https://doi.org/10.15218/zjms.2025.060

Prevalence of thyroid dysfunction in the general population in Erbil city

Received: 11/12/2024 Accepted: 30/01/2025

Khoshawi Mousa khaleel [1*] Saeed Ghulam Hussain [2]

Abstract

Background and objectives: Thyroid diseases are worldwide endocrine disorders in clinical practice. Risk prevalence is higher in females than males with significant clinical adverse effects among these cardiovascular diseases. Prevalence is high among diabetic patients; with subclinical hypothyroidism categorized as the most common endocrine disorders. The aim of the present study was to screen the prevalence of thyroid dysfunction among apparently healthy adults, with special reference to diabetic patients.
Methods: 300 apparently healthy adults' thyroid free disorders were screened included 200 females &100 males individuals of different age & BMI. Blood samples were collected & subjected to. thyroid profiles test included TSH, FT3 &FT4.Thyroid dysfunction-were further categorized according to the tested thyroid profiles.
Results: The results revealed 7.3 % prevalence of sub-clinical hypothyroidism followed by overt hypothyroidism (1.7%) & subclinical hyperthyroidism (0.7%). Among diabetic patients subclinical hypothyroidism predominate (12.5%) followed by clinical hypothyroidism (7.5%).
Conclusion: The results delineated the fact that among thyroid free subjected, screening in of paramount importance especially diagnosis of subclinical hypothyroidism that might linked with significant clinical complication especially female during pregnancy & as a cardiovascular diseases risk factor.
Keywords: Thyroid diseases; Thyroid dysfunction; Diabetic & Thyroid.

Introduction

Thyroid disease encompassing various disorders like hypothyroidism, hyperthyroidism, thyroid nodules, thyroid cancer & autoimmune thyroid disease.[1] The prevalence of thyroid disorders varies with 1-2% for hypothyroidism, 0.2- 1.3% for hyperthyroidism and 4-7% with palpable thyroid nodules in the general population.[2,3] The spectrum of thyroid disorders are varied in differed geographical regions.[4] Among factors prenatal excessive iodine intake, some considered low iodine intake.[5]
Some experts refer to increased medical detection with sensitive technique devices, metabolic syndromic & susceptible genetic factor.[6] Growing list of literatures refers to the crucial role of thyroid hormone in the normal development and physiological function and impacts on virtually every host or vertebrate.[6-8] Association between thyroid dysfunction & various health conditions such as cardiovascular diseases, diabetics, cancer, & depression – have been established.[9-13]
With increased morbidity & mortality liked to cardiovascular disease with both hypothyroidism & hyperthyroidism.[14] Linkage between type 2 diabetes mellitus especially with subclinical hypothyroidism exist that might reach 20% in some study.[14,15] Hepatic glucose transport type 2 gene which behave as enzyme necessary for insulin mediated glucose transport is down-regulated which has

[1] Department of Nursing, College of Nursing, Hawler Medical University, Erbil, Iraq.
[2] Department of Microbiology, College of Medicine, Hawler Medical University, Erbil, Iraq.
Correspondence: khoshawi2003@yahoo.com

https://doi.org/10.15218/zjms.2025.060

impact in decrease insulin sensitivity in Hashimoto s thyroiditis.[16]

The aims of study

The study aimed to screen the prevalence of thyroid dysfunction of different categories among thyroid free adult subjects; with special, reference to prevalence among diabetic patients in Erbil community.

Methods

Study design:

A cross-sectional study was performed at Hawler Medical University, College of Nursing collaboration with Rizgari Teaching Hospital and Erbil Teaching Hospital.

Data collection

Blood samples were collected from 300 individual's participants people (200 female &100 male) serum was separated, and the samples were subjected to test for thyroid function including FT3, FT4, and TSH. Likewise, Information on the whole individuals was recorded, including their gender and age range. Anthropometric measurements of the 300-adult thyroid free disorders screened included the height (m),[2] weight (kg), and the calculated body mass index kg/m2 were determined beside smoking & diabetic history. Diabetic patients were included because of the high risk of thyroid disorders among the 300 individuals, screened the mean age ± SE was 42.4±0.873 years. The majority (66.7%) of the whole sample were females & (33.3%) males. The mean BMI ± SD was 28.104±0. 309. The enrolled participants were categorized further as smokers (14.66%) & non-smokers (85.34%). Enzyme-linked immunosorbent assay (ELISA) was used to determine quantitively serum levels of TSH, FT3, FT4(Biotet, USA ELx 800 (Redaer), ELx 50(Washer).

