Are females more prone to thyroid dysfunctions in metabolic syndrome – A Retrospective cohort study

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Abstract

Context (Background): Metabolic syndrome or Insulin resistance syndrome is a cluster of metabolic abnormalities, where people are obese and have hypertension, dyslipidemia, back elevated glucose levels and a multifactorial disorder associated with the development of cardiovascular, neurological, immunological, renal and endocrine disease. Metabolic syndrome (MetS) is a condition harbouring a group of metabolic abnormalities where insulin resistance (IR) plays a major role.

Aims: The aim of our study is to evaluate the need for thyroid dysfunction and the prevalence of MetS in males and females.

Materials and Methods: A retrospective study with a total no of 100 patients both genders included who satisfied the criteria of the International diabetic federation of Metabolic Syndrome were randomly allocated to the study. The study was conducted between September 2019 to September 2022.

Statistical Analysis: The significance level was tested at $p<0.05$ with a confidence interval of (CI) 95% at 80% power of the study.

Results: The study subjects were aged between 18 to 60 years, males were 35 (35%) and females were 65 (65%) with 46.66% (Mean 45.6±4.43) of patients with the age of 41-50 years, 28.33% (56.3±3.73) of the age of 51-60 years, 16.66% with the age of 31-40 years, 6.66% with the age of 21-30 years and least 1.66% with the age of fewer than 20 years. Its prevalence was 65% among the female population (n=100) and 35% among its male counterpart (n=100) ($p<0.05$). The mean age of patients with metabolic syndrome (MetS) was 41.5±18.5 years in both males and females with $P<0.03$. To draw the conclusion ANOVA Brown- Forsythe test was applied to the parameters of metabolic syndrome and proved to be statistically significant with F 536.7, $p<0.0001$ (Figure 1). Thyroid function test revealed that 48 patients were Euthyroid, 30 patients were Hypothyroid, 8 patients were Subclinical Hypothyroid, 7 patients were in subclinical hyperthyroid, and none were Hyperthyroid. Thyroid dysfunction is 52% prevalent in Metabolic syndrome patients. Among the

Thyroid dysfunction hypothyroidism is 30%, Subclinical Hypothyroidism is highly prevalent at 8%, and subclinical Hyperthyroidism is at 7% prevalent. There were no Hyperthyroid patients in the study. To prove the statistical significance chi-square test was used with 1 degree of freedom $p<0.0079$. The results suggest that patients with metabolic syndrome significantly increased the chances of thyroid dysfunction and the prevalence of thyroid dysfunction is more in female patients when compared to males.
Conclusion: Females may be more prone to thyroid dysfunction in metabolic syndrome patients. A thyroid function test may be added as one of the basic screening tests for patients with metabolic syndrome (MetS).
Key Words: Body mass index (BMI), Metabolic syndrome, Thyroid dysfunctions, weight circumference.

Introduction:

Metabolic syndrome or Insulin resistance syndrome may be the most common and serious condition we have never heard of and it is most neglected by people and physicians. At least that's what we found out when we asked our patients, friends and relatives about it. A study published recently in JAMA shows that it's on the rise. Overall Metabolic syndrome or Insulin resistance syndrome is a group of metabolic abnormalities, where people are obese and have hypertension, dyslipidemia, elevated glucose levels and a multifactorial disorder associated with the development of cardiovascular, neurological, immunological, renal and endocrine disease [1]. A systematic review conducted among adolescents aged 10 to 18 years in 2016 in India indicated increasing rates of overweight and obesity. Metabolic Syndrome is rapidly becoming the primary cause of morbidity and mortality in developing countries surpassing trauma and smoking-related disorders. Metabolic Syndrome is a group of metabolic abnormalities wherein people are obese and have hypertension, dyslipidemia, and elevated glucose levels [2]. Metabolic syndrome is a multifactorial disorder associated with the development of cardiovascular, neurological, immunological, renal and endocrine disease. Metabolic syndrome is also known as Syndrome X or Insulin Resistance Syndrome [4]. It consists of a combination of metabolic abnormalities such as Central Obesity, Atherogenic Dyslipidemia (Elevated Triglycerides and Apolipoprotein B, small LDL particles and low HDL Cholesterol [HDL-C] concentrations), Elevated Blood Pressure and Elevated Plasma Glucose levels. According to previous study mortality in metabolic syndrome is thrice that of heart stroke [5]. Thyroid dysfunctions such as hypothyroidism are associated with obesity, hypertension, decreased HDL and elevated triglycerides, it may be associated with metabolic syndrome [5]. Coronary artery atherosclerosis is twice as common in patients with hypothyroidism compared with sex and age-matched controls, and adequate thyroid hormone replacement therapy may protect against the progression [6]. The prevalence of diabetes, premature coronary artery disease and dyslipidemia are higher among Metabolic Syndrome patients due to rapid changes in lifestyle, food habits, demography, and economic development and partly due to genetic predisposition. Thyroid hormones have ubiquitous effects and influence the function of most organs. These hormones appear to have served as a general pacemaker of accelerating the metabolic process and may be associated with Metabolic Syndrome. The objective of the current research is to study the prevalence of thyroid dysfunction in females when compared to males with its component in metabolic syndrome (MetS).

