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Physiological Changes Related to the Metabolic Syndrome in Patients with Hypothyroidism

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ABSTRACT

Objectives: To study the physiological changes related with metabolic syndrome in patients of hypothyroidism and subclinical hypothyroidism.
Study design: A Cross-sectional study.
Place and duration: department of Family medicine, Ambulatory Health Servises SEHA Abu Dhabi United Arab Emirates from June 2020 to July 2021.
Methodology: Serum levels of T3, T4 and TSH were assessed to diagnose hypothyroidism and subclinical hypothyroidism in patients. To evaluate the metabolic syndrome components, according to the guidelines of the International Diabetes Federation, body weight, waist circumference, blood pressure, fasting blood sugar estimate and lipid profile were tested.
Results: Out of 180 patients 34.7% were having metabolic syndrome. The 21.66% patients of hypothyroidism suffered from raised blood glucose levels, 66.11% patients showed increased serum cholesterol levels, 59.54% patients had increased serum triglycerides levels, 17.77% had low or abnormal HDL levels, 40.55% patients had increased low density lipoproteins levels, 57.22% patients had raised systolic pressure, 62.77% had raised diastolic pressure and 70% patients were found to have increased waist circumference. The frequency of occurrence of waist circumference was highest in the study patients. The metabolic syndrome was more common in male as compared to female while there was no significant difference regarding the metabolic syndrome in different age groups.
Conclusion: This study is therefore significant for developing approaches and techniques leading to better management and prevention of metabolic syndrome and hypothyroidism to decrease the cardiovascular risk factors and mortality.

Key words: Blood pressure, Cholesterol, Glucose, Hypothyroidism, Metabolic syndrome

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INTRODUCTION

Approximately, 2-5% of people with subclinical thyroid disease will develop overt hypothyroidism each year. Overt hypothyroidism is likely defined as decreased free serum thyroxin along with high serum TSH concentration [1,2]. The reported prevalence in Pakistan of hypothyroidism and subclinical hypothyroidism is 4.1% and 5.4%, respectively [3]. Cardiovascular risk consisting of raised triglycerides, higher blood pressure, reduced high-density lipoprotein (HDL) cholesterol levels, elevated fasting glucose levels, and central obesity is clarified by metabolic syndrome [4]. Thyroid hormones, which are disrupted in metabolic syndrome, have distinct effects on carbohydrate and fat metabolism, energy supply sand blood pressure [5]. As thyroid hormones play a crucial role

in controlling metabolism, irregular thyroid activity influences the magnitude of components of metabolic syndrome [6].

The frequency of the metabolic syndrome in the world ranges from <10% to 84%, depending upon the race, region, age, and gender. Sedentary lifestyle, high socioeconomic status, and increased body mass index (BMI) were notably linked with metabolic syndrome [7]. According to the International Diabetes Federation (IDF) reports one-fourth of the adults in the world to have the syndrome [8]. One fourth population in developed countries is affected by the syndrome and is a key for the progression of atherosclerosis and diabetes mellitus type 2. Metabolic syndrome is caused by various physiological changes in the body which leads to the disease [9].

This study will help in the early management of hypothyroidism, thus preventing the development of metabolic syndrome it will thereby reduce the risk of cardiovascular diseases. This study was conducted to the physiological changes related to metabolic syndrome in patients of hypothyroidism and subclinical hypothyroidism.

METHODOLOGY

The nonprobability was collected using this cross-sectional analysis sampling of comfort from ambulatory patients in department of Family medicine, Ambulatory Health Servises SEHA Abu Dhabi United Arab Emirates from June 2020 to July 2021. Included in study adult Patients aged between 13 and 75 years in either sex of hypothyroidism, the research involved subclinical hypothyroidism thyroxine-treated patients with malignancies, Tuberculosis, infectious diseases of the liver and kidneys, breastfeeding females. There were no oral contraceptive pills, and those taking them were not included in the study. The following factors (Circumference of Waist, Blood pressure, weight, blood sugar, systemic serum cholesterol, cholesterol Triglycerides, HDL, and LDL) have been measured/ estimated in both Researcher and laboratory assistant for sample topics. 5 mL of blood was obtained in a gel tube in a fasting state. In, through the serum was broken within half an hour by centrifugation. Via the Enzymatic fasting technique using glucose oxidase (GOD) The amount of glucose was determined. Cholesterol overall, triglycerides Colorimetric enzymatic determination of HDL-C and HDL-C in serum the 902 Roche/Hitachi Automated Analyzer Method. While the Friedwald formula calculated the serum LDL-C. The blood by an auscultatory method using mercury, the pressure was recorded the 3MTM Littmann® Classic II S.E sphygmomanometer and the 3MTM Littmann® Classic II S.E, and On SPSS version 17, data were analyzed via the Chi-square test.

