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Physio-immunological study of serum Beta-catenin in relation with hyperthyroidism

Husam Mohammed Abdulkareem

Faculty of Science, University of Kufa, Department of Biology

Email: husam4448@gmail.com

Adhraa Baqir Hassan

Faculty of Science, University of Kufa, Department of Biology

Email: adhraa.alshabawy@uokufa.edu.iq

Abstract--This study was conducted on randomly selected 60 hyperthyroidism patients (23 Males and 27 Females) attending the thyroid center in Al-Sadder Teaching City in Al-Najaf province, Iraq and a group of 30 apparently healthy subjects (15 Males and 15 Females) were included as a control group. The study was carried out from December 2021 to June 2022. The age of patients and control groups were ranged of 20-60y. The results show significant increase ($P < 0.05$) in Beta catenin level in patients compared with control groups. The results revealed that Beta catenin level are not significant in difference ($p > 0.05$) in patients and control groups at different ages. The results also revealed that there is a highly significant increase ($p \leq 0.05$) of Beta catenin level in both males and females in patients in comparing with control groups. The results also show that Beta catenin level show a significant increase ($P \leq 0.05$) in patients in all groups normal weight, over weight and obese weight in comparing with control groups. The results have shown that there is a significant negative correlation ($P \leq 0.05$) between Beta catenin and T3 levels and there is a significant positive correlation ($P \leq 0.05$) between Beta catenin and T4 levels and there is a significant positive correlation ($P \leq 0.05$) between Beta catenin and TSH levels in hyperthyroidism patients. The present study concluded that Beta catenin level was a marker for detection and diagnosis of hyperthyroidism.

Keywords--physio-immunological, serum, beta-catenin, hyperthyroidism.

Introduction

Hyperthyroidism is a common physiological disorder, affecting about 2 percent of women and 0.2 percent of men (Franklyn, 1994). Hyperthyroidism is the condition where the thyroid gland secretes high amounts of thyroxine hormone while there is a low level of thyroid stimulating hormone in blood (Nygaard, 2008). High thyroxine hormone in its turn promotes hyper-metabolic state (LiVolsi and Baloch, 2018). Hyperthyroidism is mainly caused by Graves' disease. Assays of Thyroid stimulating hormone, T4 and T3 are performed to diagnose the disorder. But to have more accurate result for the diagnosis of the disorder's cause, radioactive iodine uptake (RAIU) test is recommended (Pooria et al, 2021). Plasma- β -catenin is an intracellular protein responsible for cell growth, development, adhesion and proliferation. β -catenin plays a key role in all the previously mentioned functions by being the base that the Wnt pathway depends on. Where it activates the Wnt target genes and lead to cell development and proliferation in response to the Wnt signal. (Pai *et al.*, 2017).

Materials and Methods

The study was conducted on randomly selected 60 hyperthyroidism patients (23 Males and 27 Females) and a group of 30 apparently control subjects (15 Males and 15 Females) were included as a healthy group. Hyperthyroidism was diagnosed by consultant doctors. The information of patients was obtained through a questionnaire consisted of the name, age, sex, height, weight. Patients with heart diseases, renal dysfunction, who were on drugs affect oxidative stress, i.e.: antihyperlipidemic agents, antioxidants were excluded from the current investigation. Using a disposable needle and plastic syringes five milliliters of venous blood samples were drawn from each patient and control subject. For clotting, blood was left at room temperature for 10 minutes, centrifuged 6000 rpm for 10 minutes, and then serum was separated and transported into new disposable tubes. Beta catenin ELISA Kit for quantitative determination of Beta catenin in human serum, was supplied by MyBioSource, Inc. This assay for detecting Beta catenin protein based on the principle of Competitive Enzyme Immunoassay.

Results

The results in figure (1) show a significant increase ($P \leq 0.05$) in Beta catenin level in hyperthyroidism patients (5.1415 ± 0.181 ng/ml) in comparing with control groups (2.0520 ± 0.091 ng/ml).

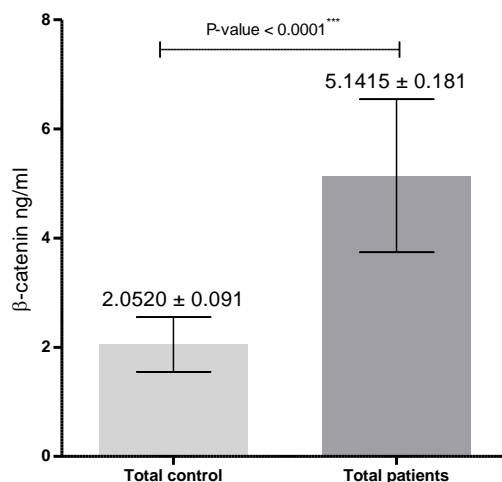


Figure 1. Beta catenin level (ng/ml) in hyperthyroidism patients and control groups

The results of table (1) show that there is no significant difference ($p > 0.05$) in serum Beta catenin levels in patients at different ages, while serum Beta catenin levels is highly significant increase ($p \leq 0.05$) in patients at different ages in comparing with control groups.

