

Goitre by Using Scintigraphy and Biopsy in Sudan

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Background and study aim: Goitre has been recognized in Sudan as a public health problem since the 1950's. Nationwide surveys on goitre were launched and various approaches in the quest for a solution to the problem were applied. Still, the number of goitrous individuals continues to grow each year. This article sheds lights and reiterates the frequency of goitre in Sudanese in the basis of scintigraphy and biopsy. The statistical findings should be especially useful to professionals in endemic medicine and endocrinology.

Patients and methods: The study was conducted at the Radiation and Isotope Center (RICK), Khartoum . A total of 400 patients received 2 mCi of Tc ^{99m} Pertechnetate intravenously. Imaging was performed using a Nucline gamma camera computer system with general purpose parallel hole collimator. Biopsy was carried out by Fine Needle Aspiration Biopsy (FNAB) with the guidance of ultrasonography.

Results: Goitre was more among females (88.8 %) as compared to males (11.2%) with a female: male ratio of 8:1. Goitre increased in the age group 20-40 with an average age of 35 years. Scintigraphy revealed diffuse goitre in 57.5% , multi nodular goitre in 37.5% and a single (solitary) thyroid nodule in 5% of the sample studied. Toxic goitre was reported in 4% of the patients while the rest were diagnosed as non-toxic goitre . The biopsy results showed that 8% of nodular goitres were malignant and the rest had cystic or degenerative changes only.

Conclusion: The study suggests that goitre in its major kinds, diffuse or nodular have the same frequency scintigraphically. Thyroid malignancy within nodular goitre remains in the minimum level. The goitre sill remains a major public health issue in Sudan and implementing iodine prophylaxis programs must be more activated.

INTRODUCTION

Goitre is an enlarged thyroid gland [1]. Goitre is a major manifestation of iodine deficiency, it is a world-wide problem [2,3,4,5,6,7]. Iodine deficiency not only causes goitre, the obvious sign of inadequate iodine intake, but may also result in irreversible brain damage in the fetus and infant, and retarded the psychomotor development in the child [8]. Goitre is classified anatomically into: diffuse and nodular (single "solitary" nodule and multinodular goitre), which is easy to detect sonographically by the outer shape. Also goiter can be divided physiologically into simple and toxic which can be detected by scintigraphy. The diffuse or nodular

nature of goitre can be diagnosed by clinical examination, as well as by using scintigraphy and sonography [3,9,10,11,12,13]. Nuclear medicine imaging of thyroid provides useful information about the shape, size and site of thyroid tissue, the function of thyroid nodule, and functioning thyroid tissue in patients with thyroid carcinoma. Either iodine-123 (¹²³I) or technetium-99m (Tc^{99m}) may be used [14].

Goitre has been recognized in Sudan as a public health problem since the 1950's [15]. This study was aimed on the scintigraphic and biopsy examinations of frequency of goitre in Sudanese population.

PATIENTS AND METHODS

The primary data and the family history for a total of 400 patients referred in to the department of Nuclear Medicine at the Radiation and Isotope Center (RICK), Khartoum were reported. Kind of goitre was studied by clinical examination to the neck and the classification of goitre was estimated.

Sample was separated into four groups: bellow 20, 20-40,41-60,and those above the age of 60 years.

Scintigraphic examination for the sample involved the intra-venous injection of 2 mCi of Tc ^{99m} pertechnetate, followed by 15 minutes (150 K counts) at the neck area using a general purpose parallel holes collimator and a Nucline gamma camera computer system, with the patient in a supine position. The examinations were sufficient to determine the kinds of goitre in the patients.

Fine Needle Aspiration Biopsy (FNAB) for the nodular goitres by a plastic disposable syringe and a glass slide was used to carry out the laboratory test. The aspiration was used with the guidance of a 7.5MHz linear probe transducer attached to a General Electric (GE) medial ultrasound system.

RESULTS

Goitre was found to affect females in the reproductive age group less than 40 years, with a female to male ratio of 8:1. The average age was 35 years. The peak was among females between 20-40 years of age presenting the percent of 54.3%.

The majority of patients were from Khartoum state (35.5%), Al Gezera and Central Sudan (29%), Kordofan and Darfur at Western Sudan (24.2%), Northern Sudan (7.8%), Southern Sudan (2.0%) and Eastern Sudan (1.5%) (**Figure 1**).

