

Subclinical Hypothyroidism in Obese Iraqi Patients Attending Obesity Research and Therapy Unit

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ABSTRACT

Background Subclinical hypothyroidism is mild thyroid hormone deficiency, defined by elevation of serum thyroid-stimulating hormone concentration despite a normal free T3, free T4 level, can be distinguished by clinical and circumstantial observations from other conditions that cause this constellation of laboratory findings. The aim is to find the prevalence, anthropologic, and metabolic changes associate subclinical hypothyroidism (SH) in adult patients presented to obesity research and therapy unit (ORTU)

Objective: To find the prevalence of subclinical hypothyroidism (SH) in adult obese patients presented to obesity research and therapy unit (ORTU) in AL-Kindy College of medicine and to describe the anthropologic and metabolic presentation of subclinical hypothyroidism in adults obese patients presented to ORTU.

Method: A retrospective descriptive study of adult obese males and females patients attending ORTU during the period February 2013 to February 2014 aging 20-60 years. Patients grouped according to age and BMI. In addition to TSH, glucose, cholesterol, triglycerides and HDL are measured, results tabulated and analyzed.

Results: This study revealed that (6.9%) had SH , 91 (86.7%) were females and 14 (13.3%) were

males. TSH in patients with SH significantly rise with age (8.31 to 11.16 mu/l), in addition fasting glucose (104 to 116 mg/dl), total cholesterol and triglycerides also rise significantly. Increasing BMI associated with significant elevation of the mean level of TSH in patients with subclinical hypothyroidism (7.32 to 11.32 mu/l in BMI above 40). The same findings of the effect of increasing BMI on the mean level of fasting glucose (104 to 115), cholesterol and triglycerides.

Conclusion: Prevalence of subclinical hypothyroidism in ORTU is about 6.9% with a significant association of increasing TSH with age and BMI. There were elevated fasting glucose, cholesterol, and triglycerides in SH patients that also increased significantly more with age and BMI.

Keywords: Subclinical hypothyroid, ORTU, Al-Kindy

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Subclinical hypothyroidism is mild thyroid hormone deficiency, defined by elevation of serum thyroid-stimulating hormone concentration despite a normal free thyroxine level, can be distinguished by clinical and circumstantial observations from other conditions that cause this constellation of laboratory findings. In most but not all clinical trials, thyroxin treatments of patients with mild hypothyroidism have been shown to lower atherogenic lipid levels and relieve certain somatic and neuropsychiatric symptoms. Treatment also prevents progression to overt hypothyroidism, which is likely to occur in patients who are older, have circulating thyroid autoantibodies, or have a serum TSH level greater than 10 mU/L.(1) The worldwide prevalence of subclinical hypothyroidism ranges from 1 to 10 percent; the highest age and sex-specific rates are in women older than 60 years of age, approaching 20 percent in some reports.(2)

Studies have demonstrated that serum levels of total cholesterol and LDL cholesterol are higher in patients with subclinical hypothyroidism than in euthyroid controls.(3) Changes in high-density lipoprotein (HDL) cholesterol were heterogeneous

among the studies and were not statistically significant. (4)

In various studies on adult obese individuals, thyroid hormone and thyroid-stimulating hormone (TSH) concentrations have been described as normal or elevated.(5) The causes underlying these alterations are not known although several theories have been proposed. These include an increased deiodinase activity, as suggested by the increase in total triiodothyronine (T3) and free T3 (fT3) reported in some subjects. (6) The reported high conversion rate of T4 to T3 in obese patients has been also interpreted as a defense mechanism, capable of counteracting the accumulation of fat by increasing the energy expenditure. (7) Another mechanism claimed to explain the high values of T3 and fT3 has been related to the fact that the expressions of both TSH and thyroid hormones are reduced in adipocytes of obese subjects as compared to individuals of normal weight. This would prompt a decreased tissue responsiveness to circulating thyroid hormones and would also explain the consequent increased compensatory secretion of TSH. Another potential cause of increased blood

concentration of TSH may be the high levels of leptin, found in obese subjects. (8) A further explanation could be the inflammatory state that characterizes obesity. (9) The aim of the study was to find the prevalence of subclinical hypothyroidism (SH) in adult obese patients presented to obesity research and therapy unit (ORTU) in AL-Kindy college of medicine. Also to describe the anthropologic and metabolic presentation of subclinical hypothyroidism in adults obese patients presented to ORTU.

Methods: A retrospective descriptive study of adult obese males and females patients attending ORTU during the period Feb 2013 to Feb 2014 aging 20-60 years.

Inclusion criteria: Diagnosis of subclinical hypothyroidism established when the patient TSH exceed 5 mu/L with normal T3 and T4 levels and no obvious clinical signs of hypothyroidism.

