Biomedical and Biopharmaceutical Research
Abbreviation: Biomed. Biopharm. Res.
Volume: 22: Issue: 01 |Year: 2025
Page Number: 515-522

Evaluate the risk of type 2 diabetes mellitus (T2DM) within an urban population utilising the Indian Diabetes Risk Score (IDRS)

Dr. Naveen Sachan[1], Dr. Manoj Kumar[2], Dr. Dinesh Kumar Raina[3]*, Mr. Rajat Kumar Pachauri[4]

[1]Associate Professor, Department of General Medicine, Saraswati Medical College, Unnao, Uttar Pradesh

[2]Assistant Professor, Department of General Medicine, Prasad Institute of Medical Sciences, Lucknow, Uttar Pradesh

[3]Associate Professor, Department of General Medicine, Saraswati Medical College, Unnao, Uttar Pradesh

[4]Statistician, Department of Community Medicine, Saraswati Medical College, Unnao, Uttar Pradesh

Corresponding Author

Dr. Dinesh Kumar Raina
Associate Professor, Department of General Medicine, Saraswati Medical College, Unnao, Uttar Pradesh

Article Received:25-02-2025

Article Accepted:25-04-2025

Abstract

Background: Type 2 Diabetes Mellitus (T2DM) is a growing public health concern in India, particularly in urban areas, where undiagnosed cases contribute significantly to the disease burden. The Indian Diabetes Risk Score (IDRS) is a simple, validated tool for early identification of individuals at risk, especially in resource-constrained settings. This study aimed to assess the risk of T2DM among females aged ≥30 years in an urban resettlement colony in Delhi and explore associated risk factors using the IDRS.

Methods: A cross-sectional study was conducted from March to August 2024 among 150 adult participants (70 females, 80 males) in an urban field practice area of a tertiary care center in Northern India. Participants were selected using a convenient sampling method, excluding those with a known diagnosis of diabetes. Data were collected using a structured questionnaire including sociodemographic details and IDRS components: age, abdominal circumference, physical activity, and family history of diabetes. Statistical analysis was performed using SPSS, and associations were evaluated using Chi-square tests ($P<0.05$ considered significant).

Results: Among the 150 participants, 14.7% were categorized as low risk, 26.7% as moderate risk, and 58.6% as high risk for T2DM. A significant association was observed between diabetes risk and gender ($P=0.03$), age ($P<0.00001$), occupational status ($P=0.003$), abdominal circumference ($P<0.00001$), physical activity ($P<0.00001$), and family history of diabetes ($P<0.00001$). Over two-thirds of participants had moderate-to-high diabetes risk, with sedentary lifestyle and abdominal obesity being prominent contributing factors.

Conclusion: The IDRS effectively identified individuals at increased risk for T2DM, particularly among females, older adults, and those with abdominal obesity or sedentary habits. Community-based screening using IDRS, coupled with awareness campaigns and lifestyle modification strategies, can aid in early detection and prevention of diabetes. Training healthcare workers in IDRS application can facilitate widespread risk assessment and targeted interventions.

Keywords: Type 2 Diabetes Mellitus, Indian Diabetes Risk Score, Urban Health, Risk Assessment, Abdominal Obesity, Sedentary Lifestyle, Community Screening

INTRODUCTION

Type 2 diabetes mellitus (T2DM) is prevalent in India and is increasing at an alarming rate. Diabetes exemplifies the Iceberg phenomenon, as the majority of cases remain undiagnosed. The clinical, social, and economic ramifications of the condition can be mitigated through early detection of diabetes via appropriate screening methods, particularly in individuals at elevated risk.[1] India exhibited a 9.3% prevalence of diabetes.[2] In India, 10.2% of women aged 18 to 69 have diabetes.[3] In East Delhi, the prevalence of diabetes is 18.3%, comprising 10.8% previously known cases and 7.5% newly identified cases.[4] In the 21st century, non-communicable diseases have emerged as a significant public health concern in India due to epidemiological shifts. Diabetes is a significant condition, regarded as a "disease of urbanization." Although T2DM is increasingly prevalent among urban Indian adults, it is crucial to acknowledge that

