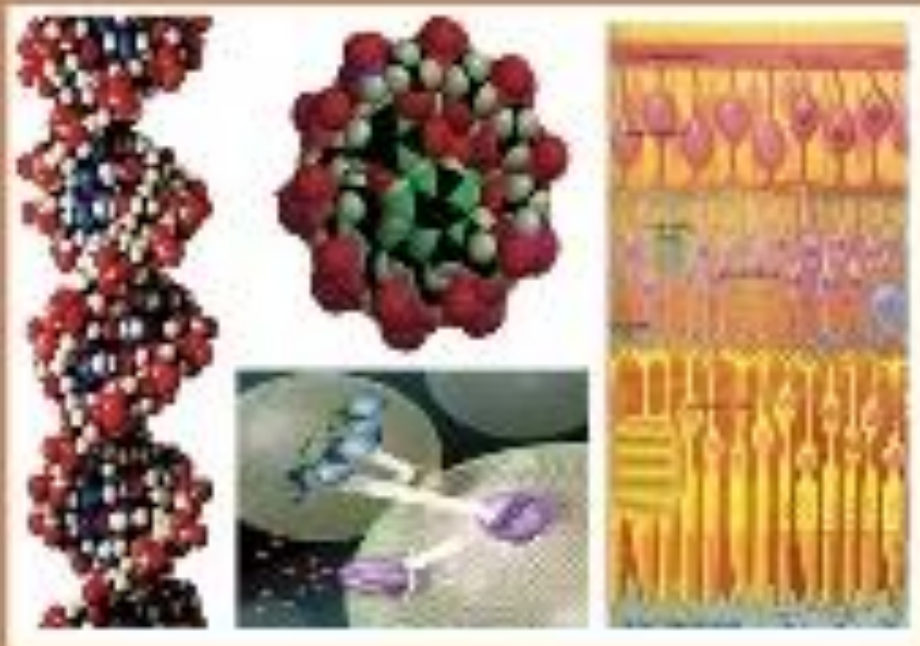




C

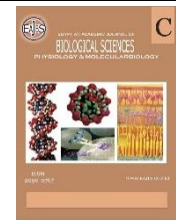
EGYPTIAN ACADEMIC JOURNAL OF  
**BIOLOGICAL SCIENCES**  
PHYSIOLOGY & MOLECULAR BIOLOGY



ISSN  
2090-0767

[WWW.EAJBS.ICA.NET](http://WWW.EAJBS.ICA.NET)

**Vol. 15 No. 2 (2023)**



## Estimation of the Body Mass Index (BMI), Thyroglobulin, and Interleukin 1 Beta of Hyperthyroidism Patients in Samarra City.

Jasim M. Awad\*, Wijdan I. A. Abd-alwahab and Omar R. K. Al-Obaidi

Biology Dept, Faculty of Education, University of Samarra, Iraq.

\*E-mail: [us4010220022@uosamarra.edu.iq](mailto:us4010220022@uosamarra.edu.iq), [Wijdan80@uosamarra.edu.iq](mailto:Wijdan80@uosamarra.edu.iq),  
[Omar.r224@uosamarra.edu.iq](mailto:Omar.r224@uosamarra.edu.iq)

### ARTICLE INFO

#### Article History

Received:20/10/2023

Accepted:1/12/2023

Available:5/12/2023

#### Keywords:

Body mass index,  
thyroglobulin,  
interleukin 1 beta,  
hyperthyroidism.

### ABSTRACT

This study aimed to indicate the levels of body mass index (BMI), thyroglobulin levels, and interleukin 1 beta among a group of patients women with hyperthyroidism. Samples were collected (60 patients) and 30 healthy women who were considered as a control group in the city of Samarra after confirming that they had hyperthyroidism.

The results of the study showed a significant decrease in body mass index (BMI) ( $P \leq 0.05$ ), as the affected group suffered from a decrease in weight compared to the control group. The results of the (TG) and (IL-1 $\beta$ ) tests also showed the presence of a significant increase at a significant level ( $P \leq 0.05$ ) in the values of the hyperthyroidism group when compared with the control group.

