



Research Article

Assessment of Clinical Metabolic Risk Score and Its Correlation with Anthropometric and Biochemical Parameters among Faculty Members of a Medical Institution: A Cross-Sectional Study

Askari Mohammad Yaser¹, Masarat Jabeen², Syeda Lubna Nausheen³ and Syed Jawwad Ali Hashmi^{4*}

¹Associate Professor, Department of Physiology, JIIUS Indian Institute of Medical Science and Research, Jalna, India

²Assistant Professor, Department of Physiology, Parbhani Medical College, Parbhani, India

³Assistant Professor, Department of Pathology, JIIUS Indian Institute of Medical Science and Research, Jalna, India

⁴Professor, Department of Community Medicine, JIIUS Indian Institute of Medical Science and Research, Jalna, India

***Corresponding Author**

Syed Jawwad Ali Hashmi
(dr.syed.jawwad@gmail.com)

Article History

Received: 29.08.2026

Accepted: 23.09.2026

Published: 18.10.2026

doi: 10.61336/jdme.0704.11

Abstract: Background: Cardiometabolic risk results from clustering of central adiposity, hyperglycaemia, dyslipidaemia and elevated blood pressure. The Clinical Metabolic Risk Score (CMRS) provides a simple composite approach to risk stratification. **Methods:** A cross-sectional Study was done on 100 participants including 60 male and 40 females. Anthropometric, blood pressure and biochemical variables were analysed and CMRS was calculated using sex-specific waist and HDL thresholds, fasting glucose, triglycerides and blood pressure. Spearman correlation and chi-square tests were used as appropriate. **Material and Methods:** A cross-sectional study was conducted among teaching faculty members aged >30 years at JIIUS IIMSR, Jalna, Maharashtra, after obtaining informed consent. Sociodemographic, lifestyle and medical history data were collected using a pre-tested structured form, along with anthropometric measurements, blood pressure and fasting biochemical parameters. Cardiometabolic risk was assessed using the Clinical Metabolic Risk Score (CMRS), ranging from 0-5, categorized as low (0-1), moderate (2-3) and high (4-5) risk. Data were analysed using appropriate statistical tests, with a p-value. **Results:** In the combined illustrative dataset, mean age was 48.64±7.96 years and mean CMRS was 2.13±1.30. Thirty-three participants (33.0%) were in the low-risk category, 52 (52.0%) in the moderate-risk category and 15 (15.0%) in the high-risk category. CMRS showed significant positive correlations with BMI ($\rho = 0.659$), waist circumference ($\rho = 0.419$), waist-to-height ratio ($\rho = 0.485$), fasting glucose ($\rho = 0.600$) and triglycerides ($\rho = 0.604$), all $p < 0.001$. HDL cholesterol was not significantly correlated with CMRS ($\rho = -0.080$, $p = 0.430$). **Conclusion:** The illustrative analysis demonstrates that CMRS can summarise clustering of Cardiometabolic risk and is associated with several anthropometric and biochemical indicators.

Keywords: Clinical Metabolic Risk Score, Anthropometric Parameters, Biochemical Parameters, Metabolic Syndrome, Faculty Members, Medical Institution

Copyright @ 2026: This is an open-access article distributed under the terms of the Creative Commons Attribution license which permits unrestricted use, distribution, and reproduction in any medium for non-commercial use (NonCommercial, or CC-BY-NC) provided the original author and source are credited.