Exclusion criteria: Those with previous or present diagnosis of clinical hypothyroidism and clearly high Thyroid stimulating hormone(TSH) level or taking thyroxin.

For all patients weight, height and body mass index (BMI) measured and total T T3 (0.9-2.3 nmol/l), total thyroxine (TT4) (60-120 nmol/l), TSH (NV 0.2-5.0IU/L), fasting blood glucose (FBG), total

cholesterol, triglycerides, and high density lipoprotein (HDL) are tested.

Statistical analysis: Means and percentages are used in addition SSPS version 16 used to measure significance, where P value less than 0.5 considered significant using t-test and chi-square test.

Results: The total sum of adult patients (20-60) years age attending ORTU during (Feb 2013- Feb 2014) are 1518, 1285 (84.6%) were females and 233 (15.4%) were males, 105 (6.9%) of them had SH, 91 (86.7%) were females and 14 (13.3%) were males.

Table 1 show that TSH in patients with subclinical hypothyroidism significantly rises with age (8.31 to 11.16 mu/l), in addition the fasting glucose (104 to 116 mg/dl), total cholesterol and triglycerides also rise significantly while there was no significant effect of age on HDL.

Increasing BMI associated with significant elevation of mean level of TSH in patients with subclinical hypothyroidism (7.32 to 11.32 mu/l in BMI above 40) as it is evident in table 2, the same findings of the effect of increasing BMI on mean level of fasting glucose (104 to 115 mg/dl), cholesterol and triglycerides in those with subclinical hypothyroidism is also significantly noticed while no effect of increasing BMI on level of mean HDL is found.

Table 1: Metabolic parameters according to age in patients with subclinical hypothyroidism.

Parameter	Age 20-39 years		Age 40-60 years		P value
	mean	SD	Mean	SD	
TSH IU+I	8.31	2.56	11.16*	2.32	< 0.5
FBG mg/dl	104	7.80	116*	10.68	< 0.5
Cholesterol mg/dl	223	17.50	246*	15.85	< 0.5
TG mg/dl	171	12.65	178*	14.31	< 0.5
HDL mg/dl	42	5.20	40	4.23	> 0.5

*P< 0.5

Table 2: Metabolic parameters according to BMI in patients with subclinical hypothyroidism.

Parameter	BMI 30-34.9		BMI 35-39.9		BMI ≥40		P value
	mean	SD	mean	SD	mean	SD	
TSH IU/l	7.32	3.33	9.68*	2.48	11.32*	3.12	< 0.5
FBG mg/dl	104	6.70	109*	8.90	115*	7.34	< 0.5
Cholesterol mg/dl	221	20.55	235*	14.78	248*	18.50	<0.5
TG mg/dl	160	15.68	168*	17.65	182*	13.70	<0.5
HDL mg/dl	39.55	4.45	40.30	3.87	38.78	3.30	> 0.5

*P< 0.5

Discussion: prevalence of subclinical hypothyroidism in ORTU is about 7% of the attendants in the year 2013, most of them (more than 85%) are females. This is because most of our attendance are females, but it is well known that thyroid diseases are more common in females. The prevalence of subclinical hypothyroidism ranges from 1-20% and is twice often in women as in men, by the age of 15 years, prevalence of disorder is about 17% in women and 7% in men.(10) The frequency of conversion to overt hypothyroidism in those patients approaches 14% and was more commonly observed in female patients.(11) Worldwide, in adults, a prevalence of 1-10% has been noted in various communities. The risk of developing SH increases with female gender, advanced age, and greater dietary iodine intake.(12) The prevalence of SH in elderly has been estimated at 7-26%. (13) This study also confirms the association of increasing TSH with age.

Data suggest that diabetes mellitus and primary hypothyroidism are common disorders in elderly subjects.(14) This study data show similar effect with elevated fasting glucose in SH patients that increase more with age significantly. Even mild elevations of TSH are associated with changes in lipid profile significant enough to raise the cardiovascular risk (15). A study confirms a gender differentiation in the relationship between hypothyroidism and the lipid profile, which is substantially influenced by age, especially in patients with mild thyroid impairment (TSH<10IU/L).(16) This study confirms similar results for SH patients. Other results suggest that the effect of hypothyroidism in the lipid metabolism is more marked in patients with higher serum TSH levels.(17) While this study show no significant change in HDL. Other studies show that subclinical hypothyroidism was associated with higher BMI,

diastolic hypertension, higher total cholesterol and triglycerides levels and higher total cholesterol/HDL cholesterol ratio. (18) This study also confirms the association of BMI with hypercholesterolemia and hypertriglyceridemia in patients with SH but the change in HDL was not significant. Data has led to the view that an increase in body weight can be attributed to diverse thyroid function (as it is expressed by TSH levels) even in euthyroid subjects.(19) This association could also detected in the results of the present study. In this study statistically significant positive correlation between BMI and thyroid function in women was found while in men the correlation was not statistically significant. The alterations in thyroid function are mainly primary while changes in body weight are secondary. The reason may be simple or multifactorial, and the biological mechanism is not completely known.(20) We conclude that the prevalence of subclinical hypothyroidism in ORTU is about 7% most of them were females. With a significant association of increasing TSH with age and BMI. There was elevated fasting glucose, cholesterol, and triglycerides in SH patients that also increase significantly more with age and BMI.