Table 1
Serum Beta catenin levels of patients and control groups in different ages

Age group /year	B-catenin (ng/ml)	
	Mean \pm SD	
	Control	patients
20-30	2.183 \pm 0.1075 a	5.063 \pm 0.276 b
31-40	2.109 \pm 0.1756 a	5.271 \pm 0.317 b
41-50	1.652 \pm 0.1911 a	5.053 \pm 0.275 b

The results of table (2) show that there is no significant difference ($p > 0.05$) in serum Beta catenin levels in patient groups according to gender, while serum Beta catenin level is on highly significant increase ($p \leq 0.05$) in both male and female patients in comparing with control groups.

Table 2
Beta catenin levels in both genders of patients and control groups

Marker	Male	Mean± SD	P-value	Female	Mean± SD	P-value
βcatenin (ng/ml)	Control	2.2753 ± 0.130	0.018**	Control	1.8287 ± 0.1011	0.023**
	Patients	4.934 ± 0.2054 ^s		Patients	5.2703 ± 0.264 ^s	

The figures (2), (3), (4) show a significant increase ($P \leq 0.05$) in Beta catenin level in patients in all groups normal weight, over weight and obese weight in comparing with control groups.

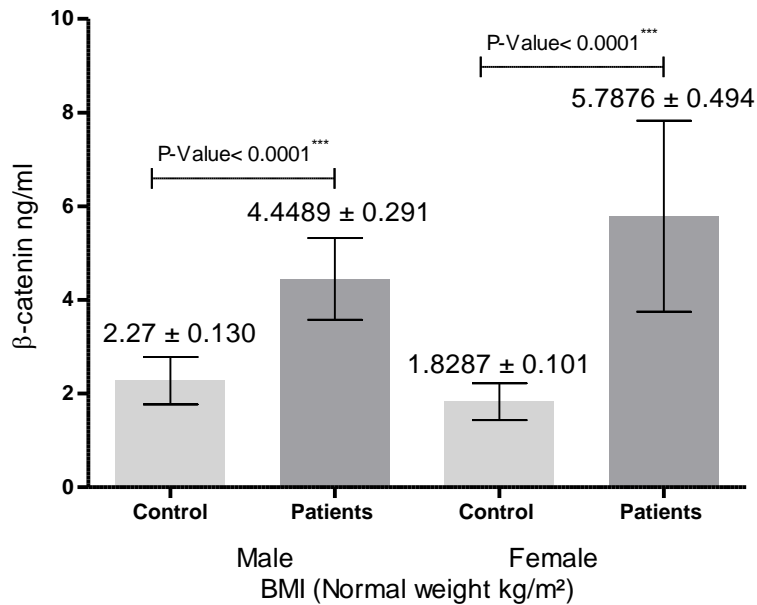


Figure 2. Beta catenin levels (ng/ml) of patients and control groups in normal weight

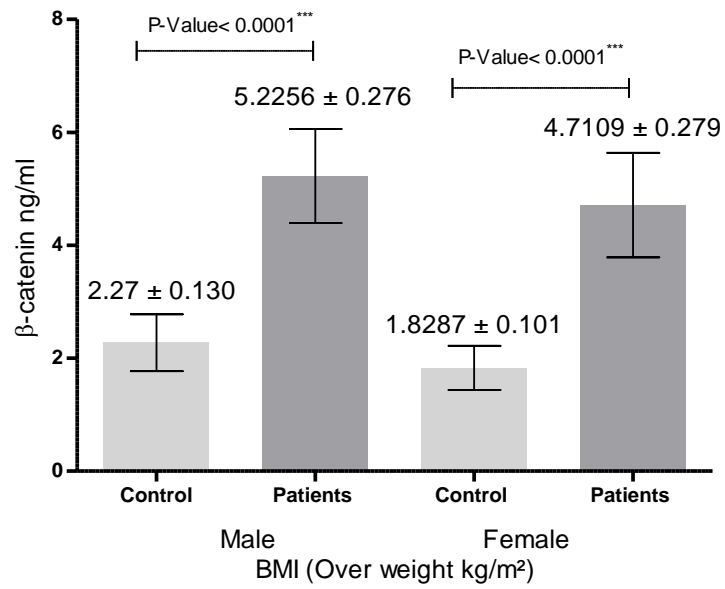


Figure 3. Beta catenin levels (ng/ml) of patients and control groups in over weight