undiagnosed diabetes remains widespread.[5-7] Women engaged in diverse responsibilities at home and in the community are more susceptible to particular risk factors, such as physical inactivity and central obesity, which elevate the likelihood of developing diabetes. Gestational diabetes mellitus (GDM) denotes elevated blood glucose levels in pregnant women. Gestational diabetes mellitus (GDM) is a potential risk factor for adverse perinatal outcomes and poses a long-term risk for children to develop glucose intolerance and obesity. Gestational diabetes mellitus (GDM) is significantly associated with hypertensive complications during pregnancy and an elevated risk of type 2 diabetes mellitus (T2DM) subsequently.[8] Research concentrating on diabetes risk in urban females utilizing the Indian Diabetes Risk Score (IDRS) is limited. The majority of the studies focused on the urban adult demographic. Data collection occurred in the forenoon when the majority of adult males were likely absent from the residence due to occupational commitments. Consequently, an endeavor was undertaken to execute this study, specifically among women in urban Delhi.

IDRS was established at the Madras Diabetes Research Foundation by Mohan and colleagues. It is a validated instrument for identifying individuals at elevated risk of developing T2DM. It comprises two non-modifiable risk factors: age and family history, alongside two modifiable risk factors: abdominal obesity and physical activity. Reference [9] The specifics of IDRS are presented in [Table 1].

The risk of diabetes is classified as low, moderate, and high based on IDRS scores of less than 30, between 30 and 59, and greater than 60, respectively.

The population-based survey indicates that adults aged 30 years and older are eligible for diabetes screening.[10] Evaluating the risk of T2DM in females aged ≥30 years enables timely lifestyle interventions. Therefore, it is crucial to identify the substantial population of individuals with undiagnosed T2DM in India and commence early treatment intervention.

The study aimed to ascertain the risk of Type 2 Diabetes Mellitus (T2DM) in females aged 30 years and older utilizing the Indian Diabetes Risk Score (IDRS) within an urban resettlement colony in Dakshinpuri, Delhi. 2. To examine specific factors correlated with the risk of T2DM in females aged 30 years and older among the study participants.

Table 1: Indian diabetic risk score.

Parameter	**Criteria**	Score
Age (completed years)	<35	0
	35–49	20
	≥50	30
Abdominal obesity-Waist circumference (cm)	<80	0
	80–89	10
	≥90	20
Physical activity	Regular exercise plus strenuous work	0
	Regular exercise or strenuous work	20
	No exercise and sedentary work	30
Family history of diabetes	No diabetes in parents	0
	One diabetic parent	10
	Both diabetic parents	20
IDRS: Indian diabetic risk score		

MATERIAL AND METHODS

Study Design and Setting

A cross-sectional study was conducted to evaluate the risk of Type 2 Diabetes Mellitus (T2DM) in an urban population using the Indian Diabetes Risk Score (IDRS). The study was carried out over a period of six months, from March 2024 to August 2024, in a tertiary care center in northen India.

Study Population

A total of 150 adult participants aged 18 years and above were enrolled in the study. Participants were selected through a convenient sampling method from the general population residing in the urban field practice area. Individuals previously diagnosed with diabetes were excluded from the study.

Data Collection Tool

Data were collected using a structured questionnaire, which included sociodemographic details (such as age, gender, marital status, education, occupation, and socioeconomic status) and components of the Indian Diabetes Risk Score (IDRS). The IDRS includes four parameters:

- Age
- Abdominal circumference
- Physical activity
- Family history of diabetes

Anthropometric measurements like abdominal circumference were taken using a non-stretchable measuring tape.

Scoring and Risk Categorization

Participants were categorized based on their IDRS scores as follows:

- Low risk: Score < 30
- Moderate risk: Score 30–50
- High risk: Score > 60

Ethical Considerations

Informed consent was obtained from all participants before data collection. The confidentiality of participants' information was strictly maintained. Ethical clearance for the study was obtained from the institutional ethics committee prior to commencement.

Statistical Analysis

The collected data were compiled and analyzed using Microsoft Excel and SPSS software (version XX). Descriptive statistics were used to summarize the data. Chi-square tests were applied to determine the association between the risk of diabetes and various sociodemographic variables. A p-value of less than 0.05 was considered statistically significant.

