Al-Mukhtar Journal of Science 39 (2): 55-58, 2024
Doi: https://doi.org/10.54172/

Research Article **Open Access**

Relationship Between Calcium Ion Concentration and Thyroid-Stimulating Hormone in Libyan Women

Nadia Al Rwab[1], Samira Al-Agouri[2], Nagwa Hamed[3] and Hussien Amgawer[4]*

[1, 2, 3] Department of Zoology, University of Benghazi; Faculty of Arts and Sciences, Tocra Branch, Libya.

***Corresponding author:**
hussien.amgawer@uob.edu.ly
Department of Zoology, University of Benghazi; Faculty of Arts and Sciences, Tocra Branch, Libya.

Received:
08 July 2022

Accepted:
04 December 2022

Publish online:
30 June 2024

Abstract

This study aimed to estimate the relationship between the thyroid-stimulating hormone (TSH) and calcium ion concentration in Libyan women, as the study conducted in the city of Tocra- eastern Libya. Venous blood samples were collected in the laboratory from a total of 34 women, whose average age was 20-50 to measure the level of TSH and calcium concentration. The findings showed that the correlation between calcium ion concentration and TSH were strong. The calcium ion concentration increased depending on the increase in TSH.

Keywords: Calcium Ion; Thyroid-Stimulating Hormone (TSH); Tocra; Libya.

INTRODUCTION

The human body controls the amount of calcium in the cells and blood; hence, it moves calcium from the bones into the blood as required to maintain a constant level of calcium in the blood. The lack of calcium-rich food consumption leads to withdrawing calcium from bones to ensure normal cell function which may lead to weakened bones. This can lead to osteoporosis. Therefore, to maintain a normal level of calcium in the blood without weakening the bones, the calcium level in the blood regulated mainly by two hormones: parathyroid hormone and calcitonin that plays an important role in calcium homeostasis (Guyton. C & Hall. J. E, 2011) and secreted by the thyroid gland.

The hormones secreted from the thyroid are regulated by thyroid stimulating hormone (TSH), which is secreted from the front part of the pituitary gland under the influence of the thyroid-releasing hormone (TRH) by the hypothalamus, which stimulates the growth of the thyroid gland and the secretion of its hormones (Boron. W. F & Boulpaep. E. L, 2012). TSH regulates thyroid gland function by stimulating iodine blocking, making and releasing thyroid hormones into the circulatory system. Releasing tri-iodothyronine (T3), thyroxine (T4), and TSH secretion controlled by TRH.

Calcium is a divalent action available in the body. More than 99% of the calcium in the body is concentrated in the skeletal system and about 1% rapidly replaced by calcium in the blood. Small amounts of calcium outside the bones diffuse into the serum, partly bound to the protein and partly ionized. Calcium plays a major role in nerve transmission, which has a vital role in

the ability of the heart to function and it is necessary to regulate the heartbeat. In addition, this ion is involved in blood clotting and hormone secretion (Bongard et al., 2008; Nix. S & William. S, 2009) Intracellular, the calcium is a key to the second intracellular messenger that plays a pivotal role in controlling various cellular processes such as secretion, differentiation, reproduction, motility and cell death. In contrast, extracellular calcium is necessary for a wide range of physiological phenomena including blood clotting, muscle function and maintenance of skeletal integrity (Sharan et al., 2008). Calcium balance tightly regulated by the interaction between gastrointestinal absorption, renal excretion, bone reabsorption, vitamin D and parathyroid hormone (Kumar, 1995).

The thyroid gland plays a major role in calcium metabolism and regulation by excretion. Thyroid stimulating hormones (TSH) are the regulating key of thyroid metabolism to produce both T4 and T3. T4 is the main product and converted in the extremities by removing iodine into T3, which is the main biological activity of thyroid hormones. The production of TSH is regulated by thyroid nutrition. Therefore, TSH is regulated by a negative feedback mechanism related to the serum level of T3 and T4 (Aaron. R. M & Robert. B. S, 2009). The objective of this study was focused on the relationship between the concentration of calcium ion in the human body and TSH in Libyan women.

MATERIALS AND METHODS

Sampling

The study was conducted in Tocra city - Libya. Venous blood samples we recollected in the laboratory from a total of 34 women with an average age of 20-50 to measure the levels of TSH and calcium.

Separation of serum from blood

The blood was placed in test tubes free of anticoagulants. Afterward, the blood was separated using a centrifuge (3000 rpm at 15 minutes), and the blood drawn using a pipette and placed in tubes and a special number and name were given to the tube to avoid losing it.

Measurement of calcium

Calcium level was measured with an electrolyte device.

Measuring the concentration of TSH

TSH concentration in the blood was measured by following the steps included with the TSH test kit and according to the manufacturer's instructions for the ELISA device.

Statistical test

The data were tested using the correlation test between TSH and calcium ion. In addition, the Paired Samples Test was applied to investigate the significance between calcium and TSH.

