PREVALENCE OF SUBCLINICAL THYROID DISORDERS AND ITS CORRELATION WITH AGE AND SEX, AMONGST NIGERIANS RESIDING WITHIN ABAKALIKI METROPOLIS

Eteudo Albert N.,[1]Agu-Eduzor S.,[2]Azi Simon O.,[3]*Uraku A. J.[4] *Igwe Chibueze C.,[5]Daniel Lawrence E.,[6]

[1]Head of Department, Department of Anatomy, Ebonyi State University, Abakaliki, Ebonyi State, Nigeria. E-mail: eteudoan@yahoo.com;
[2]Head of Unit, Chemical Pathology Unit, Federal Teaching Hospital, Abakaliki, Ebonyi State, Nigeria. Email: stellaeduzor@gmail.com;
[3]Department of Medical Laboratory Science, Ebonyi State University, Abakaliki, Ebonyi State, Nigeria. E-mail:azisimon2007@gmail.com;
[4]Department of Biochemistry, Ebonyi State University, Abakaliki,Ebonyi State, Nigeria. Email: urakuaj@yahoo.com;
[5]Federal Teaching Hospital, Abakaliki,Ebonyi State, Nigeria. E-mail: scientistigwe@gmail.com;
[6]Department of Applied Biology, Ebonyi State University, Abakaliki,Ebonyi State, Nigeria. E-mail: larryeffiongdaniel@gmail.com

Abstract

Introduction: The prevalence and incidence of thyroid disorders is influenced primarily by sex and age. Age and sex significance in the prevalence of subclinical thyroid disorders among Nigerians residing within Abakaliki metropolis was established in the study.

Materials and methods: A total of 182 blood samples of patients who visited Federal Teaching Hospital, Abakaliki between January, 2014 and June, 2015 for thyroid disorder test. Serum TSH, T4 and T3 were assayed using ADALTIS Auto Analyzer by ELISA immunoassay based method.

Result: The overall prevalence of subclinical hyperthyroidism and subclinical hypothyroidism in the study were 14.3% and 4.4% respectively. The female to male ratio of 5.83:1 was found in the study. The prevalence of subclinical hyperthyroidism with respect to gender was 2.2% for male and 12.1% for female. All the subclinical hypothyroidism subjects were female. The difference in prevalence of subclinical hypothyroidism and subclinical hyperthyroidism among

the subjects in relation to gender was not statistically significant ($p>0.05$). Subjects within age group 21-30 years and those above 50 years had the highest prevalence of SCR (5.5% each). The difference in prevalence of subclinical hyperthyroidism and subclinical hypothyroidism was dependent on age ($p<0.05$).

Discussion and Conclusion: Prevalence of subclinical thyroid disorders is dependent on age but does not depend on gender.

***Keywords*: Hyperthyroidism, Hypothyroidism, TSH, Thyroxine, Triiodothyronine**

Corresponding author: Igwe C.C., scientistigwe@gmail.com

INTRODUCTION:

The thyroid gland, located immediately below the larynx on each side of and anterior to the trachea, is one of the largest of the endocrine glands, normally weighing 15 to 20 grams in adults (Guyton and Hall,). Thyroid gland hormones mediate in lots of biological functions ranging from body metabolism to maintenance of body homeostasis (Rubina *et al*., 2010). Thyroid disorder is a broad term encompassing several different diseases involving thyroid hormones and the thyroid gland. Thyroid disorders are commonly separated into two major categories, hyperthyroidism and hypothyroidism, depending on whether serum thyroid hormone levels (TSH, T4 and T3) are increased or decreased, respectively (De Ruiter, 2002).

