

Full Length Research Paper

Pattern of thyroid dysfunction in a semiurban Nigerian population through thyroid function tests in a private laboratory, Sagamu, Ogun State, Nigeria

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Thyroid dysfunction is an important endocrine metabolic disorder which currently does not receive enough attention as required in this environment. However, while many clinical situations arise from thyroid dysfunction, others precipitate it.

This study investigated the pattern of thyroid dysfunction using the outcomes of requests for thyroid function tests in a semi-urban Nigerian population, and it involved 607 patients. The patients (age bracket 1-75 years) were those whose sera were brought for analysis in a private laboratory in Sagamu, Ogun State, Nigeria. The study showed a unique pattern of observations. From the serum T₄ values, out of the 607 patients' samples analyzed, 155 samples indicated hyperthyroidism. This is 25.5% proportion of the requests made during this period. Similarly, 51 samples indicated hypothyroidism, this is 8.4% proportion of the requests made during this period. This shows that about 34.0% proportion of the requests revealed thyroid dysfunction. Similarly, with T₃ estimations the pattern of dysfunction followed the same trend, though the proportions differ. Another observation in this study is that thyroid dysfunction occurs more in the females than males and that the age group 36-45 years are those mainly affected, there is however no statistically significant association between gender or age and T₃/T₄. The TSH values suggested that the major dysfunction in this environment is due to primary hyperthyroidism and there is a significant association between TSH and Sex. This study, although simply designed, has given some baseline information about thyroid dysfunction in the study environment. One is the fact that about one-third of the samples analyzed showed thyroid dysfunction, indicating that many people in the study environment have thyroid dysfunction, and hyperthyroidism is commoner. Secondly, it also shows that thyroid dysfunction is commoner in females and people in age range 36-45 years are more affected. Since there is paucity of information on thyroid dysfunction in the study environment, the findings of this study are compelling and should motivate clinicians and researchers in the study environment to consider problems relating to thyroid dysfunction more often than before. It will also create awareness to the general public.

Key Words: Pattern, Thyroid dysfunction, Thyroid function tests, private laboratory.

INTRODUCTION

In this environment a lot of efforts are in place for the management and prevention of diabetes mellitus, efforts on the evaluation and management of disorders due to thyroid dysfunction however, are rather not so impressive. This is likely to be due to low level of awareness on problems due to thyroid dysfunction on the

part of both the general practitioners and the public in general. Thyroid dysfunction has a lot of clinical and biochemical implications, many undefined clinical conditions are encountered in practice, some of which are called psychosomatic disorders and they are actually problems of the mind and emotions, a good number of them are linked to thyroid dysfunction (Awad A.G, 2000) which is a biochemical abnormality. While some of these problems are precipitated by thyroid dysfunction, others will precipitate thyroid dysfunction (Awad A. G, 2000).

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Thyroid dysfunction has resulted in many biochemical abnormalities in the body; hyperthyroidism has caused hypocalcaemia (Ejima E, et al, 1998) and hyperuricaemia (Sato-et al, 1995). Both hyperthyroidism and hypothyroidism have been reported as causes of infertility (Okonofua F. et al, 2005 & Maruna P, 2006). Hypothyroidism was reported to have caused decreased plasma cholesteryl ester transfer protein (CETP) activity (Tan K.C, et al, 1998). CETP mediates the exchange of cholesteryl ester and triglyceride between plasma lipoproteins. Vitiligo had been reported as a consequence of hypothyroidism (Onunu A. N & Skubeyinje E.P, 20003). It has also been reported that thyroid diseases are the second most common endocrinopathies in pregnancy (Olatinwo A. W, et al, 2009).

On the other hand, thyroid dysfunction may result from a number of factors in the body such as malnutrition, tumor, autoimmune disease and infections. Common infections include Tuberculosis, Staphylococcus and streptococcus species, and rare one from Klebsiella pneumonia has also been reported in an infant (Adeyemo, et al, 2010).

Although thyroid dysfunction manifests with many symptoms and signs, many patients with thyroid dysfunction are either not diagnosed at all or diagnosed late, especially when they don't present with classical features. This is due to low level of awareness on the existence of thyroid disorders.

This study therefore aims to

Determine the outcomes of requests for thyroid function tests on these patients' sera, use the result to reflect the pattern of thyroid dysfunction in the study population, and hence create awareness for both the general practitioners and the public on the need to consider and include thyroid function tests more often than before.