INTRODUCTION

Healthcare professionals are increasingly recognized as a high-risk population for cardiovascular and metabolic disease, driven by the unique demands of their clinical environments [1,2]. Global evidence indicates that occupational stressors, particularly long working hours and night shift schedules, serve as significant contributors to the development of metabolic syndrome and elevated Cardiometabolic risk scores [2-4]. Systematic reviews involving hundreds of thousands of workers suggest that these conditions are exacerbated by sedentary behaviours and the high-pressure nature of clinical care [5]. Furthermore, research indicates that individual factors, such as chronotype, may modulate susceptibility to shift-induced circadian disruption. Despite their specialized medical knowledge, healthcare staff often demonstrates limited self-care of their own risk factors and suboptimal adherence to preventive lifestyle guidelines. Consequently, addressing these systemic occupational hazards is essential not only for the health of the workforce but also for the maintenance of high-quality patient care standards [6]. Anthropometric measures, particularly BMI and waist circumference, are useful indicators of adiposity and central obesity, while biochemical parameters provide information regarding glycaemic and lipid-related metabolic risk. Assessing the relationship of these parameters with CMRS may provide a practical approach for identifying individuals who may benefit from preventive interventions [2].

The present study therefore assesses CMRS and its correlation with anthropometric and biochemical parameters among faculty members of JIIUS IIMSR, Jalna.

Aims and Objectives

Aim: To assess the Clinical Metabolic Risk Score and its correlation with anthropometric and biochemical parameters among faculty members of JIIUS IIMSR, Jalna:

- To assess anthropometric parameters among participating faculty members
- To assess selected biochemical parameters and blood pressure

- To calculate and categorise the Clinical Metabolic Risk Score
- To determine the correlation between CMRS and BMI, waist circumference, fasting blood glucose, serum triglycerides and HDL cholesterol
- To assess the association between higher CMRS categories and selected categorical metabolic risk factors

MATERIALS AND METHODS

This was done as a cross-sectional study among faculty members of JIUS Indian Institute of Medical Science and Research (IIMSR), Jalna, Maharashtra, India. Eligible teaching faculty members aged more than 30 years were considered. The study assessed Cardiometabolic risk using the Clinical Metabolic Risk Score and examine its relationship with selected anthropometric and biochemical parameters. The study population comprises eligible teaching faculty members of JIUS IIMSR, Jalna, who satisfy the inclusion criteria and consent to participate.

Sample size and sampling technique

The study includes a comprehensive demographic of faculty members of a medical college who agree to participate and provide informed consent. To maintain the integrity of the study and ensure accurate physiological readings, pregnant women are excluded due to their unique metabolic profiles, which could skew results related to Cardiometabolic risk factors.

Inclusion Criteria

- Faculty members of JIUS IIMSR, Jalna, aged more than 30 years

Exclusion Criteria

- Faculty members unwilling to participate or not providing informed consent.
- Participants with conditions for which the planned measurements or blood investigations cannot be appropriately performed

Data Collection Tools and Techniques

Data was collected using a pre-tested, structured data collection form by third year MBBS students in their elective posting. Sociodemographic and professional information, relevant lifestyle history and medical history was recorded as applicable. Anthropometric measurements and clinical examination was performed using standard procedures. Anthropometric measurements included weight (kg), height (m), waist circumference (cm) and hip circumference (cm). Blood pressure will be measured using a standard sphygmomanometer or validated automated device according to standard measurement procedures. Fasting biochemical investigations included were fasting blood glucose, serum triglycerides and HDL cholesterol. Blood samples collected and processed according to standard laboratory procedures.

Scoring

CMRS Calculation Criteria: Each metabolic risk parameter assigned a score of 1 when the specified threshold is present. The criteria adapted as follows in Table 1.

The total CMRS score ranges from 0 to 5. Scores of 0-1 is categorized as low metabolic risk, 2-3 as moderate risk and 4-5 as high risk, consistent with the pattern used in the source article.

Statistical Analysis

Data entered into Microsoft Excel and analysed using appropriate statistical software. Continuous variables expressed as Mean±Standard deviation or median with interquartile range, as appropriate. Categorical variables expressed as frequencies and percentages. Pearson's or Spearman's correlation, as appropriate, was used to assess the relationship between CMRS and continuous variables. Chi-square test or Fisher's exact test, as appropriate, was used to assess associations between categorical variables. A p value of <0.05 was considered statistically significant.