Subclinical hyperthyroidism is defined by low or undetectable serum thyroid-stimulating hormone (TSH) levels, with normal thyroxine (T4) and triiodothyronine (T3) levels (Surks *et al*.,2004).Subclinical hyperthyroidism can be divided into two categories: low but detectable TSH levels (0.1 to 0.4 µIU/ml), and suppressed TSH levels (less than 0.1 µIU/ml) (Surks *et al*., 2004). Hypothyroidism is characterized by low serum level of T4 and T3, and increased serum level of TSH (Cramer *et al*., 2003). Increased serum level of TSH is as a result of negative feedback effect of reduced level of T4 and T3. This low level induces the increased secretion of thyrotropin releasing hormone (TRH), TRH then stimulates thyrotrophs and lactotrophs thereby increasing the level of thyroid stimulating hormone (TSH) (Cramer *et al*., 2003).

Thyroid disorders are common, with variable prevalence among different populations (Taylor, 1968; Anidi *et al.*, 1986; Akhter and Hassan, 2009).The prevalence and incidence of thyroid disorders is influenced primarily by sex and age. Thyroid disorders are more common in women than men, and in older adults compared with younger age groups (Rubina *et al.*, 2010). Though the prevalence of thyroid dysfunction has been well documented but there is no non record of its prevalence among residence of Abakaliki, hence, the need for the present study.

METHODOLOGY:

Study area and population: This was a retrospective study carried out among residence of Abakaliki who attended Federal Teaching Hospital, Abakaliki between January, 2014 and June, 2015. The study includes all the patients that visited the hospital for the test within the period of this study. Oral consent of the subjects was sort and obtained before their inclusion in the study.

***Ethical approval*:** The consent of the ethical committee, Federal Teaching Hospital, Abakaliki (through the Head of Unit, Chemical Pathology Unit, FETHA 1) was sort and obtained. Demographic characteristics, like age, sex etc, of the subjects were extracted from the subjects' request form using a structured proforma.

Laboratory examination: Blood specimen was obtained from the subjects and was allowed to clot for 30-60minutes at room temperature. The serum was separated from the sample after centrifugation at 3000rpm for 10minutes. The specimens were kept frozen at -20^{o}C until analyzed. Serum TSH, T4 and T3 were assayed using ADALTIS Auto Analyzer by ELISA immunoassay based method. The principle of the assay is based on the principle of a solid phase enzyme-linked immunosorbent assay. In the present study, thyroid disorder was classified based on the reference range of TSH (0.4-6.0 µIU/ml), T4 (5-13.0 µg/dl) and T3 (0.6-2.1 ng/ml) (Reference range used in Federal Teaching Hospital, Abakaliki, as at the time of this publication).

***Statistical analysis*:** The data obtained was organized and presented using graphical presentation and simple frequency table. The prevalence of the disorders was established with respect to sex and age. Test of significance was determined using Kruskal-Wallis H test. P values < 0.05 were considered statistically

significant. All analysis was done using SPSS (Statistical Package for Social Sciences) version 16.0.

RESULT:

Out of 180 subjects, 26 had subclinical hyperthyroidism while 8 had subclinical hypothyroidism. Thus the overall prevalence of subclinical hyperthyroidism and subclinical hypothyroidism in the study (as shown in figure 1) were 14.3% and 4.4% respectively. Out of 26 SCR subjects, 4 were male while 22 were female. The prevalence of SCR with respect to gender was 2.2% for male and 12.1% for female. All the SCO subjects were female (table 1). The difference in prevalence of SCO and SCR among the subjects in relation to gender was not statistically significant ($p>0.05$) (table 2). Subjects within age group 21-30 years and those above 50 years had the highest prevalence of SCR (5.5% each). Subjects aged 20 years and below had neither SCR nor SCO (table 1). The difference in prevalence of SCR and SCO was dependent on age ($p<0.05$) (table 2).

