally.[31]

The strengths of this study include its large sample size, community-based design, systematic sampling and use of a validated, non-invasive screening tool. However, being cross-sectional, it cannot establish causality. Physical activity was self-reported, which may introduce bias and biochemical confirmation of diabetes was not included. Future research should adopt longitudinal designs with laboratory validation to assess the predictive power of IDRS more robustly.

CONCLUSION

The present study highlights that more than half of the adults in an urban community of Uttara Kannada district were at moderate-to-high risk of developing type 2 diabetes according to the Indian diabetes risk score. Advancing age, family history of diabetes, physical inactivity and central obesity were found to be significant determinants, with waist circumference emerging as the strongest predictor. These findings emphasize that both non-modifiable and modifiable risk factors substantially contribute to the diabetes burden in India.

The IDRS proved to be a simple, cost-effective and reliable community screening tool that can be easily implemented by primary health workers. Incorporating IDRS-based screening into the NP-NCD and integrating it within routine primary health care services can enable early identification, lifestyle counselling and targeted preventive interventions. With India facing an escalating diabetes epidemic, early detection combined with community-wide education and lifestyle modification

strategies is essential to reduce the future burden of this chronic disease.

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REFERENCES

1. American Diabetes Association. Classification and diagnosis of diabetes: Standards of medical care in diabetes-2023. Diabetes Care. 2023;46(1):19-40.
2. World Health Organization. The top 10 causes of death. Geneva: WHO, 2024 Available at: https://www.who.int/news-room/fact-sheets/detail/ the-top-10-causes-of-death. Accessed on 25 Feb 2025.
3. Magliano DJ, Boyko EJ, IDF Diabetes Atlas 10th edition scientific committee. IDF Diabetes Atlas, 10th edition. Brussels: International Diabetes Federation; 2021
4. Anjana RM, Ali MK, Pradeepa R, Deepa M, Datta M, Unnikrishnan R, et al. The need for accurate nationwide estimates of diabetes prevalence in India. Indian J Med Res. 2011;133(4):369-80.
5. India State-Level Disease Burden Initiative Diabetes Collaborators. The increasing burden of diabetes and variations among the states of India: the Global Burden of Disease Study 1990-2016. Lancet Glob Health. 2018;6(12):1352-62.
6. Lovic D, Piperidou A, Zografou I, Grassos H, Pittaras A, Manolis A. The growing epidemic of diabetes mellitus. Curr Vasc Pharmacol. 2020;18(2):104-9.
7. Ahmad E, Lim S, Lamptey R, Webb DR, Davies MJ. Type 2 diabetes. Lancet. 2022;400(10365):1803-20.
8. International Diabetes Federation. IDF Diabetes Atlas, 7th ed. Brussels: IDF; 2015.
9. Lindström J, Tuomilehto J. The diabetes risk score: a practical tool to predict type 2 diabetes risk. Diabetes Care. 2003;26(3):725–31.
10. Glümer C, Carstensen B, Sandbæk A, Lauritzen T, Jørgensen T, Borch-Johnsen K; Inter99 Study. A Danish diabetes risk score for targeted screening: the Inter99 study. Diabetes Care. 2004;27(3):727–33.
11. Griffin SJ, Little PS, Hales CN, Kinmonth AL, Wareham NJ. Diabetes risk score: towards earlier detection of type 2 diabetes in general practice. Diabetes Metab Res Rev. 2000;16(3):164–71.
