

Potassium Levels in Sudanese Female with Hypothyroidism

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Abstract:

A case control study was conducted during the period from February 2015 to August 2015 to estimate serum levels of potassium in 40 Sudanese females with hypothyroidism from Khartoum state as test group & 40 healthy volunteers as control group.

Age & sex of test group matched with control group, colorimeter & reagent from Spectrum Company used to estimate potassium levels. Levels of thyroid hormones were taken from record of El- ribat university hospital.

Statistical Package of Social Science (SPSS version 11.5) computer software, independent sample t-test & correlation used for data analysis.

Independent sample t-test show no significant difference between mean of potassium levels in females with hypothyroidism compared to control group.

Statistical analysis shows there is no significant correlation between potassium levels and TSH, T4, T3 and age.

Our recommendation is to study the effect of hypothyroidism on potassium levels in different stages of disease.

Key words: Potassium Level, Sudanese Female, Hypothyroidism

Introduction:

The thyroid gland disorders are the most abundant endocrine disorder in world second only to diabetes mellitus, and the most common presentation of thyroid disorders are thyrotoxicosis (hyperthyroidism), hypothyroidism and goiter.^{1, 2}

According to serum level of thyroid hormones the thyroid disorders can be classified into hypothyroidism and hyperthyroidism. The prevalence and incidence of thyroid disorders are influenced primarily by sex and age. Thyroid disorders are more common in women than men and in older adults compare with younger groups.³

The thyroid hormones play important role in the body metabolism also affect the blood volume, the plasma arginine vasopressin levels are increase in patients with hypothyroidism and doesn't change in the upright position under the influence of a low sodium diet.⁴

Hypothyroidism is associated with fluid retention and generalized edema, increase Anti Diuretic Hormone(ADH) , decrease Atrial Naturetic Hormone (ANH), and decrease Renine angiotensin –aldosterone system (RAAS) this will affect water and electrolytes metabolism.⁵

According to the previous studies about effect of thyroid hormones on renal function and electrolytes this study is conduct to evaluate the serum levels of potassium in hypothyroidism patients.

MATERIALS AND METHODS

Study design:

This analytical case control hospital based study.

Study area and period:

This study was conducted in Khartoum state during the period from February to August 2015.

Study population and sample size:

This study included forty females with hypothyroidism as case group and forty healthy volunteers as control group.

Inclusion criteria:

Sudanese females with hypothyroidism.

Exclusion criteria:

Any patient with renal failure, diabetes mellitus, cardiac disease, hypertension, dehydration and drug effect on potassium concentration were excluded from this study.

Data collection and clinical examination:

Demographic data of patients and results of thyroid function tests were obtained from the record of El-rebat university hospital using questionnaire.

Sample collection:

Venous blood samples (5ml) were collected by standard procedure from the case and control groups into sterile plane containers to estimate potassium levels.

Data analysis:

Data were analyzed by using computer software program statistical package of social science version 11.5 independent sample T test and correlation were used.

Ethical considerations;

Oral consent was taken from people participate in this study.

Quality control:

This method was compared with calibrated standard method and calibrated reagents using control sample give same result as external quality control.

Estimation of Thyroid Function Tests:

Thyroid function test (TFT) profile has collected from the record in El-rebat University Hospital according to the questionnaire.

Reference values:

TSH: (0.27-4.2uIU/ml).

T3: (0.8-2.0 ng /ml).

T4: (5.1-14.1ug/dl).

ESTIMATION OF POTASSIUM:

Principle:

In alkaline pH potassium ions and Tetra Phenyl Borate (TPB) form a turbid emulsion, the increase of which can be measured quantitatively in photometer at 578nm; The increase of absorbance (A) is directly proportional to the concentration of potassium in sample. ⁶

Instruments:

Potassium has been estimated by turbidmetric method from Spectrum Company using colorimeter device.

Procedure:

See in the appendix.

Reference value:

Serum:3.6-5.5mmol/l

RESULTS

A group of 40 females with hypothyroidism involved in this study as case group ,other 40 healthy volunteers as control group were in rolled in this study and the Result were analyzed using independent sample test SPSS.

Table 3.1: shows age frequencies.

Table 3.2: shows for potassium (P. Value 0.873) insignificant, for T3 (P. Value 0.168) insignificant that means there was no significant difference between case and control mean and for T4 (P. Value 0.000) significant and for TSH (P. Value .000) significant that means there was difference between case and control.

Figure 3.1: Scatter plots show insignificant weak positive correlation between potassium concentration and TSH level.

Figure 3.2: Scatter plots show insignificant weak positive correlation between potassium concentration and T4 level.

Figure 3.3: Scatter plots show insignificant weak negative correlation between potassium concentration and T3 level.

Figure 3.4: Scatter plots show insignificant weak negative correlation between age and K⁺ concentration.

Figure 3.5: Scatter plots show insignificant weak negative correlation between age and T4 concentration.

Figure 3.6: Scatter plots show insignificant weak positive correlation between the age and TSH concentration.

