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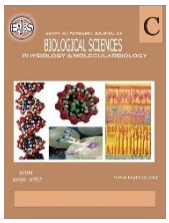

Thyroid Dysfunction and Risk Factors Among Adult People in Sulaimani Province/ Kurdistan-Iraq

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ABSTRACT

Thyroid disease is one of the most common endocrine disorders in recent years, including hypothyroidism and hyperthyroidism. The main cause of hypothyroidism globally is iodine deficiency. However, the major thyroid disease is an autoimmune thyroid disease. The current study aimed to find out the rate of thyroid dysfunction and determine the risk factors correlated with thyroid dysfunction among adult people in Sulaimani city/ Kurdistan region of Iraq. In the current study, 254 adults (male=120, female=134) were enrolled. The participants were randomly selected and the questionnaire form, which covers information about factors associated with thyroidal dysfunctions, was filled by each participant. The information included: age, sex, body mass index (BMI), physical activity, and diet. Five ml of venous blood was taken from all participants and T3, T4, and TSH were detected. The results found that 45.3% of people had abnormal levels of thyroidal hormones. The results indicated that thyroid disorders were higher significantly between female groups (60.4%) and people without physical activity (56.2%). However, there were no significant differences between age groups, normal or overweight, and healthy or unhealthy food consumers. In conclusion, approximately half of adult people in Sulaimani city had abnormal levels of thyroid hormones and it was more common among females who had no physical activity.

INTRODUCTION

Thyroid disease, including hypothyroidism and hyperthyroidism, is one of the most common endocrine disorders. The main cause of hypothyroidism worldwide is iodine deficiency (Premawardhana and Lazarus, 2006). There are two types of hypothyroidism; the first type is subclinical, where the level of thyroid hormones is within normal ranges, but serum thyroid stimulating hormone (TSH) is slightly elevated (Ogbonna and Ezeani, 2019) and the second type is hypothyroidism where the level of thyroxine (thyroid hormones) is below normal ranges (Ghadhban and Abid, 2019.

Many factors are associated with thyroid dysfunction. Genetic factors are the most important factors (Panicker, 2011), sex, age, and other factors such as ethnicity and regional area, specific iodine consumption (Ganie, 2020). Thyroid dysfunction may lead to numerous health problems such as atrial fibrillation (Cappola, *et al.* 2006). The nephrotic syndrome patients with thyroid dysfunction show higher urine protein, creatine, and lipid levels than those with normal thyroid function (Li, *et al.* 2019). The levels of thyroid hormones T3, T4, and TSH are correlated with the severity of liver diseases. T3 and T4 were decreased and TSH was increased in liver cirrhosis patients compared to seeming healthy controls (Punekar, *et al.* 2018). Thyroid dysfunctions have been associated with non-alcoholic fatty liver diseases (Wang, *et al.* 2021). Dyslipidemia is associated with hypothyroidism (Khan, *et al* . 2013) and psychological effects such as thyroid dysfunction were also present in patients with schizophrenia and mood disorders (Radhakrishnan, *et al.* 2013). This study aimed to find out the rate and determine the risk factors correlated with thyroid dysfunction among adult people in Sulaimani city.

MATERIALS AND METHODS

This study was carried out in Sulaimania city/ Kurdistan region of Iraq. 254 adult people who were admitted to the Shar and General Teaching Hospitals in Sulaimania city participated in this study. The cases were enrolled from July 2021 to February 2022. Participants were randomly selected and the questionnaire form which covers information about factors associated with thyroidal dysfunctions was filled directly by participants. The information included: age, sex, BMI, physical activity, and diet (the food that contains carbohydrates, lipids and protein), and five ml of venous blood was taken from all participants, and T3, T4, and TSH were estimated by electrochemiluminescence immunoassay (ECLIA) technique by using the Cobas C311. Data were entered into a statistical package for the social sciences "SPSS" version 26 for statistical analysis. The Chi-square test was applied to find the effect of the risk factors. In this study, the participants who were under 20 years old and who had removed totally or partially the thyroid gland through medical operation were excluded.

RESULTS

Two hundred and fifty-four adult people participated in this study; 139 (54.7%) people had normal thyroid hormones, while 115 (45.3 %) had abnormal levels of thyroidal hormones (Fig. 1).

