



Clinicopathological Evaluation in Hypothyroidism Patients for Detection of Metabolic Syndrome: A Cross Sectional Study

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ABSTRACT

Introduction: Hypo-thyroidism and Metabolic syndrome (MetS) is a well-established predecessor of atherogenic cardiovascular disease. MetS includes a group of risk factors characterized by hyper-tension, hyper-glycemia, dyslipidemia, pro-thrombotic and pro-inflammatory conditions which hasten up the atherogenic process in the body.

Aim: The main aim of this study is to find Prevalence of metabolic syndrome in Hypo-thyroidism patients.

Material and methods: In this study 100 patients known to have Hypo-thyroidism with different age group from 20 years to 60 years old were included. From all the patients who visited hospital as OPD and IPD patients, detailed history was recorded and also laboratory examinations were done. History regarding symptoms of Hypo-thyroidism was recorded as well as laboratory examination result like thyroid profile tests and Glucose and lipid analysis were also recorded.

Result: In this study out of total 100 patients, 32 were males and 68 were females. The ratio of female to male was 2.1:1. The mean age was 42.7 years old. The mean TC, TG, LDL-C, and HDL-C levels in males were 179 mg/dL, 142 mg/dL, 92 mg/dL, 34.5 mg/dL and in females were 166 mg/dL, 140 mg/dL, 85 mg/dL, and 43 mg/dL respectively. The mean WC in male and female was 110.5 and 105.2, respectively. Elevated TG (>150 mg/dL) was found in 17 (53.1%) males and 60 (88.2%) females. Low HDL-C (≤ 40 mg/dL in men and ≤ 50 mg/dL in female) was found in 14 (43.8%) male and 62 (91.2%) female. Raised WC was found in 19 (59.4%) male and 66 (97.1%) female. Hyper-tension was found in 6 (18.8%) male and 30 (44.1%) female with an overall prevalence of 36%. MetS with three or more component was found in 19 (59.4%) male and 65 (95.6%) females with overall prevalence of 84%.

Conclusion: This study showed significant association between subclinical Hypo-thyroidism and MetS. The overall prevalence rate of the MetS in this study was little bit higher than the rates reported in the general population in various studies and comparable to studies of hypothyroid patients. Hypo-thyroidism was the most common thyroid dysfunction in Indian patients with MetS.

Keywords: Thyroid Dysfunction, metabolic syndrome, Hypo-thyroidism.

INTRODUCTION:

Hypo-thyroidism and Metabolic syndrome (MetS) is a well-established predecessor of atherogenic cardiovascular disease¹. MetS includes a group of risk factors characterized by hyper-tension, hyper-glycemia, dyslipidemia, prothrombotic and proinflammatory conditions which speed up the atherogenic process in the body^{2,3}. Thyroid disorders are the most common disorder among endocrine disorders, with an overall prevalence of Hypo-thyroidism is about 11 % in the general population⁴. Hypo-thyroidism causes hyperlipidemia, diastolic hyper-tension, endothelial dysfunction, and cardiovascular disease. Hypo-thyroidism is also associated with raised cardiovascular morbidity for which various theories have been proposed^{5,6}. One of the proposed theories is the causal association with the

metabolic syndrome (MetS). The National Cholesterol Education Program's Adult Treatment Panel III report (ATP III) has identified the MetS as a multiplex risk factor for cardiovascular disease which deserved greater clinical attention. In the Indian population, overall prevalence of the MetS is about 31.6 %, with the prevalence of 39.9 % in women and 22.9 % in men^{7,8}. The prevalence rates vary greatly depending upon MetS, population, age, ethnicity etc. in India, a rapid increase in its prevalence has been noted due to socioeconomic transitions to increasing mechanization, affluence, urbanization and urban migration⁹. Worldwide, the most prevalent endocrine disorders are among thyroid diseases. Various studies in India showed that about 42 million people suffer from thyroid diseases. MetS and TD are both characterized by a cluster of common variations from the norm such as hyper-glycemia, hyper-tension, decreased high-

density lipoprotein cholesterol (HDL-C), and raised triglycerides (TG)¹⁰. Additionally, IR, distinguished as a fundamental component for MetS, too plays a part in Hypo-thyroidism^{11,12}. Unmistakably Hypo-thyroidism and subclinical Hypo-thyroidism (SH) are characterized by weakened basal plasma affront and insulin sensitivity may move forward taking after substitution treatment. With quick industrialization and urbanization, the predominance of metabolic disorder has expanded drastically¹³. By NCEP (National Cholesterol Instruction Program) basis, 41 % of Asian Indians were enduring from metabolic disorder. One reality is evident that, clinicians frequently translate expanded TSH levels with typical thyroid hormone levels in stout people as and prove of subclinical Hypo-thyroidism and endorse thyroxine substitution treatment to fortify the euthyroid status which as of now exists¹⁴.

