Original Article

Cross-Sectional Study Of The Association Between Obesity And Subclinical Hypothyroidism

Jaffar Khan[1], Sarwat Anjum[2], Muhammad Nouman[3], Naila Memon[4], Sarmad Ali[5], Muhammad Azhar[6]

1. Jaffar Khan, Fellow Critical Care Medicine, Shifa International Hospital Islamabad Pakistan. email: jaffarkhan747@gmail.com (Corresponding author)
2. Sarwat Anjum, Assistant Professor Internal Medicine and Allied, Bhitai Dental and Medical College Mirpurkhas Pakistan. email: drriakhan94@gmail.com
3. Muhammad Nouman, Assistant Professor of Medicine, Indus Medical College, Tando Muhammad khan Pakistan. email: m.noumanshaikh@gmail.com
4. Naila Memon, Senior Woman Medical Officer Medicine, Liaquat University of Medical and Health Sciences Jamshoro Pakistan. email: doctormemon76@yahoo.com
5. Sarmad Ali, Consultant Physician Medicine, Liaquat University of Medical and Health Sciences Jamshoro Pakistan. email: sarmadmorai108@gmail.com
6. Muhammad Azhar, Consultant Nephrology, King Salman Armed Forces Hospital, Tabuk , Kingdom of Saudi Arabia, email: azhar743@hotmail.com

DOI: 10.47750/pnr.2023.14.04.14

Abstract

Background: Obesity is defined by Body Mass Index (BMI). The prevalence of obesity is rising globally. Its prevalence is more than 30% in the people of well-developed countries such as the United States. Cardiovascular diseases, malignancies, chronic respiratory illnesses, diabetes and obesity are non-communicable diseases (NCDs). Its prevalence is increasing in Pakistan
Objective: To determine the frequency of subclinical hypothyroidism in obese adult people of Pakistan.

Study design: A cross-sectional study
Place and Duration: This study was conducted in Shifa International Hospital Islamabad Pakistan from March 2022 to March 2023
Methodology: This research contains a total of 150 people who were having a body mass index of more than 25 kg/m2All of the patients were between 18 years and 60 years. The past medical and drug history and clinical examination e.g vitals monitoring, BMI calculation, thyroid examination was performed on predesign questionnaire. Those participants who had CLD, CKD, or those who took statins or other lipid lowering drugs were excluded from study. Blood samples were taken from every participant for measurement of TSH, FT4, FT3

Results: Out of a total of 150 people,67 males and 83 were females. The mean age was 35 years.We noticed subclinical hypothyroidism in 15% of the study population
Conclusion: Subclinical hypothyroidism is highly prevalent in the obese population, especially in those with a body mass index (BMI) of more than 29 kg/m2

Keywords: Subclinical hypothyroidism, adults, obesity

INTRODUCTION

Obesity is defined by Body Mass Index (BMI). The prevalence of obesity is rising globally. Its prevalence is more than 30% in the people of well-developed countries such as in the United States [1-4].

Obesity is now considered as disease and it comes under the umbrella of non-communicable disease such as cardiovascular disease, malignancies, chronic respiratory illness and diabetes [5]. Increased blood pressure, excessive cholesterol, alcohol consumption, tobacco use, and insufficient physical activity are further contributors to these NCDs [6]. All of these risk factors can be altered in order to prevent these diseases. The worldwide obesity task force has recommended using a lower BMI cutoff value for overweight (23.0-24.9 kg/m2) and obesity (>25.0 kg/m2) in Asians,because they tend to have higher risk of cardiovascular diseaseat lower BMI than people belong to other geographical areas of world. According to the World Health Organization, the prevalence of overweight and obesity in adults is rising globally [7].There is strong correlation between obesity and subclinical hypothyroidism that is proven by research studies [8]. As per recent data, a hormone named leptin played an important role in obesity [9].

When peripheral thyroid hormone levels are within the normal reference laboratory range but serum thyroid-stimulating hormone (TSH) levels are slightly increased, subclinical hypothyroidism (SCH) is identified. A total of 80% of SCH patients have a blood TSH level is less than 10 mIU/L. Currently, the best course of action is routine levothyroxine administration for people whose persistent serum TSH levels are greater than 10.0 mIU/L and individualized therapy for people whose TSH levels are between 4.5 to 10.0 mIU/L.

A total of 5.4% of Pakistan's population suffers from subclinical hypothyroidism, compared to 4.1% who have overt hypothyroidism [10].Current data revealed a strong association between high BMI & increased TSH[11]. It has been shown that a one-unit rise in thyroid-stimulating hormone can result in a 3% increase in the components of the metabolic syndrome and that a two-fold change in free thyroxine levels can produce a 100-fold change in thyroid-stimulating hormone levels [12].