Figure 3.7: Scatter plots show insignificant weak positive correlation between the age and T3 concentration.

Table (1): Age frequencies

Age group	Frequency	Percent
Less than 30 years	9	22.5
30 – 45 years	18	45
More than 45 years	13	32.5
Total	40	100

Table (2): Mean difference between patients and control

		N	Mean	Std Deviation	P value
Potassium (mmol/l)	Case	40	4.123	0.8908	0.873
	Control	40	4.093	0.7757	
T3 (ng/ml)	Case	40	1.0088	0.39098	0.168
	Control	40	1.1350	0.41982	
T4 (ug/dl)	Case	40	5.8715	2.41917	0.000
	Control	40	7.6940	1.52895	
TSH (uIU/ml)	Case	40	25.1878	30.58042	0.000
	Control	40	1.5348	0.81971	

Independent samples t- test (significant p value less than 0.05)

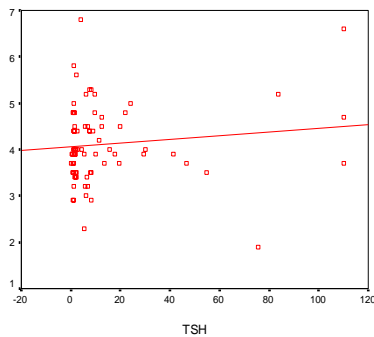


Figure (1) scatter plot of the correlation between potassium concentration (mmol/l) and TSH level (uIU/ml). ($r=0.121$, p . value= 0.283)

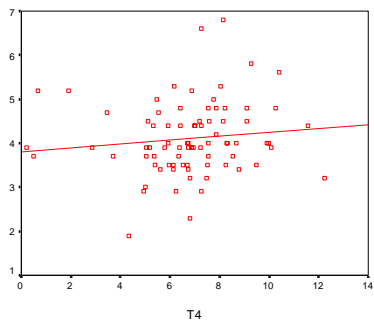


Figure (2) scatter plot of the correlation between potassium concentration (mmol/l) and T4 level (ug/dl). ($r=0.118$, p . value= 0.299)

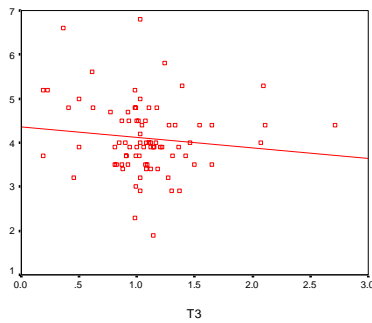


Figure (3) scatter plot of the correlation between potassium concentration (mmol/l) and T3 level (ng/ml). ($r=-0.118$, p . value= 0.296)

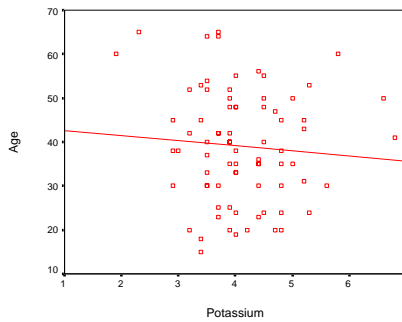


Figure (4): scatter plot of the correlation between potassium concentration (mmol/l) and age. ($r= -0.077$, p . value= 0.496)

DISCUSSION:

Hypothyroidism is a condition in which the body suffers from insufficient thyroid hormone.⁷

Thyroid hormones act as central regulator of various body functions i.e. metabolism and hemodynamic. So it has an influence on renal hemodynamic, glomerular filtration and electrolytes levels but the underlying mechanism is not well understood.⁸

Hypothyroidism is a very common condition seen in women more than men; the higher prevalence of thyroid disease in women suggests that estrogen might be involved in the pathophysiology of thyroid dysfunction.⁹

The study was carried out in February 2015 to August 2015 at Khartoum state in females with hypothyroidism.

Independent sample T test show there was no significant difference between the mean value of potassium in case (4.123 ± 8908) when compared to control (4.093 ± 7757) subjects and (p.value 0.873) and this agree with Murgod *et al*⁷ which were found serum potassium levels in hypothyroid patients were found there was no statistically significant difference (p.value 0.174).

Our findings are contradictory to Mannangi *et al*⁹ were conclude significant increase in potassium levels were seen in females with hypothyroidism compared to control (p. value 0.051).

A study was done by Schawarz C *et al*¹⁰ show no conclusive statement for thyroid function and serum-potassium could be given, because elevated TSH levels were correlated with hyper- as well as hypokalaemia this result justify our result .

Our finding show no significant correlation between age and TSH, T3 and T4 this disagree with Peeters R.P¹¹ which was found that aging results in a decrease in serum TSH and T3 levels, whereas serum T4 levels usually remain unchanged.

Statistical analysis shows insignificant correlation between potassium concentration and TSH level ($r=0.121$, p.value=0.283), T4 level($r=0.118$, p. value=0.299) ,and and T3 level($r=-0.118$, p.value= 0.296).

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