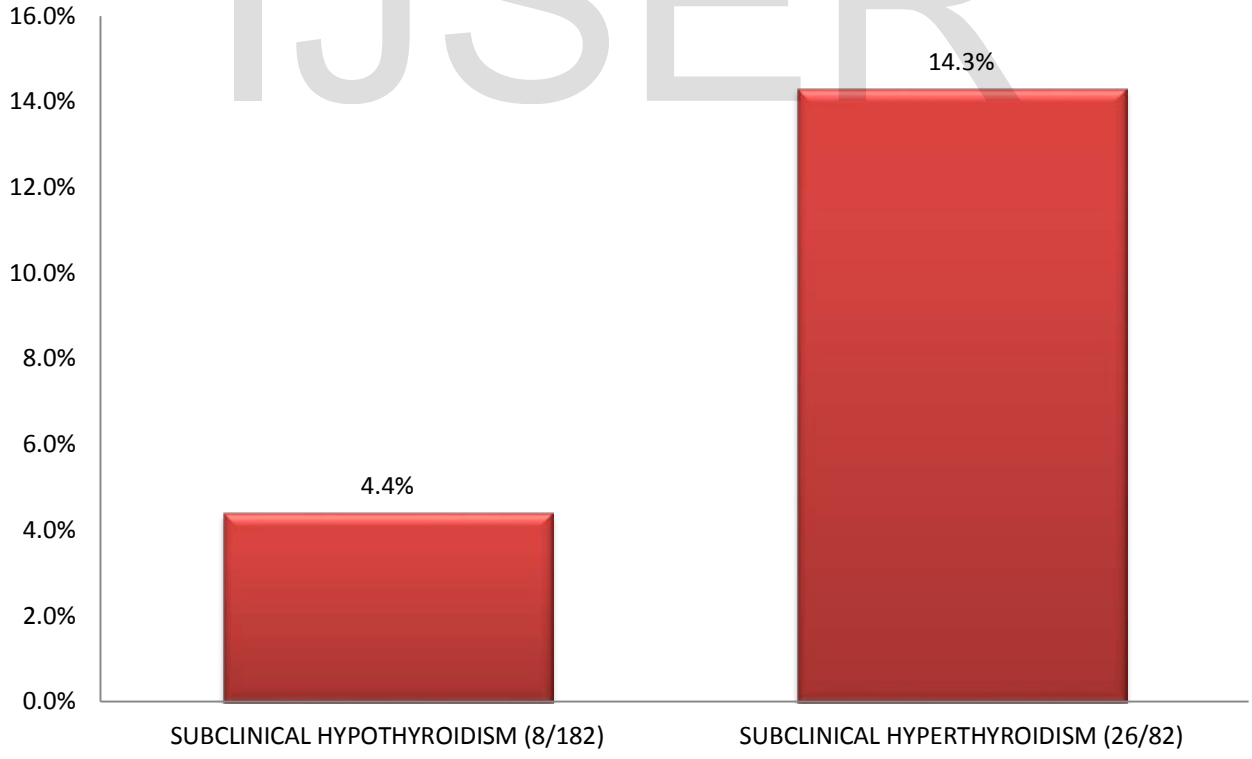

Figure 1: Overall prevalence of Subclinical thyroid disorders in the present study

Table 1: Sex and Age prevalence of Hypothyroidism and Hyperthyroidism among the study population

	No. of Subjects	No. with SCO (%)	No. with SCR (%)
SEX PREVALENCE			
Male	42 (23.1)	0 (0.0)	4 (2.2)
Female	140 (76.9)	8 (4.4)	22 (12.1)
Total	**182**	**8 (4.4)**	**26 (14.3)**
AGE PREVALENCE			
≤20 years	16 (8.8)	0 (0.0)	0 (0.0)
21-30 years	44 (24.1)	2 (1.1)	10 (5.5)
31-40 years	42 (23.1)	2 (1.1)	4 (2.2)
41-50 years	18 (9.9)	2 (1.1)	2 (1.1)
>50 years	62 (34.1)	2 (1.1)	10 (5.5)
Total	**182**	**8 (4.4)**	**26 (14.3)**