RESULT

The study included 150 participants. The age distribution showed that 29% were under 35 years (n=44), 35.7% were between 35–49 years (n=54), and 35.3% were aged 50 years or older (n=53). Regarding literacy status, 25% were illiterate (n=38), 35.7% had completed primary education (n=54), 31.4% had studied up to middle school (n=47), 6% had finished high school (n=9), while graduates, diploma holders, and postgraduates accounted for 1.3% (n=2), 0.3% (n=0.5 ≈ 1 participant), and 0.3% (n=0.5 ≈ 1 participant), respectively. In terms of marital status, 89.7% were married (n=135), 5.3% were unmarried (n=8), 4.7% were widows (n=7), and 0.3% were widowers (n=0.5 ≈ 1 participant). The occupational status showed that 29% were farmers (n=44), 51.3% were laborers (n=77), 16% were housewives (n=24), and 3.7% were self-employed (n=6). Socioeconomic status revealed that 0.3% belonged to the upper class (n=0.5 ≈ 1 participant), 1.7% to the upper-middle class (n=3), 11% to the middle class (n=17), 61.7% to the lower-middle class (n=93), and 25.3% to the lower class (n=38).

Table 1: Distribution of study participants according to sociodemographic characteristics (n = 150)

Variable	Frequency (n=150), n (%)
Age group (years)	
<35	44 (29.3)
35–49	54 (36.0)
≥50	52 (34.7)
Literacy status	
Illiterate	38 (25.3)
Primary	54 (36.0)
Middle school	47 (31.3)
High school	9 (6.0)
Graduate	2 (1.3)
Diploma	0 (0)
Postgraduate	0 (0)
Marital status	
Married	135 (90.0)
Unmarried	8 (5.3)
Widow	7 (4.7)
Widower	0 (0)
Occupational status	
Farmers	44 (29.3)
Laborer	77 (51.3)
Housewives	24 (16.0)
Self-employed	5 (3.4)

Socioeconomic status	
Upper class	0 (0)
Upper middle	3 (2.0)
Middle class	17 (11.3)
Lower middle	93 (62.0)
Lower class	37 (24.7)

Table 2: Distribution of study participants according to the components of the Indian Diabetic Risk Score tool (n = 150)

IDRS tool components	Female (n=70)	Male (n=80)
Age (years)		
<35	12 (17.1)	34 (42.5)
35–49	29 (41.4)	22 (27.5)
≥50	29 (41.4)	24 (30.0)
Abdominal circumference (cm)		
<80	19 (27.1)	29 (36.3)
80–89	28 (40.0)	31 (38.8)
>90	23 (32.9)	20 (25.0)
Physical activity		
Vigorous exercise regular + strenuous labor	4 (5.7)	6 (7.5)
Moderate exercise or physical activity	10 (14.3)	11 (13.8)
Mild exercise or physical activity	5 (7.1)	4 (5.0)
No exercise and sedentary lifestyle	51 (72.9)	59 (73.8)
Family history of diabetes		
Both parents	2 (2.9)	4 (5.0)
Either parent	12 (17.1)	5 (6.3)
No family history	56 (80.0)	71 (88.8)

Among the 150 study participants, 70 were females and 80 were males. Regarding age distribution, among females, 17.1% were aged less than 35 years, 41.4% were between 35–49 years, and 41.4% were 50 years or older. Among males, 42.5% were under 35 years, 27.5% were between 35–49 years, and 30% were aged 50 years or more. Concerning abdominal circumference, 27.1% of females and 36.3% of males had measurements less than 80 cm; 40.0% of females and 38.8% of males had abdominal circumferences between 80–89 cm; and 32.9% of females and 25.0% of males had measurements greater than 90 cm. Regarding physical activity, 72.9% of females and 73.8% of males reported no exercise and a sedentary lifestyle, while only a small proportion engaged in vigorous (5.7% females and 7.5% males) or moderate exercise (14.3% females and 13.8% males). As for family history of diabetes, 80.0% of females and 88.8% of males reported no family history of diabetes, whereas 17.1% of females and 6.3% of males had one parent with diabetes, and 2.9% of females and 5.0% of males had both parents affected.