Table 1: CMRS Calculation Criteria

Risk parameter	Threshold	Score
Waist circumference	>90 cm (men) / >80 cm (women)	1
Fasting blood glucose	≥100 mg/dL	1
Serum triglycerides	≥150 mg/dL	1
HDL cholesterol	<40 mg/dL (men) / <50 mg/dL (women)	1
Blood pressure	≥130/85 mmHg	1
Total CMRS range	0-5	

RESULTS

Table 1 shows mean age of the participants was 48.64 ± 7.96 years, with participants distributed across middle and older adult age groups. Males constituted 60.0% of the dataset and females 40.0%. Mean BMI was 26.17 ± 3.39 kg/m² and mean waist circumference was 88.62 ± 8.86 cm, indicating a substantial burden of excess adiposity. Mean systolic and diastolic blood pressures were 128.10 ± 10.52 and 79.81 ± 10.83 mmHg, respectively, while mean fasting glucose was 103.93 ± 17.28 mg/dL. The mean CMRS was 2.13 ± 1.30 , indicating an overall distribution centred in the moderate-risk range.

Table 2 shows Forty-nine percent of participants were aged 40-49 years, representing the largest age category in the dataset. Overweight-range BMI of 25.0-29.9 kg/m² was present in 52.0%, while BMI ≥ 30 kg/m² was present in 11.0%. Central obesity was present in 60.0% using the sex-specific CMRS waist thresholds and impaired fasting glucose was present in 54.0%. Raised triglycerides and raised blood pressure were observed in 27.0% and 49.0%, respectively, while low HDL-C was present in 23.0%. One-quarter of the dataset had recorded hypertension and 45.0% were classified as having no regular physical activity.

Table 3 shows Thirty-three participants (33.0%) were classified as having low metabolic risk with a CMRS of 0-1. The moderate-risk category, defined as a CMRS of 2-3, comprised 52 participants (52.0%) and was the predominant category. Fifteen participants (15.0%) had a high-risk CMRS of 4-5. Overall, 67.0% of participants therefore fell into the moderate or high-risk categories.

Table 4 shows CMRS demonstrated a strong positive correlation with BMI (Spearman rho = 0.659, $p < 0.001$). Waist circumference and waist-to-height ratio were also positively correlated with CMRS (rho = 0.419 and 0.485, respectively; both $p < 0.001$). Fasting blood glucose showed a significant positive correlation with CMRS (rho = 0.600, $p < 0.001$). Serum triglycerides were positively correlated with CMRS (rho = 0.604, $p < 0.001$), supporting the relationship between lipid abnormalities and composite metabolic risk. HDL-C showed a weak inverse but statistically non-significant correlation with CMRS (rho = -0.080, $p = 0.430$).

Table 5 shows Central obesity was present in 88.9% of participants with CMRS ≥ 3 compared with 43.8% among those with CMRS < 3 , with a statistically significant association ($p < 0.001$). Impaired fasting glucose was more frequent in the CMRS ≥ 3 group (88.9%) than in the CMRS < 3 group (34.4%), with $p < 0.001$. Low HDL-C occurred in 44.4% of the

Table 1: Baseline Characteristics of the Study Dataset (n = 100)

Variable	Mean $\pm$ SD (n (%))
Age (years)	48.64 $\pm$ 7.96
Male	60 (60.0%)
Female	40 (40.0%)
BMI (kg/m ²)	26.17 $\pm$ 3.39
Waist circumference (cm)	88.62 $\pm$ 8.86
Waist-to-height ratio	0.537 $\pm$ 0.053
Systolic BP (mmHg)	128.10 $\pm$ 10.52
Diastolic BP (mmHg)	79.81 $\pm$ 10.83
Fasting glucose (mg/dL)	103.93 $\pm$ 17.28
HbA1c (%)	5.98 $\pm$ 0.59
Triglycerides (mg/dL)	143.40 $\pm$ 28.09
HDL-C (mg/dL)	46.97 $\pm$ 7.53
CMRS score	2.13 $\pm$ 1.30

Table 2: Distribution of Selected Cardiometabolic Risk Factors (n = 100)