KEY: SCO – Subclinical hypothyroidism; SCR - Subclinical hyperthyroidism

Table 2: Kruskal-Wallis' test of significance of the prevalence of Hypothyroidism and Hyperthyroidism in relation to age and sex

	No. of Subjects	No. with SCO	No. with SCR	X^2-value	p-value
SEX PREVALENCE				**4.00**	**0.135**
Male	42	0	4		
Female	140	8	22		
Total	**182**	**8**	**26**		
AGE PREVALENCE					
≤20 years	16	0	0	9.333	0.09
21-30 years	44	2	10		
31-40 years	42	2	4		
41-50 years	18	2	2		
>50 years	62	2	10		
Total	**182**	**8**	**26**		

KEY: SCO – Subclinical hypothyroidism; SCR - Subclinical hyperthyroidism; X^2 – chi square; p-value – probability value

DISCUSSION OF FINDINGS:

Out of 182 subjects, 26 had subclinical hyperthyroidism while 8 had subclinical hypothyroidism. The overall prevalence of subclinical hyperthyroidism and subclinical hypothyroidism in the study were 14.3% and 4.4% respectively. Comparable finding has been reported elsewhere. Emokpae *et al*. (2011), recorded a subclinical hypothyroidism prevalence of 14.9% and 7.5% for subclinical hyperthyroidism among infertile women in Kano. A lower prevalence of SCO (0.67%) was recorded by Shalev *et al*. (1994) among 444 infertile women with ovulatory dysfunction.

The prevalence and incidence of thyroid disorders is influenced primarily by sex and age. In the present study, a total of 182 subjects (23.1% male and 76.9% female) with a mean age of 34.06±13.71 years were used. The female to male ratio of 5.83:1 found in this study was in accord to that reported by Rubina *et al*. (2010) and Ogbera *et al*., (2007). They recorded a female to male ratio of 5.1:1 and 5.8:1 respectively. Out of 26 SCR subjects, 15.4% were male while 84.6% were female. Gender-wise prevalence of SCR in the study population was 2.2% for male and 12.1% for female. All the SCO subjects were female. The difference in prevalence of SCO and SCR among the subjects in relation to gender was not statistically significant ($p>0.05$).Thyroid disorders are more common in women than men (De Ruiter, 2002). The reason for the prevalence recorded above was not known but several anthropometric variables, including age, gender, race, and body mass index (BMI), have been reported to have a noticeable influence over circulating TSH levels (Fatourechi, 2007; Surks and Hollowell, 2007).

Subjects within age group 21-30 years and those above 50 years had the highest prevalence of SCR (5.5% each). Subjects aged 20 years and below had neither SCR nor SCO. The difference in prevalence of SCR and SCO was dependent on age ($p<0.05$). The Third National Health and Nutrition Examination Survey evaluated thyroid antibodies and TSH and free T4 levels in persons older than 12 years who represented the geographic and ethnic distribution of the U.S. population (Hollowell *et al*., 2002). The prevalence of TSH levels less than 0.1 mIU per L was 0.7%, whereas 3.2% had levels less than 0.4 mIU per L. The prevalence of subclinical hyperthyroidism has been reported to be as high as 15% in persons older than 70 years in iodine-deficient regions (Aghini-Lombardi *et al*.,

1999) and may be as high as 20% in patients on thyroid hormone therapy, especially in those taking desiccated thyroid hormone (De Whalley, 1995; Canaris *et al*., 2000). The actual cause of the differences in prevalence of subclinical thyroid disorders varies among studies is not known but may be attributed to various factors like differences in defining the TSH level for subclinical hyperthyroidism, age of the study population, use of thyroid hormone medication etc. In older persons, toxic multinodular goiter is probably the most common cause of subclinical hyperthyroidism (Diez, 2003). Some frequently used drugs (such as steroids or exogenous T4) have been reported to have inhibitory effect on the pituitary TSH secretion (Silvia *et al*., 2012).