MATERIALS AND METHODS

This study involved a total of six hundred and nine (609) patients' blood samples which were analyzed at the endocrine unit of the Centre for Research in Reproductive Health (CRRH), Sagamu in Ogun State, for thyroid function tests (T₃, T₄, TSH). The consent of the patients attendant was obtained for this study. It involved the patients seen over a period of 5 years (Jan. 2006 – Dec. 2010). Out of the 609 samples, only 607 were eventually used for the study, the remaining 2 were not suitable due to analytical errors. While some of these patients came directly to the centre, others had their samples sent to the centre by the attending physicians. However, most of the patients were from the health institutions within Sagamu (Olabisi Onabanjo University Teaching Hospital and some of the private health facilities) and a few were from outside Sagamu. 5mls of venous blood was collected into a plain bottle in each case. The blood was spun at 3,000 u/min for 5mins and the serum collected and stored in the refrigerator at -20°C till the time of analysis. Each sample was then analysed for thyroid hormones estimation using enzyme immuno assay method (Lucia Grasco, et al, 1987). Assays for Triiodothyronine, thyroxine and thyroid stimulating hormones (T₃, T₄, TSH) were done and the plasma

levels determined. This immuno metric method (Enzyme Immuno Assay) has a good sensitivity. The minimum detectable dose for the T₄ EIA, T₃ EIA and TSH EIA are approximately 5nmol/l, 0.4nmol/l and 0.1miu/l respectively, all defined as 2 std deviation in the measurement of zero dose.

Statistical Analysis

The statistical analysis was done by using SPSS version 15 statistical computer package. The mean, standard deviation, frequencies and proportions were used as the descriptive statistics. Correlations and chi-square (χ^2) statistics were used appropriately to show the relationship and association in the continuous and discrete variables respectively. P value less than 0.05 was considered to be significant.

RESULTS

A total of 607 patients' samples were eventually analyzed for the study. Looking at serum thyroxine (T₄) values, out of the 607 samples, 155 samples gave values greater than the normal reference range and 51 samples gave lower than the normal reference range (see table 1), this means that 25.5% proportion of the samples studied showed hyperthyroidism while 8.4% proportion of the samples showed hypothyroidism (see table 1). The implication of this is that about 34% proportion of the samples studied indicated thyroid dysfunction. From table 1, it is obvious that more females were affected and the thyroid dysfunction is mainly the problem of age group 36-45 years; however there is no association between either sex or age and serum T₄ levels.

Similarly, using serum triiodothyronine (T₃) levels, the results are as observed for T₄ levels (See table 2) except that for T₃ levels higher proportion of the samples studied indicated hyperthyroidism (39.2%) and hypothyroidism (14.8%) than it is indicated by T₄ serum levels (25.5% and 8.4% respectively). The thyroid dysfunction mainly occurred in samples of patients age range 36-45 years as in T₄ with the females been more affected but there is no association between either sex or age and serum T₃ levels.

Looking at TSH values (tables 3), out of the 607 samples, 311 (51.2% proportion) had low TSH values and 81 (13.3% proportion) had high TSH values. This observation occurred in both samples for the male and female populations. Interestingly, there is a significant association between TSH and sex but no association between age and serum TSH. T₄, T₃ and TSH were also correlated with each other (table 4). There is a positive

DISCUSSION

The aim of this study is to look at the pattern of thyroid dysfunction through the outcomes of requests for thyroid function tests in the study environment. This is simply to create awareness on the degree of occurrence of thyroid

Table 1: serum T4 levels in this study

| variable | n | Frequency (%) | | | X ² | P-value |
|-------------|-----|---------------|-----------|-----------|----------------|---------|
| | | Hypo | Normal | Hyper | | |
| Sex | | | | | | |
| Female | 510 | 37(7.3) | 343(67.3) | 130(25.5) | 5.69 | 0.058 |
| Male | 97 | 14(14.4) | 58(59.8) | 25(25.8) | | |
| Total | 607 | 51(8.4) | 401(66.1) | 155(25.5) | | |
| Age (years) | | | | | | |
| <= 25 | 38 | 3(5.9) | 22(5.5) | 13(8.4) | 11.68 | 0.307 |
| 26-35 | 59 | 7(13.7) | 43(10.7) | 9(5.8) | | |
| 36-45 | 289 | 25(49.0) | 189(47.1) | 75(48.4) | | |
| 46-55 | 166 | 9(17.6) | 111(27.7) | 46(29.7) | | |
| 56-65 | 34 | 6(11.8) | 21(5.2) | 7(4.5) | | |
| >=66 | 21 | 1(2.0) | 15(3.7) | 5(3.2) | | |
| Total | 607 | 51(8.4) | 401(66.1) | 155(25.5) | | |

In this laboratory, ref range for T4 by EIA is 65 – 175nmol/L.