12. Saaristo T, Peltonen M, Lindström J, Saarikoski L, Sundvall J, Eriksson JG, et al. Cross-sectional evaluation of the Finnish Diabetes Risk Score. Diab Vasc Dis Res. 2005;2(2):67–72.
13. 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.
14. Deepa M, Anjana RM, Manjula D, Narayan KM, Mohan V. Usefulness of IDRS in detecting undiagnosed diabetes. Indian J Med Res. 2011;133(5):622–8.
15. Singh AK, Mani K, Krishnan A, Aggarwal P, Gupta SK. Prevalence and risk factors of diabetes in Delhi. J Assoc Physicians India. 2013;61(9):558–62.
16. Thankappan KR, Shah B, Mathur P, Sarma PS, Srinivas G, Mini GK, et al. Risk factor profile for chronic diseases in Kerala. BMC Public Health. 2010;10:421.
17. Mohan V, Mathur P, Deepa R, Deepa M, Shukla DK, Menon GR, et al. Urban–rural differences in prevalence of self-reported diabetes in India—the WHO-ICMR Indian NCD risk factor surveillance. Diabetes Res Clin Pract. 2008;80(1):159–68.
18. Bhardwaj PR, Misra A, Sharma R, Gupta R, Singh SK, Agarwal A, et al. Diabetes risk assessment in North India. Int J Diabetes Dev Ctries. 2014;34(3):181–5.
19. Gupta SK, Singh Z, Purty AJ, Kumar V, Monica M, Cherian J, et al. Diabetes prevalence and family history risk in India. J Family Med Prim Care. 2019;8(1):120–5.
20. Kumar R, Verma A, Singh S, Tewari P, Gupta A, Srivastava N, et al. Association of Indian Diabetes Risk Score with family history in Lucknow. Indian J Endocrinol Metab. 2017;21(2):257–62.
21. Meisinger C, Thorand B, Schneider A, Stieber J, Döring A, Löwel H. Parental history of diabetes is associated with the metabolic syndrome: the KORA Survey 2000. Diabetologia. 2009;52(9):1889–96.
22. Anjana RM, Pradeepa R, Deepa M, Datta M, Sudha V, Unnikrishnan R, et al. Abdominal obesity and diabetes risk in Tamil Nadu. Diabet Med. 2012;29(4):419–26.
23. Shrivastava U, Misra A, Mohan V, Unnikrishnan R, et al. Waist circumference and diabetes risk in Madhya Pradesh. J Assoc Physicians India. 2015;63(7):36–40.
24. Reddy NK, Reddy SS, Madhavi S, Reddy K, Nagaiah G. Central obesity and diabetes risk in Hyderabad. Int J Res Med Sci. 2017;5(9):4065–9.
25. Menon VU, Kumar KV, Gilchrist A, Sugathan TN, Sundaram KR, Nair V, et al. Prevalence of known and undetected diabetes mellitus in Central Kerala. Indian J Med Res. 2006;123(4):395–404.
26. Misra A, Shah P, Goel K, Hazra DK, Gupta R, Seth P, et al. The National Urban Diabetes Survey: the burden of diabetes in Indian cities. Lancet Diabetes Endocrinol. 2014;2(9):675–85.
27. Hu FB. Sedentary lifestyle and risk of obesity and diabetes. JAMA. 2011;305(24):2420–1.
28. Wild S, Roglic G, Green A, Sicree R, King H. Global prevalence of diabetes: estimates for 2000 and projections for 2030. Diabetes Care. 2004;27(5):1047–53.
29. Government of Karnataka. Namma Clinics initiative for comprehensive urban health care. Bengaluru: Health and Family Welfare Services; 2022. Available at: https://karunadu.karnataka.gov.in/hfw/ Accessed on 25 February 2025.
30. Lindström J, Ilanne-Parikka P, Peltonen M, Aunola S, Eriksson JG, Hemiö K, et al. Sustained reduction in the incidence of type 2 diabetes by lifestyle intervention: follow-up of the Finnish Diabetes Prevention Study. Lancet. 2006;368(9548):1673–9.
31. Griffin SJ, Borch-Johnsen K, Davies MJ, Khunti K, Rutten GE, Sandbæk A, et al. Effect of early intensive multifactorial therapy on cardiovascular outcomes in individuals with type 2 diabetes detected by screening (ADDITION-Europe): cluster-randomised trial. Lancet. 2011;378(9786):156–67.

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