



RESEARCH ARTICLE

Effect of *Salvia officinalis* on Thyroid Gland Function in Male Rats

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*Clinical and Laboratory Department, College of Pharmacy, University of Al-Qadisiyah /Iraq.****Corresponding Author:** Ihsan Raisan Ibrahim**Abstract**

The objective of the current study is to evaluate the protective role of *Salvia officinalis* extract against carbimazole that induce hypothyroidism. Experimental albino rats were divided into four groups, first group considered as a control group. While other three groups administrated *Salvia officinalis* extract, carbimazole and *Salvia officinalis* extract and carbimazole respectively. Rats were scarified at the end of experimental and blood samples collected. T₄, T₃ and TSH levels were assayed and data underwent statistical analysis. Results showed that T₄ and T₃ levels significantly increased in rat's administrated *Salvia officinalis* extract compared to the control group. While carbimazole significantly reduced these hormones in comparison with other groups. On the other hand, treatment rats with *Salvia officinalis* and carbimazole increase T₃ and T₄ significantly. TSH significantly elevated in rats treated with carbimazole compared to groups treated with *Salvia officinalis*, carbimazole and *Salvia officinalis* respectively. It's concluded that *Salvia officinalis* reduced effects induced by carbimazole in thyroid function.

Keywords: *Salvia officinalis*, Thyroid hormones, Carbimazole.**Introduction**

Thyroid hormones have important role in normal development, particularly development of central nervous system also act to maintain metabolic homeostasis. Hypothyroidism is the most common thyroid disorder, it result from iodine deficiency, autoimmune and pituitary and hypothalamus failure [1]. Patients with hypothyroidism revealed memory impairment and depression [2]. Hypothyroidism can also affects bone growth [3] in addition, low thyroid activity may affects several process which cause pathogenesis of cardiovascular disease, beyond effects on lipoproteins [4].

Hypothyroidism is subnormal thyrotropin level with increased T₃ or T₄ [5]. The most common type of hypothyroidism is Graves' disease and the others are solitary toxic adenoma and toxic mutltinodular goiter [6]. Carbimazole is the drug which used in treatment of hyperthyroidism [7]. Carbimazole can cause complication such as hepatotoxicity and jaundice [8].

Therapeutic dose of during pregnancy and lactation resulted in changes of thyroid microstructure in newborns [9]. *Salvia officinalis* is a member of lamiaceae family, however it has a long history of culinary and medicinal uses [10]. Aqueous extraction of *Salvia officinalis* contains diterpens, flavonoids, phenolic acids and volatile fatty acids [11]. *Salvia officinalis* is used for treatment of Alzheimer's disease [12], also has antibacterial activity [13].

In addition, *Salvia officinalis* has beneficial effect in diabetic patients [14], and it has anti-inflammatory properties [15], Nicotinic activity [16] and anticancer [17]. *Salvia officinalis* improve memory and cognitive function [18] and antioxidant activity [19].

Salvia officinalis prevents induced cardiac and toxicity [20]. also has protective effect in liver and kidney in rats [21]. The present study was performed to evaluate the role of *Salvia officinalis* in thyroid function in rats treated with carbimazole.

Materials and Methods

Laboratory Animals

Twenty albino male rats, weighing 120- 140 g with age 10-12 weeks were used in the current study. Rats were kept under standard laboratory condition. At temperature (22±2) C° and lighting cycle (12-12 hr/ day) and were left for two weeks before the experiment for acclimation .Rats were given standard diet and water ad libitum.

Preparation of Salvia officinalis extract

Salvia officinalis extract was prepared by adding 200 ml of boiling water on 4 g of dried plant and allowing sleeping for 5 minutes according to [22].

Carbimazole Preparation

Carbimazole was obtained from chemical industries development company, Egypt .Ten mg of Carbimazole tablets was dissolved in 100 ml distilled water to obtain concentration (0.1) mg/ml .Carbimazole was given to rats in dose 0.05 mg/kg by using stomach tube.

Experimental Design

Rats were randomly divided into four groups, five rats in each group:

Control group: rats were given drinking water for 14 days.

Group I: rats were given Salvia officinalis extract instead of drinking water for 14 days.

Group II: carbimazole was given orally at dose 0.05 mg/kg for 14 days.

Group II: rats were administrated with carbimazole orally at dose 0.05 mg/kg then given Salvia officinalis extract for 14 days.

Collection of Samples and Hormonal Assay

Blood samples were obtained by heart puncture. Sampels centrifuged at 3000 rpm for 15 minutes. Sera were kept in -20 C° until use .Serum T3, T4 and TSH levels were estimated by using kits produced by Biomerieux, France.