Clinically, 166 (42%) patients showed moderate goitre, large goitres in 81 (20%), small goitres in 95 (24%) and huge goitres in 29 (7%) (**Figure 2**).

Scintigraphy revealed diffuse goitre in 57.5%, multinodular goiter in 37.5% and a single "solitary" thyroid nodule in 5% of the sample studied. Toxic goitre (**Figure 3**) was reported in 4% of the patients while the rest were diagnosed as non-toxic goitre (**Figure 4**).

Biopsy revealed that 8% of the histopathological findings of the nodular goitre were malignancies, whereas 92% were benign cytologic findings. Among the malignancies 21% were follicular adenocarcnioma and 79% were lymphoma. Histopathological results of benign nodules included 30% benign nodular goitre and 70% were nodular goitre with cystic or degenerative changes.

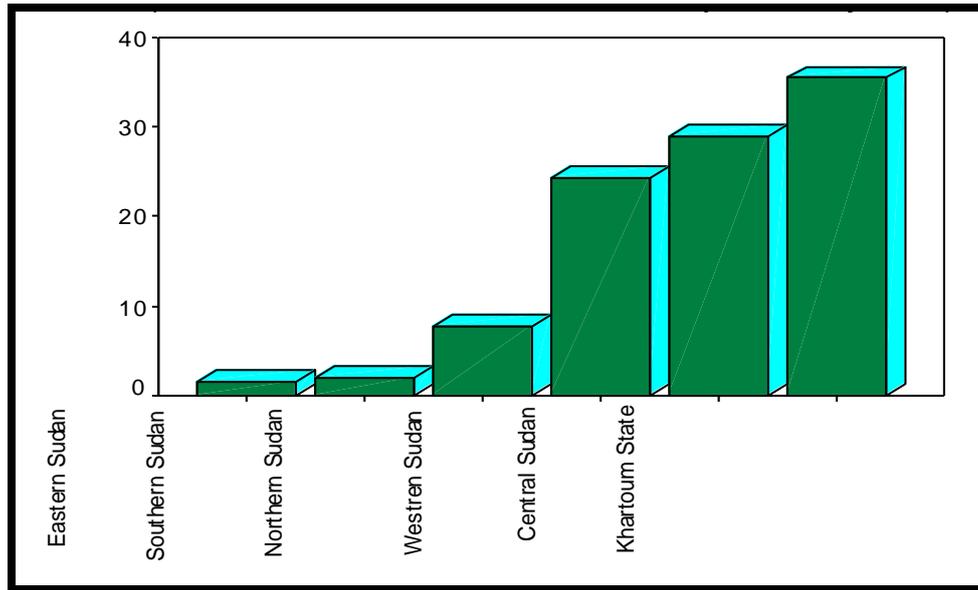


Figure 1: Geographical area

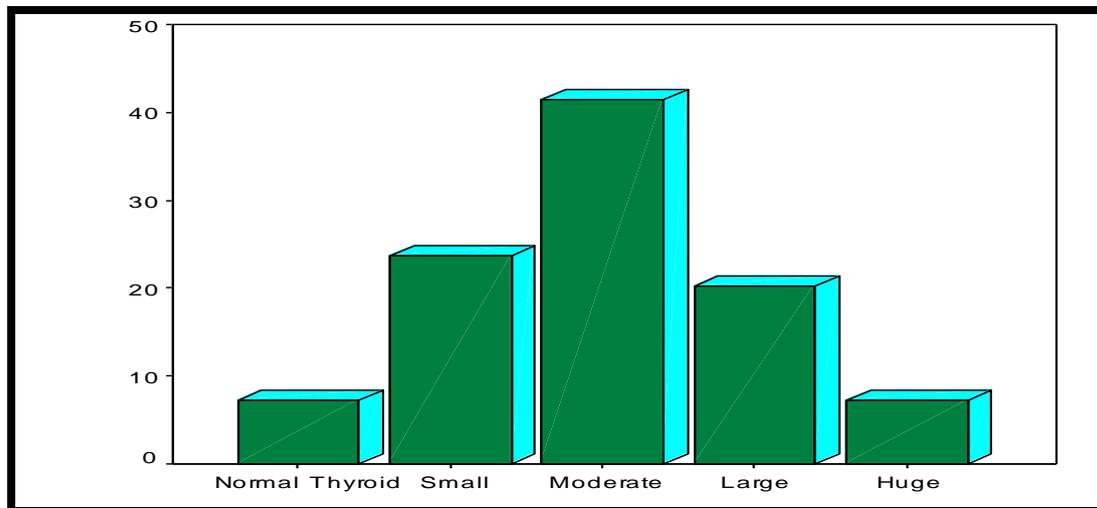


