Research Article

METABOLIC SYNDROME IN *MADHUMEGAM* (TYPE 2 DIABETES MELLITUS) PATIENTS REPORTING AT NATIONAL INSTITUTE OF SIDDHA – A CROSS SECTIONAL STUDY

Venkatesan Charumathi[1], Lakshmi Kantham T[2]*, Mohan S[3]
[1]PG Scholar, *[2]Associate Professor, [3]Professor & HOD, Department of Maruthuvam, National Institute of Siddha, Chennai, India.

ABSTRACT

Introduction: *Madhumegam* is a clinical condition characterised by frequent and excessive urination which ultimately leads to deterioration of seven body constituents and three humours. Its signs and symptoms may be correlated with Diabetes mellitus in modern science. Since, metabolic syndrome has become major cause of morbidity and mortality, identifying its cause and prevention has gained immense importance.

Aim: This study aimed at determining the prevalence of metabolic syndrome in *Madhumegam* (Type 2 Diabetes mellitus) patients and to identify the most critical predictive risk factors of metabolic syndrome.

Methods: This hospital based cross sectional study involved 100 type 2 diabetes mellitus patients and was conducted at Ayothidoss Pandithar Hospital, National Institute of Siddha. This study used questionnaire to obtain information on diabetic condition, anthropometric measurements and lipid profile. Metabolic syndrome was defined according to the International Diabetes Federation criteria.

Results: The prevalence of metabolic syndrome was 53% in the study population. Elevated triglyceride was the commonest component (77.3%) followed by lowered HDL (51%). Female type 2 diabetic patients had a higher prevalence of metabolic syndrome (54.7%) than their male counterparts (45.3%). With respect to age, individual within the age group of 60-69 had highest prevalence of metabolic syndrome while age group of 30-39 has least prevalence of metabolic syndrome.

Conclusion: Elevated triglyceride for men and lowered HDL for women were the strongest risk factors. Metabolic syndrome is a significant health problem and its preventive strategies should focus on early diagnoses and lifestyle modification.

KEYWORDS: *Madhumegam*, Diabetes mellitus, Metabolic syndrome, International Diabetes Federation.

INTRODUCTION

Madhumegam is a clinical condition characterised by frequent and excessive urination which ultimately leads to deterioration of seven body constituents and three humours.[1,2] In the text *Therankarisal*, *Madhumegam* is categorized under *Neerinai perukkal noi*. The signs and symptoms of *Madhumegam* are polydipsia, polyphagia, polyurea, fatigue, mood swings and insomnia. Its signs and symptoms may be correlated with Diabetes mellitus in modern science.

Diabetes mellitus is a metabolic disease characterised by hyperglycemia resulting from defects in insulin secretion, insulin action, or both. [3] India has the second highest burden of adult diabetes in the world after China.[4] Rapid socio-economic transition with urbanisation and industrialisation are the main causes for global diabetes epidemic.

According to International Diabetes Federation, the Metabolic Syndrome is a cluster of cardiovascular risk factor such as raised fasting plasma glucose, high blood pressure, high cholesterol (elevated triglycerides, low level of high density lipoprotein) and abdominal obesity. [5] Cardiovascular disease is a common comorbidity in type 2 diabetes mellitus. Globally, during 2018 cardiovascular disease affects approximately 32.2% of all persons with type 2 diabetes. [6]

Diabetic dyslipidaemia in India is one among the top five causes of mortality. [7] The coexistence of dyslipidaemia and type 2 diabetes is a major

contributor to the development and progression of macro vascular complications in individuals with diabetes. The coexistence of dyslipidaemia and type 2 diabetes is a major contributor to the development and progression of macro vascular complications in individuals with diabetes.

Since, metabolic syndrome has become major cause of morbidity and mortality, identifying its cause and prevention has gained immense importance. The objective of this study is to determine the prevalence of individual components of metabolic syndrome and to identify the most critical predictive risk factors in *Madhumegam* (Type 2 Diabetes mellitus) patients. This study will also elucidate the risk factors of metabolic syndrome with respect to age, gender, duration of disease and demographic details of the patients with *Madhumegam*.