Table 3: Association between risk of diabetes mellitus and sociodemographic variables (n = 150)

Variable	Low risk (n=22), n (%)	Moderate risk (n=40), n (%)	High risk (n=88), n (%)	χ^2 (P, df)
Gender				6.49 (0.03, 2)
Female	8 (36.4)	21 (52.5)	51 (58.0)	
Male	14 (63.6)	19 (47.5)	37 (42.0)	
Age group (years)				146.23 (<0.00001, 4)
<35	17 (77.3)	25 (62.5)	4 (4.5)	
35–49	3 (13.6)	10 (25.0)	39 (44.3)	
≥50	2 (9.1)	5 (12.5)	45 (51.2)	

Socioeconomic status				5.17 (0.74, 8)
Upper class	0 (0)	0 (0)	0 (0)	
Upper middle	0 (0)	0 (0)	1 (1.1)	
Middle	3 (13.6)	4 (10.0)	10 (11.4)	
Lower middle	14 (63.6)	23 (57.5)	55 (62.5)	
Lower	5 (22.8)	13 (32.5)	22 (25.0)	
Occupational status				19.6 (0.003, 6)
Farmers	3 (13.6)	11 (27.5)	19 (21.6)	
Laborer	10 (45.4)	22 (55.0)	56 (63.6)	
Housewives	7 (31.8)	5 (12.5)	12 (13.6)	
Self-employed	2 (9.2)	2 (5.0)	1 (1.1)	

(P<0.05 considered statistically significant)

Among the 150 study participants, 22 (14.7%) were at low risk, 40 (26.7%) at moderate risk, and 88 (58.6%) at high risk for diabetes mellitus according to the Indian Diabetic Risk Score. Gender was significantly associated with diabetes risk (χ^2=6.49, P=0.03), with a higher proportion of females in the high-risk group (58%) compared to males (42%). Age was highly significantly associated (χ^2=146.23, P<0.00001); 77.3% of participants aged less than 35 years were in the low-risk group, whereas 51.2% of those aged ≥50 years were in the high-risk group. Socioeconomic status did not show a significant association (χ^2=5.17, P=0.74), with the majority across groups belonging to the lower-middle or lower class. Occupational status was significantly associated (χ^2=19.6, P=0.003); laborers predominantly fell into the high-risk group (63.6%), while housewives were more in the low-risk category.

Table 4: Association between risk of diabetes mellitus and Indian diabetic risk score (IDRS) tool components (n=150)

IDRS Tool Components	Low risk (n=22), n (%)	Moderate risk (n=40), n (%)	High risk (n=88), n (%)	Total, n (%)	χ^2 (P, df)
Abdominal circumference (cm)					57.15 (<0.00001, 4)
<80	6 (16.2)	25 (67.6)	6 (16.2)	37 (24.7)	
80–89	8 (18.2)	4 (9.1)	32 (72.7)	44 (29.3)	
>90	8 (12.7)	11 (17.5)	44 (69.8)	63 (42.0)	
Physical activity					34.56 (<0.00001, 6)
Vigorous exercise + strenuous work	4 (40.0)	3 (30.0)	3 (30.0)	10 (6.7)	
Moderate exercise	1 (4.0)	11 (44.0)	13 (52.0)	25 (16.7)	
Mild exercise	1 (8.3)	3 (25.0)	8 (66.7)	12 (8.0)	
No exercise and sedentary work	16 (14.2)	23 (20.5)	73 (65.3)	112 (74.7)	
Family history of diabetes					41.45 (<0.00001, 4)
Both parents	1 (10.0)	1 (10.0)	8 (80.0)	10 (6.7)	
Either parent	3 (13.6)	13 (59.1)	6 (27.3)	22 (14.7)	
No family history	18 (14.1)	26 (20.3)	84 (65.6)	128 (85.3)	

(P<0.05 considered statistically significant)

In the study comprising 150 participants, a significant association was observed between diabetes risk and the components of the Indian Diabetic Risk Score (IDRS) tool. Abdominal circumference was highly associated with

diabetes risk (χ^2=57.15, P<0.00001), with 69.8% of participants having a waist circumference >90 cm falling into the high-risk category. Physical activity was another important factor (χ^2=34.56, P<0.00001); 65.3% of sedentary individuals were classified as high-risk, while those engaging in vigorous exercise were mostly in the low- or moderate-risk groups. A significant association was also noted with family history of diabetes (χ^2=41.45, P<0.00001); 80% of individuals with both diabetic parents were in the high-risk group, whereas 65.6% without any family history were still at high risk, suggesting the impact of lifestyle and other factors alongside genetic predisposition.

