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Research Article

A Hospital-based Study for Clinico-investigative Profile of Newly Diagnosed Patients of Hypothyroidism

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ABSTRACT

Introduction: Hypothyroidism in adults has an insidious onset with a range of non-specific symptoms resulting in delayed diagnosis. Hypothyroidism is characterized by a broad clinical spectrum ranging from an overt state of myxedema, end-organ effects and multisystem failure to an asymptomatic or subclinical condition with normal levels of thyroxine and triiodothyronine and mildly elevated levels of serum thyrotropin. Thyroid dysfunction leads to altered glucose and lipid metabolism leading to insulin resistance, which is an important risk factor for cardio vascular diseases. This study attempts to study clinical and biochemical profile of patients with subclinical hypothyroidism or overt hypothyroidism.

Aim of study: To study clinical and investigative profile of hypothyroidism in the newly diagnosed patients of hypothyroidism.

Methods: All newly diagnosed hypothyroidism patients fulfilling inclusion and exclusion criteria were taken in to study. Demographic profile of all enrolled patients was recorded. They were subjected to detailed history and examination and the findings were recorded as a predesigned Performa. The clinical diagnosis of hypothyroidism was made as per Indian thyroid society guidelines. The following laboratory investigations were performed: serum lipid profile and serum uric acid using enzymatic assay, fasting insulin, creatinine, direct bilirubin, and the following liver function parameters: aspartate aminotransferase (AST), alanine aminotransferase (ALT). Thyroid-hormone profile, including thyroid-stimulating hormone (TSH), free triiodothyronine (FT3), and free thyroxine (FT4), including anti-thyroid peroxidase (TPO).

Observation and results: Between October 1, 2015 and September 30, 2016, 226 patients with newly diagnosed hypothyroidism were studied. Out of 226 patients, 48 patients excluded from the study. Central hypothyroidism was present in 4 patients and 44 were pregnant and lactating women. 178 patients with newly diagnosed hypothyroidism were enrolled in study. Out of 178 patients' subclinical hypothyroidism was present in 29(16.9%) patients. Out of 178 patients, 131 (73.6%) were females and 47 (26.4%) were males and various parameters were studied.

Conclusion: Our study confirms that dyslipidemia, insulin resistance and metabolic syndrome correlate positively with newly diagnosed hypothyroid patients.

Keywords: Hypothyroidism; Patients; Endocrine; Thyroid

INTRODUCTION

Thyroid diseases are the most common endocrine disorders world-wide. The prevalence of hypothyroidism in the developed world is about 4-5% [1,2]. The prevalence of subclinical hypothyroidism in the developed world is about 4-15% [1-3]. According to a projection from various studies on thyroid disease, it has been estimated that about 42 million people in India suffer from thyroid diseases [4]. Hypothyroidism in adults has an insidious onset with a range of non-specific symptoms resulting in delayed diagnosis. Many of the common signs and symptoms of hypothyroidism occur frequently in euthyroid patients. Common symptoms such as fatigue, lethargy and constipation have limited diagnostic value, while weakness, insomnia and loss of memory are usually attributed to old age. This downgrading of clinical aspects of hypothyroidism has paralleled the increase in demand for thyroid

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function tests over the past 20 years. Few authors believe that a diagnosis of clinical hypothyroidism can be made on the basis of biochemical measurements alone and that signs and symptoms are not important [5]. Others challenge this statement and maintain that biochemical tests can be misleading and that diagnosis can be made on clinical grounds alone [6]. Therefore, an attempt was made to study the clinico-biochemical spectrum of hypothyroidism and the relative importance of thyroid function tests

Hypothyroidism is characterized by a broad clinical spectrum ranging from an overt state of myxedema, end-organ effects and multisystem failure to an asymptomatic or subclinical condition with normal levels of thyroxine and triiodothyronine and mildly elevated levels of serum thyrotropin [7-10].

Subclinical hypothyroidism (ScHt) is defined as high serum thyroid stimulating hormone (S.TSH) concentration with normal serum free thyroxine (FT4) and free triiodothyronine (FT3) concentrations, associated with few or no signs and symptoms of hypothyroidism [11]. Subclinical hypothyroidism is the most prevalent thyroid disorder affecting 3–15% of the adult population [12]. Its incidence increases with advanced age, female gender and greater dietary iodine intake [12-20].

