International Journal of Community Medicine and Public Health
Verma M et al. Int J Community Med Public Health. 2025 Dec;12(12):5603-5606
http://www.ijcmph.com
pISSN 2394-6032 | eISSN 2394-6040

DOI: https://dx.doi.org/10.18203/2394-6040.ijcmph20254036

Original Research Article

Assessment of clinical metabolic risk score and its correlation with anthropometric and biochemical parameters in adults aged over 30 years: a cross-sectional study in a rural setting

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Received: 03 September 2025
Revised: 10 November 2025
Accepted: 12 November 2025

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ABSTRACT

Background: Metabolic syndrome and related non-communicable diseases are emerging as significant health concerns, particularly among adults aged over 30 years. The Clinical Metabolic Risk Score (CMRS) is a useful composite tool to quantify cardiometabolic risk in populations. This study aims to assess CMRS and determine its correlation with anthropometric and biochemical parameters among adults aged over 30 years in a rural setting.
Methods: A community-based cross-sectional study was conducted among 300 adults aged above 30 years attending the outpatient department (OPD) in a rural community health centre. Anthropometric parameters such as Body Mass Index (BMI), waist circumference, and waist-hip ratio were measured. Biochemical assessments included fasting blood glucose, serum triglycerides, high-density lipoprotein (HDL) cholesterol, and blood pressure. The CMRS was calculated based on standard risk thresholds.
Results: A significant positive correlation was observed between CMRS and BMI ($r=0.62$, $p<0.001$), waist circumference ($r=0.57$, $p<0.001$), fasting glucose ($r=0.49$, $p<0.001$), and serum triglycerides ($r=0.44$, $p<0.001$). An inverse correlation was noted with HDL cholesterol ($r= -0.39$, $p<0.01$). Participants with higher CMRS values demonstrated increased prevalence of central obesity and impaired fasting glucose ($p<0.01$).
Conclusions: The CMRS is a reliable tool for assessing metabolic risk in adult populations. It depicts strong associations with standard anthropometric and biochemical risk indicators, supporting its use in early identification and intervention planning.

Keywords: Anthropometric and biochemical parameters, Clinical metabolic risk score, Metabolic syndrome

INTRODUCTION

Metabolic syndrome represents a cluster of interrelated risk factors such as central obesity, dyslipidemia, hyperglycemia, and elevated blood pressure, which substantially increase the risk of cardiovascular disease and type 2 diabetes mellitus.[1,2]

Rural populations, traditionally thought to be at lower risk, are increasingly showing trends parallel to urban counterparts due to changing lifestyles, decreased physical activity, and nutritional transitions.[3]

Clinical Metabolic Risk Score (CMRS) is a simplified metric that aggregates multiple risk parameters into a single score, helping in early diagnosis and treatment.[4,5] This study aims to assess CMRS and explore its correlation with key anthropometric and biochemical indicators in adult population at rural setting.

METHODS

Study design and setting

This was a community-based, cross-sectional study conducted in the Outpatient Department (OPD) of a rural Community Health Centre in District Hospital Dhar, M.P. The study aimed to assess adults attending the General Medicine OPD, with particular focus on individuals above 30 years of age.

Study population

The study population comprised adults aged more than 30 years who visited the General Medicine OPD during the study period. Participants were selected from among the routine attendees of the centre, ensuring a representative sample of the rural community.

Sample size and sampling technique

A universal sampling technique was adopted, whereby all eligible individuals attending the OPD during the data collection period were invited to participate. A total of 300 individuals fulfilling the eligibility criteria were enrolled in the study.

Study duration

The data collection was carried out over a period of three months from June 2025 to August 2025, starting from the date of obtaining permission from the Institutional Ethics Committee (IEC) until the compilation of the study report.

Inclusion criteria

Participants included in the study were: Adults aged more than 30 years, and individuals willing to participate and provide written informed consent.

Exclusion criteria

The following individuals were excluded from the study: Known cases of metabolic syndrome, patients diagnosed with chronic illnesses such as malignancy or renal failure.

Data collection tools and techniques

Data were collected using a pre-tested, structured questionnaire designed to capture detailed sociodemographic information and relevant clinical history. The questionnaire covered variables such as age, sex, occupation, education level, lifestyle factors, and medical history. Clinical examination and relevant investigations were performed as per standard protocols to supplement the information obtained through the questionnaire.

Anthropometric measurements included weight (in kilograms), height (in meters), and waist circumference (cm), hip circumference (cm).

Blood pressure measured using a standard mercury sphygmomanometer. Biochemical tests (fasting blood sample) included fasting blood glucose, serum triglycerides, and HDL cholesterol.

