A COMPARATIVE ANALYSIS OF THYROID DISORDERS (LABORATORY FEATURES) IN TWO NIGERIAN CITIES- JOS AND KANO

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SUMMARY

Aims: To describe the pattern of thyroidal dysfunctions prevailing among the residents of Kano metropolis and compare with that observed in Jos - Plateau State of Nigeria.

Methods: Serum level of T_4, T_3 and TSH in 186 blood samples obtained from various patients with suspected thyroidal disorders were determined using ELECSYS 1010 auto analyzer (Germany) based on an 'electrochemiluminiscence' technique at the Aminu Kano Teaching Hospital.

Results: In Kano the prevalence of hypothyroidism was found to be low (3.2%) as compared to a high prevalence rate seen in Jos (31.4%) ($p<.005$)). Hyperthyroidism with substantial quantity of T_3 toxicosis was however found to be high and comparable in both the areas.

Conclusion: Adequate iodine intake through effective salt iodization programme is advocated to achieve good iodine status with low level of hypothyroidism..

Key words: Thyroidal dysfunction: Jos, Kano, Iodine status, Thyroxine.

INTRODUCTION

The prevalence of thyroid disease is widespread [1-4] and occupies a very prominent place in the general population as well as in clinical practice among vast majority of developing nations including Nigeria. [5-6] It is one of the most common diseases encountered in clinical endocrinology after diabetes mellitus, and is currently considered a major public health hazard globally in the form of iodine deficiency disorders (IDD). [7] In the present hospital based study we provide the essential Laboratory features of the prevailing thyroid diseases that are seen at the Aminu Kano Teaching Hospital Kano and its immediate environment of north western Nigeria, and a comparison of the findings with those obtained by a previous study carried out in Jos, Plateau State, Central Nigeria. [8]

SUBJECTS AND METHODS

Thyroid function investigation is a routine analytical procedure of the Chemical Pathology Department of the Aminu Kano Teaching Hospital, Kano, Nigeria and the direct analysis of the plasma hormones is carried out with automatic 'ELECSYS 1010' (Roche, Germany) equipment based on 'electro chemiluminescence's' technique. The sensitivity and specificity of this method is very high and there is a in-built quality control device which on an automation basis provides necessary quality control input and calibration curve for each batch of the analysis. In the present investigation a total of 186 blood samples obtained from the various hospital cases with suspected thyroid disorders (37 males and 149 females with age range 9 to 70 years) referred from the medical and surgical out-patient departments, in-patients and some from outside the hospital covering a period of 6 months (from August 2002 to March 2003) were analyzed and the results obtained were

computed and compared with the normal reference range values of thyroid hormones established earlier in the Department. Parameters measured included plasma thyroxin (T_4), tri-iodotyronine (T_3) and thyrotrophic hormone (TSH). The intra and interbatch variation (imprecision) between the batches of analysis were less than 8% C.V. (co-efficient of variation) and student t' test was employed to determine the level of significance between the paired parametric data. The statistical analysis was done using the hospital's 'Compaq' micro-computer using ANOVA (analysis of variance) diskette.

Criteria used for lab evaluation and diagnosis of groups of Thyroid dysfunction (using serum T4, T3 and TSH levels).

Ref Range: Serum T4 = 66 - 161 nmol/L.
Serum T3 = 1.3 - 3.1 nmol/L.
Serum TSH = 0.27 - 4.2 my/L.

Lab diagnosis (Groups)	Criteria adopted		
1. Hyperthyroidism			
- Primary	T4↑	T3↑	TSH↓↓
- T_3 Toxicosis	T4 N or↓	T3↑↑	TSH↓↓
- Secondary (Ectopic).	T4↑	T3↑	TSH↑
2. Hypothyroidism			
- Primary	T4↓	3↓	TSH↑
- Secondary	T4↓	T3↓	TSH↓
- Sub-clinical (compensated)	T4 low N	T3 low N	TSH (mild- moderate rise 4.2-7mu/l)
3. Euthyroidism	T4 N	T3	TSH N
4.. Hyperthyroxinaemia	T4↑	T3↑or N	TSH N
5. Hypothyroxinaemia (Sick euthyroid syndrome)	T4↓	T3↓ or N	TSH N