Various studies have shown that ScHt is associated with hyperlipidemia, neuromuscular and neuropsychiatric symptoms, myocardial dysfunction and decrease in quality of life with progression to overt hypothyroidism [13-16,20-26].

Thyroid dysfunction, prominently subclinical hypothyroidism has been observed more frequently in metabolic syndrome patients than general population [26]. Both metabolic syndrome and hypothyroidism are independent risk factors for cardiovascular diseases (CVD). Presence of both conditions may be compounded to increase the risk for CVD and a considerable overlap occurs in the pathogenic mechanisms of atherosclerotic cardiovascular disease by metabolic syndrome and hypothyroidism [27]. There are reports about higher thyroid stimulating hormone (TSH) level in metabolic syndrome patients than in healthy ones, and high prevalence of metabolic syndrome in subjects with TSH level higher than normal as compared to those with normal TSH level [28,29]. However, the association between thyroid dysfunction and components of metabolic syndrome is still debatable [30].

Thyroid dysfunction leads to altered glucose and lipid metabolism leading to insulin resistance, which is an important risk factor for cardio vascular diseases. Early detection of insulin resistance and prompt intervention for it in hypothyroid patients will be helpful to decrease cardiovascular morbidity and mortality.

Due to apparently asymptomatic nature of the illness, the "American Thyroid Association'(ATA) has recommended routine population screening of both genders at age 35 years and then every 5 years thereafter for early detection and treatment of subclinical hypothyroidism. There is paucity of Indian data on prevalence, clinical profile, biochemical profile and therapy of this condition. There are no Indian guidelines for screening of high-risk population for subclinical hypothyroidism. In Himachal Pradesh, we still have a long way to go in achieving adequate knowledge regarding the prevalence and profile of common endocrine diseases, such as hypothyroidism. Thyroid disorders are common endocrine diseases in the state. District Kangra in Himachal Pradesh is a known area of endemic iodine deficiency. This study attempts to study clinical and biochemical profile of patients with subclinical hypothyroidism or overt hypothyroidism.

MATERIAL AND METHODS

All the newly diagnosed indoor/outdoor patients of hypothyroidism presenting to the department of medicine at Dr. Rajendar Prasad Govt. Medical College, Kangra at Tanda were studied. All the patients referred from other departments for evaluation of hypothyroidism were also enrolled.

Inclusion criteria

- All the patients presented with signs and symptom suggestive of hypothyroidism.
- Patients referred from other departments, for evaluation of hypothyroidism.
- Patients with thyroid profile suggestive of hypothyroidism.

Exclusion criteria

- Patients less than 18 years of age.
- Pregnant and lactating women.
- Central hypothyroidism.

Methodology

- All consecutive newly diagnosed hypothyroidism patients fulfilling inclusion and exclusion criteria were taken in to study. Demographic profile of all enrolled patients was recorded. They were subjected to detailed history and examination and the findings were recorded as a predesigned Performa (Annexure 1).
- The clinical diagnosis of hypothyroidism was made as per Indian thyroid society guidelines [31].
- Height in meters was measured without shoes.
- Weight in kgs was measured in light indoor clothes with foot wear removed.
- Waist circumference in cms was measured midway between inferior margin of rib and superior border of iliac crest during mid expiration.
- Body Mass Index (BMI) was calculated using following Formula:
- BMI (Kg/m^2)=Weight (Kg)/Height (m^2)
- The blood pressure was measured after a 5 minutes' rest period to allow for acclimatization in the right arm supine position with electronic apparatus.
- Laboratory investigations: Blood (5 mL) was collected from each participant in ethylenediaminetetraacetic acid tubes and mixed well. Part of it was used as whole blood for detection of complete hemogram, and the remainder centrifuged at 8,000 rpm for 10 minutes, with the separated part kept frozen at -80°C till analysis. The following laboratory investigations were performed: serum lipid profile (cholesterol [high- and low-density lipoprotein] and triglycerides) and serum uric acid using enzymatic assay (Boehringer, Mannheim, Germany); fasting insulin, creatinine, direct bilirubin, and the following liver function parameters: aspartate aminotransferase (AST), alanine aminotransferase (ALT). Thyroid-hormone profile, including thyroid-stimulating hormone (TSH), free triiodothyronine (FT3), and free thyroxine (FT4), measured by enzyme-linked immunosorbent assay (DRG International,

Springfield, NJ, USA);8 antithyroid antibodies, including anti-thyroid peroxidase (TPO).

