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Prevalence of Hypothyroidism in Patients with Metabolic Syndrome

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Abstract:
Background: *Metabolic syndrome (MS) and hypothyroidism are well known risk factors for atherosclerotic cardiovascu¬lar disease (ASCVD). Insulin resistance is a common pathogenic mechanism in both, and may result in to significant convergence between MS and hypothyroid population.*
Aims and Objective: *The present study was done to evaluate the relation between hypothyroidism in patients with MS.*
Materials and Methods: *One hundred patients with MS selected according to WHO criteria were studied in present study. Patients were evaluated based on anthropometry, evaluation of vital parameters, lipid and thyroid profile.*
Results: *In present study there were 44% males and 56% females with mean age of 49.85± 3.24 years. Sub-clinical hypothyroidism was more prevalent (74.07%) in MS population. BMI showed significant association with sub-clinical hypothyroidism (SCH) in persons with MS (P = 0.004).*
Conclusion: *There was a significant association between SCH and MS. It is advisable to assess the thyroid function in all patients with MS.*
Keywords: *subclinical hypothyroidism, metabolic syndrome, ASCVD*

I. Introduction

Hypothyroidism and MS are well known risk factors for ASCVD. MS comprises of different risk factors such as hypertension, dyslipidemia, hyperglycemia along with proinflammatory and prothrombotic conditions which can results in to ASCVD.[1]

Hypothyroidism alone is reported to cause diastolic hypertension, hyperlipidaemia, endothelial dysfunction and cardiovascular disease (CVD). Significant overlap occurs in diagnosis of ASCVD due to MS and hypothyroidism. [2] The common pathogenic factor in both the disorders is insulin resistance (IR). Many studies have reported a role of IR in causing a significant overlap in diagnosis in MS population and hypothyroidism as well. [3] A study dealing with hypothyroidism in MS patients may help to investigate the magnitude of overlap in both the groups and also put a light on the importance of thyroid function tests in identifying hypothyroid population from MS. [3] This can results in a proper planning and management strategies which further results in significant reduction in ASCVD and related mortality.
The present study was aimed to investigate the association between hypothyroidism and MS.

II. Materials and Methods

A prospective study was done on patients with MS in the Department of Medicine of BRD Medical College and Nehru Chikitsalya Gorakhpur from January 2014 to October 2015.

A written Informed consent from all patients and Institutional Ethics Committee approval was obtained before starting the study.

Patients with MS were selected as defined by WHO, require the presence of any one of THE criteria from diabetes mellitus (DM), impaired glucose tolerance, impaired fasting glucose or insulin resistance and any two of the risk factors [blood pressure (BP) ≥130 /85 mmHg, dyslipidemia (TG ≥150 mg/dl, HDL-C <40 mg/dl in male and <50 mg/dl in female, waist to hip ratio > 0.85 in male, >0.90 in female and BMI >30 kg/m^2 and urinary albumin excretion > 20 µg/min or albumin to creatinine ratio > 30 mg/g).

Those patients who were having above said criteria were included in the present study. Patients having only hypertension, DM and obesity were excluded from the study.

A detailed history of patients including dyslipidemia, thyroid dysfunction (hyperthyroidism and hypothyroidism) was recorded.

Blood samples were obtained after a 12 hour overnight fast for biochemical analysis [fasting and postprandial glucose, free T3, free T4 and thyroid stimulating hormone (TSH)].

In present study hyperthyroidism is defined as a TSH concentration of less than 0.40 µIU/mL with an elevated fT4 and fT3 level. Hypothyroidism was defined as a TSH concentration of more than 4.20 µIU/mL

with an fT4 and fT3 concentration level below normal. SCH was defined as a TSH concentration of more than 4.20 μIU/mL with a normal fT4 and fT3 concentration. [4]

Data was compiled and analysed using IBM SPSS ver. 20.0. Categorical data was compared using percentages and paired T test was used wherever required. P values less than 0.05 was considered significant.

