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Effect of Human Hypothyroidism & Hyperthyroidism on Some Electrolytic Minerals and Total antioxidants Capacity

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Introduction:

Hypothyroidism is a clinical entity resulting from the deficiency of thyroid hormones or from their impaired activity (Hallengren,1998)[1].Thyroid hormones perform a wide array of metabolic functions including regulation of lipid ,carbohydrate ,protein and electrolyte minerals metabolisms. These hormones play a critical role in cell differentiation during development and help to maintain thermo genic, minerals and metabolic homeostasis in adult. Hyperthyroidism ,abnormal activity of thyroid gland that leads to mental and physical slowing because of increased basal metabolic rate (Marc *et. al.*,2002)[2].Free radicals and disorders of the antioxidant defense system have a pathogenic impact on human tissues and hence are seen as important factors in the development of various diseases (McCode ,2000;Mahadik*et.al.*,2001)[3].The main free radicals in human tissues are superoxide ,hydroxyl ,hydrogen peroxide , singlet oxygen ,and nitric oxide (Gutteridge ,1995)[4] . Free radicals are produced in the normal cell metabolism, in biochemical reaction involving oxygen , for the purpose of destroying bacteria and other living organisims taken into the cell by phagocytosis (Patil*et al.*, 2006)[5].

Materials & Methods

Calorimetric method was used to determine Na in serum as follows:

Serum was pipetted into clean test tubes and mixed well and was let to stand for 5 minutes at room temperature. Then absorbance were read for A standard and A sample against reagent blank at 630 nm are length.

	Blank	**Standard**	**Sample**
Reagent (R)	1ml	1 ml	1 ml
Standard	---	10 µl	---
Sample	---	---	10 µl

Calculation

Serum Sodium Conc.(mEq/1)=$\frac{A\ sample}{A\ standad}\ x\ 150$

Potassium

Turbidimetric tetraphenylborate (TPB) method was used for potassium measurements in serum by mixing and incubating for 3 minutes at 37 ˚C, and mixed again thoroughly and absorbance's of sample (A sample) and standard (A standard) against blank were read at 630 nm wave length.

	Blank	**Standard**	**Sample**
Reagent (R)	1ml	1 ml	1 ml
Standard	…….	20 µl	…….
Sample	……..	……	20 µl

Calculation

Serum Potassium Conc.(mmol/L)=$\frac{A\ sample}{A\ standad}\ x\ 5$

Calcium

Colorimetric method was used for Calicium measurements in serum as follows:

1. Reagents and sample were brought to room temperature.
2. Pipetted into labeled test tubes and mixed.
3. The tubes were let to stand for 2 minutes at room temperature.
4. Absorbance of the samples (A) and the standard against the reagent blank were read at 570 nm, wave length

The color must remain stable for at least 1 hour.

Tubes	**Blank**	**Sample**	**Cal Standard**
Working reagent	10 mL	10 mL	10mL
Sample	……	10 µL	……
CAL Standard	……	…….	10 µL

Calculations

=$\frac{A\ sample}{A\ standad*Ca\ Standard}$= mg/d L total calcium

Total antioxidant capacity assay

Principle and assay procedure were based:

Dilution buffer, copper solution and stop solution were brought to equilibrate to room temperature prior to running the assay. Both samples and standards were diluted to 1:40 by the provided dilution buffer.

1. 200 µL of diluted samples or standards were placed in each well.
2. The plate was read at 450 nm war length for a reference measurement.
3. To each well 50µL of the Cu solution were added and left incubated for 3 minutes at room temperature.
4. 50 µL of stop solution were added.
5. The plate was read for a second time at 450 nm.

Results

Table (1)Comparison of studied parameters betweenfemale and male patients

parameters	Females			Males		
	Normal	Hypothyroid	Hyperthyroid	Normal	Hypothyroid	Hyperthyroid
Calcium (mmo L/L)level	2.45±0.07 b	1.82±0.33 a	3.05±0.38 c	2.42±0.13 b	1.82±0.52 a	3.04±0.10 c
Potassium(m Eq/L) level	5.05±0.29 b	3.69±0.44 a	5.93±0.51 c	5.20±0.42 b	3.82±0.47 a	6.37±0.50 c
Sodium(m E q/L) level	131.0±3.39 b	116.88±5.24 a	151.70±10.95 c	312.62±2.96 b	114.63±5.44 a	151.0±12.77 c
TAC(pg/d L) level	3.90±0.78 c	2.39±0.94 b	0.65±0.49 a	3.97±1.05 c	2.50±0.96 b	0.89±0.56 a

Different letters indicate significant differences.

The serum calcium level was significantly lower in hypothyroidism female patients compared to control, while it was significantly higher in hyperthyroid females compared to controls, and in males it was significantly lower in hypothyroid male patients and was significantly higher in hypothyroid male patients.

The serum levels of potassium was significantly lower in hypothyroid female patientscompared to control and was higher in hyperthyroidism female patients compared with control, while in male patients it was significantly lower in hypothyroid male patients compared with control and was significantly higher in hyperthyroid male patients compared to control.

In serum levels of Sodium were significantly lower in hypothyroid female patients compared to control, while they were significantly higher in hyperthyroid female patients compared to control. In males it was significantly lower in hypothyroid male patients compared with control, and was significantly higher in hyperthyroid males compared to control. Serum levels of total antioxidant capacity were significantly lower in hypothyroid female patients compared with control and was significantly lower in hyperthyroid females compared with control, while in males it was significantly lower in hypothyroid males compared to control and was significantly lower in hyperthyroid males compared with control.

Discussion

Thyroxin normally regulates blood electrolytes and when less thyroxin level in the blood stream exist, less thyroxin enters the cells and less calcium is released (Roopa & Gladys , 2012)[7].Our results agreed with (Abbas *el . al*.,2013)[8] who found changes in serum electrolytes .The association between thyroid function and electrolyte disorders seems to exist ,although it is probably only relevant in marked hypo-hyperthyroidism (Christoph *et. al*.,2012)[9]and in male the results table (1) showed that calcium was being higher in hyperthyroidism and lower in hypothyroidism than normal males which may be due to the involvement of T4 and T3 in the metabolism of body cells .The decrease in hypothyroidism is in agreement with results by (Roopa& Gladys ,2012)[7].Thyroid dysfunction may cause marked changes in the absorption , metabolism and excretion of calcium in both men and other mammals (Abbas *et. al*.,2013)[8].

The serum sodium changes agree with the results obtainment by (En –ZhiJia *et. al*.,2007)[10].In general , the changes in serum electrolytic (Na, Ca, K) are consistent in the direction of change (elevation with hyperthyroidism and reduction with hypothyroidism found by (Suneel *et. al*.,2011)[11].

The cause of higher total antioxidant capacity (TAC) in hyperthyroidism patients was probably because of increased production of free radicals (Saeed *et. al*.,2014)[12] and the TAC decrease in hypothyroidism patients was probably caused by increased body lipid (V-LDL ,LDL,TG) and increased Malondialdehyde (MAD) in body cell which is anatural product of peroxidation of unsaturated fatty acids. Chronic hypothyroidism is characterized by failure of the redox potential that release free radicals chain reaction and metabolic suppression of antioxidant capacity (Komosinka –Vassev *et. al*.,2000)[13].The reduction of TAC in hypothyroidism patients reflects increased oxidative stress which is associated with early aging and a precipitating factor of many anomalous metabolic reactions (Bhawna Bhimte *et. al*.,2001)[14-16].

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