Thyroid dysfunctions were further categorized into: Euthyroid: If FT4, FT3 and TSH were normal; clinical hypothyroidism: if the TSH was raised (> 4.2) together with a decreased (<12) FT4; clinical hyperthyroidism: if the TSH was low (< 0.270) with normal or high (>22) FT4; Subclinical hypothyroidism if the TSH was high (> 4.2) with normal FT4; Subclinical hyperthyroidism: if TSH was low (< 0.270) with normal FT4.

Ethical approval: The study was approved by the Research Ethical Committee of Hawler Medical University/ College of Nursing –Erbil. The information consent was obtained from participant by verbal.

Statistical Analysis: Data were analyzed using the Statistical Package for Social Sciences (SPSS, version 26). Numerical variables were presented in the form of means and standard deviations. Categorical variables were presented in the form of frequencies and percentages. Fisher's exact test was used (instead of the chi-square test) because the expected frequencies (values) were less than 5 of more than 20% of the cells of the table. A *P*-value of ≤0.05 was considered statistically significant.

Results

It is evident in Table (1) that the majority (90.3%) of the participants screened for thyroid profiles were euthyroid, 7.3% had subclinical hypothyroidism, 1.7% had clinical hypothyroidism, and 0.7% had subclinical hyperthyroidism. Categories for thyroid dysfunction- was clarified in methodology

Table 1 Prevalence of thyroid dysfunction in the general population in Erbil city

		Frequency	(%)
Valid	Euthyroid	271	(90.3)
	Subclinical hypothyroidism	22	(7.3)
	Clinical Hypothyroidism	5	(1.7)
	Subclinical hyperthyroidism	2	(0.7)
	Total	300	(100.0)

https://doi.org/10.15218/zjms.2025.060

The age & gender of the screened groups is shown in Table (2) with 24.3% were in age range from 35-44 years and 1:2 male to female ratio. No signification association was found between the thyroid categories & age (*P* = 0.727).

In Table (3) although prevalence of subclinical hypothyroidism predominates in comparison with clinical hypothyroidism & sub clinical hyperthyroidism – (7.3 versus 1.7 & 0.7 respectively).

Table 2 Distribution of thyroid dysfunction by age and gender

	No.	(%)
Age (years)		
15-24	45	(15.0)
25-34	53	(17.7)
35-44	73	(24.3)
45-54	53	(17.7)
55-64	49	(16.3)
≥ 65	27	(9.0)
Gender		
Males	100	(33.3)
Females	200	(66.7)
Total	300	(100.0)

Table 3 Distribution of thyroid dysfunction by age

Age (Years)	Euthyroid No. (%)	Subclinical Hypothyroidism No. (%)	Clinical Hypothyroidism No. (%)	Subclinical Hyperthyroidism No. (%)	Total No. (%)	*P*-value*
15-24	40 (88.9)	4 (8.9)	1 (2.2)	0 (0.0)	45 (100.0)	
25-34	48 (90.6)	5 (9.4)	0 (0.0)	0 (0.0)	53 (100.0)	
35-44	67 (91.8)	4 (5.5)	0 (0.0)	2 (2.7)	73 (100.0)	
45-54	48 (90.6)	3 (5.7)	2 (3.8)	0 (0.0)	53 (100.0)	0.727
55-64	44 (89.8)	3 (6.1)	2 (4.1)	0 (0.0)	49 (100.0)	
≥65	24 (88.9)	3 (11.1)	0 (0.0)	0 (0.0)	27 (100.0)	
Total	271 (90.3)	22 (7.3)	5 (1.7)	2 (0.7)	300 (100.0)	

*Calculated by Fisher's exact test.
- Sub clinical hypothyroidism –: TSH (>4.2) & normal FT4 (12-22)
- Clinical hypothyroidism -: TSH (> 4.2) &decreased FT4 (<12)
- Sub clinical hyperthyroidism-: TSH low (< 0.270) & normal FT4 (12-22)

https://doi.org/10.15218/zjms.2025.060

Five females (2.5%) had clinical hypothyroidism, while none of the males had such condition, but the difference was not significant between males and females among the different thyroid categories, although prevalence of subclinical hypothyroidism was higher in females than male (*P* = 0.417) (Table 4).