The issue of routine screening for thyroid disorder maybe controversial because cost-effectiveness has not been clearly proven and it may not be economically feasible to test all patients for thyroid dysfunction, there are instances (e.g. the senior years (aging), the reproductive years etc.) when thyroid screening is apposite.

REFERENCES

Akhter, N. and Hassan, M.A. (2009). Subclinical hypothyroidism and hyperprolactinaemia in infertile women: Bangladesh perspective after universal salt iodinisation. *The internet J Endocrinol*; **5**(1):1-5.

Aghini-Lombardi F., Antonangeli, L. and Martino, E. (1999). The spectrum of thyroid disorders in an iodine-deficient community: the Pescopagano survey. *J Clin Endocrinol Metab*; **84**(2):561–566.

Anidi, A.I., Ejeckam G.C., Ojukwu, J. (1986). Histological pattern of thyroid diseases in Enugu, Nigeria. *E. Afr. Med. J.*; **60**(8):546-550.

Canaris, G.J., Manowitz, N.R., Mayor, G. and Ridgway, E.C. (2000).The Colorado thyroid disease prevalence study. *Arch Intern Med*; **160**(4):526–534.

Cramer, D.W. Sluss, P.M. and Powars, R.D. (2003). Serum prolactin and TSH in an in vitro fertilization population: is there a link between fertilization and thyroid function? *Assist Reprod Genet*; **20**:210-215.

De Ruiter, J. (2002). Thyroid hormone tutorial: thyroid pathology. *Endocrine Module (PYPP 5260), Thyroid Section, Spring*; p1-30.

De Whalley P. (1995). Do abnormal thyroid stimulating hormone level values result in treatment changes? A study of patients on thyroxine in one general practice.*Br J Gen Pract*; **45**(391):93–95.

Diez, J.J. (2003). Hyperthyroidism in patients older than 55 years: an analysis of the etiology and management. *Gerontology*; **49**(5):316-23.

Emokpae, M.A., Osadolor, H.B. and Omole, O.A. (2011). Sub-clinical hypothyroidism in infertile Nigerian women with hyperprolactinaemia. *Nig. J. Physiol. Sci*; **26**:035–038.

Fatourechi, V. (2007).Upper limit of normal serum thyroid-stimulating hormone: a moving and now an aging target? *J Clin Endocrinol Metab*; **92**(12):4560-2.

Hollowell, J.G., Staehling, N.W. and Flanders, W.D. (2002). Serum TSH, T(4), and thyroid antibodies in the United States population (1988 to 1994): National Health and Nutrition Examination Survey (NHANES III). *J ClinEndocrinolMetab*; **87**(2):489–499.

Ogbera, A.O., Fasanmade, O. and Adediran, O. (2007). Pattern of thyroid disorders in Southwestern region of Nigeria. *Ethn. Dis*; **17**(2):327-30.

Rubina, M., Syed, S.R.R., Sibga, T.H. and Changaz, K., (2010).Spectrum of Thyroid Diseases, An Experience in the Tertiary care and Teaching Hospital. *Ann. Pak. Inst. Med. Sci*; **6**(2):101-106.

Silvia, S.P., Eider, P. and Juan, C.G. (2012).Management of Subclinical Hyperthyroidism.*Int J Endocrinol Metab*; **10**(2):490-496.

Surks, M.I., Ortiz, E. and Daniels, G.H. (2004). Subclinical thyroid disease: scientific review and guidelines for diagnosis and management. *JAMA*; **291**(2):228–238

Surks, M.I. and Hollowell, J.G. (2007).Age-specific distribution of serum thyrotropinand antithyroid antibodies in the US population:

implicationsfor the prevalence of subclinical hypothyroidism. *J Clin Endocrinol Metab*;**92**(12):4575-82.

Taylor, J.R.E. (1968). The thyroid in western Nigeria part 1: Anatomy. *E. Afr. Med. J.*; **45**:383.