Figure 2: Clinical classification of goiter

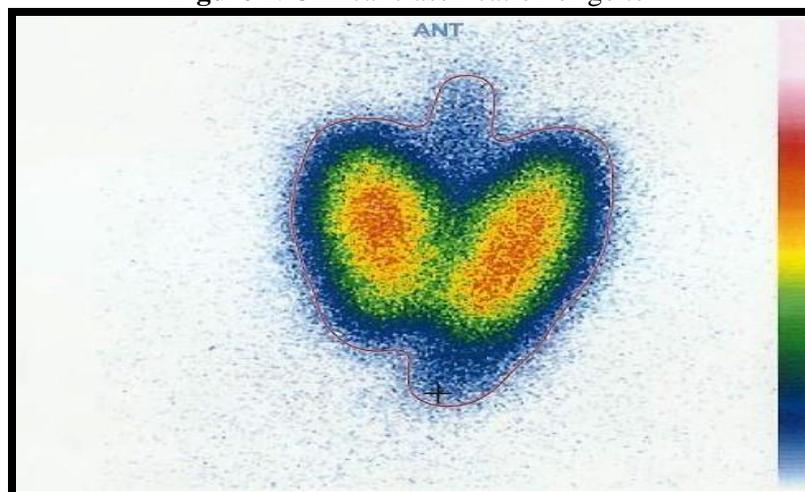


Figure 3: Scintigraphic features of diffuse toxic goitre. The static Spot of the anterior neck was acquired 15 min. following administration of 2 mCi of Tc^{99m} . The thyroid gland is enlarged with no suprasternal extension. Intense homogenous radiotracer uptake portrayed all over the gland with deprivation of extra thyroid tissue from their normal tracer share denoting the activity of the gland to the tracer uptake, with the appearance of pyramidal lobe.

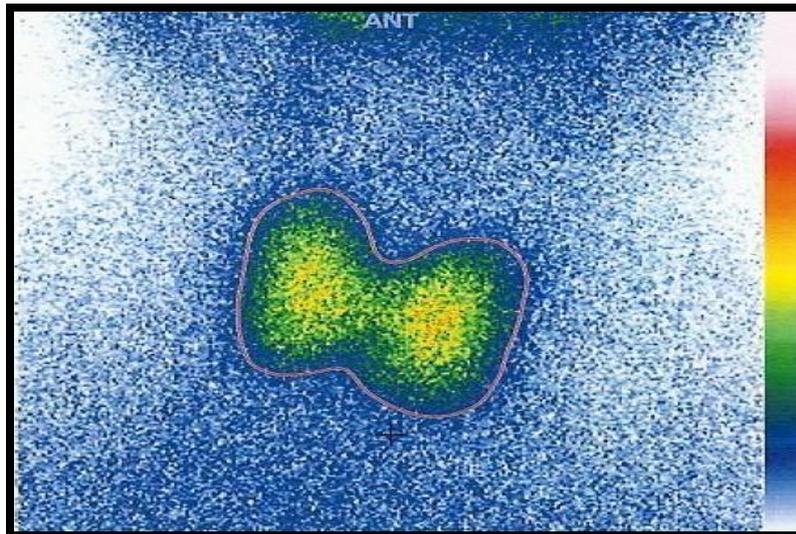


Figure 4: Scintigraphic features of diffuse non toxic goitre. The static spot view of anterior neck was acquired 15 min. following administration of 2 mCi of Tc^{99m} . The thyroid gland is enlarged with no evidence of retrosternal extension. Homogenous radiotracer uptake portrayed all over the gland with normal extra thyroidal tissue tracer uptake.