Aims & Objectives: The main aim of this study is to find Prevalence of metabolic syndrome in Hypo-thyroidism patients.

Material and methods:

This study was conducted in the Department of General Medicine of a Medical College in Central India during 1 year period. In this study 100 patients known to have Hypo-thyroidism with different age group from 20 years to 60 years old were included. From all the patients who visit hospital as OPD and IPD patients, detailed history was recorded and also laboratory examination were done. History regarding symptoms of Hypo-thyroidism was recorded as well as laboratory examination result like thyroid profile tests and Glucose and lipid analysis were also recorded. Adult patients with previously diagnosed Hypo-thyroidism on treatment and willing to participate in the study were included. The patients who met the consideration criteria were included and history relating to Hypo-thyroidism, administration

modalities and the nearness of comorbidities which included diabetes mellitus and hyper-tension was taken. In laboratory examination parameters that were evaluated included fasting blood glucose and fasting lipid parameters (add up to cholesterol [TC], high-density lipoprotein cholesterol [HDL-C], low-density lipoprotein cholesterol [LDL-C], and triglycerides [TG]. The nearness of the MetS was decided utilizing the ATP III criteria. The nearness of three or more of any of the followings: WC \geq 102 cm in men and \geq 88 cm in ladies; serum TG level \geq 150 mg/dL; HDL-C \leq 40 mg/dL in men and \leq 50 mg/dL in women; blood weight \geq 130/85 mmHg (or already analyzed hypertensive on antihypertensive treatment); and fasting serum glucose \geq 110 mg/dL (or already analyzed diabetic on antidiabetic treatment).

Result:

In this study out of total 100 patients, 32 were males and 68 were females. The ratio of female to male was 2.1:1. The mean age was 42.7 years old. Baseline characteristics of patients were shown in table no 1 and components of MetS in table no 2 below. The mean TC, TG, LDL-C, and HDL-C levels in males were 179 mg/dL, 142 mg/dL, 92 mg/dL, 34.5 mg/dL and females were 166 mg/dL, 140 mg/dL, 85 mg/dL and 43 mg/dL respectively as shown in table no 1 below. The mean waist circumference in male and female was 110.5 cm and 105.2 cm respectively. Elevated TG ($>$ 150 mg/dL) was found in 17 (53.1%) males and 60 (88.2%) females. Low HDL-C (\leq 40 mg/dL in men and \leq 50 mg/dL in female) was found in 14 (43.8%) male and 62 (91.2%) female. Raised WC was found in 19 (59.4%) male and 66 (97.1%) female. Hyper-tension was found in 6 (18.8%) male and 30 (44.1%) female with an overall prevalence of 36%. MetS with three or more component was found in 19 (59.4%) male and 65 (95.6%) females with overall prevalence of 84 %.

Table 1: Showing the baseline characteristics of patients

Parameters	Range (male)	Mean value \pm SD (male)	Range (female)	Mean value \pm SD (female)
Age (years)	20-60	50.3 \pm 10.3	20-59	41.9 \pm 11.1
BMI (kg/m ²)	15.6-49.4	28.4 \pm 6.1	17.5-35.3	28.2 \pm 5.5
WC (cm)	85.6-105.4	110.5 \pm 11.2	80.2-135.2	105.2 \pm 12.1
TC (mg/dL)	80-340	179 \pm 67.2	71-349	166 \pm 69.8
LDL (mg/dL)	60-240	92 \pm 41.5	56-287	85 \pm 44.2
HDL (mg/dL)	13-60	34.5 \pm 10.6	22-75	43 \pm 12.6
TG (mg/dL)	65-450	142 \pm 64.1	54-379	140 \pm 64.9
Duration of hypo-thyroidism (years)	2-39	10.5 \pm 15.2	1-49	12.6 \pm 17.1