It is clear from the results of the study that there is an effect of the disease on the body mass index, and that an increase in the levels of both (TG) and (IL-1 $\beta$ ) may indicate an immune influence on the progression of the disease.

### INTRODUCTION

Hyperactivity of the thyroid gland is one of the widespread medical conditions that affects all ages in a varying manner. Women aged 35-45 years are more susceptible to this disease than children, women younger than this age, or men, and it results in an increase in thyroid disease. The concentration of thyroid hormones (T3, T4) in the blood is more than the normal limit, which contributes to accelerating and activating metabolic processes within the body. Hyperthyroidism is called thyrotoxicosis (Moniuszko *et al.*, 2015), and this increase in the concentration of thyroid hormones can occur. A result of the large secretion of hormone-producing thyroid cells, in this case, it is called primary hyperthyroidism, and the increase may be resulting from increased secretion of hormones that stimulate the thyroid gland, (Al-Tekreeti *et al.*, 2017), such as TSH, due to a disorder or malfunction in the pituitary gland, or the occurrence of tumors and hyperplasia in the pituitary cells. The hyperthyroidism resulting from this condition is called secondary hyperthyroidism (Al-Mashhadani, 2011).

People suffering from hyperthyroidism suffer from many symptoms that appear as a result of the infection, as they notice excessive activity, disturbance, nervous tension, and constant emotions, as well as anxiety (Abdulbaqi *et al.*, 2018), inability to sleep normally, and heavy hair loss. The person suffering from hyperthyroidism also suffers from a rapid heart rate. Persistent, which results in heart palpitations and muscle weakness resulting in trembling of the limbs (Niu *et al.*, 2017).

Those affected also suffer from allergies to hot climates, and an increase in body temperature is observed due to the increase and acceleration of metabolic processes within the body, which in turn leads to continuous sweating greater than the normal limit in unaffected people, as well as causing softness in the skin (Palos-Paz *et al.*, 2008).

Despite the significant increase in appetite that accompanies people with hyperthyroidism and eating additional amounts of food, they notice a clear weight loss and activity in the intestines, especially the large intestine, where food passes quickly before the reabsorption process is completed, causing diarrhea. (Al-Mashhadani, 2011), and people also appear to breathe rapidly in order to obtain a sufficient amount of oxygen for the purpose of completing the metabolic processes that accelerate due to the increased concentration of thyroid hormones in the blood circulation. In return, the largest possible amount of carbon dioxide is excreted (Pellegriti *et al.*, 2008).

It also causes hormonal changes and disorders, especially in women, where irregular menstruation and disorders may occur in the fertility process, as these are considered among the most noticeable symptoms in people suffering from hyperthyroidism in general, in addition to the specific symptoms that accompany a specific disease and no other diseases, Hyperthyroidism, as in Graves' disease, where bulging of the eyes is considered the distinguishing sign that can appear in people with this disease, depending on the progression of the disease (Ploski, 2010). Thyroxin binding globulin (TBG) is a single chain of polypeptides that are synthesized in liver cells. This transporter is characterized by the presence of special hormonal binding sites (T<sub>3</sub>, T<sub>4</sub>) (Abdullah *et al.*, 2019). These sites allow the transport of hormones and because of the high affinity between this transporter (TBG) and thyroid hormones, about 70% of the total amount is transported by Hormones

present in the bloodstream (Shlien, 2010).

There are many factors and diseases that directly affect the percentage of TBG in the blood in terms of increase or decrease. For example, during pregnancy, its percentage increases significantly due to hormonal disorders, and also increases in Hepatitis, As for the factors that are caused by a deficiency in the proportion of this transporter (TBG), it is liver cirrhosis, as well as taking doses of the male hormones androgens. interleukin 1 beta: IL-1 $\beta$  plays a role in resolving acute inflammation resulting in the initiation of adaptive anti-tumor responses; However, chronic inflammatory conditions increase the cancer risk in human breast cancer.