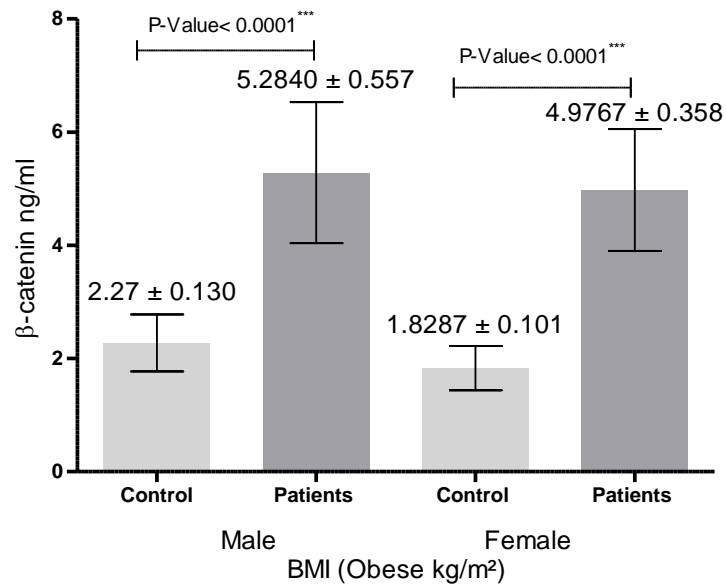


Figure 4, Beta catenin levels (ng/ml) of patients and control groups in obese weight

The figures (5), (6), (7) reveal that there is a significant positive correlation ($P < 0.05$) between Beta catenin (ng/ml) and T3 levels (ng/dL), a significant positive correlation ($P < 0.05$) between Beta catenin (ng/ml) and T4 levels ($\mu\text{g/dL}$) and a significant weak positive correlation ($P < 0.05$) between Beta catenin (ng/ml) and TSH levels (mU/L) of hyperthyroidism patients.

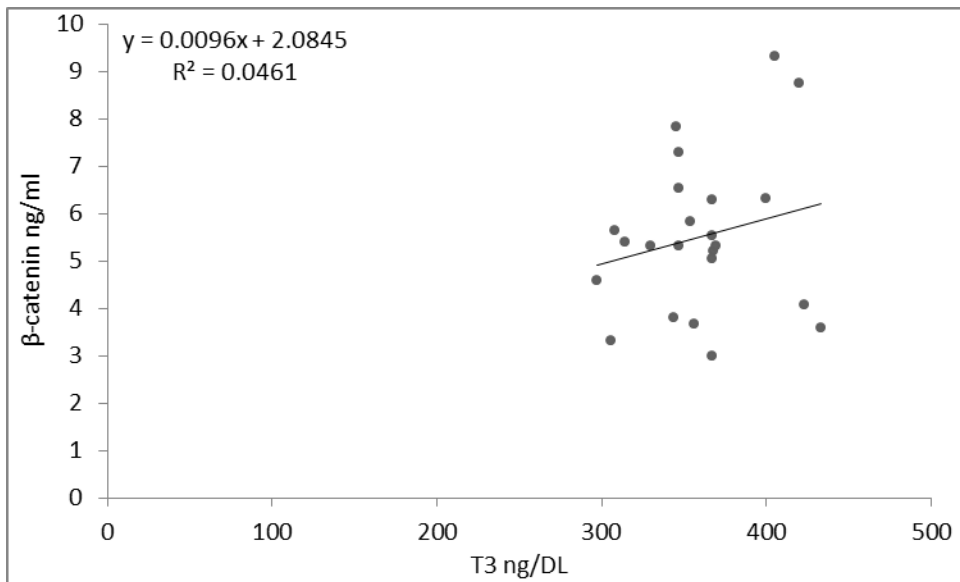


Figure 5. Correlation between Beta catenin level (ng/ml) and T3 (ng/dL) in hyperthyroidism patient groups