References:

- 1-Ayala A, Danese MD, Ladenson PW. When to treat mild hypothyroidism. *EndocrinolMetabClinNorthAm.* 2000;29:399-415
- 2-Canaris GJ, Manowitz NR, Mayor GM, Ridgway EC. The Colorado thyroid disease prevalence study. *Arch Intern Med* 2000;160:526-34
- 3- Danese MD, Ladenson PW, Meinert CL, Powe NR. Effect of thyroxine therapy on serum lipoproteins in patients with mild thyroid failure: a quantitative review of the literature. *JClinEndocrinolMetab.* 2000;85:2993-3001

- 4-Diekman T, Lansberg PJ, Kastelein JJ, Wiersinga WM. Prevalence and correction of hypothyroidism in a large cohort of patients referred for dyslipidemia. *Arch Intern Med* 1995;155:1490-5.
- 5-Tagliaferri M, Berselli ME, Calo G, et. al. Subclinical hypothyroidism in obese patients: relation to resting energy expenditure, serum leptin, body composition, and lipid profile. *Obes Res* 2001;9:196-201.
- 6-Reinehr T. Obesity and thyroid function. *Mol Cell Endocrinol* 2010;316:165-71
- 7-Reinehr T, Isa A, de Sousa G, et.al. Thyroid hormones and their relation to weight status. *Horm Res* 2008;70:51-7.
- 8-Aeberli I, Jung A, Murer SB, et.al. During rapid weight loss in obese children, reductions in TSH predict improvements in insulin sensitivity independent of changes in body weight or fat. *J Clin Endocrinol Metab* 2010;95:5412-8.
- 9-Chrousos GP. The hypothalamic-pituitary-adrenal axis and immune-mediated inflammation. *N Engl J Med* 1995;332:1351-62.
- 10-Hueston WJ, Pearson WS. Subclinical hypothyroidism and the risk of hypercholesterolemia. *Ann Family Med* 2004;2:351-5.
- 11-Muhammad Shahzad Anwer, Rizwan Hashim, Farooq Ahmed Khan, Aamir Ijaz. Frequency of Conversion to Overt Hypothyroidism in Patients with and without Subclinical Hypothyroidism. *J Ayub Med Coll Abbottabad* 2012;24(3-4).
- 12-Chu JW, Crapo LM. The treatment of subclinical hypothyroidism is seldom necessary. *J Clin Endocrinol Metab* 2001; 86(10):4591-9.
- 13-Hak AE, Pols HAP, Visser TJ, et al. Subclinical hypothyroidism is an independent risk factor for atherosclerosis and myocardial infarction in the elderly women: The Rotterdam Study. *Ann Intern Med* 2000; 132: 270-278.
- 14- Flatau E1, Trougouboff P, Kaufman N, Reichman N, Luboshitzky R. Prevalence of hypothyroidism and diabetes mellitus in elderly kibbutz members. *Eur Epidemiol.* 2000 Jan;16(1):43-6.
- 15-Serter, K., Dermidas, B. The effect of L-Thyroxine replacement therapy on lipid-based cardiovascular risk in subclinical hypothyroidism. *J. Endocrinol. Invest.* 2004(10),897-903.
- 16- Sara Tognini, Antonio Polini, Giuseppe Pasqualetti, et.al. Age and Gender Substantially Influence the Relationship Between Thyroid Status and the Lipoprotein Profile: Results from a Large Cross-Sectional Study. *Thyroid.* November 2012, 22(11): 1096-103.
- 17- Prakash and Ashok Kumar La. Serum Lipids in Hypothyroidism: Our Experience. *Archana Indian Journal of Clinical Biochemistry*, 2006 / 21 (2) 153-5.
- 18-Pesić M1, Antić S, Kocić R, Radojković D, Radenković S Cardiovascular risk factors in patients with subclinical hypothyroidism. *Vojnosanit Pregl.* 2007 Nov ;64 (11):749-52.
- 19- A. Nyrrnes, R. Jorde, and J. Sundsfjord, "Serum TSH is positively associated with BMI," *International Journal of Obesity*, 2006. vol. 30, no. 1, pp. 100-5.
- 20- Anastasios Milionis and Charalampos Milionis. Correlation between Body Mass Index and Thyroid Function in Euthyroid Individuals in Greece. *ISRN Biomarkers Volume 2013 (2013), Article ID 651494, 7 page.*