- Metabolic syndrome was diagnosed based on modified Asian NCEP-ATP III panel criteria [32].
- Abdominal ultrasonography (Logic Q700 MR, GE, Milwaukee, WI, USA) was performed in all subjects. Fatty liver was diagnosed based on standard criteria, including hepatorenal echo contrast, liver brightness, deep attenuation, and vascular blurring, using a 3.5 MHz probe. Several experienced radiologists, who were blinded to the clinical status of the subjects, performed the ultrasounds. However, we did not assess inter-observer reliability.
- Acanthosis was graded based on standard scale of 0-4 as described by Burke et al. [33]. Neck grading 0: Not visible, grade 1 Present: clearly present on close visual inspection, not visible to the casual observer, extent not measurable. Grade 2, Mild: limited to the base of the skull, does not extend to the lateral margin of the neck (usually, 3 inches in breadth), grade 3: extending to the lateral margins, not visible from the front, and grade 4: extending anteriorly.

OBSERVATION AND RESULTS

Between October 1, 2015 and September 30, 2016, 226 patients with newly diagnosed hypothyroidism were studied. Out of 226 patients, 48 patients excluded from the study. Central hypothyroidism was present in 4 patients and 44 were pregnant and lactating women. 178 patients with newly diagnosed hypothyroidism were enrolled in study. Out of 178 patients' subclinical hypothyroidism was present in 29 (16.9%) patients. Out of 178 patients, 131 (73.6%) were females and 47 (26.4%) were males. The female to male ratio was 3:1. Mean age of the patients was 43.11 ± 11.6 years. The mean age of males was 48.40 ± 12.17 years, while the mean age of females was 41.21 ± 10.81 years. Significant difference of age between male and female cases was present. (p value: 0.0001)

Questionnaire based symptom prevalence in newly diagnosed hypothyroidism patients are listed in Table 1.

Most common symptom in newly diagnosed patients of hypothyroidism are tiredness (68.5%), muscle cramps (57.9), weight gain (56.2%), cold extremities (49.4), heaviness in eyes (43.3%), backache (41.5%), palpitations (38.2). Whereas less

Table 1: Showing symptom prevalence in newly diagnosed hypothyroidism patients.

Variable	Number	Proportion
Tiredness	122	68.50%
Muscle cramps	103	57.90%
Weight gain	100	56.20%
Cold extremities	88	49.40%
Heaviness in eyes	77	43.30%
Mental sluggishness	75	42.00%
Backache	73	41.50%
Memory loss	70	39.30%
Early upset of sleep	70	39.30%
Palpitation	68	38.20%
Heat and cold intolerance	68	38.20%
Numb legs	68	38.20%
Breathlessness	62	34.80%
Hoarseness of voice	62	34.80%
Numb toes	60	33.70%
Migraine	60	33.70%
Slow movements	59	33.10%
Eczema or psoriasis	58	32.60%
Insomnia	57	32%
Puffiness of eyes	57	32%
Cessation of periods	57	32%
Numb arm	55	30.90%
Pale skin	55	30.90%
Brittle hair	54	30.30%
Constipation	53	29.80%
Dizziness	51	28.70%
Panic attacks	51	28.70%
Body hair loss	50	28.10%
Puffiness of face	49	27.50%
Hemorrhoids	49	27.50%
Noise in ear	48	27%
Loss of libido	47	26.40%
Poor response to treatment	45	25.30%