No significant association was detected between BMI and thyroid categories (*P* = 0.490); although BMI 18.5-24.9 was associated with high prevalence of Subclinical hypothyroidism (Table 5).

Table 4 Frequencies of thyroid dysfunction by gender

Diagnosis	Males No. (%)	Females No. (%)	Total No. (%)	*P*-value*
Euthyroid	93 (93.0)	178 (89.0)	271 (90.3)	
Subclinical Hypothyroidism	7 (7.0)	15 (7.5)	22 (7.3)	0.417
Clinical Hypothyroidism	0 (0.0)	5 (2.5)	5 (1.7)	
Subclinical Hyperthyroidism	0 (0.0)	2 (1.0)	2 (0.7)	
Total	100 (100.0)	200 (100.0)	300 (100.0)	

*Calculated by Fisher's exact test.

Table 5 Distribution of thyroid dysfunction according to body mass index (BMI)

BMI	Euthyroid No. (%)	Subclinical Hypothyroidism No. (%)	Clinical Hypothyroidism No. (%)	Subclinical Hyperthyroidism No. (%)	Total No. (%)	*P*-value
<18.5	3 (100.0)	0 (0.0)	0 (0.0)	0 (0.0)	3 (100.0)	
18.5-24.9	61 (83.6)	9 (12.3)	1 (1.4)	2 (2.7)	73 (100.0)	
25-29	128 (92.1)	8 (5.8)	3 (2.2)	0 (0.0)	139 (100.0)	
30-34	56 (93.3)	3 (5.0)	1 (1.7)	0 (0.0)	60 (100.0)	0.490
35-39	12 (100.0)	0 (0.0)	0 (0.0)	0 (0.0)	12 (100.0)	
≥40	11 (84.6)	2 (15.4)	0 (0.0)	0 (0.0)	13 (100.0)	
Total	271 (90.3)	22 (7.3)	5 (1.7)	2 (0.7)	300 (100.0)	

*Calculated by Fisher's exact test.

https://doi.org/10.15218/zjms.2025.060

The rates of thyroid disorders were significantly higher among diabetics than non-diabetics (*P* = 0.004). The rates of subclinical hypothyroidism, clinical hypothyroidism, and subclinical hyperthyroidism among diabetics were 12.5%, 7.5% and 2.5% compared with 6.5%, 0.8% and 0.4% respectively among the non-diabetics (Table 6).

Discussion

In clinical field, thyroid diseases are regarded as the most prevalence endocrine disorders after diabetes.[17] It represents 30-40% of cases visited endocrine clinic.[18] With subclinical hypothyroidism has noteworthy public health complication and consequences[18] especially in females. Of these, adverse impacts on metabolic control and increasing predisposing risk factor for Cardiovascular disease.[18]

In the present study, the frequency of subclinical hypothyroidism was 7.3% followed by clinical hypothyroidism (1.7%) & subclinical hyperthyroid (0.7%). The prevalence of thyroid dysfunction of different categories varies from location to location. In Iraq / Duhok city, the prevalence of hypothyroidism was 20.55% with 94.85% of subject screened were classified as sub-clinical type of hypothyroidism.[19]

In Middle-East, meta- analysis included 345 studies reported rolled prevalence of thyroid disorders, (19,2%) Subclinical hypothyroidism (8.3%), overt hypothyroidism (7.2%), subclinical hyperthyroidism (3.2%) & overt hyperthyroidism (2.4%).[20]

In Iranian population, the frequencies reported for clinical hypothyroidism, subclinical hypothyroidism & subclinical hyperthyroidism were 2.8%,5.8% &3.7% respectively.[21,22] In Europe, meta-analysis of 17- studies reported prevalence of 3.05% & 0.75% for hypothyroidism & hyperthyroidism respectively. In united states, reported prevalence of 4.3% & 0.3% as subclinical & clinical overt hypothyroidism.[22]