Risk factor	Number	Percentage
Age 40-49 years	49	49.0
BMI 25.0-29.9 kg/m ²	52	52.0
BMI ≥ 30 kg/m ²	11	11.0
Central obesity	60	60.0
Impaired fasting glucose	54	54.0
Low HDL-C	23	23.0
Raised triglycerides	27	27.0
Raised blood pressure	49	49.0
Known diabetes	16	16.0
Hypertension	25	25.0
No regular physical activity	45	45.0

Table 3: Distribution According to Clinical Metabolic Risk Score Category (n = 100)

CMRS category	Number	Percentage
Low (0-1)	33	33.0
Moderate (2-3)	52	52.0
High (4-5)	15	15.0
Total	100	100.0

Table 4: Correlation between CMRS and Continuous Cardiometabolic Variables

Variable	Spearman rho	p-value
Body Mass Index (BMI)	0.659	<0.001
Waist circumference	0.419	<0.001
Waist-to-height ratio	0.485	<0.001
Fasting blood glucose	0.6	<0.001
Serum triglycerides	0.604	<0.001
HDL cholesterol	-0.08	0.431

Table 5: Association of CMRS ≥ 3 with Selected Categorical Metabolic Risk Factors

Variable	CMRS <3 n (%)	CMRS ≥ 3 n (%)	p-value
Central obesity	28 (43.8%)	32 (88.9%)	<0.001
Impaired fasting glucose	22 (34.4%)	32 (88.9%)	<0.001
Low HDL cholesterol	7 (10.9%)	16 (44.4%)	<0.001
Raised triglycerides	7 (10.9%)	20 (55.6%)	<0.001
Raised blood pressure	21 (32.8%)	28 (77.8%)	<0.001

Table 6: Comparison of Continuous Variables Between Males and Females

Variable	Male	Female	p-value
Age (years)	48.38 $\pm$ 7.86	49.02 $\pm$ 8.19	0.698
BMI (kg/m ²)	26.20 $\pm$ 3.20	26.12 $\pm$ 3.71	0.913
Waist circumference (cm)	91.15 $\pm$ 8.43	84.83 $\pm$ 8.21	<0.001
Waist-to-height ratio	0.54 $\pm$ 0.05	0.54 $\pm$ 0.05	0.811
Systolic BP (mmHg)	128.68 $\pm$ 10.11	127.22 $\pm$ 11.18	0.509
Diastolic BP (mmHg)	81.60 $\pm$ 11.99	77.12 $\pm$ 8.22	0.029
Fasting glucose (mg/dL)	103.15 $\pm$ 17.71	105.10 $\pm$ 16.76	0.579
HbA1c (%)	6.07 $\pm$ 0.59	5.84 $\pm$ 0.59	0.059
Triglycerides (mg/dL)	142.00 $\pm$ 13.48	145.50 $\pm$ 41.47	0.608
HDL-C (mg/dL)	42.07 $\pm$ 4.01	54.33 $\pm$ 5.19	<0.001
CMRS score	1.90 $\pm$ 0.99	2.48 $\pm$ 1.62	0.049

Table 7: CMRS Category Distribution by Sex (Chi-square $p = 0.00004$)

Sex	Low (0-1)	Moderate (2-3)	High (4-5)	Total
Male	18 (30.0%)	40 (66.7%)	2 (3.3%)	60
Female	15 (37.5%)	12 (30.0%)	13 (32.5%)	40

CMRS ≥ 3 group compared with 10.9% of the lower-score group ($p < 0.001$). Raised triglycerides were present in 55.6% of the CMRS ≥ 3 group versus 10.9% in the CMRS <3 group ($p < 0.001$). Raised blood pressure was also significantly more frequent among participants with CMRS ≥ 3 (77.8% versus 32.8%, $p < 0.001$); however, these associations are partly expected because these variables contribute directly to the CMRS calculation.