Diminished sweating	45	25.30%
Head hair loss	45	25.30%
Numb fingers	44	24.70%
Scanty periods	43	24.20%
Puffiness of feet	41	23%
Abdominal distension	40	22.50%
Puffiness of hands	35	19.70%
Low infertility	35	19.70%
Difficulty in swallowing	34	19.10%
Swollen tongue	34	19.10%
Imbalance	33	18.50%
Dry skin	32	18%
Repeated urinary infection	30	16.90%
Boils and spots	30	16.90%
Flaky skin	29	16.30%
Dry mouth	27	15.20%
Coarse patches	27	15.20%
Lump in throat	23	12.90%
Deafness	19	10.70%
Wrist pain	18	10%
Halitosis	17	9.60%
Blurred vision	15	8.40%
Nightmares	15	8.40%
Heavy periods	13	7.30%
Gritty eyes	6	3.40%
Dry eyes	5	2.80%
Double vision	3	1.70%

common symptom is deafness (10.7%), wrist pain (10%), halitosis (9.60%), dry eyes (2.80), double vision (1.70%). Out of 47 males 25(53.2%) were smoker and out of 131 females only 2 (1.5%) were smoker. Significant difference was noted between male and female. (p value 0.0001) Out of 47 males 24 (51.1%) were consuming alcohol and out of 131 females only 2 (1.5%) were consuming alcohol. significant difference was noted between male and female. (P value 0.0001). Mean body mass index in our study was 29.065 ± 2.74 kg/m^2 and with a mean body mass index male 28.48 ± 2.6 kg/m^2 and mean body mass index female 29.27 ± 2.77 kg/m^2. Body Mass Index ≥ 25 kg/m^2 was present in 44 (93.6%) males and 121 (92%) females. No significant difference between male and female. (P value 1.00) Mean Waist circumference in our study was 93.3 ± 11.7 cm with mean male waist circumference 91.45 ± 11.03 cm and mean female waist circumference 94.8 ± 11.9 cm. Waist circumference ≥ 85 cm in males was present in 23 (48.9%) and ≥ 80 cm in females was present in 111 (84.1%). Significant difference was noted with P value 0.0001. Mean systolic blood pressure in our study was 137 ± 20.4 mmhg with mean male systolic pressure 150 ± 19 mmhg and mean female systolic blood pressure 133 ± 19 mmhg. Significant difference between male and female systolic blood pressure was present with p value of 0.0001. Systolic blood pressure >130 mmhg was present in 36 (76.6%) males and 62 (47.7%) females without significant difference. (p value 0.0003). Mean diastolic blood pressure in our study was 79.56 ± 8.7 mmhg with mean male diastolic pressure 81.26+11 mmhg and mean female diastolic blood pressure 78.95 ± 7.7 mmhg. No significant difference between male and female diastolic blood pressure was present (p value 0.124). Diastolic blood pressure >85 mmhg was present in 9 (19.1%) males and 22 (16%) females without significant difference. (p value 0.8) Mean hemoglobin level in our study was 11.4 ± 7.02 gm/dl. Mean male hemoglobin level in males was 11.89 ± 1.83 gm/dl and 10.64 ± 1.5 gm/dl in females. (p value 0.0001). Mean MCV levels in our study was 91.6 ± 8.46 fl/red cell ranged from maximum 124 fl/red cell to minimum 73.5 fl/red cell. Male mean MCV was 91.9 ± 9.9 fl/red cell and 91.8 ± 7.9 fl/red cell in female. No significant difference was present. (p value 1.0) A mean level of FT3 in our study was 2.04 ± 0.096 pg/dl with maximum of 2.6 pg/dl and minimum of 1.8 pg/dl. Mean male FT3 level was 2.03 ± 0.096 pg/dl and female mean was 2.04 ± 0.097 pg/dl. No significant difference between males and females was observed. (P value 0.579) A mean level of FT4 in our study was 1.15 ± 0.24 ng/dl with maximum of 2.0 ng/dl and minimum of 0.4 ng/dl. Mean male FT4 level was 1.12 ± 0.24 ng/dl and female mean was 1.15 ± 0.25 ng/dl. No significant difference between males and females was observed. (p value 0.432) A mean level of TSH in our study was 39.3 ± 32.14 μ/ml with maximum of 100 μ/ml and minimum of 7.8 μ/ml. Mean male TSH level was 53 ± 36 μ/ml and female mean was 34 ± 28.8 μ/ml. significant difference between males and females was observed. (p value 0.001) A mean level of anti TPO was 277.9 ± 341 μ/ml with minimum level of 10 μ/ml and maximum level of 1326 μ/ml. Mean male anti TPO was 203 ± 254 μ/ml and mean female levels was 304 ± 364 μ/ml. No significant difference between males and females was observed. (p value 0.4) A mean total cholesterol level in our study was 233.6 ± 63.4 mg/dl with maximum level of 500 mg/dl and minimum of 124 mg/dl. Mean male total cholesterol was 269 ± 58 mg/dl and 220 ± 60 mg/dl in female. Significant difference between males and females was