The clinical impacts of untreatable thyroid disorders might increase risk of neuropsychiatric problem. Osteoporosis & dyslipidemia, with significant impacts on cardiovascular system such as coronary artery disease & heart failure.[23,24] Metabolic syndrome might be a risk in both subclinical &overt hypothyroidism & its components such as abdominal obesity & hypertriglyceridemia .[25]

Thyroid dysfunction is more common in female population.[25,26] In the current study, analysis for the prevalence of thyroid dysfunction according to sex, age & BMI revealed no statistically significant

Table 6 Frequencies of thyroid categories among diabetes patients

Diagnosis	Diabetes No. (%)	No diabetes No. (%)	Total No. (%)	*P*-value*
Euthyroid	31 (77.5)	240 (92.3)	271 (90.3)	
Subclinical Hypothyroidism	5 (12.5)	17 (6.5)	22 (7.3)	
Clinical Hypothyroidism	3 (7.5)	2 (0.8)	5 (1.7)	0.004
Subclinical Hyperthyroidism	1 (2.5)	1 (0.4)	2 (0.7)	
Total	40 (100.0)	260 (100.0)	300 (100.0)	

*Calculated by Fisher's exact test.

https://doi.org/10.15218/zjms.2025.060

association (Table 2,3,4,5) except for history of diabetes mellitus (Table 4); although prevalence of subclinical hypothyroidism was higher in female than male our finding is in agreement with other study.[24] Thyroid dysfunction is strongly linked with age, genetic factors, ethnicity as well as iodine intake.[27]

Among endocrine disorders, diabetes mellitus & thyroid disorders are most common in clinical fields.[27] Thyroid dysfunctions are much common in diabetic patients &influence each other mutually due to intersecting pathology.[28] Diabetes mellitus on the other hand has impacts on thyroid function at the level of hypothalamic control of TSH release & level of T4 to T3 conversion.[29] In the present study, the prevalence of thyroid dysfunction among patients with history of types 2 diabetes mellitus was 22.5% (Table 6). In comparison with other studies in different location, the prevalence of thyroid dysfunction among diabetes patients were; 12.5 in Jordon,12.3% in Greece, 16% in Saudi Arabia, 29.7% in Nigeran & 32.4% in Spain.[30]

TSH has impacts on metabolic parameters that cause hyperglycemia. Among mechanisms; increasing hepatic glucose production, stimulate leptin secretion and decreasing insulin synthesis & secretion from pancreatic Beta-cells. Furthermore, thyroid hormone increases lipolysis & gut glucose absorption that further enhances hepatic gluconeogenesis. Meanwhile, hyperglycemic cause low serum concentration of T3 with raised normal or low T4 & decrease in hepatic concentration of T3-T4 deiodinase.[31] Genetic factors possibly implicated in Co-existed thyroid dysfunction & Type 2 diabetes mellitus. Among gene identified GLUT2, inhibitory G protein & protein kinase B.[32]

The limitation of this prospective study on one hand is sample size. Larger sample size, more the precise & representative prevalence of thyroid disorders or dysfunction. Besides, other groups should be involved like pregnant women some autoimmune diseases that co-existed with thyroid dysfunction.

Further extensive for assessing prevalence of autoimmune thyroid disease like Hashemites thyroid is necessary from clinical stand of view.

Conclusion

Final conclusion evidence of the study was the finding of subclinical hypothyroid to be the more thyroid dysfunction category among the apparently healthy adult people screened. This category of thyroid dysfunction has risk impacts in reducing quality of life, cognitive disjunctive = slceleted muscle, osteoporosis, dyslipidemias, metabolic syndrome, & coronary artery disease & heart failure; with special impact on pregnancy.

Competing interests

The authors declare that they have no competing interests.