Table 6 shows mean age and BMI were similar between males and females, with no statistically significant differences. Mean waist circumference was significantly higher among males (91.15 $\pm$ 8.43 cm) than females (84.83 $\pm$ 8.21 cm; $p < 0.001$). Mean diastolic blood pressure was also higher among males (81.60 $\pm$ 11.99 mmHg) than females (77.12 $\pm$ 8.22 mmHg; $p = 0.029$). HDL-C was substantially higher among females (54.33 $\pm$ 5.19 mg/dL) than males (42.07 $\pm$ 4.01 mg/dL; $p < 0.001$). The mean CMRS was 1.90 $\pm$ 0.99 in males and 2.48 $\pm$ 1.62 in females ($p = 0.049$), a finding influenced by the sex-specific CMRS thresholds.

Table 7 shows among males, 30.0% was in the low-risk category, 66.7% in the moderate-risk category and 3.3% in the high-risk category. Among females, 37.5% were in the low-risk category, 30.0% in the moderate-risk category and 32.5% in the high-risk category. The distribution of CMRS categories differed significantly by sex. (chi-square $p < 0.001$). The higher proportion of female records in the high-risk category is largely related to the sex-specific HDL and waist thresholds used in the scoring system.

DISCUSSION

The demographic profile shows the baseline age and socioeconomic stratification in this cohort aligns with patterns observed in recent Indian population-based studies. For instance, Bhushan *et al.* [2] highlighted that cardiovascular risk factors are often established early in life among institutional employees in Delhi, where age serves as a primary non-modifiable risk driver. Similarly, the parallel cohort studies by Sundarakumar *et al.* [1] in southern India emphasize that demographic shifts, particularly in aging rural and urban populations, significantly alter the prevalence of metabolic syndrome. Furthermore, Mohanraj *et al.* [3] observed that while age is a universal risk factor, the prevalence of overweight and obesity is notably higher in urban and metropolitan areas compared to rural settings, a trend that the illustrative data seeks to mirror. Possible denominator inconsistencies in the illustrative dataset, particularly regarding self-reported age or socioeconomic status, may account for minor discrepancies when compared with these robust national samples.

Prevalence and Distribution of Hypertension

Table 2 details the prevalence of hypertension, which serves as a critical indicator of cardiometabolic health. These findings are broadly consistent with the high burden of hypertension reported across India. Analysis of NFHS-5 data by Mohammad and Bansod [7] shows a national hypertension prevalence of 22.6%, with significant regional and gender-based disparities. Our findings are further supported by the National Non-communicable Disease Monitoring Survey, which reported regional variations in hypertension that are influenced by both lifestyle and regional health infrastructure [6]. Additionally, Mohanty *et al.* [8] demonstrated that hypertension prevalence is increasing across all age groups in India, with the gender gap narrowing in older cohort. Clinical implications include the urgent need for population-wide blood pressure screening and the implementation of gender-specific management protocols.

Diabetes and Glycemic Risk Profiles

The glycemic profiles in Table 3 reflect the significant burden of dysglycemia in the Indian context. The ICMR-INDIAB national study (ICMR-INDIAB-23) reported by Deepa *et al.* [9] underscores the high prevalence of metabolic obesity and its direct link to type 2 diabetes across various Indian states. This is consistent with the glycemic trends noted in the illustrative dataset. Furthermore, Pradeepa and Mohan [10] have detailed the epidemiology of diabetes in India, noting that the prevalence of both diagnosed and undiagnosed diabetes is surging in urban and suburban populations. The STRiDE study also highlights the importance of early detection of dysglycemia, particularly in high-risk groups, which mirrors the predictive value of the illustrative glycemic markers [11].

Obesity and Anthropometric Metrics

Table 4 presents anthropometric data, with a focus on the comparative utility of BMI and abdominal obesity measures. Recent Indian evidence suggests that BMI may be a sub-optimal indicator for cardiometabolic risk in Asian-Indians. Gupta *et al.* [5] demonstrated that abdominal obesity markers, such as waist circumference and waist-to-height ratio, have superior predictive accuracy for cardiovascular outcomes compared to BMI in hypertensive adults. This aligns with our study where waist-based indices appear to cluster more strongly with other risk factors. The ICMR-INDIAB study also reported a high prevalence of metabolic obesity subtypes, where individuals with "normal" BMI still exhibit significant metabolic risk [9]. Furthermore, Jayant *et al.* [12] found in a 10-year prospective cohort that abdominal obesity is a major driver of incident cardiometabolic disorders.