Materials and methods

In the current retrospective study 100 patients from a tertiary care centre associated with a Teritiatry care hospital, Telangana were enrolled for the study and their records were accessed from the Medical Record Department (MRD) who attended the OPD of the General Medicine and Endocrinology Department from September 2019 to September 2022 and satisfied the criteria of the International diabetic federation of Metabolic syndrome were enrolled. The inclusion criteria of central obesity- waist circumference>=90cm for men and >=80cm for women and any two of the following factors, raised TG level>=150mg/dl, Reduced HDL cholesterol<40mg/dl in males and <50mg/dl in females, Raised BP>=130/85mmHg or medication, Raised fasting glucose >=100mg/dl or previously diagnosed type 2 diabetes and individuals above the age of 18 years. Cases of thyroid dysfunction both hypo and hyper thyroid diseases, use of steroids, severely ill, pregnant women and individuals below 18 years of age were excluded from the studies. All of the anthropometric measurements of subjects' height, weight, and WC (Waist Circumference) were collected which was measured with a simple folding tape at the natural waistline (the level of the umbilicus) in a horizontal plane. Body mass index (BMI) was obtained by dividing the body weight (kg) by the square of height (m). Blood pressure data recorded using Diamond BPMR 111 Blood Pressure Monitor were collected, and SOP was followed while collecting the data. Ethical permission was obtained from IHEC to carry out the study.

Biochemical investigations- Each venous blood sample was drawn after a minimum fasting period of 12 hours (h). All samples were collected at 07:00 am and were centrifuged to obtain serum which was used for investigating Fasting blood glucose, post-prandial glucose, Serum electrolytes, Fasting lipid profile, Blood urea, Serum creatinine, Assessment of all these biochemical parameters was performed by using turbidimetric based autoanalyzer, Erba 200 (TransAsia Bio-Medicals Ltd, Germany) was used. Haematological investigations were performed by a cell counter (H360 -3 parts, TransAsia Bio-Medicals Ltd, Germany) Complete blood picture. The thyroid profile was done by using CLIA (Chemiluminescence Immunoassay) Mindray Pvt Ltd, GLP and SOP were maintained before processing the samples to avoid bias in sample processing and its results.

Statistical analysis: Data presented as Mean ± SD, GraphPad Prism (version 9.0, USA) was used to perform ANOVA, Row means with SD and a chi-square test was used to prove the statistical significance at $p<0.05$, with a confidence interval (CI) of 95% and at 80% power of the study.

Results: The study subjects were aged between 18 to 60 years, males were 35 (35%) and females were 65 (65%) with 46.66% (Mean 45.6±4.43) of patients with the age of 41-50 years, 28.33% (56.3±3.73) of the age of 51-60 years, 16.66% with the age of 31- 40 years, 6.66% with the age of 21-30 years and least 1.66% with the age of fewer than 20 years. Its prevalence was 65% among the female population (n=100) and 35% among its male counterpart (n=100) ($p<0.05$). The mean age of patients with metabolic syndrome (MetS) was 41.5±18.5 years in both males and females with $P<0.03$. To draw the conclusion ANOVA Brown- Forsythe test was applied to the parameters of metabolic syndrome and proved to be statistically significant with F 536.7, $p<0.0001$ (Figure 1). Thyroid function test revealed that 48 patients were Euthyroid, 30 patients were Hypothyroid, 8 patients were Subclinical Hypothyroid, 7 patients were in subclinical hyperthyroid, and none were Hyperthyroid. Thyroid dysfunction is 52% prevalent in Metabolic syndrome patients. Among the

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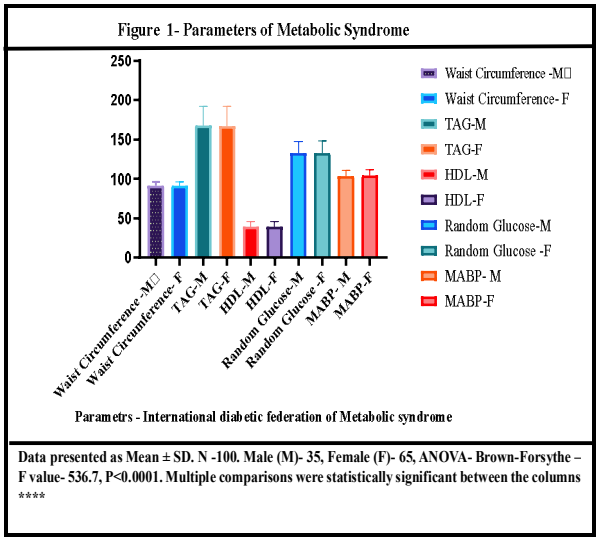