References

1. Zhang X, Wang X, Hu H, Qu H, Xu Y, Li Q. Prevalence and trends of thyroid disease among adults. Endocr Pract. 2023; 49(11):875-80. https://doi.org/10.1016/j.eprac.2023.08.006
2. Lancet T. Thyroid disease-more research needed. The Lancet. 2012; 379(9821):1076. https://doi.org/10.1016/s0140-6736(12)60445-0
3. Taylor P.N., Albrecht D, Scholz A, Gutierrez-Buey G, Lazarus J.H, Dayan C, et al. Global epidemiology of hyperthyroidism & hyperthyroidism. Nat Rev Endocrinol. 2018; 14 (5):301-16. https://doi:10.1038/nrendo.2018.18.
4. Fisher S.B, Perrier N.D. The incidental thyroid nodule.CA: A cancer Journal for clinical. 2018; 68(2):97-105. https://doi:10.3322/caac.21447
5. Wang X, Mo Z, Mao G, Zhu W, Xingn M, Li X, et al. Geographical influences on thyroid abnormalities in adult population from iodine - regions: across- sectional study. Scientific reports. 2021; 11(1); 994. https://doi:1038/s41598-020-80248-710.
6. Mendoza A, Hollenberg A N. New insights into thyroid hormone action. Pharmacology & therapeutics. 2017; 173:135-45. DOI: 10.1016/j.pharmthera.2017.02.012
7. Leitch V D, Bassett J H D, Williams G R. Role of thyroid hormones in craniofacial development. Nat Rev Endocrinol. 2020; 16(3):147-64. DOI: 10.1038/s41574-019-0304-5

