PROTOCOL PAPER

Dietary Patterns and Their Impact on Metabolic Syndrome Among Patients in the Endocrine Department: A Cross-sectional Study

Naina Kanwar Rathore[*], Manimegalai B[*], Mahasampath Gowri S[†]

[*]Dept. of Dietetics, Christian Medical College, Vellore, Tamil Nadu, India
[†]Dept. of Biostatistics, Christian Medical College, Vellore, Tamil Nadu, India

Abstract

Metabolic syndrome is a multifactorial condition characterized by the coexistence of central obesity, dyslipidemia, hypertension, and impaired glucose metabolism, significantly increasing cardiometabolic risk. In India, recent estimates report a prevalence of 20% to 40%, highlighting the need for targeted public health strategies. Dietary habits are a modifiable determinant of metabolic health, yet their specific association with metabolic syndrome remains underexplored in clinical populations. This study will examine dietary patterns and their relationship with individual components of metabolic syndrome among patients attending the endocrine department of a tertiary care hospital. A cross-sectional design will collect dietary, anthropometric, clinical, and biochemical data from 250 participants aged 25-60 years. The study aims to generate evidence supports the development of nutrition-focused interventions to reduce cardiometabolic risk in outpatient settings.

Keywords: Metabolic syndrome, dietary patterns, cardiometabolic risk, obesity, lifestyle

Background

Metabolic syndrome (MetS) is a clustering of interrelated cardiometabolic risk factors, notably central (abdominal) obesity, dyslipidemia, hypertension, and hyperglycemia[1]. According to the International Diabetes Federation (IDF), diagnosis requires central obesity (waist ≥90 cm in South Asian men, ≥80 cm in women) along with any two of the following: elevated triglycerides (≥150 mg/dL), reduced high-density lipoprotein cholesterol (HDL-C) (<40 mg/dL in men, <50 mg/dL in women), raised blood pressure (≥130/85 mmHg), or raised fasting glucose (≥100 mg/dL)[2]. This syndrome is also called "insulin resistance syndrome," reflecting its pathophysiology[3]. Individuals with metabolic syndrome have approximately twice the risk of atherosclerotic cardiovascular events and nearly five times the risk of developing type 2 diabetes compared to those without it[4].

Worldwide, the prevalence of MetS is common and rising, with estimates ranging from 25% to 30% in adults[5]. In India, national and regional studies have reported prevalence rates from 20% to nearly 40%, driven mainly by increasing rates of obesity, hypertension, and diabetes[6].

Clinically, metabolic syndrome is signified by obesity-driven insulin resistance and atherogenic dyslipidemia[7]. Key indicators include high body mass index (BMI), increased waist circumference, high triglycerides, low HDL, raised blood pressure, and impaired glucose metabolism[2]. Central (visceral) adiposity leads to chronic low-grade inflammation: enlarged adipocytes secrete adipokines (e.g., TNF-α, leptin, resistin) and less adiponectin, impairing insulin signaling[8]. This results in elevated triglycerides, small dense LDL particles, and low HDL. Together with hyperglycemia and hypertension, these abnormalities accelerate atherosclerosis and vascular damage[9]. In sum, metabolic syndrome represents a metabolic-biochemical milieu (insulin resistance, inflammation, endothelial dysfunction) that greatly magnifies long-term cardiometabolic risk. Therefore, evaluating the role of dietary patterns in shaping this risk is essential, particularly in clinical populations where early intervention is possible[10].

Address for correspondence
Dr Manimegalai B
Dept. of Dietetics, Christian Medical College,
Vellore, Tamil Nadu, India

Aim and Objectives

Aim

- To assess the association between dietary patterns and metabolic syndrome and its individual components among patients attending the endocrinology department of a tertiary care hospital.

Objectives

- To investigate the relationship between dietary patterns and individual components of metabolic syndrome, including central obesity, dyslipidemia, hypertension, and hyperglycemia.
- To examine the influence of sociodemographic and lifestyle factors on dietary patterns and metabolic health outcomes.
- To provide structured nutrition education through a customized pamphlet to support improved dietary habits among patients.

Tools and Techniques

- Structured questionnaire for collecting sociodemographic and lifestyle data.
- 24-hour dietary recall (3 non-consecutive days) and a validated Food Frequency Questionnaire (FFQ) for dietary assessment.
- Anthropometric measurements, including height, weight, BMI, and waist circumference.
- Biochemical data, including fasting blood glucose and lipid profile (documented from hospital records).
- Clinical data, including blood pressure (recorded or documented).
- International Physical Activity Questionnaire (IPAQ) is used to assess physical activity.

