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Research Article

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Epidemiology of goiter in Elfigaiga, River Nile state, Sudan

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ABSTRACT

Background: Iodine deficiency continues to be a significant public health problem in many areas all over the world, more than 1.5 billion people worldwide are estimated to be at risk of iodine deficiency, of these more than 650 million have goiter.

Methods: A total coverage of the whole population had been carried out to measure the prevalence of goiter, only 556 inhabitants were examined using cross-sectional study and house to house survey. Questionnaire and observation were used as a tool for data gathering, which had been carried out by a well-trained and expert professionals, water samples from houses (goitrous and nongoitrous families) was examined in the laboratory for determination of iodine deficiency in drinking water and for determination of calcium salts and flourides as goitrogens in drinking water.

Results: The study showed that goiter prevalence in the study area was (11.9%), the clinical assessment was done for both sexes at different age group, and it was found that goiter was more frequent among females (85%) furthermore it is mainly distributed within the age group 31-40 years (30%). Water samples from goitrous and non-goitrous families were investigated to detect iodine concentration in drinking water, and it was found not deficient of iodine (0.12 mg/l) and (0.18) respectively.

Conclusions: This study was carried out during the period (May-December 2010) to study the epidemiology of goiter, a cross-sectional design was used to achieve the stated objectives, the study is consist of seven chapters and 140 pages, and contain both theoretical and practical parts. Then all the field work and clinical assessment was done by professional personnel. On the other side there was some constrains that a rise during the study, as financial problems and some missed cases. Then by the end of the study there were some recommendations to be fulfilled.

Keywords: Goiter, Thyroidism, Iodine deficiency, Goitrogens, Goitrous

INTRODUCTION

The term goiter is used to designate abnormal hypertrophy of the thyroid gland. There is no good evidence that a natural goitrogens is a primary cause of endemic goiter in any areas, but there is no doubt that the major cause of endemic goiter is iodine deficiency.¹

Iodine deficiency has been recognized as a public health problem in the Sudan since 1950s, Wood man described three areas deficient in Iodine, namely: The Upper Nile, around Damar and Dar four.²

A number of pilot studies and nation-wide surveys were conducted in the 1980s in Darfour, Kordufan and Khartoum state. Endemic goiter was not reported from the areas of River Nile State, as far as stated in the literature review.¹

Objectives

The overall objective of this study, to study the epidemiology of goiter in Elfigaiga area, and consequently, the frequency, determinants, and distribution of the disease.

Definition

The term goiter is defined as an enlargement of the thyroid gland. Simple or nontoxic goiter is not accompanied clinically either by signs of hyper- or of hypothyroidism or by inflammatory or neoplastic process, however it should be noted that in endemic goiter there are biochemical abnormalities of iodine metabolism which may have no clinical manifestation except for goiter.²

Iodide goiter and hypothyroidism

Goiter and hypothyroidism, either alone or in combination, are sometimes induced by chronic administration of large doses of iodine in either organic or in organic form. This is seen more commonly among patients with chronic respiratory diseases, who are often given potassium iodide as an expectorant, iodide goiter develops in only a small proportion of patients given iodine.

Hyperthyroidism

This disorder is also known as thyrotoxicosis and occurs in about 0.2% of adult women and smaller proportion of men, in most cases the cause appears to be the production of a thyroid stimulating antibody with an action mimicking that of thyroid stimulating hormone.⁴

Simple (nontoxic) goiter

Simple goiter is by far the commonest form of goiter and occurs in all parts of the world. Simple goiter is so called because it does not cause any toxic symptoms, its medical importance due to the fact that nodular goiter may frequently have its origin in a preexisting colloid goiter, and when this occurs nodular goiter may subsequently become toxic also. A pilot surveys were conducted in the 1980s in Darfour, Kordofan, Khartoum. Eastern, and Northern Sudan, the prevalence of goiter was found to be 86% in Dufour, Khartoum 18% and 75% in Kosti.