#### **MATERIALS AND METHODS**

Samples were collected from (60 patients) and 30 healthy women who were considered a control group by drawing blood from a vein using a disposable plastic syringe. The amount of blood drawn was about (5 ml) for each sample, and the blood was divided based on the type of test after centrifuging it for 5 minutes at a speed of 8000 rpm, the serum free of red blood cells was quickly isolated from the rest of the sample. The serum was then divided into 2.5 ml Eppendorf tubes and stored at -20 degrees until used and the necessary tests were performed while the second part was used for immunological tests based on the ELISA device and also using blood serum (M.T. *et al.*, 2019).

#### **Ready-Made Kit For Examination:**

The concentration of interleukin IL-1 $\beta$ , interleukin 6, and thyroglobulin in the blood serum of the study sample was estimated by using a ready-made kit (Kit) for their estimation from the German manufacturer Human. (Kondo *et al.*, 2021).

#### **Statistical Analysis:**

The results of this study were analyzed statistically using the statistical analysis program (Statistical Package for the Social Sciences-SPSS) using the completely randomized design method (CRD) by testing (T-TEST) to analyze the variance between the two groups at the probability level ( $P \leq 0.05$ ).

A simple linear correlation coefficient was found between all variables for the purpose of finding the relationship between them.

**RESULTS AND DISCUSSION**

**The Relationship of Weight And Age To Hyperthyroidism:**

Hyperthyroidism is associated with the body mass index (BMI) of the affected person, as the current study showed a decrease in the average weight of people with diagnosed hyperthyroidism, and it is a distinguishing feature of the phenotypic signs that can be inferred from the disease, as Table (1) shows the weight values for the control groups and those with hyperthyroidism. The mean and standard deviation for the two groups are noted. It was observed that there was a significant decrease in the body mass index (BMI) at the probability level ( $P \leq 0.05$ ), as the group of patients suffered from a decrease in weight compared to the control

group whose weight was normal, as studies indicated that there was a correlation between the level of glandular hormones. Thyroid and body mass index (BMI) increases and decreases (Al-Shahri, 2010), as thyroid hormones have a significant impact on the oxidation of fat stores in the body’s tissues, which results in a significant decrease in the level of stored fats, and the increased secretion of hormones also leads to the breakdown the proteins for the purpose of energy production, as weight loss has been observed after an increase in the level of thyroid hormones in people with thyroid diseases in United States of America. Al-Sayel (2017) obtained the same current results for the group whose thyroxine concentration was higher than the normal limit in his study conducted at Tikrit University(Hussein *et al.*,2019).

**Table 1:** shows the means and standard deviations for the BMI and age variables for the study samples.

Variables	NO	Mean ±SD	SIG
BMI	Control	3.117 ± 24.77	0.000
	patients	2.07 ± 21.61	
AGE	Control	11.757 ± 43.9	0.49
	patients	18.185 ± 46.42	

Hyperthyroidism diseases affect people of different ages, and age is one of the important factors in infection and the development of the patient’s disease condition. The condition can be controlled and its seriousness is reduced the earlier the diagnosis is and in the initial period of the infection, as the results of the current study showed, as shown in Table (1), which includes the arithmetic mean and standard deviation for the age factor, There is no significant difference between the control group and the hyperthyroidism group ( $0.05P \leq$ ). Autoimmune diseases are diseases that affect the kidneys of both males and females at different ages and affect newborns (Hussain *et al.*,2018) , which result from the transfer of autoimmune antibodies. Examples

of autoimmune diseases include Graves' disease, which can be transmitted from the mother to the fetus through the placenta(Mahmood Z. F. *et al.*,2023). It applies to about 12% of pregnant women who suffer from hyperthyroidism and increased secretion due to a mutation that occurs in the thyroid-stimulating hormone receptors, which is a recessive genetic condition (Al-Samarrai, 2012).