observed. (p value 0.0001) Mean triglycerides levels in our study was 183 ± 49.5 mg/dl with mean male triglycerides levels 212 ± 51 mg/dl and mean female triglycerides levels 172 ± 44.5 mg/dl. Significant difference between male and female was present. (p value 0.0001) Triglycerides >150 mg/dl was present in 41 (87.2%) males and 83 (62.9%) females with p value of 0.007. Mean HDL levels in our study were 45.15 ± 8.1 mg/dl with mean male HDL levels 42.5 ± 8.1 mg/dl and mean female HDL levels 46.08 ± 7.9 mg/dl. Significant difference between males and females was present. (p value 0.011) High Density Lipoproteins <40 mg/dl in males was present in 24 (51.1%) and <50 mg/dl in females was present in 92 (62.9%) with p value of 0.02. A mean serum total bilirubin level was 1.47 ± 0.92 mg/dl and mean male serum total bilirubin 1.65 ± 0.77 mg/dl and female serum total bilirubin 1.41 ± 0.97 mg/dl. No significant difference was observed. (p value 0.140). Mean AST in our study was 85.5 ± 40.3 µ/l with maximum of 245 µ/l and minimum of 25 µ/l. Mean male AST was 103 ± 47.9 µ/l and 79 ± 28.5 µ/l in females. Significant difference between males and females was present. (P value 0.0001). Mean ALT levels in our study was 79.3 ± 30.7 µ/l with maximum of 234 µ/l and minimum of 14 µ/l. Mean male ALT was 86.8 ± 35.5 µ/l and 76.7 ± 28.5 µ/l. No significant difference between male and female was present. (P value 0.052) Mean uric acid levels in our study were 6.94 ± 1.5 mg/dl ranged from maximum 11.6 mg/dl and minimum 4.1 mg/dl. Mean male uric acid level was 8.3 ± 1.3 mg/dl and 6.4 ± 1.25 mg/dl. Significant difference between male and female was observed. (p value 0.0001) Mean fasting blood glucose level in our study was 109 ± 32.3 mg/dl with ranged from maximum 215 mg/dl to minimum 75 mg/dl. Mean male fasting blood glucose level was 116.8 ± 35 mg/dl and mean female fasting blood glucose 106 ± 30 mg/dl. No significant difference was present between male and female. (p value 0.058) Fasting blood glucose ≥ 100 mg/dl was present in 31(65.9%) males and 67(51%) females. (P value 0.08) Mean fasting insulin level in our study was 15.56 ± 11.64 mIU/L with ranged from maximum 48.2 mIU/L to minimum 2.3 mIU/L. Mean male fasting insulin level was 20.5 ± 12.3 mIU/L and mean female insulin levels was 13.79 ± 10.9 mIU/L (p value 0.001) Fasting insulin levels ≥ 25 mIU/L was present in 19 (40.4%) males and 29 (22.1%) females. (p value 0.02) Out of 47 male patients 36 (76.6%) had fatty liver on ultrasound. Grade 1 fatty liver was present in 14 males and grade 2 was present in 22 patents. Out of 131 females 62 (47.3%) had fatty liver. Grade 1 fatty liver was present in 36 female patients and grade 2 was present in 26 patents. No significant difference was present between male and female with p value of 0.0006. Out of 47 male's acanthosis Nigerians was present in 26 (55.3%). Out of 26 males grade 1 was present in 10 (28.6%), grade 2 was present in 13 (38.2%) and grade 3 was present in 3 patents. No male patients were presented with grade 4. Out of 131 female's acanthosis Nigerians was present in 47 (33.6%). No significant difference was present between male and female with p value 0.02. Out of 47 females grade 1 was present in 25 (71.4%), grade 2 was present in 21 (61.8%) and no female patient was presented with grade 3 and grade 4.