MATERIALS AND METHODS

Sampling

A hospital based cross sectional study was conducted between May 2019 and July 2019. One hundred (100) participants with previously diagnosed type 2 diabetes from Ayothidoss Pandithar Hospital, National Institute of Siddha were purposively recruited in the study. The study was approved by Institutional Ethical Committee, National Institute of Siddha (IEC No. NIS/IEC/2019/M-2).

Socio Demographic Data

Information on demographic and clinical characteristics such as age, gender, duration of diabetes, family history of diabetes, physical activity, occupation, smoking and alcohol consumption were collected using a questionnaire and participants medical records.

Biochemical Parameters

Biochemical parameters of participants were collected from their laboratory reports which was already taken within a month. The biochemical parameters included the lipid profile (total cholesterol, triglycerides, high density lipoprotein and low density lipoprotein in milligrams per decilitre) and fasting plasma glucose (milligrams per decilitre).

Anthropometric Variables

Waist circumference (centimeters) was measured using a measuring tape midway between the inferior angle of ribs and the suprailiac crest.

Participants height (centimeters) and weight (kilograms) were also been measured. Body Mass Index (BMI) was calculated by dividing weight by height in metre squared (m^2).

Blood Pressure

Blood pressure was recorded using a sphygmomanometer. Participant's systolic and diastolic blood pressure was recorded in sitting position in the left arm with the arm supported at heart level and feet flat on the floor. Two readings were taken 5 minutes apart and the mean of the two was taken as blood pressure.

Metabolic Syndrome criteria

As per International Diabetes Federation, a person to be defined as having the metabolic syndrome they must have, Waist circumference ≥90 cm in men or ≥80 cm in women (South Asians) and any two of the following four factors 1.Raised TG levels: ≥150 mg/dl, or specific treatment for this lipid abnormality 2.Reduced HDL: cholesterol <40 mg/dl in males and <50 mg/dl in females 3.Raised blood pressure: systolic BP ≥130 or diastolic BP ≥85 mmHg 4.Raised fasting plasma glucose: ≥100 mg/dl or previously diagnosed diabetes. [5]

Statistical Analysis

The statistical software statistical product and service solutions (SPSS) will be used for the analysis of the data and Microsoft word and Excel will be used to generate graphs and tables.

RESULTS

General Characteristics of the Population

The study population comprises of 100 type 2 diabetes mellitus patients with 55 males (55.0%) and 45 females (45.0%). The participants were found to be predominantly in the age group between 60-69 (47%) while least in the age group of 30-39(6%). The subjects were residing more highly in urban (69%) followed by rural (17%) and least in semi urban (14%). 7% and 8% of the participants were smokers and consume alcohol respectively but none of the female were found. The subject with high pressure was found to be 39%.

Prevalence of Metabolic Syndrome and its individual components

The overall percentage prevalence of metabolic syndrome was 53%. Males had a lower percentage prevalence of 45.3% compared to a higher percentage prevalence of 54.7% for the female (fig.1).
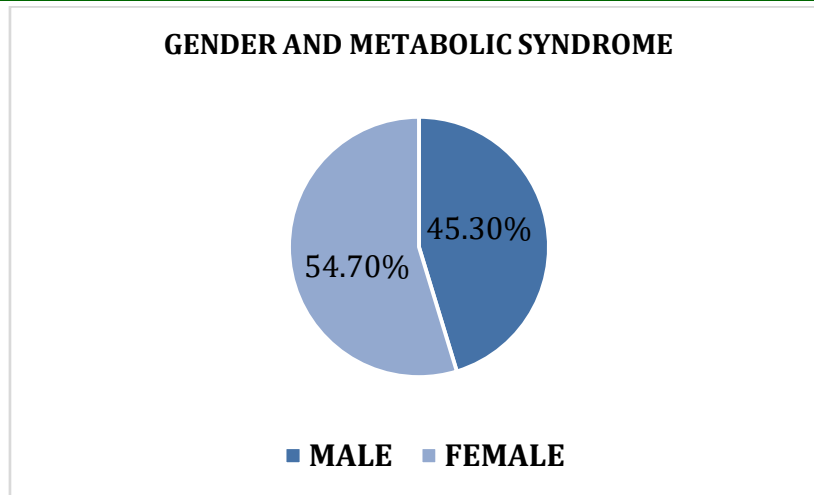
Fig.1: Prevalence of metabolic syndrome in male and female participants

With respect to age, individual within the age group of 60-69 had highest prevalence of metabolic syndrome while age group of 30-39 has least prevalence of metabolic syndrome. The overall mean age of the population was 59.17 whereas the mean age of the population with metabolic syndrome was 57.85 (table 1).

