



Original article

A Study of Prevalence of Goiter among Population in Shendi Locality River Nile State of Sudan

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ABSTRACT

Background: the aim of this study is to assess prevalence of goiter among population in Shendi locality, River Nile State, Sudan, during the period 2011-2013. This is the first assessment for the prevalence of goitre in Shendi locality. **Methods:** This study was conducted as a community based descriptive Cross – sectional study. In this study 636 households were included .Questionnaire which included a checklist were used as tools for data collection. The households were selected through a multistage cluster-sampling technique to determine the prevalence of goitre, three cluster stage was used (The locality was divided into four administrative units, All administrative units were divided into cluster villages or block and The required number of households in each village and block was selected by following the systemic random sampling technique) 636 respondents were selected through systemic random sampling. **Results:** The study was found that the overall prevalence of goitre was 18% amongst the population surveyed. The highest prevalence of goitre (5.3%) was observed in Hajer-Alasal administration, while the lowest prevalence (3.6%) was recorded in Shendi town. The study also found Goiter was more prevalent among age group 31 to 45 years which represented 43,5% of persons who had goiter. Also high prevalence was seen among females than male with a ratio of 3:1. As well, Iodine deficiency disorder affects children and women throughout life. More than 2 out of 10 school age children have goiter. **Conclusion:** The total prevalence of goiter among respondent is found to be high. Therefore shendi locality can be classified as endemic area for goiter. The relative proportion of goiter was higher among female to male 3:1.

KEYWORDS: Prevalence, Goiter, Iodine, deficiency, disorder.

INTRODUCTION

IDD is now identified as a significant public health problem in Sudan with a total goiter prevalence of 22% [1]. Iodine deficiency disorders (IDD) constitute a severe public health problem in Sudan. IDD affects children and women throughout life. More than 2 out of 10 school age children have goiter. The prevalence reaches 40% in some regions of the country. Several interventional measures were introduced to control the IDD problem. [2].

In Sudan, the period of 80s and 90s saw significant activity in association with iodine deficiency disorders (IDDs) in the form of epidemiological and etiological studies and assessments of the effects of different interventions. The total prevalence of goiter reported, ranged from 13% in the eastern city of Port Sudan and 17% in Khartoum state, to 78% in the central region and 87% in Darfur, in the

west[3]. . More than two billion people worldwide are at risk of developing IDD due to the inadequate dietary intake of iodine either from plant or animal sources. The soils of the countries at high risk of IDD are often deficient in iodine. This leads to insufficient uptake of iodine by their food crops. Furthermore, they often lack access to iodine-rich sea foods, increasing the risk of IDD development [4].

Study objectives:

To determine the prevalence of goiter in Shendi locality. To identify the environmental and socio-economic factors which predispose to goitre in the study area. To identify the most affected Age groups and gender.

MATERIALS AND METHODS

Shendi locality is one of the localities of River Nile State. It is bounded by Khartoum state in the south, Elddamer locality to the north, River Nile to the west and Gadarif state to the east. The locality area is about 14596 Km². The rural areas of the Shendi locality are composed of about 96 villages, 63 of them are at southern side of the locality. Topographically, the Locality lies on a flat mud-sandy area adjacent to the River Nile with a few scattered mountains in the eastern part and is accessible all the year. Geographically it lies between line 36 east to 31 west longitudinal and line 19 north to line 15 south latitudinal in the arid zone of Sudan with an annual rainfall ranging between 0 and 119/ml per year. It is situated on the main River Nile, which is the source of water for the agriculture. The main cash crops are white beans, onions, wheat and sorghum. Goats and camels are reared both by the few nomadic 'Rashaida' and the settled farmers,

Culturally the population of Shendi is a mixture of the various cultures that occur in Sudan though the Northern tribes, particularly ElGaalien, are predominant. The population of Shendi locality is estimated to be about 269446. About 60 % of the population is rated as poor. Growth Rate: 2.3%, Male 48.7%, Female 51.3%. In addition, the average of family size is 6 members. 78% of the population depends upon the agriculture while the rest are traders, teachers and handicraft workers, including spinners, weavers and other artisans.

Study design is a community based descriptive cross-sectional study. The sample size was determined for study area using the formula for cluster survey. It was calculated on the bases of prevalence of 50% and design effect of 1.5.

The multistage cluster- sampling technique was followed for selecting the study population in three stage (First the locality was divided into four administrative units, the three clusters were selected using the probability proportional to size (PPS) sampling method, Second stage: All administrative units were divided into cluster villages or block (cluster sampling technique). A random sampling technique was then used on any relevant clusters to choose which villages or block to include in the study in each identified cluster and third stage: All households of the selected cluster were enlisted. An attempt was made to select an equal number of households in the unit as far as possible. The required number of households in each village and block was selected by following the systemic random sampling technique .The sample size was distributed for each village using the following formula: $K= N/n$ Where: (K= interval, N= population, n= sample).

Statistical analysis: After the data was collected, they were coded and transferred into specially designed formats to be suitable for computer feeding. Analysis of correlation (chi sq.) was used to find the significance of study parameters between two or more group of samples. Statistical package for social sciences (SPSS version 11.5) was used for analysis.

RESULTS

Out of the total 636 population studied, four hundred fifteen (65.3%) of respondent were formal educational level(primary, secondary and high education),two hundred fifty eight (40,6%) were Laborer and three hundred five (48.0%)of the respondent their income per month (including wages, rent, sales, state grants) were about 500-1000 pounds (Table 1).

