PREVALENCE OF THYROID DYSFUNCTION AMONG LOCAL INHABITANTS IN NILE STATE, NORTHERN SUDAN

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Abstract

This study aimed the assessment the prevalence of the thyroid dysfunction among local inhabitants in Nile State, who visited Shandi Teaching Hospital during June to August 2014, presented with thyroid hormones abnormalities symptoms.During this period one hundred and thirty six patients(116 females: 20 males) had visited Shendi Hospital suffering from thyroid dysfunction presented with different clinical features. Blood samples collected and T3,T4 and TSH were estimatedby using commercial *Human Gesellschaft* kits and ELISA. Study participants were diagnosed (61%) as euthyroidism , (24 %) with hyperthyroidism and (13%) were hypothyroidism**.** Mean values for Thyroxine(T_4) were (8.7±3.40), (2.6±1.57), (13.4±3.41) µg/dl. Triiodothyronine(T_3) were (1.5±1.27),(0.7±0.90),(3.3±2.00) ng/dl. While, serum Thyroid Stimulating Hormone (TSH) concentrations were (3.3±4.53),(24.3±2.63),(0.16±0.20) µU/ml for Euthyroidism, Hypothyroidism and Hyperthyroidism respectively**.** This study showed that (100%) of the illiterate participants neither aware nor consume iodized salt. In contrast, (11%) of those who have general education and (90%) of graduated participants reported their awareness of iodized salt.While, consumption of iodized salt documented for 2% in those who have general education compared to 16% who have higher education**.** Most of thyroid dysfunction patients in this study had euthyroidismdue to dietary iodine deficiency.In addition tomost of endogenous people neither aware norhad never consumed the iodized salt. The prevalence of thyroid hormones abnormalities is more predominant among females.Health promotion program should be established by health authorities to educate local inhabitants regarding the iodized salt to tackle the iodine deficiency diseases among local community.

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Introduction

The incidence of thyroid dysfunction was increase in the last years which may affect other organs causing abnormalities including cardiac and skeletal muscle problems, many people may die from the heart attack and/ or become unable to do work (Wendy,2009). Thyroid hormones play a particularly crucial role in brain maturation during fetal development (Kester,2004). They also play a vital role in normal human physiology with effects on almost all tissues to influence growth and development, maintain normal cognition, cardiovascular function, bone health, metabolism and energy balance. In recent times the understanding of the important influence that genetics play in normal and abnormal thyroid function has led to a greater knowledge of the intricacies of thyroid hormone action, differences between individuals and resultant disease (McLeod, 2010).

The primary function of the thyroid is production of the hormones triiodothyronine (T_3), thyroxine (T_4), and calcitonin. Up to 80% of the T_4 is converted to T_3 by peripheral organs such as the liver, kidney and spleen. T_3 is several times more powerful than T_4, which is largely aprohormone, perhaps four (Danish,2005) or even ten times more active (Stephen,2001).Thyroxine (T_4) is synthesised by the follicular cells from free tyrosine and on the tyrosine residues of the protein called thyroglobulin (Tg). Iodine is captured with the "iodine trap" by the hydrogen peroxide generated by the enzyme thyroid peroxidase (TPO)(Ekholm,1997) and linked to the 3' and 5' sites of the benzene ring of the tyrosine residues on Tg, and on free tyrosine. Upon stimulation by the thyroid-stimulating hormone (TSH), the follicular cells reabsorb Tg and cleave the iodinated tyrosine from Tg in lysosomes, forming T_4 and T_3 (in T_3, one iodine atom is absent compared to T_4), and releasing them into the blood. Deiodinase enzymes convert T_4 to T_3(Bianco,2002) Thyroid hormone secreted from the gland is about 80-90% T_4 and about 10-20% T_3(Nawaz,2012&Stephen,2001).While, TSH production is blunted by somatostatin also called somatotropin releasing-inhibiting hormone (SRIH), rising levels of glucocorticoids and sex hormones (estrogen and testosterone), and excessively high blood iodide concentration (Jack,2002).

Imbalance in production of thyroid hormones arises from dysfunction of the thyroid gland itself, the pituitary gland, which produces thyroid-stimulating hormone (TSH), or the hypothalamus, which regulates the pituitary gland via thyrotropin-releasing hormone (TRH).(Surks, *et al.* 2007).

The most common presenting clinical features of thyroid disease are the result of hypothyroidism, hyperthyroidism and goiter. (Bennett and Brown 2003&Martin andcrook, 2006).

To the best of our knowledge there is lack of information regarding the prevalence of Thyroid dysfunction among local inhabitants in Nile State in Sudan.This study aims to assess thyroid functions of hospital patients presenting with thyroid symptoms

Materials and Methods

Study area and population

Nile state, Northern Sudan, data collected from patients visitedShandi Teaching hospital with thyroid dysfunction symptoms during the period of June to August 2014

Study Objective

Assessment the prevalence of the thyroid dysfunction among local inhabitants inNile State, whovisited Shandi Teaching Hospital,presented with thyroid hormones abnormalities symptoms.

Ethical consideration

An informed consent, aims and benefits of this study were explained to the participants**.** Authors declare that there is no conflict of interest.

Specimen collection

Sample was collected under aseptic condition 5ml of blood was obtained from each study participant.

Assessment of thyroid hormones andTSH

Serum thyroid hormones and TSH concentrations of patients were measured by using commercial *Human Gesellschaft* kitsand ELISA.