Table 1: Age wise distribution of metabolic syndrome among male and female population

Age	Male (n = 24) (%)	Female (n = 29) (%)	Total (n = 53) (%)
30 – 39	0 (0)	3 (100)	3 (5.7)
40 – 49	2 (33.3)	4 (66.7)	6 (11.3)
50 – 59	7 (43.7)	9 (56.3)	16 (30.2)
60 – 69	10 (47.6)	11 (52.4)	21 (39.6)
70 +	5 (71.4)	2 (28.6)	7 (13.2)
Total	24	29	53

Majority of the participants with metabolic syndrome were residing in urban (62.3%) followed by similar percentage (18.9%) in rural and semi urban. Among the study population, metabolic syndrome was highly found in the physically inactive (37.7%) group compared with the moderately active (35.8%) and least present in the highly active (26.4%) group (fig.2).
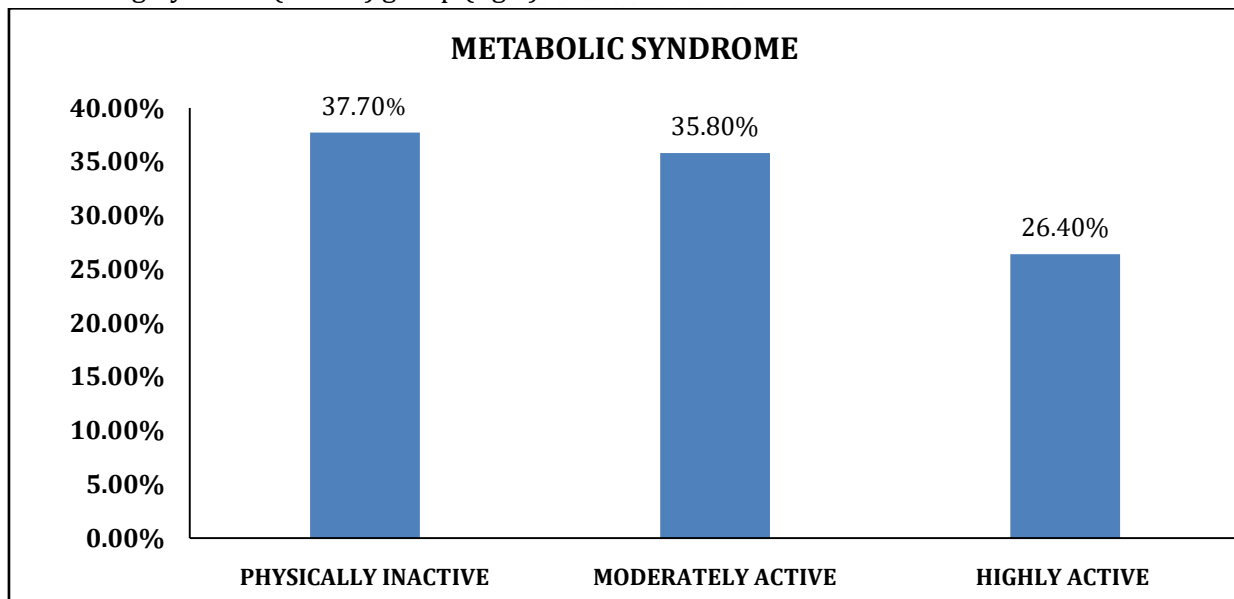

Fig.2: Relationship between metabolic syndrome and physical activity among study population

The study found that mixed diet consuming participants were more prone to metabolic syndrome (81.1%) compared with the group consuming vegetarian diet (18.9%). Elevated triglyceride was found to be present in 77.3% of participants and present predominantly in female (51.2%) compared with the male

(48.8%). Lowered high density lipoprotein was found in 51% of participants with metabolic syndrome and more prevalent in female (63%) compared with the male (37%) (Table 2).