Al-Qaisi (2011) stated that the spread of hyperthyroidism in the United Kingdom and their ability to be treated is more effective in people, whose ages range from newborns to 20 years, as their percentage of the total number of infected people was 21.3%, and their response rate to treatment was 95.2%, and this was the largest age group. People

under the age of 40 are susceptible to infection, and as they age, the chance of responding to treatment decreases.

#### Thyroglobulin TG:

The results of the TG tests showed a significant increase at a significant level ( $P \leq 0.05$ ) in the values of the hyperthyroidism group when compared with the control group, where the results of the TG test for the group of patients were equal to  $(39.53 \pm 4.51)$ , while the results for the control group are  $(30.00 \pm 3.85)$ . Through these results, it is noted that there is a significant increase in the values of the affected group and the effect of hyperthyroidism, as shown in the Table 2.

Autoimmune diseases that affect the thyroid gland are the most common types. Autoimmunity is characterized by the abundance of antibodies specific for thyroglobulin (TG), which is a glycoprotein that is manufactured exclusively in the follicular cells of the thyroid gland and is stored inside the thyroid follicles in the form of a colloidal fluid, and its concentration inside them is higher than the concentration in the thyroid gland. Blood circulation: Measuring the percentage of TG in the blood is considered one of the most important tests through which the incidence of thyroid

tumors can be determined by Estimating the extent of the incidence of glandular cancer or the predisposition for benign tumors to turn into cancerous tumors, and that an increase in its percentage above the normal limit is evidence of an enlargement of the thyroid gland or the occurrence of autoimmune diseases such as Graves' disease or the occurrence of thyroid nodules, the resulting increase in TG leads to an increase The production and formation of thyroid hormones is, therefore, one of the causes that lead to hyperthyroidism (Nouri *et al.*, 2015).

The current study showed the effect of hyperthyroidism on some immune parameters. The effect of hyperthyroidism on the immune interleukins was studied, and (interleukin IL- $\beta$ 1) was taken and the changes that occurred in them as a result of the infection were studied. The results showed that the (IL- $\beta$ 1) test showed the presence of Significant differences between the control and affected groups ( $111.39 \pm 14.62$ ) and ( $158.69 \pm 15.76$ ). It was noted that there was a significant increase in the probability level ( $P \leq 0.05$ ) in the immune parameters of people affected by hyperthyroidism (Nemat J. A. *et al.*, 2015).

**Table 2:** Shows the means and standard deviations for the TG and IL-  $\beta$ 1 variables for the study samples.

Variables	NO	Mean $\pm$ SD	SIG
TG	Control	$3.85 \pm 30.00$	0.000
	patients	$4.51 \pm 39.53$	
IL- $\beta$ 1	Control	$14.62 \pm 111.39$	0.000
	patients	$15.76 \pm 158.69$	

Many studies have indicated an association between levels of interleukins in the blood and disorders affecting the thyroid gland. Xeni *et al.*, (2014) indicated that the condition of thyroid disorder with nodular diseases, thyroid cancer, and Graver's disease is linked to the changing levels of some interleukins, IL-1 $\beta$ , IL-2, IL-4, IL-5, and IL-6, where a significant increase in them was observed. When compared to the control

group.

The reason for the increase in interleukins may be due to the important role that interleukins play in the immune response or causing immune diseases, including those affecting the thyroid gland.

IL-4 is one of the important interleukins that regulates the immune response associated with the growth and effectiveness of lymphocytes. The increase is

also linked to an increase in the metabolic rate and the rate of cancer cell transmission and spread (Matilde *et al.*, 2023), Many studies have also indicated that when cancerous tumors, such as thyroid cancer, interleukin IL-4 receptors are activated (Seddiq *et al.*, 2022), its expression increases and its effectiveness in the blood circulation increases. Tumor cells also secrete IL-4, which is a stimulator of macrophages that are associated with this tumor and derived suppressor cells. From the marrow, which leads to the occurrence of tumor (Suzuki *et al.*, 2015).