Table 2: Serum T3 levels in this study

| Variable | N | Frequency (%) | | | X ² | P-value |
|-------------|-----|---------------|-----------|-----------|----------------|---------|
| | | Hypo | Normal | Hyper | | |
| Sex | | | | | | |
| Female | 510 | 75(14.7) | 225(44.1) | 210(41.2) | 2.39 | 0.032 |
| Male | 97 | 15(15.5) | 50(51.5) | 32(33.0) | | |
| Total | 607 | 90(14.8) | 275(45.3) | 242(39.2) | | |
| Age (years) | | | | | | |
| <=25 | 38 | 5(5.6) | 13(4.7) | 20(8.3) | 12.09 | 0.279 |
| 26-35 | 59 | 12(13.3) | 26(9.5) | 21(8.7) | | |
| 36-45 | 289 | 38(42.2) | 138(50.2) | 113(46.7) | | |
| 46-55 | 166 | 25(27.8) | 69(25.1) | 72(29.8) | | |
| 56-65 | 34 | 6(6.7) | 21(7.6) | 7(2.9) | | |
| >=66 | 21 | 4(4.4) | 8(2.9) | 9(3.8) | | |
| Total | 607 | 90(14.8) | 275(45.3) | 242(39.9) | | |

In this laboratory, ref range for T3 by EIA IS 1.0 – 3.25nmol/L.

Looking at TSH values (tables 3), out of the 607 samples, 311 (51.2%proportion) had low TSH values and 81 (13.3%proportion) had high TSH values. This observation occurred in both samples for the male and female populations. Interestingly, there is a significant association between TSH and sex but no association between age and serum TSH.

T4,T3 and TSH were also correlated with each other (table 4). There is a positive correlation between T4 and T3 ($r = 0.56$, $p>0.01$), there is a negative correlation between T4 and TSH ($r = -0.18$, $p>0.01$) and a negative correlation between T3 and TSH($r = 0.057$, $p>0.01$).

However, there is no statistically significant association between T4 and T3 or between either T4 or T3 and TSH.

dysfunction in the environment. Many clinicians hardly consider thyroid dysfunction as an important differential in clinical practice. Interestingly, this study gave a unique finding, suggesting that thyroid dysfunction is fairly common in this environment. This might assist the thinking of clinicians in the course of evaluating a patient's medical problems such that the need for thyroid

function profile will receive more attention than it ever had.

A number of documented studies are in literature justifying why it is necessary to consider thyroid dysfunction in clinical settings. For instance, thyroid dysfunction had been implicated in emotional problems (Awad A. G, 2000). Female infertility and menstrual cycle

Table 3: Serum TSH levels in this study

| Variable | N | Frequency (%) | | | X ² | P-value |
|-------------|-----|---------------|-----------|----------|----------------|---------|
| | | Hypo | Normal | Hyper | | |
| Sex | | | | | | |
| Female | 510 | 272(53.3) | 179(35.1) | 59(11.6) | 10.38 | 0.006 |
| Male | 97 | 39(40.2) | 36(37.1) | 22(22.7) | | |
| Total | 607 | 311(51.2) | 215(35.4) | 81(13.3) | | |
| Age (years) | | | | | | |
| <=25 | 38 | 22(7.1) | 10(4.7) | 6(7.4) | 7.42 | 0.685 |
| 26-35 | 59 | 31(10.0) | 22(10.2) | 6(7.4) | | |
| 36-45 | 289 | 154(49.5) | 102(47.4) | 33(40.7) | | |
| 46-55 | 166 | 81(26.0) | 59(24.7) | 26(32.1) | | |
| 56-65 | 34 | 16(5.1) | 13(6.0) | 5(6.2) | | |
| >=66 | 21 | 7(2.2) | 9(4.2) | 5(6.2) | | |
| Total | 607 | 311(51.2) | 215(35.4) | 81(13.3) | | |

In this laboratory, ref range for TSH by EIA is 0.5 – 6.5mu/L.