RESULTS

The current study investigated a total of 34 samples. Through this study, the relationship between calcium ion concentration and TSH was monitored. It was obviously noted that there was a significant difference at $P<0.0001$ in females at different ages. The correlation between calcium ion concentration and TSH was strong (Figure 1).

The calcium ion concentration increased depending on the increase of this hormone. This finding is shown in (Table 1).

Table: (2). Composition of the basal diets (as fed basis) used in the AME digestibility assays**.**

Samples	TSH(MU/L) mean± SD	Ca (MU/L) mean± SD	P- value
34	1.8874 ± 1.49	7.7853 ± 0.97	P<0.0001

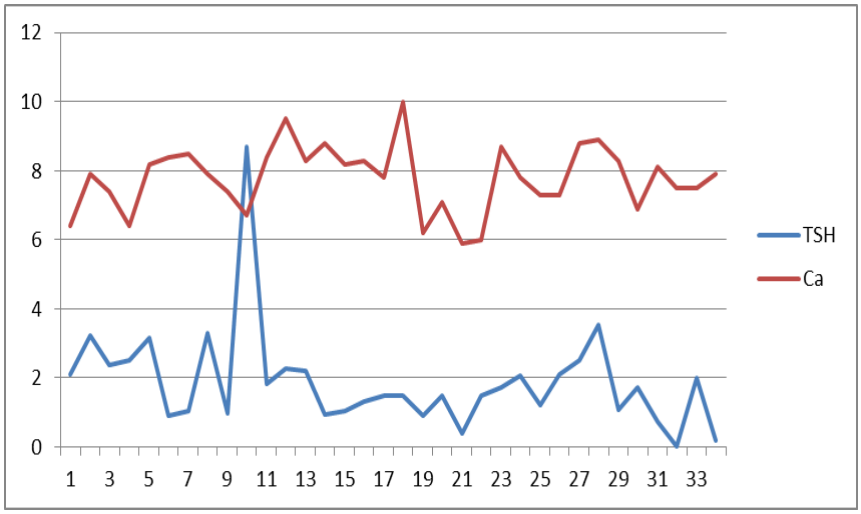

Figure: (1). Correlation between calcium concentration and TSH level in Libyan women.

DISCUSSION

It is known that calcium reduces the activity of the thyroid gland and that its absorption increases the activity of the thyroid gland (Watts, 1989). The secretion of TSH is highly dependent on the concentration of ionized calcium and represents a simple negative feedback loop. However, the level of calcium in the blood drops significantly in patients with elevated TSH concentration in contrast to individuals with normal TSH levels. In addition, renal calcium affected by TSH may decrease in case of hypothyroidism and severe hypothyroidism (Chen & Goodman, 2004). The thyroid gland usually enlarges in response to the increased demand for thyroid hormone that occurs in puberty, pregnancy, iodine deficiency and a viral or genetic immune disorder. In this case, the thyroid follicle synthesis and thyroid hormone will be affected. As a result, high thyroid hormone can lead to Graves' disease or other thyroid abnormalities.

CONCLUSION

In conclusion, the calcium ion concentration increases depending on the increase of TSH in blood.

ACKNOWLEDGEMENT

The authors would like to thank the Dean of the Faculty of Faculty of Arts and Sciences, Tocra Branch, Libya, the Head of Department of Zoology for the facilities provided and help rendered during the study.

Duality of interest: The authors declare that they have no duality of interest associated with this manuscript.

Author contributions: Contribution is equal between authors.

Funding: No specific funding was received for this work.

REFERENCES

Aaron. R. M, & Robert. B. S. (2009). Thyroid hormone in cardiac surgery. *Journal of Pharmacology*, 11(9), 49-60.

Bongard, F. S., Sue. D. Y, & Vintch. J. R. (2008). Current diagnosis and treatment critical care, New York: McGraw Hill/Lange, p. 51.

Boron. W. F, & Boulpaep. E. L. (2012). Medical Physiology, *Philadelphia: Saunders*, p. 1052, ISBN 978-1-4377-1753-2.

Chen, A., & Goodman, W. (2004). Role of the calcium-sensing and extracellular calcium signalling. *Am J Physiol Renal Physiol*, 286, 1005-1011.

Guyton. C, & Hall. J. E. (2011). Textbook of medical physiology, *Philadelphia: Elsevier Saunders*.

Kumar, R. (1995). Calcium metabolism. *The Principles and Practice of Nephrology*, 964-971.

Nix. S, & William. S. (2009). Basic nutrition and diet therapy," St. Louis: Mosby/ Elsevier, p. 126.

Sharan, K., Siddiqui, J., Swarnkar, G., & Chattopadhyay, N. (2008). Role of calcium-sensing receptor in bone biology. *Indian Journal of Medical Research*, 127(3), 247-286.

Watts, D. L. (1989). The nutritional relationships of the thyroid. J. *Orthomol*. Med, 4(3), 165-169.