The increase plays an important role in regulating the tumor's microenvironment, as it enhances the effect of the anti-tumor response, and is associated with stabilizing the disease and modifying the rate of irregular cell growth and thus helps in cell death without harming other cells. Thus, it is a contributing factor to getting rid of the disease with the assistance of interleukin (Sultani *et al.*, 2015).

#### Conclusions:

The results of the study show that there is a relationship between the body mass index (BMI) and the level of infection, as it was found that the levels of (BMI) were low, and this may indicate a diagnostic sign in determining the severity of the disease, in addition to the fact that thyroglobulin and IL1 beta, as immune indicators, have an important role in the progression of the disease.

#### REFERENCES

- Al-Mashhadani, Ahmed Jassim Muhammad (2011) Functions of the thyroid glands and C-reactive protein in chronic renal failure patients continuing on hemodialysis and renal transplant patients, Master's thesis, College of Education for Pure Sciences/ University of Diyala.pp 56-60.
- Al-Tekreeti, A. R., Al-Halbosiy, M. M. F., Dheeb, B. I., Hashim, A. J. and Al-Zuhairi, A. F. H. (2017). Molecular identification of clinical Candida isolates by simple and randomly amplified polymorphic DNA-PCR. *Arab Journal Science Engineering*, 17(2)762-64.
- Abdulbaqi, N. J. and Dheeb, B. I. and Irshad, R. (2018). Expression of Biotransformation and Antioxidant Genes in the Liver of Albino Mice after Exposure to Aflatoxin B1 and an Antioxidant Sourced from Turmeric (*Curcuma longa*). *Jordan Journal of Biological Sciences*, 11(2) 89 – 93.
- Abdullah, H.I., Hammadi, S.Y., Hussein, A.S., Dheeb, B.I. (2019). Investigation of genetic diversity and relationships among the clinical candida species using random amplified polymorphic DNA (RAPD) analysis. *Research Journal of Biotechnology* , 14(Special Issue 1), pp. 6–13.
- Al-Qaisi, Amal Mahrouz Abdullah (2011) Study some of physiological and biochemical parameters for patients with thyroid disorders, Master's thesis / College of Science / Tikrit University.pp 33-35.
- Al-Samarrai, Sahar Abdel-Wahab (2012), Study of some physiological and biochemical variables in people with thyroid disorders in the city of Samarra and its environs, Higher Diploma / College of Science / Tikrit University.PP 90-92.
- Al-Sayel, Mayah, Mustafa Sayel Mayah (2017) Monitoring the level of thyroid hormones in patients with chronic kidney failure treated with dialysis / Higher Diploma / College of Science / Tikrit University.PP 66-70.
- Al-Shahri, Hazem Allawi (2010). Lipid alteration in thyroid-pathy patients before and after internal therapy, Doctoral thesis, College of Science, University of Mosul.PP 70-80.
- Arulanantham, S. (2018). The Role Of FER Kinase In Human Melanoma Growth and Invasion (Doctoral dissertation, The University of Western Ontario (Canada)).PP 44-60.
- Bruno, M., Bonomi, C. G., Ricci, F., Di