Statistical Analysis

All data were expressed as means ± standard Error; data were analyzed by one-way-analysis of variance. The statistical analysis performed by using SPSS (version 20). P value (< 0.05) was determined for evaluating the significant differences.

Results

Statistical analysis showed that thyroid hormones T3 and T4 significantly (p < 0.05) increased in rats which administrated Salvia officinalis extract. Compared to a control group. As observed in Table (1) there was significant (p < 0.05) decreased in T3 and T4 level in group treated with carbimazole compared to other group.

Regarding effect of Salvia officinalis in rats which administrated with carbinazole, results reveals significant (p < 0.05) increase in T3 and T4 levels in comparison with group treated with carbimazole.(Table,1; Figures 1 and 2) On the other hand, TSH level significantly (p < 0.05) decreased in group treated with carbimazole in comparison with a control group, while TSH level significantly increased in rats treated with both Salvia officinalis extract and carbimazole compared to rats treated with carbimazole only (Table,1 Figure3).

Table 1: levels of T3, T4 and TSH in rats treated with Salvia officinalis and carbimazole

Group	T3 ng/ml	T4 ng/ml	TSH μ IU / ml
Control	0.67±0.014 (a)	21.56± 1.48 (a)	0.017± 0.002 (ac)
Group I	0.82±0.029 (b)	28.23± 1.14 (b)	0.014± 0.002 (a)
Group II	0.53±0.026 (c)	13.43± 1.12 (c)	0.019± 0.001 (bc)
Group III	0.73±0.031 (a)	18.50± 0.55 (a)	0.013± 0.0015 (a)

All data represented as mean ± S.E.

Different letters refer to significant differences (p < 0.05)

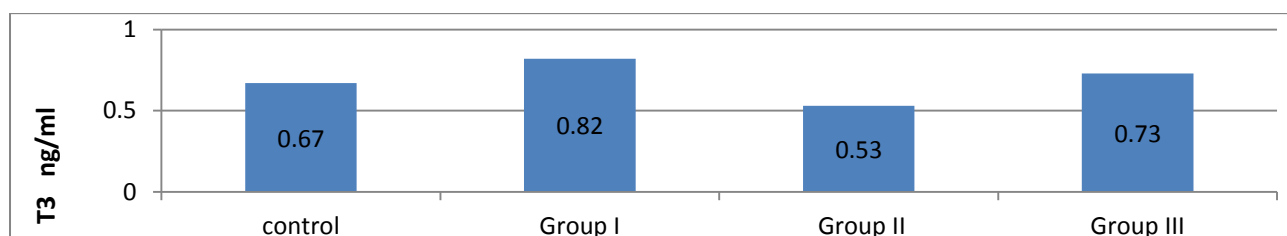


Figure 1: level of T3 in rats treated with Salvia officinalis extract and carbimazole

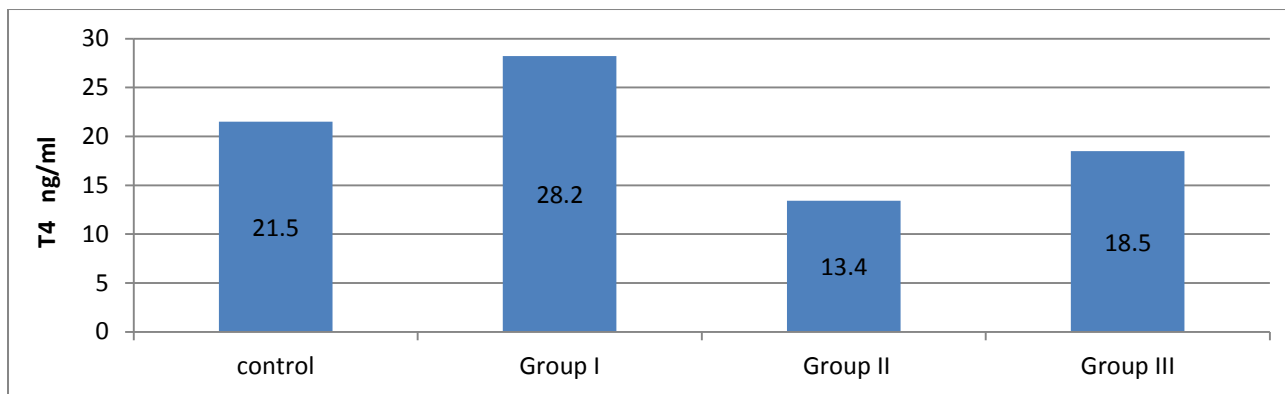


Figure 2: level of T4 in rats treated with *Salvia officinalis* extract and carbimazole