DISCUSSION

The present study included 178 patients, conducted at Dr. RPGMC TANDA at Kangra, the study period being October 2015-September 2016. The age range of the study is between 17-80 years. Most patients belonged to the age groups of 21-60 years. There is an overall female preponderance over all age groups. The female population constituted about 73% of the total patients. Female to male ratio was 3:1 in this study compared to 4:1 in William et al. [34], 3.3:1 in Jagdish et al. [35], 3:1 Sharath et al. [36] and 3:1 in Rishabh Dixit et al. [37] study. This is well in concordance to Harrison's Principles of Internal Medicine 19th edition.

Sex ratio in various studies is seen in Table 2.

Most common symptom in present study is tiredness in 68.50% compared to 62% in Sureshbabu et al. and 28.5% in Shende et al. and 69.75% in Watanakunakorn et al. study. 56.2% had weight gain in present study compared to 31% Sureshbabu et al., 18% in Shashi et al. and 47% in Watanakunakorn et al. study. 34.8% had breathlessness in present study compared to 12% in Sureshbabu et al., and 3.3 in Shashi et al. and 12.5% in Watanakunakorn et al. study (Table 3) [38-40].

High prevalence of Metabolic syndrome is a global phenomenon. Hypothyroidism and metabolic syndrome are recognized risk factors for atherosclerotic cardiovascular disease. In our study out of 178 patients, metabolic syndrome on the basis of modified Asian NCEP-ATP III panel criteria was present in 125 (70.2%) [41]. 37 (29%) were males and 88 (71%) were females compared to 82.5% in a study done by Haque et al. [42] with similar criteria in Bangladesh. Female predominance was noted in both studies. Majority of the study subjects were female which indicates the preponderance of hypothyroidism among the females compared to males. In other study of Metabolic Syndrome and Associated Thyroid Dysfunction done by Punia et al. [43]. they found that

Table 2: Sex ratio in various studies.

Present Study F:M	William FC et al. [36]	Jagdish et al. [37]	Sharath et al. [38]	Rishabh Dixit et al. [39]
3:1	4:1	3.3:1	3:1	3:1

Table 3: Symptom analysis.

Symptom	Present study N=178	Sureshbabu KP et al. [40] N=100	Shashi et al. [41] N=30	Watanakunakorn et al. [42] N=1965	Ravindra Kumar et al. [57] N=100
Easy fatiguability	68.5%	62%	28.5%	69.7%	36.6%
Breathlessness	34.8%	12%	3.3%	12.5%	20.2%
Weight gain	56.2%	31%	18%	47%	43.3%
Swelling of limb	23%	26%	46%	-	34%
Dry skin	18%	19.35%	23%	15%	73.3%
Puffiness of face	27.5%	22.5%	-	31%	37%
Intolerance to cold	32%	12.9%	26%	28%	30%

hypothyroidism was present in 28% of patients with metabolic syndrome. In one another study done by Khatiwada et al. [44] found that Thyroid dysfunction was seen in 31.9% metabolic syndrome patients.

This study used modified NCEP-ATP III criteria, which include lower values as cut-off points for waist circumference compared to that of NCEPATP III and higher values for HDL cholesterol compared to WHO criteria. Most of the study subjects in hypothyroid group showed higher waist circumference as well as lower HDL cholesterol level. This study found that prevalence of Metabolic syndrome is quite high in newly diagnosed patents of hypothyroidisim. So newly diagnosed hypothyroid people need to be screened for Metabolic syndrome and cardiometabolic risk factors. On the other hand, people with Metabolic syndrome need to be screened for presence of hypothyroidism. This clinical awareness will substantially help to give adequate attention to Metabolic syndrome, hypothyroidism and cardio-metabolic risk factors in an attempt to reduce the morbidity and mortality out of Metabolic syndrome [45].