DISCUSSION

Goitre has been sufficiently investigated in many of its manifestation, world-wide. Williams determined that goitre is 7 to 9 times more common in women than in men [16]. The prevalence of goitre in women has been supported in the studies done in Turkey [5,17,18,19,20]. However, the female/male ratio varies among the researchers: 4.5 was reported by Kologlu [5]; 3.2 by Urgancioglu[18] ; 4.0 by Karpuzoglu [19]; 5.2 by Yilmaz [20]. In Sudan also, the prevalence of goitre in women has been supported by Mohamed et al, study [21]. Mohamed and his colleagues study showed the frequency of 81% were females. The current study result of 8.1 and 88.8% is within Williams and Mohamed range of values respectively. Still women suffer from goitre more than men in Sudanese patients.

Many of the researchers point out that the incidence of goitre increases during puberty, and that the upward trend continues thereon, especially in women, becoming most frequent in both sexes in the age group 20-40 [5,17,22,23].

The current study has shown that the frequency of goitre was higher in women, and that for both sexes goitre was highest, in the age group of 20-40 while Erkan reported that the frequency of goitre is highest in the age group of 15-30 [24].

Greig et al. reported a frequency of goitre of 12.2% in Khartoum region. He considered Khartoum to be an endemic area according to the

World Health Organization (WHO) committee which regarded any area in which the frequency of goitre exceeding 10% to be considered as an endemic area [25].

Geographical area distribution in this study points to where the patient used to live within the past 20 years permanently. The majority of our patients (35.5%) were from Khartoum State. Those from Gazira and Central region constituted 29% of our patients. Kordofan and Darfur at western Sudan, being known endemic areas of goitre were presented by 24.2% of our patients.

Also the current results confirmed diffuse goitre in 57.5% , multinodular goiter in 37.5% and a single "solitary" thyroid nodule in 5% of the sample studied. This results near to matches with Mohamed's study who revealed that 58% of patients had nodular goitre while the rest had diffuse goitre [21].

Malignancies with the nodular goitre types was only 8% of the histopathological findings. This result is near to Mohamed's study from Sudan who revealed that 14% of the nodular goitre showed a type of malignancy[21].Also, Kapur from India reported a frequency of 10 % malignancy among patients with solitary thyroid nodule [26].

CONCLUSION

Goitre still remains a major problem in Sudan. The geographic isolation and the socioeconomic, cultural, and political factors in Sudan contribute

to the technical difficulty in implementing iodine prophylaxis programs. Scintigraphy is an important method to identify the morphology of the thyroid gland as well as monitoring and curing the disease.

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Conflicts of interest:Non.

Ethical considerations: Special consideration was given to the right to confidentiality and anonymity of all patients. Anonymity was achieved by using numbers for each patient that will provide link between the information collected and the participants. In addition confidentiality was ensured by making the collected data accessible only to the researchers. The right to equality was ensured by giving each patient the same number and type of scintigraphy and laboratory procedures.

Justice and human dignity was observed by treating selected patients equally when offering them an opportunity to participate in the study. The patients are free to decide whether to participate or not. The patient was given informed consent that will be signed after explanation of the purpose, possible outcomes of the study and conditions applying to their participation. Permission to conduct the study was obtained from the hospitals directors as well as the superintendent radiographer in the nuclear medicine department at RICK.