Questionnaire: Including information about sex, prominent features of patients and iodized salt consumption.

Statistical analysis

The data was analyzed by using Statistical Package for Social Sciences (SPSS), Windows version16, 2012 SPSS, Inc, Chicago, IL, and USA. Percentage in addition to mean and standard deviation were calculated.

Results

During the study period one hundred and thirty six patients(116 females :20 males) had visitedShendi Hospitalsuffering from thyroid dysfunction presented with different clinical features were diagnosed (61%) as euthyroidism, (24 %) withhyperthyroidism and (13%) werehypothyroidism(Table1)

Distribution of thyroid dysfunction among study population (Table 1)

Euthyroidism	Hyperthyroidism	Hypothyroidism
61%	24 %	13%

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This study showed Mean values for Thyroxine(T_4) were (8.7±3.40),(2.6±1.57), (13.4±3.41) µg/dl.Triiodothyronine(T_3) were (1.5±1.27),(0.7±0.90),(3.3 ±2.00)ng/dl. While, serum Thyroid Stimulating Hormone (TSH) concentrations were(3.3±4.53),(24.4±2.63),(0.16±0.20) µU/ml for Euthyroidism, Hypothyroidism and Hyperthyroidism respectively (Table 2)

Mean and standard deviation of thyroid hormones and TSH of study participants Table (2)

Hormone	Euthyroidism Mean ±SD	Hypothyroidism Mean ±SD	Hyperthyroidism Mean ±SD
Thyroxine (T_4) µg/dl	8.7±3.40	2.6±1.57	13.4±3.41
Triiodothyronine (T_3)ng/dl	1.5±1.27	0.7±0.90	3.3±2.00
Thyroid Stimulating Hormone (TSH)µU/ml	3.3±4.53	24.4±2.63	0.16±0.20

This study showed that (100%) of the illiterate participants neither aware nor consume iodized salt. In contrast, (11%) of those who have general education and(90%) of graduated participants reported their awareness of iodized salt.While,consumption of iodized salt documented for 2% in those who have general education compared to 16% who have higher education(Table 3).

Educational level of study population and their awareness of iodized salt Table (3)

Education level	*Do you know iodized salt?*		*Do you use it?*	
	Yes (%)	**No (%)**	**Yes (%)**	**No (%)**
Illiterate	0.0	100	0.0	100
General education	11	89	2	98
Graduate and post graduate	90	10	16	84

Discussion

Euthyroidism patients showed serum hormones levels slightly beneath the lower limit of the normal range this could be due to compensation of the iodine deficiency by the thyroid gland. The suggested mechanism is that decrease in the thyroid hormones production lead to increase TSH production, which leads to compensatory hyperplasia of the thyroid gland resulting in hormone levels becoming normal with enlargement of the gland. This euthyroidism is not exclusively iodine dependent as many factors as medications may have a role.

Hypothyroidism phenomenon might be due to the impact of iodine deficiency as main factor.A marked reduction can be observed in T_4 level in these patients.Despite the deficiency state in the hypothyroidism, the T_3 level showed mild reduction (lower limit of normal range) and this might explain the metabolism of $T_4$and itsdeiodination to T_3. Moreover, high TSH mean level could be observed due to continuous pituitary stimulation by lower levels of thyroid hormones. Variations in TSH level among the three studied groups. It was high in euthyroid group, and this explains variable levels for stimulation of thyroid hormones. On the other hand the TSH standard deviation was low in hyperthyroid group, since inhibition of TSH secretion.These results also documented by Danish, (2005)&Chakera,(2012)&Gaberscek,(2011) This high TSH level

resulted in goiter development with no effect on thyroid hormones, may be due to iodine deficiency.Iodine deficiency is the most common cause of hypothyroidism worldwide, in iodine-replete individuals hypothyroidism is frequently caused by Hashimoto's thyroiditis, or otherwise as a result of either an absent thyroid gland or a deficiency in stimulating hormones from the hypothalamus or pituitary.

Most of infected participants are females this could be justified by the findings obtained by Lazarus,(2002)&Galofre, and Davies (2009) who citedHypothyroidism can result from postpartum thyroiditis up to 9 months after giving birth, characterized by transient hyperthyroidism followed by transient hypothyroidism. The syndrome is seen in 5 to 9% of women. The first phase is typically hyperthyroidism; the thyroid then either returns to normal, or a woman develops hypothyroidism. Of those women who experience hypothyroidism associated with postpartum thyroiditis, 25 to 30% will develop permanent hypothyroidism requiring lifelong thyroxine replacement therapy.

Hyperthyroidism patients revealedclassic characterization of hyperthyroidism that reported by Klooman, *et al*.,(2009) &Gharib, (2010)who reportedamong the several types of hyperthyroidism, the most common are Graves' disease ,toxic multinodular goiter, and iatrogenic disease .The typical profile for primary hyperthyroidism is low TSH and a high free T4 level. In some cases of hyperthyroidism, the profile is low TSH, normal T4, and high T3 levels.

Conclusion

Most of thyroid dysfunction patients in this study hadeuthyroidism,as reflectedasmild reduction in thyroid hormones level due to dietary iodine deficiency. The prevalence of thyroid hormones abnormalities is more predominant amongfemales rather than males.Most of endogenous inhabitants had never consumed the iodized salt.

Recommendations:

Health promotion program should be established by health authoritiesto educate Nile state population regarding the iodized salt to tackle the iodine deficiency diseases among local community.

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