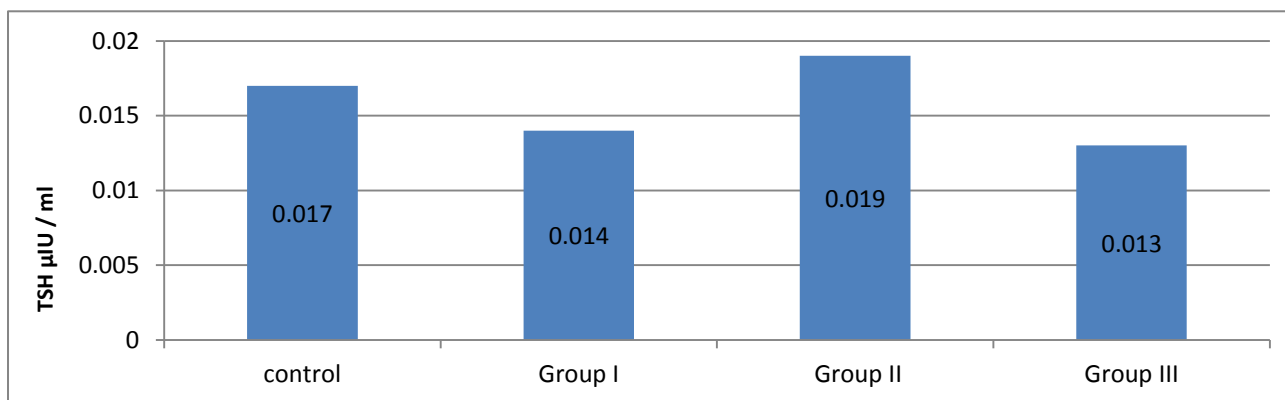


Figure 3: level of TSH in rats treated with *Salvia officinalis* extract and carbimazole

Discussion

In the present study, there was significant decrease in the level of thyroid hormones following administration of carbimazole for 14 days. Carbimazole is an anti-thyroid drug, which reduce the formation of thyroid hormones, it was reported that carbimazole is converted to methimazole which inhibits activity of thyroid peroxidase [23, 24] indicated that methimazole keeps thyroid peroxidase from iodinating tyrosin, thus reducing levels of T₃, T₄ [25].

Reported that treatment of rabbits with carbimazole decreased the distribution of thyroglobulin inside thyroid follicles, thus reducing thyroid hormones biosynthesis. On the other hand, reduced thyroid hormones may be resulted from carbimazole Induced oxidative stress [26]. Mentioned that carbimazole may increase lipid peroxidase in thyroid gland. In addition, hypothyroidism accompanied with disturbance in antioxidant defense system, and this represented in reduced antioxidants and elevated malondialdehyde MDA [27, 28] indicated that oxidative stress was correlated with genotoxicity that resulted in tissue damage.

These studies above, agree with the results of current study represented in T₃ and T₄ level in rats treated with carbimazole .On the other hand, thyroid stimulating hormones TSH significantly decreased in rats enriched with *Salvia officinalis* extract. Regarding effect of *Salvia officinalis*, there was significant elevation in T₃ and T₄ level compared to other groups [29].

Concoluted that *Salvia officinalis* has stimulating increase T₃ and T₄ level in rats with the present study. On the other hand, *Salvia officinalis* has scavenging activity against reactive oxygen species and inhibits lipid peroxidase [30].Rats administrated with *Salvia officinalis* led to improvement in superoxide dismutase SOD, catalase and glutathione GSH level, resulting increase in antioxidant activity [18, 31] mentioned that flavonoids of *Salvia officinalis* had high antioxidant activity, therefore *Salvia officinalis* scavenging free radicals.

The accumulation of *Salvia officinalis* radicals result in alteration in gene expression of antioxidant enzyme [32]. Oxidative stress was correlated with genotoxicity that resulted in tissue damage.

On the other hand *Salvia officinalis* possessed antioxidant protection by increase the resistency of liver cells against induced oxidative stress in rats [33]. In addition, [34] reported that *Salvia officinalis* has chemo protective role against genotoxins. *Salvia officinalis* reduced oxidative damage by carbimazole resulting in improvement T3 and T4 level in the current study.

Conclusion

Salvia officinalis has stimulating and protection activity in thyroid gland activity, also reduced the hypothyroid induced by carbimazole.

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