N = Normal. Low N = Lower end of the normal range.
↑Increased ↓Decreased

RESULTS

Results of the present investigation together with a comparison obtained from Jos are detailed in Table 1. Prevalence of hyperthyroidism was found to be 38.7% (72 out of 186 assessed) in the present study conducted in Kano which comprised of primary hyperthyroidism 27.4% and T_3 toxicosis 11.3%. In Jos the recorded values were slightly higher - hyperthyroidism 45.1% (96 out 213) with primary form 36.6%. T_3 toxicosis 6.6% and secondary (ectopic) hyperthyroidism 1.9%. The prevalence of hypothyroidism (3.2%) in all its forms (primary 1.6%, secondary 0% and sub-clinical 1.6%) was, however, found to be drastically low in the patient seen in Kano($p<.005$) as compared to that observed in Jos where the level of hypothyroidism was found to be 31.4% with primary 16%, secondary 2.3% and in sub-clinical form 17.8%.. In the present investigation out of a total of 186 patient assessed 103 were found to be in euthyroid state showing a prevalence rate of 55.4%. This was in sharp contrast to what was observed in Jos 18.8% ($P<.001$). Furthermore, a few patients in a state of hyperthyroxinaemia' (1/186 or 0.5%) and in sick euthyroid syndrome (hypothyroxinaemia) (4/186 or 2.2%) were seen in the present investigation carried out in the Kano sub-region while studies conducted in Jos Plateau region did not register any patient within these groups.

Table 1; Laboratory Diagnosis of various groups of thyroid dysfunction in the present investigation and a comparison with those obtain from Jos, Plateau State, Nigeria.

Lab Diagnosis (Group)	Present study (Kano) No of Patients (n)	%	Previous study (Jos) [8] No of Patients (n)	%
1. Hyperthyroidism	72	38.7	96	45.1
- Primary	51	27.4	78	36.6
- T3 Toxicosis	21	11.3	14	6.6
- Secondary (ectopic)	0	0	4	1.9
2. Hypothyroidism	6***	22	77	31.4
- Primary	3***	1.6	34	16..0
- Secondary	0***	0	5	2.3
- Sub-clinical (compensated)	3***	1.6	38	17.8
3. Euthroidism	103***	55.4	40	18.8
4. Hyperthyroxinaemia	1	0..5	-	-
Hypothyroxinaemia/Sick Euthyroid Syndrome	4	2.2	-	-
Total (n)	180	100	213	100

P values vs. Jos *p<.05, **p<.001, ***p<.005.

DISCUSSION

It is evident from the findings of the present investigation that thyroid disease is indeed a common endocrine problem in the region of Kano and its environment. The evaluation of the Lab results indicates that among the patients assessed in Kano the prevalence of hyperthyroidism was found to be highest (38.7%) (Primary 27.4% and T_3 toxicosis 11.3%) followed by that of hypothyroidism (3.2%) (Primary 1.6% and sub-clinical 1.6%), hypothyroxinaemia (sick euthyroid syndrome) 2.2% and hyperthyroxinaemia (0.5%) in that order. A similar but more pronounced pattern was seen in the Jos-Plateau region of central Nigeria where a prevalence of hyperthyroidism was found to be 45.1% (primary 36.6%, T_3 toxicosis 6.6% and secondary 1.5%) while that of hypothyroidism in Jos was found to be 31.4% (primary 16%, secondary 2..3% and sub-clinical 17.8%). Five cretins (four in the same family)[9] with secondary hypothyroidism was seen[9]. Prevalence of euthyroidism (normal thyroid) was markedly higher in Kano (55.4%) compared to that in Jos (`18.8%) (P<0.001). A close assessment of comparative evaluation of Jos and Kano pattern (Table 1) further indicates that the prevalence of hypothyroidism in Jos region was markedly higher (31.4%) in all its forms - primary 16%, secondary 2.3% and sub-clinical 17.8% compared to the level seen in the present investigation carried out in Kano (3.2%) - primary 1.6%), secondary (nil) and sub-clinical 1.6%(p<.005). Environmental iodine deficiency (EID) [10] present in water, soil, food etc. coupled with excess intake of dietary goitrogens [cassava, millet, etc],[11] lack of effective iodination programme at the time of that study and rugged high terrain of Jos Plateau region (4000 ft) above sea level) [12] appear to be an aggregate of factors responsible for this high prevalence of hypothyroidism seen in Jos. While in Kano the present study area, the iodine content of drinking water, soil and food (sea-fish, crops and meat etc) was believed to be adequately supplemented with sustained availability of iodized salt (cooking or table) manufactured & distributed by Dicon, Dangote etc. which might have contributed significantly to the improvement of iodine status of the subjects and residents of Kano metropolis and have thus prevented the onset of hypothyroidism appreciably in the local population. As an additional factor in respect of relatively high prevalence rate of hyperthyroidism observed in the present study carried out in Kano [38.7%] one wonders whether it is partly due to overenthusiastic hyper-production and uncontrolled distribution of iodized salt (UNICEF) without any monitoring or regulatory mechanism such as recommended

yearly measurement of UIE (urinary iodine excretion) among the population is responsible for this. It is known that iodine excess (increased intake of iodized salt) especially after the age of 40 years in a population may cause thyrotoxicosis (Jod-Basedows syndrome) [13, 14] which is characterized by elevated thyroid hormones associated with tachycardia, trembling, excessive sweating, instability, nervousness and loss of weight and is one of the major drawbacks of the current salt iodization programme which is being undertaken globally. [14,15]