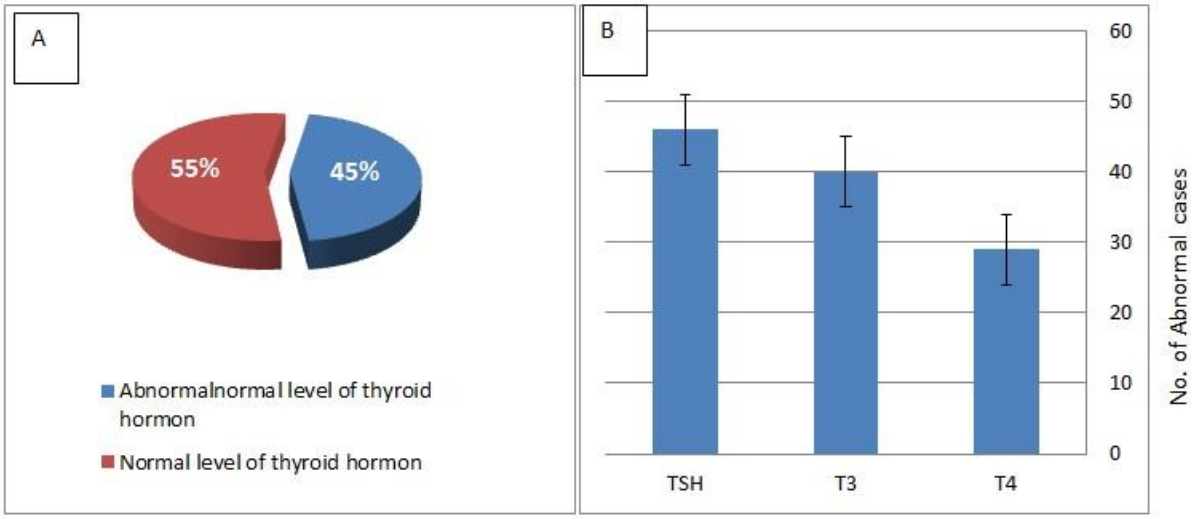

Fig. 1: A: Percentage of normal thyroid function and abnormal cases, **B**: The abnormal cases of thyroid function according to the thyroid hormones.

There was statistically a significant difference between male and female groups; 81 (60.4%) adult females had abnormal thyroid hormone levels from 134 participants and only 34 (28.3%) males had abnormal thyroid hormones from 120 participants (Table 1).

Table 1: The difference in incidences between males and females in abnormal thyroid hormone concentration.

Number of tests (254)	Sex		Total	Chi-square	P value
	Male	Female			
Abnormal TSH	13	33	46	34.5047	0.0001
Abnormal T3	18	22	40		
Abnormal T4	3	26	29		
Control	86	53	139		
Total	120	134	254		

Regarding age groups, there were no significant differences between all three age groups. The incidence of abnormal thyroidal hormones at ages (20-35), (36-50), and (51-65) years were 19 (25%), 43 (53.75%), and 53 (54.1%), respectively. The results are shown in Table 2.

Table 2: The differences in the number of incidences of abnormal thyroid hormone concentration between different age groups.

Number of cases (254)	Age group			Total	Chi-square	P-value
	20-35 year	36-50 year	51-65 year			
Abnormal TSH	4	16	26	46	23.4527	0.001
Abnormal T3	8	18	14	40		
Abnormal T4	7	9	13	29		
Healthy	57	37	45	139		
Total	76	80	106	115		

There was a high difference in the incidence of abnormal thyroidal hormones between BMI and abnormal BMI people, but statistically, no significant differences were found in normal BMI and abnormal BMI was 19 (17.2%) from 110 and 96 (66.7) from 144 cases, respectively. (Table 3).

Table 3: The differences in the number of incidences of abnormal thyroid hormone concentration between people who had normal and abnormal BMI.

Number of tests (254)	BMI		Total	Chi-square	P value
	Normal BMI (No. 110)	Overweight and obesity (No. 144)			
Abnormal TSH	8	38	46	62.0697	0.0001
Abnormal T3	8	32	40		
Abnormal T4	3	26	29		
Healthy	91	48	139		
Total	110	144	254		

Furthermore, in the current study, there were no significant differences between people who had healthy food and those who had unhealthy (the diet contains high carbohydrates and lipids daily) or partially healthy food with abnormal thyroid hormone concentrations but there were significant differences in the incidences. Only 17 (12.6%) abnormal cases from 135 were in healthy food people, while 98 (82.4) of 119 were from abnormal healthy food (Table 4).