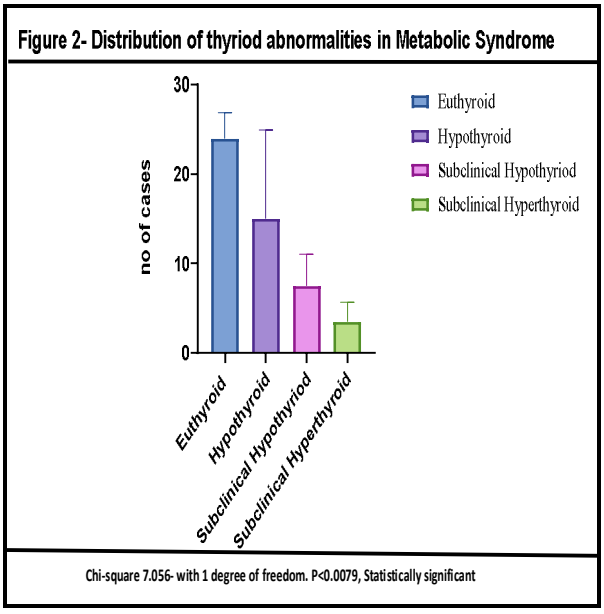

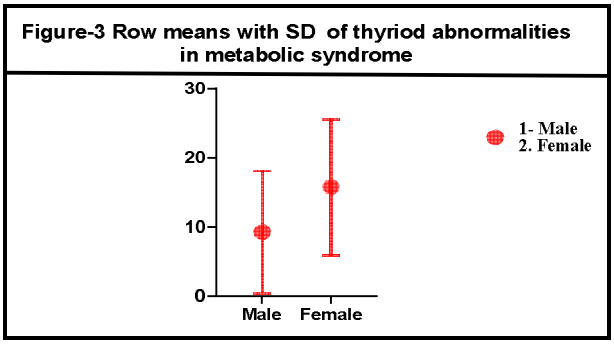

Discussion

Metabolic syndrome is most common and sever condition which is neglected worldwide and its attention is required. Metabolic syndrome is a group of signs and symptoms that occur together and characterize a particular abnormality or condition. A person has metabolic syndrome when at least three of body mass index (BMI) of above 30, elevated TAG levels above 150mg/dL, Low HDL below 40 mg/dL in males and 50mg/dL in females, high blood pressure and increased glucose level above 100mg/dL or using diabetic medicines may fall into the category of MetS. In the current study, we reported the prevalence of thyroid dysfunctions more in females (65%) than that in males (35%). Studies in Turkey have shown a much more prevalence of Metabolic syndrome than our study [7]. Researchers Ozsahin et al and Kozan et al have determined the prevalence of metabolic syndrome using the same criteria as 33.4% and 33.9% respectively. Metabolic syndrome's prevalence was similar in both sexes (61% in women, 55% in men). Metabolic syndrome is significantly more prevalent in women in the national prevalence studies by Ozsahin et al. (39.1% vs 23.7%) and Kozan et al (39.6% vs. 28%) [7] which supports our study. This may potentially be attributable, at least partially to the selected group [8]. That is Metabolic syndrome may be a risk factor for thyroid diseases. In some countries, MetS has been reported to be more prevalent among women, whereas, in others, the prevalence of the syndrome was similar in the two sexes [11,12] this study is in contrast with our study. Considering, nodular thyroid disorders i.e., 80% of the study group of female population, one might expect to see this in MetS prevalence also [9]. The prominently increased frequency of MetS in this special population might have swept away this difference. Thyroid hormones have the potential to act as a general metabolic controller organizing many metabolic processes and, as shown in previous studies, they may be associated with MetS and/or its components [10-11]. Though there is scarce information on the effect of hyperinsulinemia in the development of thyroid nodules or thyroid cancer, recent studies have shown the existence of a relationship between MetS and thyroid functional and morphological abnormalities [4,5]. Rezzonico et al. reported that cases with hyperinsulinemia have larger thyroid glands and a higher prevalence of thyroid diseases [4] all these studies were in line of agreement with our study.

Limitations: A small sample size was the limitation of the study; further prospective studies are warranted with a large sample size with other confounding factors.

Conclusion:

In conclusion, when population data is considered, we clearly demonstrate that the prevalence of thyroid dysfunction is higher in females with metabolic syndrome. We further demonstrated that one-fifth of metabolic syndrome patients have overt or subclinical hypothyroidism. These findings indicate the need for investigation of thyroid profiles to detect thyroid dysfunction during the management of metabolic syndrome patients. This may be a boon in treating people for thyroid dysfunction in metabolic syndrome.

Conflict of Interest: No conflict of interest.

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