Endemic goiter was not reported from the areas of river Nile state as far as stated in the literature review; this may be due to inadequate surveys conducted in the area.

This study was carried out for many reasons, the most important ones are:

There were many complaints concerning goiter received by the junior health authority from some villages in same area.

Although the records in Shendi hospital (central hospital in river Nile state) was not show much cases of goiter, there is no adequate surveys conducted in the area to show the current situation of goiter.

Etiology

Simple goiter is sometimes due to a definable cause of impaired thyroid hormone synthesis, such as iodine deficiency, ingestion of goitrogens, or a defect in hormone biosynthesis pathway, but in most instances its cause is unknown.⁶

Pathogenesis

The histopathology of the thyroid in simple goiter varies with the etiology and the stage at which the examination is made.in its initial stage, the gland exhibits a uniform hypertrophy, hyperplasia, and hyper- vascularity. As the disorder persists or undergoes repeated exacerbations and remissions, uniformity of thyroidal architecture is lost. Occasionally, the greater part of the gland may display a uniform involution or hyper involution with colloid accumulation.⁷

METHODS

A total coverage of the whole population had been carried out to measure the prevalence of goiter; only 556 inhabitants were examined using cross-sectional study and house to house survey.

Questionnaire and observation were used as a tools for data gathering, which had been carried out by a welltrained and expert professionals, water samples from houses (goitrous and nongoitrous families)was examined in the laboratory for determination of iodine deficiency in drinking water and for determination of calcium salts and flourides as goitrogens in drinking water.

Clinical examination

Clinical assessment was done by physicians, goiter stages were determined using the WHO classification criteria which stated as follows:

- Stage (0) absence of goiter.
- Stage (1A) goiter palpable but not visible.
- Stage (1B) goiter palpable and visible only when the neck is fully extended backward.
- Stage (2) goiter easily visible with a neck in the normal position.
- Stage (3) very large goiter.

DPD method (using spectrophotometer DR/2000) was used for determination of iodine concentration in drinking water, in which iodine will react with DPD (N,N-diethyl-p-phenylene diamine)forming a red color, which is proportional to the total iodine concentration.

The method that had been used for determination of fluoride concentration in the water sample was the SPANDS method in which fluoride reacts with red zirconium-dye solution, the fluoride combines with part of the zirconium to form to form a colorless complex thus

bleaching the red color in an amount proportional to the fluoride concentration.

EDTA (ethylene diamine tetra-acetic acid) method was used in the laboratory to determine calcium salts in drinking water samples in which calcium is made alkaline (ph=12-13).

Data analysis

Data was collated and entered in to a microcomputer. Data processing was carried out using an IBM personal computer (win word soft program). Data was analyzed statistically using Statistical Package for Social Sciences for personal computer (SPSS/PC) frequencies were computed for all variables and χ^2 test was used to compare the proportions, differences were considered significant when p is less than 0.05.

RESULTS

Table 1: Frequency of goitre among families.

Cases	Total number examined	%
Goitrous	66	11.9
Nongoitrous	490	88.1
Total	556	100

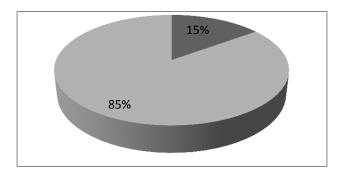


Figure 1: Sex distribution of goiter among resident (N=66).

The figure showed that disease was more frequent among females (85%).

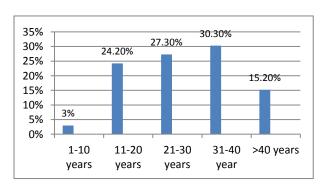


Figure 2: Goiter distribution according to age in Elfigaiga, Sudan (N=66).

The age group 31-40 years represents the most common age group of the cases.