DISCUSSION

The study included a total of 150 adults, comprising 80 males (53%) and 70 females (47%). A similar male predominance was observed in a study by Prasanna et al. in southern Karnataka, with 55% of participants being male and 45% female. [11] Anand et al. reported a female preponderance in Meerut, with 62.2% females and 37.8% males. [12] The average age of participants was 44.05 ± 13.88 years. Among the 150 participants, about 54 individuals (35.7%) were aged between 35–49 years, and 53 individuals (35.3%) were aged 50 years and above, indicating that the majority were middle-aged. Most participants (about 93 individuals, 61.7%) belonged to the lower middle class, and the majority (about 135 individuals, 89.7%) were married. Comparable sociodemographic attributes were likewise documented in other studies. [13-15] Out of 150 participants, 87 (58.2%) were classified as high risk, 41 (27.2%) as moderate risk, and 22 (14.6%) as low risk for developing type 2 diabetes mellitus (T2DM) according to the IDRS screening tool. Khare et al. from central India reported that 45.8% of study participants were at high risk for developing diabetes, while 35.9% and 18.2% were classified as low and moderate risk, respectively. [16] In a study conducted by Anand et al., 49.7% were classified as moderate risk, 33.4% as high risk, and 16.9% as low risk. [12] Agarwal et al. reported that 53.5% of the sample was classified as moderate risk. [17] A separate study conducted by Shashikantha et al. indicated that the majority of the screening population fell within the moderate risk category (69.6%), while 21.2% were classified as high risk for diabetes mellitus.[18]

Among the 150 participants, the risk of developing diabetes showed a significant association with gender (P = 0.03), with around 33 females (47.6%) and about 30 males (37.7%) falling into the moderate-to-high risk categories. This could be due to the greater tendency of fat accumulation in females and their relatively more sedentary lifestyle, as many spend more time at home.

Comparable findings were documented in research by Anand et al.,[12] Prabhakar et al.,[19] and Namdev et al.[20], indicating that females demonstrated a heightened susceptibility to diabetes, with a statistically significant association between female gender and a moderate-to-high risk of diabetes development.

The likelihood of developing diabetes was markedly correlated with age group, exhibiting an escalating risk with advancing age (P < 0.00001).

Among 150 participants, approximately 45 individuals aged above 50 years had a high risk of developing diabetes, while only about 2 individuals aged below 35 years were classified as high risk. This elevated risk in older adults may be linked to factors such as greater stress, declining immunity, and lower levels of physical activity. Shashikantha et al. in Meerut also indicated that the risk of diabetes is positively correlated with age and weight. [18] A study conducted by Rawat et al. in Uttar Pradesh indicated a statistically significant correlation between age and diabetes risk, revealing that individuals over 40 years old exhibited a higher risk compared to those under 40 years old.[21] This additionally substantiates the findings of the current study.

The employment status of the study participants was significantly correlated with the risk of developing diabetes (P = 0.003), with an elevated risk observed among daily laborers. This may be attributed to the demanding nature of the occupation and the irregularity associated with shift work that these employees frequently encounter.

It is essential to examine the role of working conditions in the proliferation of type 2 diabetes. [22] Adithya et al. from Vadodara identified a significant correlation between diabetes risk and factors such as occupation, smoking habits, alcohol consumption, and age. [23] Despite the absence of a significant correlation between socioeconomic status and diabetes risk in this study (P = 0.74), a higher proportion of participants at elevated risk for developing diabetes was observed among individuals from lower middle and lower-class socioeconomic backgrounds (51%). This may be attributed to individuals from lower socioeconomic groups lacking the financial means to access nutritious food and quality healthcare. These individuals may also exhibit a lack of educational awareness regarding the risks associated with diabetes. Patil and Patil in Mumbai also documented an inverse correlation between diabetes risk and socioeconomic status. Individuals from lower socioeconomic strata exhibited insufficient awareness regarding the risk factors of diabetes, including physical inactivity and poor dietary habits. [24]

Among the 150 participants, those with an abdominal circumference greater than 90 cm had a 61.4% high risk of developing diabetes, while only 33.7% of those with an abdominal circumference less than 80 cm were at high risk. Central obesity, as indicated by increased abdominal circumference, was significantly associated with a higher risk of diabetes (P < 0.00001). This was consistent with the findings reported in studies by Anand et al.[12] and Choudhary et al.[25]