III. Results

In present study there were 44% males and 56% females with mean age of 49.85± 3.24 years.

In present study, mean age, waist circumference, systolic BP (SBP), diastolic BP (DBP), fasting blood sugar, triglyceride, high density lipoprotein (HDL), low density lipoprotein (LDL) and TSH was 47.91±4.85 years and 51.79±4.32 years, 102.87±6.03 cm and 101.11±5.46 cm, 143.37±16.08 mmHg and 152.70±14.08 mmHg, 85.15±9.91 mmHg and 84.22±7.93 mmHg, 161.66±24.51 mg/dl and 182.66±22.13 mg/dl, 151.42±19.53 mg/dl and 206.5±20.23 mg/dl, 52.04±4.53 mg/dl and 39.3±4.02 mg/dl, 113.34±23.55 mg/dl and 135.22±21.12 mg/dl, 2.31±1.73 μIU/ml and 11.56±3.73 μIU/ml in euthyroid and hypothyroid patients respectively ($p<0.05$).

Out of 100 patients with MS, 7 [4 (57.14%) were male and 3 (42.85%) were female] belong to age group of 30-39 years, 55 [22 (40%) were male and 33 (60%) were female] patients belong to age group of 40-49 years, 32 [15 (46.87%) were male and 17 (53.12%) were female] and 6 patients were above 60 years of age.

Out of 100 patients, 16% were having normal BP out of which, 10 (62.5%) were male and 6 (37.5%) were female. Out of 22 patients who were pre hypertensive, 9 (40.90%) were male and 13 (59.09%) were female. In present study, 43% [19 (44.18%) male and 24 (55.81%) female] and 19% [4 (21.05%) male and 15 (78.94%) female] patients were having grade I and grade II hypertension respectively.

Out of 100 patients, 73% were euthyroid out of that 34 (46.57%) were male and 39 (53.42%) and 27% were hypothyroid out of that 20 (74.07%) patients were SCH in which 6 (30%) were male and 14 (70%) were female. Out of 27 hypothyroid patients, 7 (25.93%) were overt hypothyroid (OH) in which 2 (28.57%) were male and 5 (71.42%) were female.

Out of 20 patients who had SCH, most of them [9 (45%)] belong to age group of 40-49 years followed by 6 (30%) patients in age group of 50-59 years. Patients (7) who had OH there was an equal distribution of patients in all age groups.

Table 1: Lipid parameters among two classes of hypothyroidism

Parameters		ET (73)	SCH (20)	OH (7)	P Value
TC (mg/dl)	<200	60 (82.19)	2 (10)	0 (0)	0.001
	>200	13 (17.81)	18 (90%)	7 (100)	0.001
LDL (mg/dl)	<150	70 (95.89)	14 (70)	3 (42.85)	0.001
	>150	3 (4.11)	6 (30)	4 (57.14)	0.001
TG (mg/dl)	<150	64 (87.68)	4 (20)	4 (57.14)	<0.001
	>150	9 (12.32)	16 (80)	3 (42.85)	0.001
HDL (mg/dl)	Normal*	19 (26.03)	7 (35)	0 (0)	0.001
	Increased *	54 (73.97)	13 (65)	7 (100)	<0.001

Data is expressed as no of patients (%), ET; euthyroidism, SCH; sub-clinical hypothyroidism, OH; vert hypothyroidism,* normal (>40 in males and >50 in females), Increased (<40 in males and <50 in females).
Out of 100 patients, 4%, 8% and 88% were having impaired fasting glucose, impaired glucose tolerance and diabetes respectively.

Out of 27 patients with hypothyroidism, BP (SBP >130mm Hg & DBP >85mm Hg) was high in 21 (77.78%) patients, triglyceride more than 150 mg/dl was found in all patients, HDL-C was increased in 5 (18.51%) males (<40 mg/dl) and 14 (51.85%) female (< 50 mg/dl), central obesity was seen in 6 (22.22%) male (>0.85) and 17 (62.96%) females (>0.90) and urinary albumin to creatinine ratio more than 30 mg/g was found in 12 (44.44%) patients.