RESULTS

The percentage of the patients having metabolic syndrome was 34.7% (n=180), which proves the hypothesis of the study that every one out of three patients of hypothyroidism suffers from the metabolic syndrome as shown in Figure 1. The present study results showed that 21.66% (n=39) patients of hypothyroidism suffered from raised blood glucose levels while 66.11% (n=119) patients of this study showed increased serum cholesterol levels however 59.44% (n=107) patients of this study have increased serum triglycerides levels. The numbers of cases with low or abnormal HDL levels were 17.77% (n=32) while 40.55% (n=73) patients have increased low-density lipoproteins levels. According to this criterion, 57.22% (n=103) patients in this study have raised systolic pressure which is one of the components of the metabolic syndrome, and diastolic blood pressure was raised in 62.77% (n=113) patients. Waist circumference is an indirect measurement of obesity, and 70.00% (n=126) patients were found to have increased waist circumference. The frequency of occurrence of waist circumference was highest in the study patients (Table 1). The metabolic syndrome was more common in male as compared to female. There was no significant difference regarding the distribution of metabolic syndrome among males and females, as shown in Table 2. (P-value 0.85).

Chi-square test for homogeneity has been applied to compare the distribution of metabolic syndrome among different age groups. There was no significant difference regarding the metabolic syndrome in different age groups, as shown in Table 2.

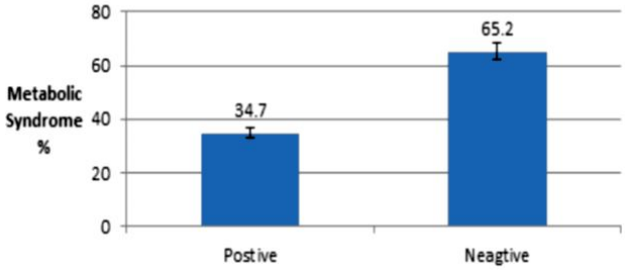

Figure 1: Frequency of metabolic syndrome (N=180).

Table 1: Frequency of metabolic syndrome components (N=180).

Sl No.	Variables	Suffered patients	Normal Patients	Percentage
1	Blood sugar (mg/100m)	39	141	21.66%
2	Total cholesterol	119	61	66.11%
3	Triglyceride	107	73	59.44%
4	Decreased HDL	32	148	17.77%

5	LDL	73	107	40.55%
6	Blood Pressure Systolic	103	77	57.22%
7	Blood Pressure Diastolic	113	67	62.77%
8	Waist circumference	126	54	70.00%

*HDL=High Density Lipoprotein; LDL=Low Density Lipoprotein

Table 2: Frequency of metabolic syndrome among gender and age wise (N=180).

Age groups	Metabolic syndrome causes	Gender wise causative causes	Percentage
13-30	68	M31	37.78%
		F37	
31-45	73	M28	40.55%
		F45	
46-60	31	M13	17.22%
		F18	
61-75	8	M3	4.45%
		F5	
Total	180	180	100%

DISCUSSION

In our study of 180 adult patients with hypothyroidism were selected from both the sexes, it was observed that the cases of central obesity measured by waist circumference were highest in the study. Serum cholesterol, serum triglycerides and diastolic blood pressure were also raised in the study participants. Prevalence of metabolic syndrome fluctuated by country and time of study. This amount was 14-63 % in Pakistan [10]. The overall prevalence of metabolic syndrome in patients with hypothyroidism and subclinical hypothyroidism in our study was 34.7%. One community based epidemiological study by Zahid et al. from the rural area of Pakistan reported 31% incidence of metabolic syndrome in the general population without known thyroid disease [11].

Thyroid hormones play a vital role in the regulation of lipids metabolism, synthesis, and mobilization. The present study agrees with the study conducted by Chiappa et al. [12]. All these studies asserted that a significant increase in serum triglycerides, serum cholesterol and LDL levels were observed in people with hypothyroidism [13,14]. Waist circumference is an indirect measurement of obesity, and according to the (ATP 111) Plan, obesity is responsible for the increasing incidence of metabolic syndrome [15].

Obesity is strongly linked with cardiovascular risks resistance to insulin and type 2 diabetes mellitus [16]. The intra-abdominal fat and the visceral adipose tissue is related to resistance to insulin and the metabolic syndrome. Asian people despite their smaller built have tendency to gather more fat and are at risk to develop heart disease at a smaller waist circumference or low body weight than Europeans [17], and due to these ethnic differences, International Diabetes Federation (IDF) defines abdominal obesity at waist circumference of 80 cm or more in females and 90 cm or more in males in Asians [18].

The present Study showed 70 % prevalence of increased waist circumference according to the IDF criteria. Comparable results were found between the present Study and Refetoff et al. study, both the research studies proved to have a positive relation of low thyroid function with increased waist circumference [19]. According to Taylor et al. low thyroid function may lead to increase peripheral vascular resistance and may stimulate the sympathoadrenal system, causing increase blood pressure, especially diastolic blood pressure [20,21]. A similar finding was obtained by the present study showing increased systolic and diastolic blood pressures in the study participants. The cases regarding the frequency of metabolic syndrome were compared between hypothyroidism through chi-square test. There was no significant difference regarding the distribution of metabolic syndrome in hypothyroidism.

CONCLUSION

This research is also important for the advancement of approaches and procedures, leading to better treatment and prevention of metabolic syndrome and hypothyroidism to minimize cardiovascular risk factors and mortality.

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