- Donna, M. G., Mercuri, N. B., Koch, G., ... & Motta, C. (2023). Blood–brain barrier permeability is associated with different neuroinflammatory profiles in Alzheimer's disease. *European Journal of Neurology*, 16 (8)66-70.
- Dahham, M.T., Omar, A.F., Dheeb B.I. (2019). Synergistic effect of tea tree oil on fungi causing vaginal thrush in pregnant women(2019). *Journal of Biotechnology Research Center*, 13 (2)35-44.
- Hussein, H.S., Dheeb B.I., Hamada,T.A.. Studying the candida resistance and sensitivity for some antifungals (2019). *Journal of Biotechnology Research Center*, 13 (2)25-34.
- Hussain, A.F., Sulaiman, G.M., Dheeb, B.I. , Hashim, A.J., .(2018). Histopathological changes and expression of transforming growth factor beta (TGF- $\beta$ 3) in mice exposed to gliotoxin. *Journal of King Saud University Science*, 27(12): 193–197.
- Hashim S. S, Mahmood Z. F, Abdulateef S. F, Dheeb B. I. (2023).Evaluation Cytotoxicity Effects of Centaurea Cineraria Extracts Against some of Cancer Cell Lines. *Biomedical Pharmacology Journal* ;16(1).23-24.
- Kondo, T.; Ezzat, S. and Asa, S.L. (2006), Path genetic mechanisms in thyroid follicular-cell neoplasia. *National Reverser Cancer journal*, 6(2):292-306.
- Kwaśniak, K., Czarnik-Kwaśniak, J., Maziarz, A., Aebisher, D., Zielińska, K., Karczmarek-Borowska, B., & Tabarkiewicz, J. (2019). Scientific reports concerning the impact of interleukin 4, interleukin 10 and transforming growth factor $\beta$  on cancer cells. *Central European Journal of Immunology*, 44(2), 190-200.
- Moniuszko, A.; Wawrusiewicz- Kurylonek, N.; Bossowska, A.; Gościak, J.; Łuczyński, W.; Głowińska-Olszewska,B.; Krętowski, A.and Bossowski. (2015).The association between rs4684677 T/A polymorphism in preproghrelin gene and predisposition to autoimmune thyroid diseases in children. *Autoimmunity*, 48(6):418-22.
- Niu, H.; Yang, J.; Yang, K.; Huang, Y. (2017), The relationship between RASSF1A promoter methylation and thyroid carcinoma: A meta-analysis of 14 articles and a bioinformatics of 2 databases (PRISMA). *Medicine*, 96, e8630.
- Nouri, M. A., Al-Halbosiy, M. M. F., Dheeb, B. I. (2015). and Hashim, A. J. Cytotoxicity and genotoxicity of gliotoxin on human lymphocytes in vitro. *Journal of King Saud University Science*, 27, 193–197.
- Palos-Paz, F., Perez-Guerra, O., Cameselle-Teijeiro, J., Rueda-Chimeno, C., Barreiro-Morandeira, F., Lado-Abeal, J., ... & Victoria, B. (2008). Prevalence of mutations in TSHR, GNAS, PRKAR1A and RAS genes in a large series of toxic thyroid adenomas from Galicia, an iodine-deficient area in NW Spain. *European journal of endocrinology*, 159(5), 623-631.
- Pellegriti, G., Frasca, F., Regalbuto, C., Squatrito, S., & Vigneri, R. (2013). Worldwide increasing incidence of thyroid cancer: update on epidemiology and risk factors. *Journal of cancer epidemiology*,67(2):23-30.
- Ploski, R. 2010. Thyroid stimulating hormone receptor (TSHR) intron 1 variants are major risk factors for Graves' disease in three European Caucasian cohorts. *PLoS One*, 5, 5512.
- Provatopoulou, X., Georgiadou, D., Sergeantanis, T. N., Kalogera, E., Spyridakis, J., Gounaris, A., & Zografos, G. N. (2014). Interleukins

- as markers of inflammation in malignant and benign thyroid disease. *Inflammation Research*, 63, 667-674.
- Rassin, N. K., Nemat J. A, Dheeb, B. I. (2015). Molecular Identification of *Aspergillus fumigatus* Using ISSR and RAPD Markers. *Iraqi Journal of Science*, 56 (4A), 2788-2797.
- Salih, I.I., Seddiq, S.H., Hashim, S.S., Dheeb, B.I. Application of Omics and Proteomics in Fungi. *AIP Conference Proceedings*, 2022.
- Shlien, A. (2010). Genomic DNA Copy Number Variations and Cancer: Studies of Li-Fraumeni Syndrome and its Variants. University of Toronto (Canada).pp90-99.