For overall study population with metabolic syndrome, abdominal obesity was the most common component followed by elevated triglyceride (77.3%) and lowered HDL (51%). In male the most common component was elevated triglyceride (48.8%) followed by abdominal obesity (45.3%) and elevated fasting glucose (45.3%).

Table 2: Gender wise prevalence of individual components of metabolic syndrome

Parameter	Male (n = 55) (%)	Female (n = 45) (%)	Total (n = 100) (%)
Abdominal obesity	24(45.3)	29(54.7)	53(100)
Elevated fasting glucose	24(45.3)	29(54.7)	53(100)
Elevated triglyceride	20(48.8)	21(51.2)	41(77.3)
Lowered high Density lipoprotein	10(37.0)	17(63)	27(51.0)
Metabolic syndrome	24(45.3)	29(54.7)	53(100)

Similarly, in female subjects lowered HDL was most prevalent component (63%) followed by abdominal obesity (54.7%) and elevated fasting glucose (54.7%). Total cholesterol and elevated LDL were the only components that showed statistically significant difference between males and females. With respect to age, individual within the age group of 60-69 had highest prevalence of metabolic syndrome while age group of 30-39 has least prevalence of metabolic syndrome. The overall mean age of the population was 59.17 whereas the mean age of the population with metabolic syndrome was 57.85.

Prevalence of metabolic syndrome found to be more in the in the participants having type 2 diabetes duration between 1 to 9 years. The least prevalence of metabolic syndrome was found in the participants having type 2 diabetes more than 30 years. The result shows that participants with hypertension has higher prevalence of metabolic syndrome (58.5%) compared with participants without hypertension (41.5%) (fig.3).
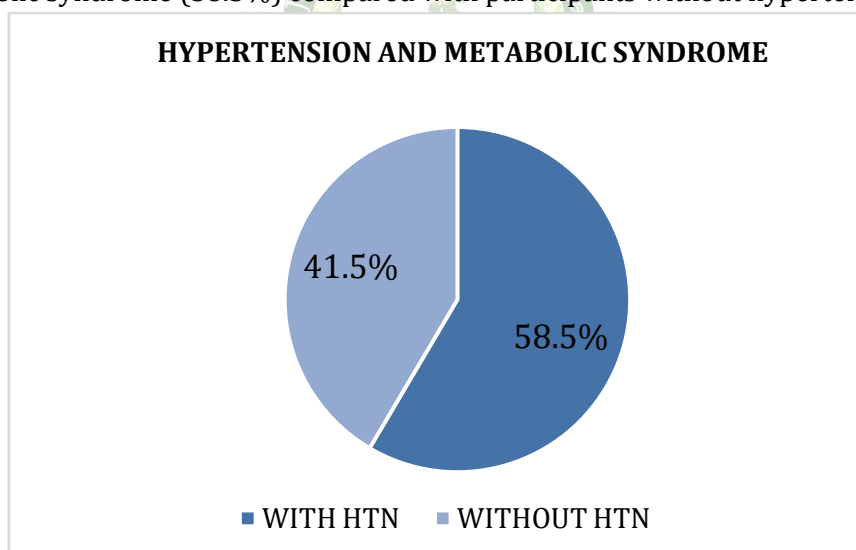

Fig.3: Prevalence of metabolic syndrome among hypertensive and non-hypertensive participants