Scoring

CMRS calculation criteria

Each risk parameter was assigned a score of 1 based on the following thresholds: Waist circumference >90 cm (men)/>80 cm (women), Fasting glucose ≥100 mg/dL, Triglycerides ≥150 mg/dL, HDL cholesterol <40 mg/dL (men)/<50 mg/dL (women), Blood pressure ≥130/85 mmHg, and Total CMRS Range: 0-5.

The total CMRS score ranges from 0 to 5, where scores of 0-1 indicate low metabolic risk, 2-3 indicate moderate risk, and 4-5 indicate high risk.

Statistical analysis

Data was entered into a MS excel and analysed using appropriate statistical software, and a p value of less than 0.05 was considered statistically significant.

RESULTS

Out of the 300 participants, the mean age was 46.5±9.2 years, with a slight female predominance (54%). The average BMI was 25.3±3.8 kg/m². The distribution of CMRS showed that 22% of participants had a score of 0 or 1, while 38% had a score of 2 or 3, and 40% scored 4 or 5.

Table 1: Baseline characteristics of study participants (n=300).

Variable	Mean±SD, N (%)
Age (years)	46.5±9.2
Gender	
Male	138 (46.0)
Female	162 (54.0)
Body Mass Index (kg/m²)	25.3±3.8
CMRS Score Category	
0-1	66 (22.0)
2-3	114 (38.0)
4-5	120 (40.0)

Pearson's correlation analysis revealed a strong positive association between CMRS and body mass index (BMI) ($r=0.62$, $p<0.001$) and waist circumference ($r=0.57$, $p<0.001$). Moderate positive correlations were observed with fasting glucose levels ($r=0.49$, $p<0.001$) and serum triglycerides ($r=0.44$, $p<0.001$).

In contrast, CMRS demonstrated a moderate negative correlation with HDL cholesterol levels (r=-0.39, p<0.01), indicating that higher CMRS values were associated with lower HDL concentrations.

Table 2: Correlation between CMRS and continuous variables.

Variable	Correlation Coefficient (r)	P value	Interpretation
Body Mass Index (BMI)	0.62	<0.001	Strong positive correlation
Waist circumference	0.57	<0.001	Strong positive correlation
Fasting glucose	0.49	<0.001	Moderate positive correlation
Serum triglycerides	0.44	<0.001	Moderate positive correlation
HDL cholesterol	-0.39	<0.01	Moderate negative correlation (inverse)

Table 3: Association between CMRS ≥3 and selected categorical variables (Chi-square analysis).

Variable	P value	Significance	Interpretation
Central obesity	<0.01	Significant	Higher prevalence in CMRS ≥3 group
Impaired fasting glucose	<0.01	Significant	Higher prevalence in CMRS ≥3 group
Low HDL cholesterol	<0.05	Significant	Higher prevalence in CMRS ≥3 group

Chi-square analysis showed that participants with a CMRS score of 3 or higher had a significantly greater prevalence of central obesity (p<0.01), impaired fasting glucose (p<0.01), and low HDL cholesterol levels (p<0.05) compared to those with lower CMRS scores. These associations highlight the clustering of key metabolic risk factors in individuals with elevated CMRS.

DISCUSSION

This study highlights the growing burden of metabolic risk among rural adults, as reflected by the CMRS. The strong positive correlations between CMRS and parameters like BMI and waist circumference reinforce their predictive value.[6] The inverse relationship with HDL supports its protective role in cardiometabolic health.[7]

While rural populations were previously considered low risk, the findings indicate a shift toward metabolic derangements commonly seen in urban areas.[3] These changes can be attributed to evolving dietary habits, sedentary behaviour, and poor health awareness.

The utility of CMRS in this context is noteworthy due to its simplicity, objectivity, and ability to capture multi-dimensional risk in a single score.[8] This can aid in early risk stratification and guide public health interventions.[9]

As this study is conducted at a single rural community health centre, the findings may have limited generalizability to other populations with different demographic or lifestyle characteristics.

Furthermore, the study did not assess dietary habits or physical activity levels due to the rush in opd setting, which are also important determinants of metabolic risk, thereby limiting the comprehensiveness of the analysis.

CONCLUSION

The clinical metabolic risk score is an effective tool to assess metabolic risk among adults aged over 30 years in rural areas. Its strong correlation with anthropometric and biochemical parameters makes it a valuable indicator for early detection and preventive strategies.

Recommendations

Routine screening for metabolic risk using CMRS in rural OPDs. Community-based lifestyle modification programs targeting diet, physical activity, and weight management.

ACKNOWLEDGEMENTS

Authors would like to thank the community health staff and all participants for their cooperation and contribution to this study.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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Cite this article as: Verma M, Patidar G. Assessment of clinical metabolic risk score and its correlation with anthropometric and biochemical parameters in adults aged over 30 years: a cross-sectional study in a rural setting. Int J Community Med Public Health 2025;12:5603-6.