As there were only a few studies conducted on Obesity and subclinical hypothyroidismthe goal of this study was to determine the frequency of subclinical hypothyroidism in obese adult Pakistani population. This research will help clinicians in better management of obese patients.

METHODOLOGY: A total of 150 participants were recruited in this study between 18 to 55 years of age. All of the study population has BMI $\geq$ 25 Predesign questionnaire was used for data collection . it includes demographic details, history of previous thyroid disorders/ drug history, BMI, Thyroid examination and laboratory tests (TSH, FT4, FT3). Patients taking statins or other cholesterol-lowering medicines, or having CKD, CLD are excluded from the study. Patients who had been previously diagnosed with any form of thyroid disease were also excluded. .

IBM SPSS version 26 was used to collect and analyze the data. Quantitative factors like age, thyroxineFT3, FT4 and TSH level were expressed in mean and standard deviations (SDs). Whereasqualitative data such as Subclinical hypothyroidism &gender, were presented as percentages and frequencies.

RESULTS

A total of 150 patients were enrolled in this research out of which 67 were males and 83 were females. The mean age was 34.5 years.

Table number 1 shows Age distribution of the patients with subclinical hypothyroidism**.**

Table 1. Age distribution of the patients having subclinical hypothyroidism			
Age (in years)	**Subclinical hypothyroidism**		**P-value**
	Present	**Absent**	
18-30	2	22	0.001
31-40	17	39	
41-50	3	38	
51-55	2	27	
Total	**24**	**126**	

Table number 2 shows the most common symptoms of subclinical hypothyroidism.

Table No. 2:

Signs	N	%
Depression	24	16
Constipation	114	76
Cold intolerance	143	95
Dry skin and hair	96	64
Loss of energy	105	70
Weight gain	126	84

Table No. 3: Laboratory values of the study participants

Parameters	Mean
BMI (kg/m2)	32.05
Serum Thyroxine (ng/dl)	FT3: 5.8 FT4: 18
TSH (mIU/L)	6.13
Hypothyroidism occurrence (%)	15

DISCUSSION

The sedentary life style and junk eating is the most common cause of imbalance between the energy production and expenditure that imbalance ultimately leads to obesity. However, thyroid dysfunction also plays a role in obesity by upsetting the balance inresting energy expenditure [13, 14].

According to our study, the average TSH level was 6.13 mIU/L, the mean serumFT3 level was 5.8pmol/l and FT4 level was 18pmol/l, and the Mean BMI was 32.05.Subclinical hypothyroidism was observed in 15% of study participants [15], which is consistent with the findings of Michalaki et al., Who also showed a similar prevalence of thyroid dysfunction in obese patients Adipose tissue accumulation in obese patients causes a drop in blood TSH levels [16,17], and there is inverse relation of FT3, FT4 with BMI i-e increasing FT4,FT3 leads to decrease BMI, wheresas BMI increases with increasing TSH.

In Obese patient the thyroid dysfunction can return to normal after weight loss through lifestyle modification , medicine and surgery [18,19,20]. According to recent research, rats that consume a diet high in fat exhibit increased levels of TSH, despite maintaining normal levels of FT4 and FT3.

It has been observed that elevated levels of thyroid-stimulating hormone (TSH) in individuals who are obese are a consequence of weight gain rather than being the underlying cause of thyroid dysfunction Therefore, it cannot be assumed that elevated TSH levels in obese patients necessarily indicate the presence of overt hypothyroidism.

The obese population had a 70% greater incidence of subclinical hypothyroidism, according to a meta-analysis of 14 research on this topic [21, 22].

CONCLUSION

Subclinical hypothyroidism is highly prevalent in the obese population, especially in those with a body mass index (BMI) more than 29 kg/m2. Thyroid problems and obesity have been linked, but more research is needed to draw firm conclusions.