The metabolic syndrome was more prevalent in the participants with overweight (BMI:25.0–29.9). None of the participants was found to be underweight. The participants with normal BMI (18.5 - 24.9) had more risk of metabolic syndrome compared with obese BMI (more than 30) (fig.4).
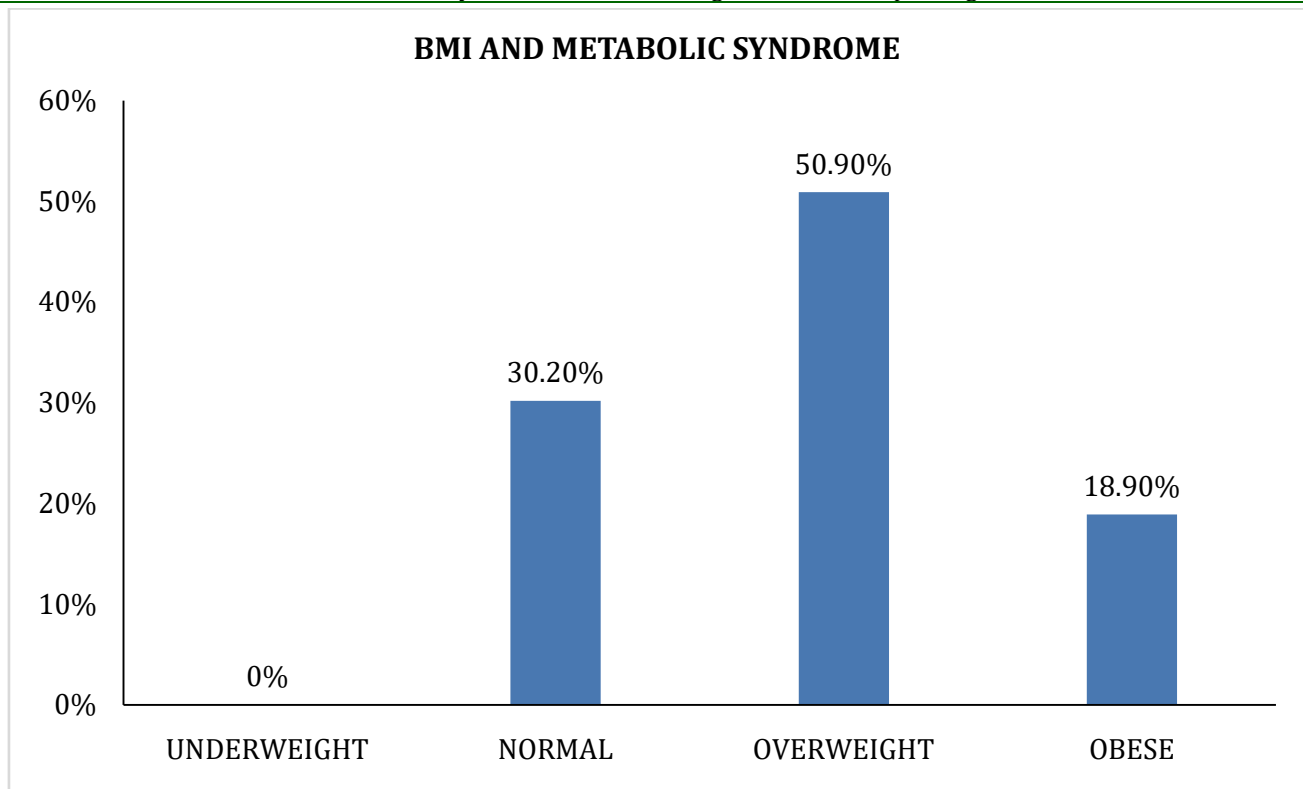
Fig.4: Distribution of BMI among the study population with metabolic syndrome

The participants with metabolic syndrome who are following Siddha system of medicine was 37.7%. Participants with metabolic syndrome following both Siddha and Allopathy system of medicine for diabetes were 62.3%.

DISCUSSION

Despite the increasing prevalence of metabolic syndrome, limited studies have been reported in India[8,9] in specific none of the studies has been documented in Tamilnadu. In gender category, females had higher prevalence of metabolic syndrome (54.7%) as they had more of the risk factors contributing to metabolic syndrome, compared to males (45.0%) which was similar with a previous study.[10,11] Subjects living in urban areas are more prone to metabolic syndrome compared with semi urban and rural areas and this coincides with previous report.[8] Briefly, urban subjects were 3 times more likely to have metabolic syndrome than rural subjects and the reason may be due to a relatively sedentary lifestyle.