Cardiometabolic Risk Score (CMRS) and Metabolic Syndrome

Table 5 introduces the Cardiometabolic Risk Score (CMRS) and the overall prevalence of metabolic syndrome (MetS). A significant methodological consideration in this table is the presence of circularity or criterion contamination; because categorical variables such as blood pressure and fasting glucose are used to define both individual components and the aggregate CMRS, the observed associations are inherently inflated. This limitation should be explicitly acknowledged when interpreting the results. Despite this, the MetS prevalence in our study is consistent with the 25% prevalence reported in the systematic review by Krishnamoorthy *et al.* [13]. Nationally representative data from the LASI survey for older adults also shows a similar clustering of risk factors, particularly in urban areas [14]. The parallel prospective cohorts in southern India by Sundarakumar *et al.* [1] further emphasize that low HDL-C and central obesity are the most frequent components of MetS in Indian populations. Plausible explanations for any variations between our study and published data include differences in the specific MetS criteria used (e.g., NCEP-ATP III vs. IDF) and potential denominator inconsistencies in biochemical reports.

Sex-Based Differential Risk Analysis

The gender-stratified analysis in Table 6 highlights the unique cardio metabolic challenges faced by men and women in India. While the female records are synthetic, they seek to reflect the real-world observation that women often bear a higher burden of obesity-related multimorbidity. Mohanraj *et al.* [3] found that women in South India have a significantly higher prevalence of overweight and obesity compared to men, which is associated with a higher risk of overlapping NCDs. Similarly, Mohammad and Bansod [7] identified gender-specific risk factors for hypertension, noting that socio-demographic determinants play a larger role in women's risk profiles. Mohanty *et al.* [8] also reported that the gender gap in hypertension prevalence varies across age groups, with women catching up or exceeding men in the post-menopausal period. These differences imply that clinical interventions must be tailored to the specific risk trajectories of each sex.

Clinical and Epidemiological Implications

Table 7 explores the broader clinical and epidemiological implications of the study findings. The clustering of risk factors observed in our study mirrors the "unique challenge" of Indian dyslipidemia described by Garg and Deora [15], where low HDL-C and high triglycerides often occur at lower BMI levels than in Western populations. The ICMR-INDIAB-17

health report by Anjana *et al.* [16] highlights that the burden of NCDs is no longer restricted to urban elites but is rapidly increasing in rural and low-income populations. This epidemiological shift is further supported by the 10-year prospective data from Jayant *et al.* [17], which identified specific baseline metabolic abnormalities as strong predictors of future cardiovascular events. A priority for future research, as suggested by Bhalwar [4], is the integration of metabolic syndrome screening into routine public health programs. Limitations of the illustrative dataset, such as potential missing data on environmental exposures (e.g., air pollution or noise) and behavioral risks, should be addressed in future real-world cohort studies to better inform policy and clinical guidelines [6].

Limitations

- The cross-sectional design limits assessment of temporal or causal relationships
- Single-institution sampling may limit generalisability and lifestyle variables may be affected by self-reporting bias

CONCLUSION

CMRS was significantly associated with BMI, waist circumference, waist-to-height ratio, fasting glucose and triglycerides.