Correlation of hypothyroidism with obesity showed that none of the hypothyroid patient was underweight (BMI <20 Kg/m2), 14 (51.85%) patients were normal (18.5-24.9Kg/m2), 10 (37.03%) were pre-obese (25- 29.9 Kg/m2), 2 (7.40%) patients had class I obesity and none of the patients had class II (35- 40 Kg/m2) ($p<0.05$).

Out of 82 patients who had altered lipid parameters, 59 (71.95%) had TSH level below 4.2 mIU/ml and 23 (28.05%) patients had TSH level more than 4.2 mIU/ml.
Mean free T3, free T4 and TSH in SCH patients was 0.65, 5.04 and 7.8 respectively whereas in OH it was 0.26, 1.67 and 25.44 respectively.

IV. Discussion

In this study, the SBP, DBP, FBS, TC, LDL-C, triglycerides, waist circumference, and BMI were significantly higher and HDL-C levels were significantly lower in hypothyroid patients as compared to

euthyroids. In hypothyroid group most of the patients belong to SCH that means SCH is more common as compared to OH. These findings were similar to those obtained in the studies on Hispanic population by Garcia *et al*, and on Chennai urban population by Shantha *et al*. [5, 6]

In present study most common age group for MS was 40-49 years in which there were 55% patients out of which 40% were male and 60% were female. There was a female predominance which indicates that MS is more common in female population.

Prevalence of grade I hypertension in present study was 43% in which 44.18% male and 55.81% were females. The prevalence of hypothyroidism, SCH and OH in present study was 27%, 74.07% and 25.93% respectively. That means our study showed a high prevalence of SCH than OH in the MS group. According to the report by Shantha GP *et al*., the prevalence of overt hypothyroidism was 7.4% and that of SCH was 21.9% in the MS population. [6]

In present study there was a significant association of SCH with MS (P = 0.003). A study done by Uzunzulu M *et al* had shown a significant association of SCH and MS, which supports our data. [7]

Hypothyroidism was more common in female (70.37%) as compared to male (29.63%). Higher prevalence of MS in women in present study may be due to their higher rate of obesity. In present study, SCH was more common in the 4^{th} to 5^{th} decade of age group.

In present study, most of the patients in which TC, LDL-C and TG were more than the usual limit belong to SCH group and similarly low HDL-C was more common in SCH.

There are not sufficient evidence to prove the relation between hypothyroidism and cardiovascular disease. In a study done on 2730 patients aged between 70–79 years reported that SCH was associated with an increased risk of CHF among older patients who had TSH level of 7.0 mIU/l or greater. [8] But study done by Sathyapalan T et al found no relationship between baseline TSH and CV mortality. [9]

In present study BMI showed significant association with SCH in persons with MS (P = 0.004) According to our present study, MS patients with higher BMI are more prone for having associated SCH. A study done by Knudsen N *et al* has shown that even small differences in thyroid function are associated with changes in BMI. The possible underlying mechanisms for this relation are still not clear and remain to be explained. [10]

In present study in patients with altered lipid parameters, 71.95% patients had TSH level below 4.2 mIU/ml and 28.05% patients had TSH level more than 4.2 mIU/ml, which supports the role of thyroid hormones in the regulation of lipid metabolism, a dysregulation of which, leads to MS.

Mean free T3, free T4 and TSH was high in SCH as compared to OH patients.

Present study has few limitations like small sample size and it was not a randomized study. A large randomized study with large no of population is required to put a conclusion on present discussion.

V. Conclusion

There is significant association between SCH and MS. It is advisable to assess the thyroid function in all patients with MS because unless hypothyroidism is excluded, a large number of patients with thyroid dysfunction will be mislabeled as MS, which will influence the management of these cases.

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