Table 2: Iodine concentration in drinking water, Elfigaiga-Sudan.⁹

Study group	Concentration (mg/l)	Standard concentration (mg/l)
Goitrous	0.12	Traces
Nongoitrous	0.18	Traces

The above table showed that iodine concentration in drinking water was at the normal level.

Table 3: Calcium concentration (as carbonate) in drinking water, Elfigaiga-Sudan.⁹

Study group	Concentration (mg/l)	Standard concentration (mg/l)
Goitrous	65	100-300
Nongoitrous	65	100-300

The table showed that calcium concentration was in the safe limit, according to the WHO guidlines for drinking water.

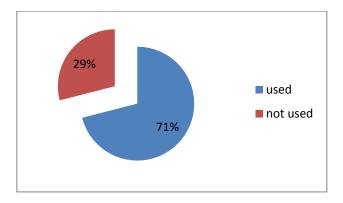


Figure 3: Usage of treatment by cases (N=66).

The figure showed that some cases were not used any type of treatment.

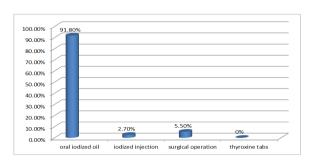


Figure 4: Distribution of different therapeutic measures used by goitrous patients in the study area (N=54).

Oral iodized oil was used more frequently by the cases.

Table 4: The reasons of not using any sort of treatment by the patients in Elfigaiga-Sudan.

Reasons behind no treatment	Frequency	Percentage
There is no treatment in the area	3	25
They don't know the symptoms of the disease	4	33.3
Not accepted	2	16.7
Don't know	3	25
total	12	100

DISCUSSION

Goiter prevalence in Elfigaiga area was found to be (11.9%) which is considered as endemic goiter, because it is greater than the endemicity limit that defined by Isselbacker 1992, On the other it was contradicted with Elnagar findings" endemic goiter was not reported from the areas of River Nile" such finding does not show the exact magnitude of the problem since the literature does not showed much studies carried out during the last decades, excluding some surveys conducted in 1995 around Eldamar regarding iodine deficiency as described by Elnagar. ^{1,6}

The study also showed that goiter was commonly prevalent among females than males with approximate ratio of 5:1 such finding is support Hassan's study 1992.

Goiter distribution according to age is varied with different age groups. But the age group 31- 40 years is the most common one of the cases. This finding is in agreement with King et al 1990.9

The study also conducted that many cases (86.6%) showed relatively similar history of complain with approximate period of time greater than one year. Furthermore those respondents are almost sharing the same grandfather-motherhood links (71.7%) hence, it is conducted that there is an explicit linkage between goiter prevalence and the studied hereditary factor which proved to be the most probable contributor in the causation of the problem as compared with all factors investigated in the study.

Onion and millet (The expected goitrogenic food stuff in the area) are consumed in different amount, but onion (as a separate item) is abundantly used by the majority of the goitrous families (63.4%) and by nearly quarter of the nongoitrous families (20%) such finding is found to be positively associated with the problem in the area (P<0.05). Hence onion intake may be highly attributed with the high prevalence of goiter.

Goiter prevalence by source of water supply was also investigated for iodine deficiency detection, the source of water of the study population was investigated and it was found that it was not deficient in iodine, although the assumption of iodine deficiency was given the highest probability as a cause but, but calcium was not found to be highly concentrated in water source of both groups (65 mg/L) when compared with the standard concentration (100-300 mg/L).

Although the whole study population (goitrous+nongoitrous) are using it, pipe water is not related to goiter prevalence (P>0.05). This finding is not in agreement with Tibeb et al (1993).¹⁰

Regarding the chemotherapy of goiter, an evidence is accumulating that (28.9%) were not have any sort of treatment, regardless to the reason behind such attitude, it may be quoted that the respondents were not fully aware about the problem.

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Ethical approval: The study was approved by the

Institutional Ethics Committee

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