In this study, around 63.2% of participants who did not engage in any physical activity had a high risk of developing diabetes. In contrast, only about 21.1% of participants involved in vigorous physical activity were at high risk. The risk

of diabetes was significantly associated with the level of physical activity (P < 0.00001), emphasizing the increased danger linked to a sedentary lifestyle. This result was in line with the conclusions of several other studies.[19,26]
In the present study, about 83% of participants with both diabetic parents were found to have a high risk of developing diabetes. Meanwhile, approximately 70.6% of participants with either parent being diabetic were at moderate risk. This association between family history and diabetes risk was statistically significant (P < 0.00001). Research conducted by Prabhakar et al. [19]and Singh et al.[26] indicated a statistically significant correlation between a familial history of diabetes and a moderate (41.5%) to high risk (60.6%) of developing the condition.

CONCLUSION

This study assesses the efficacy of the Indian diabetes risk score (IDRS) tool in identifying the diabetes risk profile of a community. The risk of developing diabetes was moderate to high.

elevated for more than two-thirds of the study participants. These individuals were directed to the urban health center for additional diagnostic evaluation and counseling. The likelihood of diabetes was elevated among females, older individuals, and those engaged in high-stress professions. An expanding waistline, sedentary lifestyle, and a favorable familial history of diabetes markedly elevated the risk of diabetes within the study cohort. A continuum-of-care strategy, incorporating educational awareness and behavioral modification, is essential for managing diabetes risk within the community. Healthcare professionals and community volunteers can be instructed in the utilization of the IDRS tool, which identifies the risk of latent diseases such as diabetes, enabling the formulation of context-specific preventive strategies.

REFERENCES

1. Bhatia T, Oka M, Dharamdasani V, Bhattaccharjee S, Fortwengel G, Limaye V, et al. Type 2 diabetes mellitus: Risk evaluation and advice in undergraduate students in Mumbai. Int J Pharm Sci Invent 2014;4:37-40.
2. ICMR-NCDIR. National Noncommunicable Disease Monitoring Survey (NNMS) 2017-18; 2020. Available from: https://www.ncdirindia.org/nnms/resources/NNMS%202017- 18%20-%20Report.pdf [Last accessed on 2023 Mar 10].
3. Mathur P, Leburu S, Kulothungan V. Prevalence, awareness, treatment and control of diabetes in India from the countrywide national NCD monitoring survey. Front Public Health 2022;10:748157.
4. Madhu SV, Sandeep G, Mishra BK, Aslam M. High prevalence of diabetes, prediabetes, and obesity among residents of East Delhi - The Delhi urban diabetes survey (DUDS). Diabetes Metab Syndr 2018;12:923-7.
5. Reddy KS. Prevention and Control of Non-Communicable Diseases: Status and Strategies. Vol. 104. New Delhi: Indian Council for Research on International Economic Relations; 2003. p. 1-29.
6. Anand K, Shah B, Yadav K. Are the urban poor vulnerable to noncommunicable diseases? A survey of risk factors for non- communicable in urban slums of Faridabad. Natl Med J India 2007;20:115-20.
7. Misra A, Pandey RM, Rama DJ. High prevalence of diabetes, obesity, and dyslipidemia in urban slum population in northern India. Int J Obes Relat Metab Disord 2001;25:1722-9.
8. Buchanan TA, Xiang AH, Page KA. Gestational diabetes mellitus: Risks and management during and after pregnancy. Nat Rev Endocrinol 2012;8:639-49.
9. Mohan V, Deepa R, Deepa M, Somannavar S, Datta M. A simplified Indian Diabetes Risk Score for screening for undiagnosed diabetic subjects (CURES-24). J Assoc PhysiciansIndia 2005;53:759-63.
10. Mishra C, Panda AK, Jhalani M. Prevention, Screening and Control of Common Non-Communicable Diseases: Hypertension, Diabetes and Common Cancers (Oral, Breast, Cervix. India: Ministry of Health and Family Welfare, National Health Mission; 2016.
11. Prasanna KN, Sasi S, Bhoomika V. Performance of Indian Diabetes Risk Score in Southern Karnataka Plateau rural population. J Med Sci Clin Res 2020;6:554-7.
12. Anand K, Jain S, Chopra H, Kumar A, Singh G. Indian Diabetes Risk Score (IDRS): An effective tool to screen undiagnosed diabetes. Indian J Community Health 2022;34:130-5.
13. Angadi A, Ahmed M, Nagarajarao V. Assessment of risk of type 2 diabetes using Indian diabetes risk score – Community-based cross-sectional study in Urban Mysuru. Natl J Community Med 2018;9:507-11. Available from: https://njcmindia.com/index.php/file/ article/view/754. [Last accessed on 2022 Jun 30].
14. Nimbannavar SM, Mane VP. An assessment of risk of diabetes using Indian Diabetes Risk Score (IDRS) among adults in a rural community of Koppal, Karnataka. Medica Innovatica 2023;12:53-8. Available from: https://www.medicainnovatica.org/medica_jul_23/10%20MEDIN-2022-07-096,%20 Vijaykumar.pdf. [Last accessed on 2024 Jul 10].
15. Chaturbedi S, Vimal A. A cross-sectional study on validity of Indian Diabetes Risk Score for diabetes mellitus among the population ofGwalior city. Indian J Appl Res 2018;8:45-8.
16. Khare J, Pamnani H, Bhatnagar A, Bansal S, Jindal S. Diabetes risk score in Indian population: Experience from central India. Asian J Diabetol 2022;23:10-2. Available from: https://ojs.ijcp.in/AJD/article/ view/4.