Note: BMI: Body mass index, TC: Total cholesterol, LDL: Low density lipoprotein, HDL: High density lipoprotein, TGs: Triglycerides, SD: Standard deviation, WC: Waist circumference

Components	Male (n=32)	Percentage (%)	Female (n=68)	Percentage (%)	Total (n=100)
DM	7	21.9	37	54.4	44
HTN	6	18.8	30	44.1	36
TG (≥ 150 mg/dL)	17	53.1	60	88.2	77
HDL (<40 mg/dL in men, <50 mg/dL in female)	14	43.8	62	91.2	76
WC (>102 cm in men, >88 cm in female)	19	59.4	66	97.1	86
Three or more components simultaneously (metabolic syndrome)	19	59.4	65	95.6	84

Note: DM: Diabetes mellitus, HTN: Hypertension, HDL: High density lipoprotein, TGs: Triglycerides, WC: Waist circumference

Discussion:

Hypo-thyroidism is regularly associated with expanded cardiovascular assault, but the components that increase this hazard are still under research. Different components have been proposed to be possibly responsible for it and the MetS is one of these. Thus, our point of consideration was to discover the predominance of MetS in hypothyroid patients. The study of Gupta et al⁶ showed the prevalence of the MetS in the Indian population was about 31.6%. Predominance of individual components of the MetS in men and women were as taken after as follows: Waist Circumference: men >102 cm, women >88 cm), HDL cholesterol (men < 40 mg/dL, women < 50 mg/dL) 54.9% and 90.2%; TGs (≥ 150 mg/dL) 32.3% and 28.6%; and impeded fasting glucose or diabetes in 16.9% and 16.1%. The predominance of hypertension, hypercholesterolemia, and LDL-C was more noteworthy within the MetS in both men and women. Another study of Chow et al¹⁵ showed that, prevalence of MetS of 26.9 % in males and 18.4 % in females in Southern India and study of Deepa et al¹⁶ reported a prevalence of MetS of 18.3 %. According to studies done by Shantha et al¹⁷ showed the prevalence of overt Hypo-thyroidism was 7.4% and that of subclinical Hypo-thyroidism was 21.9% in the MetS population. Uzunzulu et al¹⁸ studied showed that significant association of subclinical Hypo-thyroidism and MetS, which supports our data. The predominance of MetS and its component was essentially higher in our group of hypothyroid patients than within the general population, as detailed. Not much-published data exists with respect to the predominance of MetS in hypothyroid persistent, but a report from

Nigeria^{19,20} found the predominance of MetS in hypothyroid patients being as high as 40%. Common lipid abnormalities include hypercholesterolemia and elevated LDL-C levels was seen in Hypo-thyroidism but HDL-C levels may be normal or even elevated in severe Hypo-thyroidism whereas in this study the mean levels of TG and TC were high and mean HDL-C was low and also mean LDL was within normal limits. Hyper-tension findings in this study were similar to the study of Saito et al²¹ which showed significantly higher prevalence of hyper-tension in hypothyroid patient (15.8%) in comparison with euthyroid subjects (5.5%). In this study the prevalence of hyper-tension was 36% in hypothyroid patients²². The possible pathophysiological mechanisms responsible for this include changes in circulating catecholamines, their receptors, and abnormalities in the renin-angiotensin-aldosterone system. Another study of Gyawali et al²³ which was done in Korea showed that relationship between abnormal thyroid function and individual MetS components such as BP, TC, TG, HDL-C and fasting glucose and also showed that higher levels of TSH may predict MetS in population and also cohort to this study. In this study WC was raised and showed that the most common component of MetS which showed the similar to the study of Cameron AJ et al²⁴.

Conclusion:

Our study showed significant association between subclinical Hypo-thyroidism and MetS. The overall prevalence rate of the MetS in this study was little bit higher than the rates reported in the general population in various studies and comparable to studies of hypothyroid patients. Hypo-thyroidism was the most common TD in Indian patients with

MetS. It is prudent to evaluate the thyroid work in all patients with MetS since unless Hypo-thyroidism is prohibited, a huge number of patients with thyroid dysfunction will be mislabeled as MetS, which will influence on the impact of administration of these cases.

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