Funding source

None

Conflict of interest

None

REFERENCES

1. Sami A, Iftekhar MF, Rauf MA, Sher A. Subclinical hypothyroidism among local adult obese population. Pakistan journal of medical sciences. 2018 Jul; 34(4):980.
2. Verma A, Jayaraman M, Kumar HK, Modi KD. Hypothyroidism and obesity. Saudi Med J. 2008; 29(8):1135-8.
3. Qasim B, Arif S, Mohammed A, Abduljabbar R. Dyslipidemia in subclinical hypothyroidism: a case-control study. J Endocrinol Diab. 2018 Jan; 5(1):1-6.
4. Jabbari A, Besharat S, Razavianzadeh N, Moetabar M. Common signs and symptoms in hypothyroidism in central part of Iran. Pakistan Journal of Medical Sciences. 2008 Jan 1; 24(1):44.
5. Aksoy N, Yeler MT, Ayan NN, Ozkeskin A, Ozkan Z, Serin NO. Association between thyroid hormone levels and insulin resistance and body mass index. Pakistan journal of medical sciences. 2015 Nov; 31(6):1417.
6. Khan MA, Ahsan T, Rehman UL, Jabeen R, Farouq S. Subclinical Hypothyroidism: Frequency, clinical presentations and treatment indications. Pakistan journal of medical sciences. 2017 Jul; 33(4):818.
7. World Health Organization. Burden:mortality, morbidity and risk factors. Chapter 1. In:Global status report on noncommunicable diseases 2010. Description of the global burden of NCDs, their risk factors and determinants. World Health Organization. April 2011. Available from URL: http://www.who.int/entity/nmh/publications/ncd_report_chapter1.pdf .
8. Akbar DH, Ahmed MM, Hijazi NA. Subclinical hypothyroidism in elderly women attending an outpatient clinic. Med Sci Monit. 2004 May 1; 10(5):229-32.
9. Rohil V, Mishra AK, Shrewastwa MK, Mehta KD, Lamsal M, Baral N, Majhi S. Subclinical hypothyroidism in eastern Nepal: A hospital based study. Kathmandu University Medical Journal. 2010; 8(2):231-7.
10. Maskey R, Shakya DR, Baranwal JK, Lavaju P, Karki P, Poudel SK. Hypothyroidism in diabetes mellitus patients in Eastern Nepal. Indian Journal of Endocrinology and Metabolism. 2015 May; 19(3):411.
11. Duntas LH, Biondi B. The interconnections between obesity, thyroid function, and autoimmunity:the multifold role of leptin. Thyroid. 2013; 23(6):646–653. doi:10.1089/thy.2011.0499.
12. De Moura Souza A, Sichieri R. Association between serum TSH concentration within the normal range and adiposity. Eur J Endocrinol. 2011; 165:11–15. doi:10.1530/EJE-11-0261.
13. Kitahara CM, Platz EA, Ladenson PW. Body fatness and markers of thyroid function among US men and women. PLoS One. 2012; 7:e34979. doi:10.1371/journal.pone.0034979.
14. Fatourechi V. Subclinical hypothyroidism:an update for primary care physicians. Mayo Clinic Proc. 2009;84(1):65–70
15. Michalaki MA, Vagenakis AG, Leonardou AS, Argentou MN, Habeos IG, Makri MG, et al. Thyroid function in humans with morbid obesity. Thyroid. 2006; 16:73–78. doi:10.1089/thy.2006.16.73
16. Spencer CA, Hollowell JG, Kazarosyan M, Braverman LE. National Health and Nutrition Examination Survey III:thyroid-stimulating hormone (TSH)-thyroperoxidase antibody relationships demonstrate that TSH upper reference limits may be skewed by occult thyroid dysfunction. J Clin Endocrinol Metab. 2007; 92:4236–4240. doi:10.1210/jc.2007-0287
17. Biondi B. Thyroid and obesity:an intriguing relationship. J Clin Endocrinol Metab. 2010;95:3614–3617. doi:10.1210/jc.2010-1245
18. Araujo RL, Andrade BM, Padron AS, Gaidhu MP, Perry RL, Carvalho DP. High-fat diet increases thyrotropin and oxygen consumption without altering circulating 3, 5,3′-triiodothyronine (T3) and thyroxine in rats:the role of iodothyronine deiodinases, reverse T3 production, and whole-body fat oxidation. Endocrinology. 2010; 151:3460–3469. doi:10.1210/en.2010-0026.
19. Yadav R, Rohil V, Nepal AK, Gelal B, Chaudhari RK, Jha P, Shrestha S, Lamsal M, Baral N. Dyslipidemia associated with subclinical hypothyroidism in Eastern Nepal. Asian Journal of Medical Sciences. 2014 Feb 25; 5(3):22-5.
20. Knudsen N, Laurberg P, Rasmussen LB, Bulow I, Perrild H, Ovesen L, et al. Small differences in thyroid function may be important for body mass index and the occurrence of obesity in the population. J Clin Endocrinol Metab. 2005; 90:4019–4024. doi:10.1210/jc.2004-2225
21. Song RH, Wang B, Yao QM, Li Q, Jia X, Zhang JA. The impact of obesity on thyroid autoimmunity and dysfunction: a systematic review and meta-analysis. Frontiers in immunology. 2019 Oct 1; 10:2349.
22. Yan Y, Xu M, Wu M, Wang X, Li F, Zhang J, You L, Pan X, Feng W, Wu J, Chen C. Obesity is associated with subclinical hypothyroidism in the presence of thyroid autoantibodies: a cross-sectional study. BMC Endocrine Disorders. 2022 Apr 8; 22(1):94.