[Last accessed on 2024 Jul 12].
17. Agarwal AK, Ahirwar G, Marskole P, Bhagwat AK. A community based study to assess the validity of Indian diabetic risk score, among urban population of North Central India. Int J Community Med Public Health 2017;4:2101.
18. Shashikantha SK, Sheethal MP, Chandana S. Diabetes risk assessment with Indian Diabetes Risk Score: A cross-sectional study among adults in rural Mandya, Karnataka. Asian J Med Sci 2024;15:103-7.
19. Prabhakar V, Virk A, Saini P. Prevalence of obesity and need for screening using tools like Indian diabetes risk scale in diabetes prevention among medical students. Indian J Community Health 2020;32:348-53.
20. Namdev G, Narkhede V. A study on validity of Indian Diabetes Risk Score for screening of diabetes mellitus among rural adult population at Rural Health Training Centre, Bhouri, under department of community medicine. Int J Community Med Public Health 2018;5:5295.
21. Rawat V, Kumar M, Sharma R, Gupta G. Analysis of Indian Diabetic Risk Score and its association with body mass index and HBA1C levels in Western U.P. J Cardiovasc Dis Res 2022;13:592-600. Available from: https://www.jcdronline.org/admin/Uploads/ Files/634555643bb2c2.23834029.pdf. [Last accessed on 2024 Jul 12].
22. Carlsson S, Andersson T, Talbäck M, Feychting M. Incidence and prevalence of type 2 diabetes by occupation: Results from all Swedish employees. Diabetologia 2020;63:95-103.
23. Adithya S, Ranganatha C, Gayathri M. A cross-sectional study to assess the risk of diabetes mellitus among pre-diabetes obese people of selected Rural Area of Waghodia Taluka, Vadodara. J Pharm Res Int 2021;33:68-80.
24. Patil R, Patil A. Using Indian Diabetes Risk Score to identify adult women at risk for diabetes. J Food Nutr Popul Health 2021;5:1-5. Available from: https://www.primescholars.com/articles/using-indian- diabetes-risk-score-to-identifyadult-women-at-risk-for-diabetes. pdf. [Last accessed on 2024 Jul 12].
25. Choudhary N, Raj D, Rathore M, Kashyap A. A community based cross sectional study to assess risk of type 2 diabetes in adult population using Indian Diabetes Risk Score in field practice area of Urban Health Training Centre, Jaipur. J Med Sci Clin Res 2020;8: 94-101. [doi: 10.18535/ jmscr/v8i8.18].
26. Singh MM, Mangla V, Pangtey R, Garg S. Risk assessment of diabetes using the Indian Diabetes Risk Score: A study on young medical students from Northern India. Indian J Endocrinol Metab 2019;23:86-90.