Table 4: Differences in the number of incidences of thyroid hormone dysfunction between people who had healthy foods and those who had unhealthy or partially healthy foods

Number of tests (n=254)	Type of food		Total	Chi-square	P-value
	Healthy (No chronic disease) (n=135)	Unhealthy (have a chronic disease) (n=119)			
Abnormal TSH	6	40	46	124.9504	0.0001
Abnormal T3	8	32	40		
Abnormal T4	3	26	29		
Healthy	118	21	139		
Total	17	98	115		

On the other hand, there were significant differences between people who had a daily activity (walking more than 30 minutes daily) or even occasional activity with those who had no activity or abnormal thyroid hormone concentrations. The number of incidences in the daily or occasional activity group was 42 (33.9%) from 124 participants and in groups with no activity was 73 (56.2%) from 130 participants (Table 5).

Table 5: Differences in the number of incidences of thyroid hormone concentrations between groups of two have daily activity and no activity people

Number of tests (n=254)	Physical activity		Total	Chi-square	P value
	Daily or occasional (n= 124)	No activity (n= 130)			
Abnormal TSH	11	35	46	18.5212	0.0003
Abnormal T3	16	24	40		
Abnormal T4	15	14	29		
Healthy	82	57	139		
Total	42	73	115		

DISCUSSION

The present study recorded the high prevalence of thyroid dysfunction among adult people in Sulaimani City, Kurdistan region of Iraq. This result was very high compared to a study which is done in Duhok city. They revealed that the prevalence of thyroid dysfunction was lower (25.03%) among all age groups (Zaman, *et al.* 2021). This might be due to the age groups because these data were collected from adult people only (aged between 20-65 years old). In addition, this result disagreed with a study performed in Egypt; they reported that the prevalence of thyroid dysfunction was 29.3% among adult people (Rashad and Samir, 2019). However, in agreement with this result, the prevalence of thyroid disorders was

49.8% in Saudi Arabia (Alqahtani, 2021). Moreover, this study investigated many factors known to be associated with thyroid dysfunctions among adult people such as; female groups having thyroidal dysfunction more than males. This is similar to a study achieved in the Diyala city of Iraq. The incidence of thyroid diseases in females is nearly six times more than in males (Habash, 2021). In addition, the current study showed that an increase in age leads to a high level of thyroid dysfunction, but statistically, it is not significant, this variation may be due to the physiological differences between males and females or the lifestyle, and behavior of the male and female. While our finding agrees with the previous study (Diab, *et al.* 2019) which found the highest prevalence rate of thyroid dysfunctions among older age groups. The reason for this may be that in elderly people the thyroid gland slightly decreased its functions and this led to an increase in TSH levels (Barbesino, 2019). Moreover, despite the differences found between healthy and unhealthy food people and between normal BMI and abnormal BMI people with abnormal thyroidal hormone concentration, statistically, there were no significant differences found in this study between them. In contrast with this finding, a study done in Iran found that abnormal BMI was significantly associated with underactive thyroid functions (Barzegari, et al. 2021). Based on these results, people with no activity have a remarkable contribution to abnormal thyroid hormone concentrations, which is considered one of the most established risk factors. Inconsistent with this finding, a study concludes that to recover thyroid function, every hypothyroid patient should do regular physical exercise along with thyroxine replacement (Bansal, *et al.* 2015). However, a study in China found no relationship between exercise and hyperthyroidism but they designate that hypothyroidism may be protected by regular physical activity (Huang, *et al.* 2019). In addition, (Duenas, *et al.* 2021) found no association between the endogenous thyroid hormone level and physical activity.

Conclusion:

This study concludes that nearly half of the participating people in Sulaimani City had an abnormal level of thyroid hormones. The female was more at risk than the male. People who had no daily activity would be at higher risk for thyroid dysfunction than those who had regular activity. However, there was no link between the following factors, age, BMI, and healthy food with thyroid dysfunction.

Declarations:

Ethical Approval:This work was conducted in accordance with the ethical standards outlined in the approval letter received under reference number (Nur 00065). The study protocol was reviewed and approved by the (Ethical Committee of College of Health & Medical Technolog), and each respondent provided their informed consent.

Conflict of interests: The authors declare no conflict of interest.

Authors Contributions:I hereby verify that all authors mentioned on the title page have made substantial contributions to the conception and design of the study, have thoroughly reviewed the manuscript, confirm the accuracy and authenticity of the data and its interpretation, and consent to its submission.

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Availability of Data and Materials: All datasets analysed and described during the present study are available from the corresponding author upon reasonable request.

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