Educational Intervention Material

- A customized pamphlet will be developed, covering practical dietary and lifestyle guidelines for managing the key components of metabolic syndrome: hypertension, hyperglycemia, dyslipidemia, and obesity.
- The pamphlet will be distributed during data collection and accompanied by a brief verbal explanation to enhance understanding and encourage practical application.

Methodology

This cross-sectional observational study will be conducted in the endocrine department of a tertiary care hospital. 250 participants aged 25-60 years will be recruited from the outpatient clinic. Inclusion will require written informed consent and the ability to provide complete dietary and lifestyle information. Individuals with diabetes, major chronic illnesses, cardiovascular disease, pregnancy, or those on medications influencing glucose metabolism (e.g., glucocorticoids) will be excluded.

Dietary assessment will include a 3-day 24-hour dietary recall and a food frequency questionnaire (FFQ). Anthropometric data (height, weight, waist circumference) will be collected, and BMI will be calculated. Blood pressure will be recorded, and biochemical markers, including lipid profile and fasting glucose, will be extracted from hospital records.

Sociodemographic and lifestyle data will be captured using structured forms. Physical activity will be evaluated through the IPAQ. Metabolic syndrome will be classified based on IDF criteria: central obesity plus any two raised triglycerides, low HDL cholesterol, elevated blood pressure, or high fasting glucose. Given the growing burden of metabolic syndrome in clinical populations, evaluating the role of diet offers essential insights for preventive and therapeutic strategies.

Sample Size and Statistical Analysis

The previous studies on the association of diet and metabolic syndrome reported effect sizes of 0.4-0.79 SD. To detect a moderate effect size of 0.3 SD with 90% power and 5% error, the minimum required sample size was 235. To accommodate incomplete responses, 250 subjects will be included. Data will be summarized using means, SD, medians, or percentages. Dietary patterns will be derived from FFQ using factor or cluster analysis. Statistical tests include *t*-tests, *chi*-square, Pearson's correlation, and regression models. STATA BE 18.0 will be used, with $p < 0.05$ considered significant.

Future Scope

The findings from this study may strengthen the evidence base linking dietary patterns with metabolic health and support the formulation of targeted nutritional strategies for long-term risk reduction.

References

1. Swarup S, Mishra M, Grigorova Y, Zeltser R. Metabolic syndrome. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2024.
2. International Diabetes Federation. The IDF consensus worldwide definition of the metabolic syndrome. Brussels: IDF; 2023.
3. Grundy SM. Metabolic syndrome update. Trends Cardiovasc Med. 2016;26(4):364-73.
4. Alberti KGMM, Eckel RH, Grundy SM, Zimmet PZ, Cleeman JI, Donato KA, et al. Harmonizing the metabolic syndrome. Circulation. 2009;120(16):1640-45.
5. Noubiap JJ, Nansseu JR, Lontchi-Yimagou E, Nkeck JR, Nyaga UF, Ngouo AT, et al. Geographic distribution of metabolic syndrome and its components in the general adult population: A meta-analysis of global data from 28 million individuals. Diabetes Res Clin Pract. 2022:188:109924.
6. Latha PS, Sangeetha S, Vijayakarthikeyan M, Shankar R, et al. Prevalence and influencing factors of metabolic syndrome among rural adult population in a district of South India. J Family Med Prim Care. 2024;13(8):3122-28.
7. Krohn K, Sharma A. Indicators and complications of MetS. Exp Clin Endocrinol Diabetes. 2023;131(4):247-65.
8. Kumar R, Singh V, Chauhan A. Oxidative stress in MetS. J Clin Biochem Nutr. 2021;68(3):215-22.
9. Eckel RH, Grundy SM, Zimmet PZ. The metabolic syndrome. Lancet. 2005;365(9468):1415-28.
10. Anjana RM, Unnikrishnan R, Deepa M, Pradeepa R, Tandon N, Das AK, et al. Metabolic non-communicable disease health report of India: the ICMR-INDIAB national cross-sectional study (ICMR-INDIAB-17). Lancet Diabetes Endocrinol. 2023;11(1):474-89.

■ ■ ■ ■