From Table1, 39.6% of the 60-69 age group and 30.2% of the 50-59 age group had higher incidence of metabolic syndrome irrespective of gender. So, preventive measures should be taken for subjects in the above age groups since the prevalence of metabolic syndrome increases with age group above 50. [12]

Previous study has recorded significantly higher measurements of abdominal obesity among the females with type 2 diabetes compared to their male counterparts.[13] This could partially be attributed to the lower cut-off for waist circumference and higher cut-off for HDL in women as compared to men.

Compared to previous studies in Indian subcontinent with diabetes, one of the strengths of the current study is that revealed the subject following the Siddha and allopathy system of medicine, relative effect of vegetarian and mixed diet and duration of diabetes with effect on metabolic syndrome.

The atherogenic lipid parameters were found to be higher among the female participants compared to their male counterparts but not significant which was similar to previous study.[14] The limitations of the study are hospital-based and cross-sectional study.

CONCLUSION

Elevated triglyceride for men and lowered HDL for women were the strongest risk factors of metabolic syndrome in this study. Metabolic syndrome is a significant health problem and its preventive strategies should focus on early diagnoses and lifestyle modification.

REFERENCES

1. Yugi mamunivar (2005), Yugi vaidhiya chinthamani. pp.149.

2. Kuppusamy Mudhaliar (2012), Siddha Maruthuvam. pp.460-510.

3. Diagnosis and Classification of Diabetes Mellitus. (2010). Diabetes Care, 33 (Supplement 1), pp.S62-S69.

4. IDF. IDF Diabetes Atlas 2015.

5. International Diabetes Federation: The IDF consensus worldwide definition of the metabolic syndrome.

6. Einarson T, Acs A, Ludwig C, Panton U. Prevalence of cardiovascular disease in type 2 diabetes: a systematic literature review of scientific evidence from across the world in 2007-2017. Cardiovascular Diabetology. 2018; 17(1).

7. Mishra D. Prevalence of dyslipidemia in patients with type 2 diabetes mellitus: a cross sectional study. Journal of Medical Science And clinical Research. 2019;7(8).

8. Khadanga S, Khan Y, Lalchandani A, Gupta A, Kumar S. Prevalence of metabolic syndrome crossing 40% in Northern India: Time to act fast before it runs out of proportions. Journal of Family Medicine and Primary Care. 2018;7(1): 118.

9. Subramani S, Mahajan S, Chauhan P, Yadav D, Mishra M, Pakkirisamy U et al. Prevalence of metabolic syndrome in Gwalior region of Central India: A comparative study using NCEP ATP III, IDF and Harmonized criteria. Diabetes & Metabolic Syndrome: Clinical Research & Reviews. 2019;13(1):816-821.

10. Felix-Val K, Titty WK, Owiredu WK, Agyei-Frimpong MT. Prevalence of metabolic syndrome and its components among diabetes patients in Ghana. J Biol Sci. 2008;8:1057–61.

11. Osuji C. U, Nzerem B. A, Dioka C. E, Onwubuya E. I. Metabolic syndrome in newly diagnosed type 2 diabetes mellitus using NCEP-ATP III, the Nnewi experience. Niger J Clin Pract. 2012;15:475–80.

12. Eckel RH, Yost TJ, Jensen DR. Alterations in lipoprotein lipase in insulin resistance. Int J Obes Relat Metab Disord. 1995;19(Suppl 1):S16–21.

13. A. P. Kengne, S. N. Limen, E. Sobngwi, C. F. T. Djouogo, and C. Nouedoui, "Metabolic syndrome in type 2 diabetes: comparative prevalence according to two sets of diagnostic 8 criteria in sub-Saharan Africans," Diabetology and Metabolic Syndrome, vol. 4, article 22, 2012.

14. Osei-Yeboah J, Owiredu W, Norgbe G, Yao Lokpo S, Gyamfi J, Alote Allotey E et al. The Prevalence of Metabolic Syndrome and Its Components among People with Type 2 Diabetes in the Ho Municipality, Ghana: A Cross-Sectional Study. International Journal of Chronic Diseases. 2017;2017:1-8.

*Address for correspondence
Dr Lakshmi Kantham T
Associate Professor,
Department of Maruthuvam, National Institute of Siddha, Chennai, India
Email:
drlakshmiramaswamy@gmail.com
Ph: 9025575185