8. Vucic S, Korevaar T.I.M, Dhamo B, Jaddoe V.W.V, Peeters R.P, Wolvius E.B, et al. Thyroid function during early life and dental development. Journal of dental research. 2017;96(9):97-105. https://doi.org/10.1177/0022034517708551.
9. Ferrari S.M, Fallahi P, Elia G, Ragusa F, Ruffilli I, Paparo S.R, Antonelli A. **Thyroid autoimmune disorders and cancer.** Seminars in cancer biology.2020;64:135-146. DOI: 10.1016/j.semcancer.2019.05.019
10. Biondi B, Kahaly G.J, Robertson R.P. Thyroid dysfunction and diabetes mellitus: two closely associated disorders. Endocr Rev. 2019; 40 (3):789-824. DOI: 10.1210/er.2018-00163
11. Kwon M, Jeong YJ, Kwak J, Jung KY, Baek SK. Association between oral health and thyroid disorders: population-based cross-section study. Oral Dis. 2022; 28(8):2277-2284. https://doi.org/10.1111/odi.13895
12. Floriani C, Gencer B, Collet T H, Rodondi N, Subclinical thyroid dysfunction and cardiovascular disease:2016 update. European heart journal. 2018; 39(7):503-7. https://doi.org/10.1093/eurheartj/ehx050
13. Tang R, Wang J, Yang L, Ding X, Zhong Y, Pan J, et al. Subclinical hypothyroidism and depression: a systematic review and meta-analysis. Front Endocrinol (Lausanne). 2019; 10:1-10. https://doi.org/10.3389/fendo.2019.00340
14. Moon S, Kim MJ, Yu JM, Yoo H J., Park YJ. Subclinical hypothyroidism and the risk of cardiovascular disease and all-cause mortality: a meta-analysis of prospective Cohort Studies. Thyroid. 2018; 28(9):1101-10. https://doi.org/10.1089/thy.2017.0414
15. Delitala AP. Subclinical hyperthyroidism and the cardiovascular disease. Hormone and Metabolic Research. 2017; 49(10):723-31. DOI: 10.1055/s-0043-117893
16. Ballou S, Katon J, Singh P, Rangan V, Lee H.N, McMahon C, et al. Chronic diarrhea and constipation are more common in depressed individuals. Clinical Gastroenterology and Hepatology. 2019; 17(13):2696-703. https://doi.org/10.1016/j.cgh.2019.03.046
17. Aminorroaya A, Meamar R, Amini M, Feizi A, Tabatabae A, Faghih Imani E. Incidence of thyroid dysfunction in an Iranian adult population: the predictor role of thyroid autoantibodies: results from a prospective population-based cohort study. Eur J Med Res. 2017; 22(1):21. https://doi.org/10.1186/s40001-017-0260-2
18. Rashad NM, Samir GM. Prevalence, risks, and comorbidity of thyroid dysfunction: a cross-sectional epidemiological study. Egypt J Intern Med. 2019; 31(4):635–41
19. Kargar S, Tabatabaei SM, Okati-Aliabad H, Rad HI. Prevalence of Thyroid Dysfunction Disorders among Adult Populations in the Middle–East: A Systematic Review and Meta-analysis. The Open Public Health Journal. 2024; 17. DOI: 10.2174/0118749445317174240827052511
20. Zaman B, Rasool SO, Sabri SM, Raouf GAM, Balatay AA, Abdulhamid MA et al. Prevalence of thyroid dysfunction in a large, unselected population in Duhok city, Iraq Kurdistan: A cross-sectional study. Journal of Biological Research-Bollettino Della Société. 2021; 92(2):1-9. https://doi.org/10.4081/jbr.2021.10067.
21. Amouzegar A, Mehran L, Takyar M, Abdi H, Azizi F. Tehran thyroid study (TTS). Int J Endocrinol Metab. 2018; 16(4):1-6. https://doi.org/10.5812/ijem.84727
22. Garmendia M. A, Santos P. S, Guillén-G. F, Galofré JC. The incidence and prevalence of thyroid dysfunction in Europe: a meta-analysis. J Clin Endocrinol Metab. 2014; 99(3):923-31. DOI: 10.1210/jc.2013-2409.
23. Mehran L, Amouzegar A, Rahimabad PK, Tohidi M, Tahmasebinejad Z, Azizi F. Thyroid function and metabolic syndrome: a population-based thyroid study Hormone and Metabolic research. 2017; 49(3):192-200. https://doi.org/10.1055/s-0042-117279
24. Ghaemmaghami Z, Firoozbakhsh P, Gholami D, Khodabandelu S, Baay M, Maleki M, et al. Increased prevalence of thyroid dysfunction in Tehran – HAMRAH study. BMC Endocr Disord. 2023; 23(1):270. https://doi.org/10.1186/s12902-023-01524-x
25. Shahrokh E.S, Tabatabaee A, Aminorroaya A, Amini M, Feizi A, Janghorbani M, et al. Isfahan thyroid cohort study (ITCS). Hormone and Metabolic research, Arch Iran Med. 2021; 24(11):788–95. https://doi.org/10.34172/aim.2021.118
26. Haugen BR, Alexander EK, Bible KC, Doherty GM, Mandel SJ, Nikiforov YE, et al. 2015 American Thyroid Association Management Guidelines for adult patients with thyroid nodules and differentiated thyroid Cancer: the American Thyroid Association Guidelines Task Force on thyroid nodules and differentiated thyroid Cancer. Thyroid. 2016; 26(1):1–133. https://doi.org/10.1089/thy.2015.0020
27. Hussein SMM, AbdElmageed RM. The relationship between type 2 diabetes mellitus and related thyroid diseases. Cureus. 2021; 13(12):e20697. https://doi.org/10.7759/cureus.20697
28. Kahaly GJ, Robertson RP. Thyroid Dysfunction and Diabetes Mellitus: Two Closely Associated Disorders. Endocr Rev. 2019; 40(3):789-824. https://doi.org/10.1210/er.2018-00163
29. Nishi M, Diabetes mellitus and thyroid diseases. Diabetol Int. 2018; 9(2):108–112. https://doi.org/10.1007/s13340-018-0352-4
30. Jali MV, S Kambar S, Jali SM, Pawar N, Nalawade P. Prevalence of thyroid dysfunction among type 2 diabetes mellitus patients. Diabetes & Metabolic. 2017; 11(1):105-108. https://doi.org/10.1016/j.dsx.2016.12.017

31. Khassawneh AH, Al-Mistarehi AH, Zein Alaabdin AM, Khasawneh L, AlQuran TM, Kheirallah KA , et al. Prevalence and Predictors of Thyroid Dysfunction Among Type 2 Diabetic Patients: A Case–Control Study. Int J Gen Med. 2020; 13:803-16. https://doi.org/10.2147/IJGM.S273900
32. Santini F, Marzullo P, Rotondi M, Ippolito S , Chiovato L , Biondi B et al. Mechanisms in endocrinology: the crosstalk between thyroid gland and adipose tissue: signal integration in health and disease. Eur J Endocrinol. 2014; 171 (4):137-52. https://doi.org/10.1530/eje-14-0067