CONCLUSION

In conclusion, looking at the results of the thyroid parameter of Jos and Kano group of population it can safely be concluded that the iodine status and the integrity of thyroid function of Kano residents are comparatively better as compared to their Jos, Plateau counterparts. As a result, the incidence of thyroid disease and other iodine deficiency (ID), related disorders namely stillbirths, congenital anomalies, neurological and myxoedenatous cretinism, ,neonatal goiter and hypothyroidism, juvenile hypothyroidism, mental impairment, physical growth retardation, lack of intelligence (low IQ), goiter an its complication etc.[7] would be significantly less in this sub-region. Further work is necessary to establish this claim more firmly as the interval between the two studies may be considered significant. The population of Kano appears to have better iodine status compared to residents of Jos, an endemic zone for goiter.

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REFERENCE

1. Stanbury JB. The iodine deficiency disorders, Introduction and general aspects. In: Hetzel B.S. Dunn JT, Stanbury JB (eds). The prevention and control of iodine deficiency disorders, Elsevier, Biomedical Division, Amsterdam 1987:35-47.
2. Mediros-Neto G. Iodine Deficiency Disorders. Thyroid. May Ann Liebert Inc. (Publishers) Vol. I, No 1 1990: 73:82.
3. Isichei UP, Morimoto I, Das SC, Egbuta JO, Banwo AI, Nogataki S. Endernic goiter in the Jos Plateau region of northern Nigeria. Endocrine Journal. 1995: 42 : 23-25.
4. Das SC. Isichei UP. Egbuta JO, Banwo A I. Cations and anions in drinking water as a putative contributory factor to endernic goiter in plateau state Nigeria. Trop George MED 1989: 41:346-352.
5. Ekpechi OL. Pathogenesis of endemic goiter in Nigeria. British J. Nutri 1967, 21:537-545.
6. Olurin EO, Itayemi SO, Oluwasanmi JO, Ajayi OO. The pattern of thyroidal gland disease in Ibadan. Nigeria Med. J. Nigerian Med. J. 1973, 3: 58-65.
7. Hetzel BS. An overview of the prevention and control of iodine deficiency disorders. In the prevention and control of iodine deficiency disorders. Hetzel B.S, Dunn J.T. Stanbury J.B. (eds). Elsevier Biomedical Division, Amsterdam 1987:7-31.
8. Das SC. Isichei UP, Obekpa PO. Laboratory evaluation of thyroidal dysfunction - Jos experience Nig Med. Practitioner 1996:311:32-36.
9. Isichei UP, Das SC,Egbuta JO. Central cretinism in four successive siblings. British postgrad Med. J. 1990:66:755-756.
10. Havegraaf THA, McGill PE. Prevalence and geographical distribution of endemic goiter in Eastern Africa East Africa Md. J. 1970:47:60-65.
11. Gaitan E. Goitrogens in the aetiology of endemic goiter. In: Endemic goiter an endemic cretinism. Standury JB. And Hetzel BS. (eds). John Wiley and Sons. New York 1980:219-236.
12. Das SC, Isichei UP, Obekpa PO. Iodine efficiency disorders in pre-adolescent and adolescent children in Nigeria. West Africa. West African J. Med. 1998:17:113-120.
13. Maberly GF, Corcoran J M, Eastman CJ. The effect of iodized oil on goiter size,

thyroid function and the development of he Jod Basedow Phenomenon. Clin. Endocrinal (oxf) 1982: 17:253-259.

14. Connolly RJ, Widor GL, Stewart JC. Increase in thyrotoxicosis in endemic area after iodination of bread, Lancet 1970:1:500-502.
15. Clugston GA, Dluberg EM, Landar CS, Tilden RL. Iodine deficiency disorders in South East Asia. In: The Prevention and Control of iodine deficiency disorders. Hetzel BS, Dunn JT, Stanbury JB (eds). Elsevier, Biomedical Division, Amsterdam 1987: pp. 273-308.