Insulin resistance is a cardinal feature of type 2 diabetes mellitus 46 and is relatively frequently found in mild thyroid dysfunction with increased risk of dyslipidemia [46]. In recent times tremendous interest has been raised in the influence of thyroid hormone action on insulin levels. The development of insulin resistance leads to many metabolic abnormalities. Hypothyroidism can increase the risk of cardiovascular disease, infertility and osteoporosis. In the present study we have explored the possible linkage among TSH, insulin resistance and serum total cholesterol in newly diagnosed hypothyroidism patients [47,48]. In this study total cholesterol are 233.66 ± 63.46 highly significantly elevated, compared to 222 ± 53 mg/dl in on study done by Guddanti Rajeswari et al. in hypothyroidism pateients [49].

Thyroxine increases the activity of HMG CoA reductase leading to increased synthesis of cholesterol. So hypothyroidism should manifest with low cholesterol levels, but levels of serum total cholesterol increase in hypothyroidism. This is due to that even though decrease production of cholesterol in hypothyroidism but there is significant decrease in clearance of cholesterol by liver due to decrease in cholesterol receptors on liver cells in hypothyroidism. So net effect is the accumulation of cholesterol leading to hypercholesterolemia.

Thyroid hormones exert profound effects in the regulation of glucose homeostasis. These effects include modifications of circulating insulin levels, counter regulatory hormones, intestinal absorption, hepatic production and uptake of glucose by peripheral tissues, all these changes produce insulin resistance which is the culprit for many complications mainly cardiovascular diseases.

Nonalcoholic fatty liver disease (NAFLD) is characterized by excessive hepatic accumulation of triglycerides and free fatty acids in the liver. The incidence of NAFLD is increasing rapidly, and it is the most common cause of abnormal liver function results worldwide. The increase in the prevalence of NAFLD has been attributed to the global increase in the prevalence of obesity and other metabolic risk factors. Advanced age and metabolic disorders such as type 2 diabetes mellitus, impaired glucose tolerance, and central obesity, are among the risk factors for NAFLD.

The thyroid gland is significantly involved in energy homeostasis, lipid and carbohydrate metabolism, regulation of body weight and adipogenesis. Subclinical and overt hypothyroidism has been associated with metabolic syndrome, cardiovascular mortality and disturbance in lipid metabolism.

In present study fatty liver was present in 98 (55%) of patients and 63 (67%) patients had HOMA IR >2.5 with p value of 0.001. Several studies have investigated the association between hypothyroidism and NAFLD. Chung et al. [50] showed that subclinical hypothyroidism, even in the range of upper normal TSH levels, is closely associated with NAFLD in a dose-dependent manner. In addition, three studies have indicated that hypothyroidism is an independent risk factor for developing NAFLD/NASH [51-55]. Several studies have reported that lower free T4 is an independent risk factor for NAFLD [52-57]. Several other studies have shown that increased serum TSH is an independent risk factor for NAFLD/NASH [56,57]. An explanation for the association between hypothyroidism and NAFLD is that hypothyroidism is associated with metabolic syndrome. Several studies have reported that hypothyroidism is related to obesity and metabolic syndrome [57,58]. Thyroid hormones stimulate the expression of uncoupling proteins in the mitochondria of fat and skeletal muscle, through modulate adrenergic receptor numbers by enhancing responsiveness of catecholamine [59]. Thus, thyroid hormones influence body weight, thermogenesis, lipolysis, and cholesterol metabolism [60].

LIMITATIONS OF THE STUDY

The present study has however several limitations. First the sample size was small, which may have affected the correlation between components of metabolic syndrome and thyroid function and correlation with other factors. Second, the iodine nutrition status in the patients was not assessed. It has been found that both iodine deficiency and excess can lead to thyroid disorder.

CONCLUSION

This study comprised of 178 patients, all of them were newly diagnosed hypothyroid patients. As in most literature, there was a female preponderance in this study. Most patients belonged to the age groups of 21-60 years. The most common of the symptoms included Tiredness, Muscle cramps, Cold extremities, Heaviness in eyes, Mental sluggishness, Weight gain, Hair loss, Dry skin, Hoarseness of voice, Lethargy, Cold intolerance and Constipation.

Our study confirms that dyslipidemia, insulin resistance and metabolic syndrome correlate positively with newly diagnosed hypothyroid patients.

Prevalence of NAFLD has been reported with newly diagnosed hypothyroidism patients and prevalence increases as HOMA IR increases.

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