Table 4: Relationship between T4, T3 and TSH

| | T4 | T3 | TSH |
|-------------------------------------|--------|--------|-----|
| T4 | 1 | | |
| T ₃ Correlation coef.(r) | 0.555 | 1 | |
| p-value | 0.000 | | |
| N | 607 | | |
| TshCorrelationcoef.(r) | -0.182 | -0.057 | 1 |
| p-value | 0.000 | 0.157 | |
| N | 607 | 607 | |

disorders have been attributed to thyroid dysfunction (Maruna P, 2006). Thyroid dysfunction has been reported as the unusual cause of muscle weakness (Ghandi M, 2006) causing periodical paralysis. Heart failure and atrial fibrillation have been linked with thyroid dysfunction (Johannsson B, et al,2000), so also is reversible dilated cardio myopathy (Flaherty G, et al, 2006).

The findings in this study showed that about 25.5% (155 out of 607samples) of the samples reflected hyperthyroidism and 8.4% (51 samples out of 607) reflected hypothyroidism. This means that 33.9% proportion showed thyroid dysfunction. The thyroid dysfunction shown in this study occurred mainly in age group 36-45 years. There is however, no statistically significant association between T4 /T3 and sex or age.

There is an association between TSH and Sex but none between TSH and age.

So, the findings showed that 25.5% and 8.4% of the samples studied indicated hyperthyroidism and hypothyroidism respectively in the corresponding patients, and it is also shown that more females are

affected. The finding of thyroid dysfunction being commoner in females than males and that hyperthyroidism being more frequent than hypothyroidism in a Nigerian community is not peculiar to this study, it was also reported by the study of Ogbera and his group (Ogbera, et al, 2007) for the pattern of thyroid disorders in south western Nigeria and same findings were still reported by another study in the year 2010 (Ogera A.O, 2010). This same pattern was reflected by a study in Denmark to look at the influence of borderline iodine deficiency on the occurrence of thyroid dysfunction by Knudsen N. et al (Knudsen, et al,1999).

From the correlation table, T4 correlated positively with T3 and negatively with TSH, this is because T4 levels directly influence T3 levels and TSH will be inversely affected by T4 levels. The result of TSH estimation generally showed a larger proportion of the study population having low TSH levels; this may suggest that most of the hyperthyroid cases are primary hyperthyroidism.

Although this is not a prevalence study, it is necessary to look at some prevalence studies on thyroid dysfunction

in different places despite the paucity of this in literature. Obembe and Abengowe (Obembe A and Abengowe C, 1994) found a prevalence of 0.2% for hypothyroidism and 0.6% for hyperthyroidism in Nigerian psychiatric outpatients studied in Kaduna. Muller et al (Muller, et al, 1997) studied thyroid dysfunction in the elderly in capetown and found a low TSH estimations in 6.2% of the study population and 9.4% had high TSH levels, with overall prevalence of 11.2%. Luboshir Z Kay et al (Luboshirzkay, et al. 1995) investigated thyroid dysfunction in Ethiopian children and found a prevalence of 2% and 0.8% for hypothyroidism and hyperthyroidism respectively. Lastly, another work (Ketsamathi et al, 2006) studied prevalence of thyroid dysfunction in thai HIV patients and found a prevalence of 16%. These prevalence studies were done in different defined populations and varied results were obtained, with each indicating the presence of thyroid dysfunction. This present study, though not exactly a prevalence study, was done in the general population and it indicated that thyroid dysfunction is relatively common in the study environment. All these show that thyroid dysfunction is relatively common in different clinical situations and populations.

The variations in the frequency of occurrence of thyroid dysfunction in different places have to do with several factors, one of such is diet. There are foods that cause thyroid dysfunction because they contain goitrogens (Raj Kumar,2008), Such include soy products, pea nuts,millet, cabbage, pear, peaches, cauliflower, straw berry, etc. Other factors are malnutrition, autoimmune disease, infection, tumor, inborn errors, stress factors and oral contraceptives. However, in this study environment, nutrition, tumor, stress and oral contraceptives may be important factors for consideration.

CONCLUSION

In conclusion, 25.5% and 8.4% proportions of the samples indicated that the corresponding patients have hyperthyroidism and hypothyroidism respectively, and the TSH results suggested more of primary hyperthyroidism. Also, 36-45 years is the age range mainly affected with the females being more affected . We considered these findings worthy of documenting, at least to stimulate the clinicians in our local setting to increase their awareness of the occurrence of thyroid disease in this environment. The public is also to be educated with this as the economically active age group is mainly affected.

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