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REFERENCES

1. James RM. Goitre. Medscape reference. 2007. www.patient.co.uk/health/goitre- (Thyroid swelling)-html (Accessed 12 December 2011).
2. Berkow R, Talbott JH. Goitre. In the Merck Manual, 13th ed., *Merck Sharp and Dohme Research Labs ;Rahway* 1977 ;1264
3. Bilir N. The problem of simple goitre in Turkey. *Toplum ve Hekim* 1986 ;41:23-27
4. Hershman JM, Due DT, Sharp B, My I, Kent JR, Binh LE, et al. Endemic Goitre in Vietnam. *J Clin Endoc Metab* 1983 ;57:243-249
5. Kologlu S. Endemic Goitre in Turkey. University of Istanbul, *Cerrahpasa Journal of Medical Faculty, Emek Matbaacilik* 1984; 1-64
6. Roti E, Gardini E, D'amato L, Salvi M, Robuschi G, Manfredi A, et al. Goitre Size and Thyroid Function in an endemic Goitre Area in Northern Italy. *J Clin Endoc Metab* 1986 ;63:558-562
7. Urgancioglu I, Hatemi H, K okoglu E, Guven Y, Sur N, Yilmaz O. Iodine Determination in Drinking Water Samples of Turkey; In Relation to the Endemic Goitre Problem. University of Istanbul, *Cerrahpaşa Journal of Medical Faculty, Istanbul* 1982;3:1-16
8. Pharoah POD, Buttfield IH, Hetzel BS. The effect of iodine prophylaxis on the incidence of endemic cretinism', In: Human Development and the Thyroid Gland, Stanbury JB, Kroc RL (eds). *Plenum Publishing Corp ;New York* 1972 :201
9. Harbert J. The Thyroid. In Harbert J, Rocha AFG (Eds.), *Textbook of Nuclear Medicine*, 2nd ed., *Philadelphia, Lea and Febiger* 1984 ;3-52
10. Ikekubo K, Higa T, Hirasa M, Ishihara T, Waseda N, Mori T. Evaluation of Radionuclide Imaging and Echography in the Diagnosis of Thyroid nodules. *Clin Nucl Med* 1986 ;11:145
11. Katz JF, Kane RA, Reyes J, Clarke MP, Hill TC. Thyroid Nodules; Sonographic-Pathologic Correlation. *Radiology* 1984 ;151:741-745
12. Raikor UR, Sharma SM. Ultrasound and Radionuclide Imaging in Management of Thyroid Nodules. Presented at the International Symposium on Nuclear Medicine and Related Medical Applications of Nuclear Techniques in Developing Countries organized by IAEA and WHO, Vienna 1986.
13. Simeone J, Mueller PR, Sonnenberg EV. Sonography of Thyroid Gland. In Leopold GR (Ed.), *Ultrasound in Breast and Endocrine Disease*, 1st edition, *New York, Churchill Livingstone Inc.*, 1984 ;83-92
14. Donald R. Bernier, Paul E. Christian, James K. Langa. *Nuclear Medicine Technology and Techniques*, 4th ed., *Mosby* 1971.

15. Woodman H. Endemic Goitre in Central Africa. *East. Afr. Med J* 1952 ;29(6), 217-28
16. Williams RH. Textbook of Endocrinology. 4th ed., *WB Saunders Co, London* 1968 ;259-260.
17. Köksal O. Nutrition in Turkey. In Köksal O (Ed), *Nutrition, Health and Food Consumption Research in Turkey for 1974, Aydin Matbaasi, Ankara* 1977.
18. Urgancioglu I, Hatemi H, Yenici O, Guven Y, Sur N, Yilmaz O et al. Endemic Goitre in Turkey. *Istanbul, Ornek Matbaasi*, 1988 ;8-39.
19. Karpuzoglu T, Akaydin M, Emek K. Surgical Approach in the Treatment of Thyroid patients at Akdeniz University Hospital, Presented at the 4th *Balkan Congress of Endocrinology, Izmir* 1985.
20. Yilmaz M, Sencer E, Yenerman M, Orhan Y, Molvalilar S, Kaya M. Diagnostic Value of Fine Needle Aspiration Biopsy in Nodular Goitre, Presented at the 4th *Balkan Congress of Endocrinology, Izmir* 1985.
21. Mohamed Y, Sulieman A , Osman H, Adam M, Eltom K. Evaluation of thyroid nodules, *SMM* 2011 ;6(3): 221-227
22. Clements FW. Endemic goitre, nutrition and preventive medicine. *WHO Monograph Series*, 1976 ;62:83-93.
23. Eser S. Nutrition and goitre in Northern Anatolia. *Journal of Istanbul University Medical School*, 1966 ;2:578-582.
24. Erkan I, Radife A, Guner E, Gulsern A, Hulusi O, Asim A. The incidence of nodule in patients with goitre. *Journal of Islamic Academy of Science* 1990 ;3:3, 221-224
25. Greig WR, Gray HW, McGirr EM, Kambal A, Rahman IA. Investigation of Endemic Goitre in Sudan. *BJS* 1970 ;57(1): 11-16
26. Kapur, M.M, Senda, AK, Kumar. A. The Cold Solitary Thyroid Nodule, *Indian J. cancer* 1980 ;179, 172-175.