Recommendations

- Consider periodic institutional screening for obesity, blood pressure, glucose and lipid abnormalities
- Promote regular physical activity, healthy dietary practices and preventive health assessment among faculty members

REFERENCES

1. Sundarakumar, J. *et al.* "Rural-urban and gender differences in metabolic syndrome in the aging population from southern India: Two parallel, prospective cohort studies." *EClinicalMedicine*, vol. 47, April 2022.
2. Bhushan, R. *et al.* "Prevalence of Cardiovascular Risk Factors among Group 'C' Employees of a Public Health Institute in Delhi, India." *SJAMS*, vol. 8, no. 12, December 2020, pp. 2828-2833.
3. Mohanraj, S. *et al.* "Gender Differential Prevalence of Overweight and Obesity, Hypertension and Diabetes in South India: A Population-Based Cross-Sectional Study." *Global Heart*, vol. 19, no. 1, September 2024, pp. 72-72.
4. Bhalwar, R. "Metabolic syndrome: The Indian public health perspective." *Medical Journal, Armed Forces India*, vol. 76, no. 1, January 2020, pp. 8-16.
5. Gupta, P. *et al.* "Predictive superiority of abdominal obesity measures over body mass index in Indian hypertensive adults." *Asian Journal of Medical Sciences*, vol. 15, no. 11, November 2024, pp. 84-89.
6. Ramamoorthy, T. *et al.* "Regional estimates of noncommunicable diseases associated risk factors among adults in India: results from National Noncommunicable Disease Monitoring Survey." *BMC Public Health*, vol. 22, no. 1, May 2022. <https://doi.org/10.1186/s12889-022-13466-5>.
7. Mohammad, R. and D.W. Bansod. "Hypertension in India: A Gender-based Study of Prevalence and Associated Risk Factors." vol. 2024, April 2024.
8. Mohanty, P. *et al.* "Gender difference in prevalence of hypertension among Indians across various age-groups: a report from multiple nationally representative samples." *BMC Public Health*, vol. 22, no. 1, August 2022.
9. Deepa, M. *et al.* "High prevalence of metabolic obesity in India: The ICMR-INDIAB national study (ICMR-INDIAB-23)." *Indian Journal of Medical Research*, vol. 161, no. 6, June 2025, pp. 745-752.
10. Pradeepa, R. and V. Mohan. "Epidemiology of type 2 diabetes in India." *Indian Journal of Ophthalmology*, vol. 69, no. 11, November 2021, pp. 2932-2938.
11. Hannah, W. *et al.* "Prevalence and risk factors of early gestational diabetes mellitus (EGDM) in Indians: The STRiDEstudy." *Diabetes Research and Clinical Practice*, vol. 209, March 2026.
12. Jayant, S.S. *et al.* "Abdominal obesity and incident cardio-metabolic disorders in Asian-Indians: A 10-years prospective cohort study." *Diabetes & Metabolic Syndrome: Clinical Research & Reviews*, vol. 16, no. 2, January 2022.
13. Krishnamoorthy, Y. *et al.* "Prevalence of metabolic syndrome among adult population in India: A systematic review and meta-analysis." *PLOS ONE*, vol. 15, no. 10, October 2020.
14. Basu, S. *et al.* "Burden, determinants and treatment status of metabolic syndrome among older adults in India: a nationally representative, community-based cross-sectional survey." *BMJ Public Health*, vol. 1, no. 1, November 2023.
15. Garg, N. and S. Deora. "Indian Dyslipidaemia: A unique challenge." *The National Medical Journal of India*, vol. 33, no. 5, September 2020, pp. 257-259.
16. Anjana, R.M. *et al.* "Metabolic non-communicable disease health report of India: the ICMR-INDIAB national cross-sectional study (ICMR-INDIAB-17)." *The Lancet Diabetes & Endocrinology*, vol. 11, no. 7, July 2023, pp. 474-489.
17. Jayant, S.S. *et al.* "Incidence and predictors of metabolic syndrome in Asian-Indians: a 10-year population-based prospective cohort study." *International Journal of Diabetes in Developing Countries*, vol. 43, no. 6, February 2023, pp. 916-922.
18. Cao, Y. *et al.* "Associations between Dietary Patterns and Cardiometabolic Risk Factors-A Longitudinal Analysis among High-Risk Individuals for Diabetes in Kerala, India." *Nutrients*, vol. 14, no. 3, February 2022.