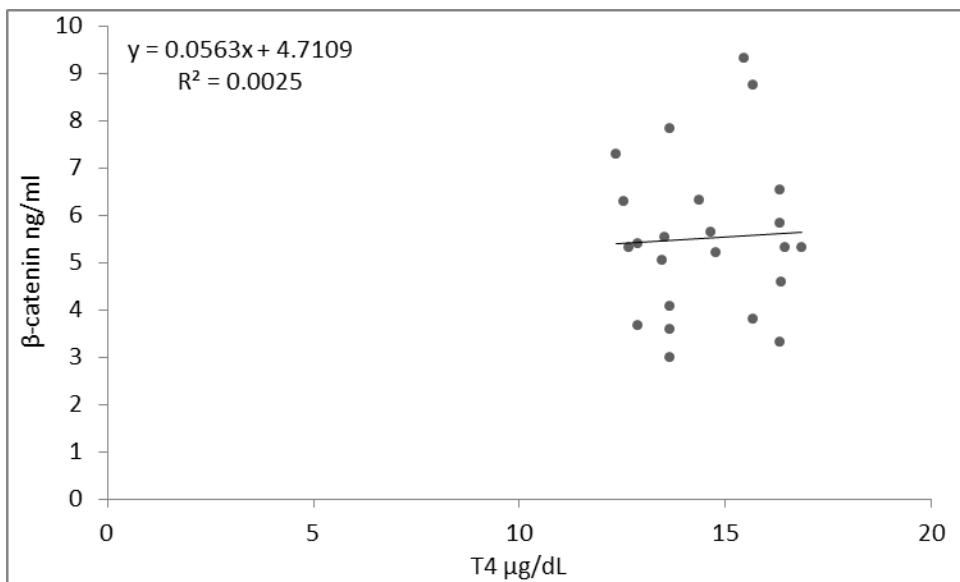


Figure 6. Correlation between Beta catenin level (ng/ml) and T4 (ng/dL) in hyperthyroidism patient groups

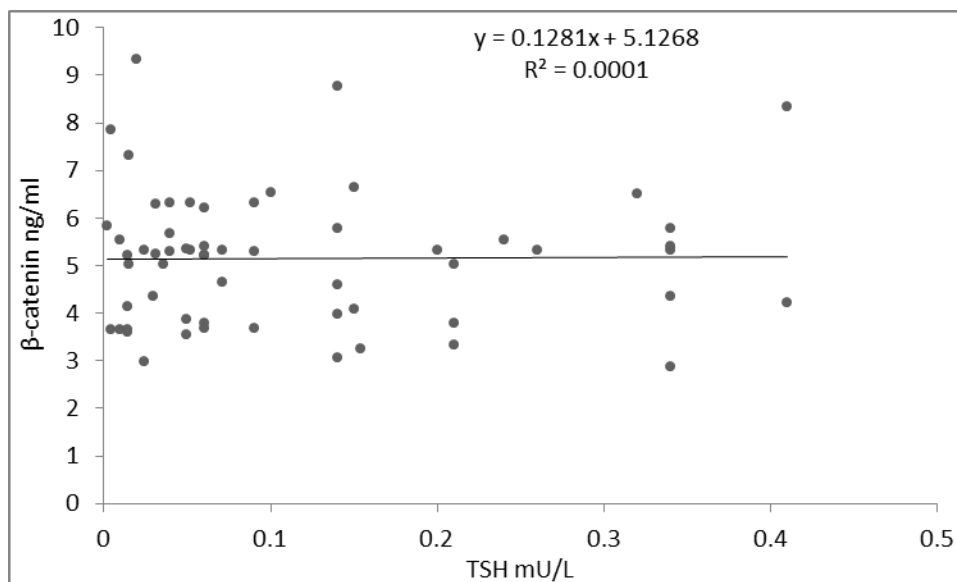


Figure 7. Correlation between Beta catenin level (ng/ml) and TSH (mU/L) in hyperthyroidism patient groups

Discussion

The study indicates a significant increase in β -Catenin level in hyperthyroidism patients in comparing with control group as presented in figure (1). The recent study suggests that the irresponsibility of cell adhesion and proliferation, Beta catenin is highly expressed when there is hyper activity in cells. These results distinctly point out the relation of hyperthyroid secretion to the activity of β -Catenin due to the probable over activation to the Wnt/ β -Catenin pathway to promote cell proliferation and differentiation, thereby over production of thyroid hormones as a result of this process (Chen *et al.*, 2013; Ye *et al.*, 2020). The study also illustrates an elevation in β -Catenin level when comparing patient's groups to control groups according to age as shown in table (1),

These results strengthen the claim of the connection between hyperthyroidism and β -Catenin over-expression probably due to the multilevel interactions between thyroid hormone nuclear receptors (TRs) and the Wnt/ β -Catenin signaling pathway, these signal alterations are responsible for the development of dysregulations and pathologies for the internal homeostasis of thyroid cells, hence may lead to the hypersecretion of thyroid hormones (Skah *et al.*, 2017). As the results in table (2) suggest, there was no mentionable difference in serum β -Catenin levels in patient groups according to gender, while β -Catenin level is over expressed in both male and female patients when compared to control groups. β -Catenin level as shown in figures (2), (3), (4) is notably elevated in all different weight categories, which indicates no significant correlation of β -Catenin and weight (Li *et al.*, 2019;; Shokrani *et al.*, 2020).

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