Table: 1 Socio-demographic status of study population:

Variables:	Number	Percentage
level of education		
Illiterate	161	25.3
Informal	60	9.4
Formal	415	65.3
Employment status		
Farmer	188	29,6
Laborer	258	40,6
Provisional	127	20,0
No Laborer	63	9,9
Household income per month (including wages, rent, sales, state grants)		
Less than 500 pound	261	41.0
500 - 1000 pound	305	48.0

Above 1000 pound	70	11.0
Total	636	100

In the present study, Out of 636 respondent examined. 115 were affected with goiter. Thirty four of them (29.6%) were visible goiter similar to not visible goiter and sixteen (13.9%) were large goiter. It was observed that the increase

in prevalence was consistent with increase in age of the studied population, in the age group of 31-45 years. The prevalence of goiter (affected persons) was higher in females (76%) compared to males 24%. (Table 2)

Table 2: Age, gender, affected person and grade of goiter distribution of goiter prevalence:

Variables:	Number	Percentage
levels of goiter disease among affected population		
Not visible	34	29.6
Palpable	31	26.9
Visible	34	29.6
Large	16	13.9
persons who have goiter disease		
Father	24	20.9
Mother	57	49.6
Daughters	34	29.5
Ages		
less than 15 years	2	1.7
16 -30 years	23	20
31 -45 years	50	43.5
Above 45 years	40	34.8
gender		
Male	28	24
Female	87	76

The overall prevalence of goiter was found to be 18.1%. Prevalence of visible goiter was 29.6% and that of large goiter was 13.9%. Table 3 shows the geographical difference between administrations regarding the prevalence of total goiter. During the study, it was found that a high prevalence was seen in Hager-Elassal (5.3%). Kaboshia, (4.9%) rural (North and South) (4.2%) and urban (3.6%), respectively. Prevalence of goiter showed significant association among females (39.6%) when compared to that of males (6.9%) ($X^2 = 103.26$, $P < 0.000$). (Table 4).

Effect of socio-demographic characteristic of population on the prevalence of goiter:

The prevalence of goiter compared with socio-demographic status of study subjects and is presented in table 4. Majority of the subject belonged to the laborer and housewives in occupation of respondent. The prevalence of goiter showed nonsignificant association with householder occupation ($X^2 = 4.50$, $p < 0.105$). Compared with significant association with housewives ($X^2 = 42.14$, $p < 0.000$). Sixty five percent of the sample had education above informal level. The prevalence of goiter was found significant effect with education levels ($X^2 = 42.14$, $p < 0.000$). (Table 5)

Table 3: Distribution of goiter disease among population in administrative units / Shendi locality River Nile State

Prevalence	distribution in administrative unites									
	Shendi town		Rural		H.Elasal		Kaboshia		Total	
	No	%	No	%	No	%	No	%	No	%
Present	23	3.6	27	4.2	34	5.3	31	4.9	115	18
Not present	131	20.6	210	33.1	94	14.8	86	13.5	521	82
Total	154	24.2	237	37.3	128	20.1	117	18.4	636	100

Table 4: distribution of gender with prevalence of goiter:

Cases gender	Disease		Non disease		Total	X ²	p- value
	N	%	N	%			
Male	29	(4.5)	390	(93.1)	419	103.26	<i>p</i> < 0.000
Female	86	(13.5)	131	(60.4)	217		
Total	115	(18)	521	(82)	636		

Table 5 Socio- demographic characteristic with Prevalence of goiter:

S.No	Characteristic	Prevalence				X ²	p- value
		Goiter		No goiter			
		N	%	N	%		
1	Householder occupation					4.50	<i>p</i> < 0.105
	Farmer	31	4.9	157	24.7		
	Laborer	44	6.9	210	33		
	Provisional	26	4.1	105	16.5		
	No labor	14	2.2	49	7.7		
2	House wives occupation					42.14	<i>p</i> < 0.000
	Farmer	2	0.3	21	3.3		
	Laborer	29	4.6	33	5.2		
	Provisional	18	2.8	62	9.7		
	House wives	66	10.4	405	63.7		
3	Monthly income					1.24	<i>p</i> < 0.536
	Less than 500 pound	52	8.2	207	32.5		
	500- 1000 pound	50	7.9	254	39.9		
	Above 1000 pound	13	2	60	9.4		

4	Level of education					
	Illiterate	38	6	123	19.3	8.01
	Informal	15	2.4	45	7.1	
Formal	62	9.7	353	55.5		
5	Family number					
	Less than 6	66	10.4	297	46.7	2.97
	6-9	36	5.7	188	29.6	
Above 9	13	2	36	5.7		

DISCUSSION

Iodine deficiency is a major public health problem throughout Africa and is the commonest cause of thyroid disorders in this continent, [5]. Most iodine supplementation programmes, if not all, had ceased to exist, and only 1% of all Sudanese households had access to iodized salt, according to estimates by the United Nations Children's Fund (UNICEF) [3]. The prevalence of all grades of goiter in Sudan was found to be 38.8% overall and ranged from 12.2% in Omdurman to 77.7% in Kosti city, as described by Abdel Monim[3]. This study showed that goiter prevalence was found to be 18%, 5.3% of them in Hajar Elassal, 4.9% Kaboshia, 4.2% in rural area and 3.6% in urban area, which is considered as endemic goiter, because it is greater than endemicity limit (more than (10%) compared with goiter prevalence in El-figaga area which is (11.9%) estimated by Elamin in 2016[6].

A study was done by Faroug et al in basic school children in Shendi showed the incidence of goiter was 14.6% (9). Kamath *et al* was found prevalence of goiter among rural population of Belgaum District to be 16.6%. Goiter of grade 1 was 15.7% and that of grade 2 was 0.9% (10). Makwana *et al* found goiter rate was 4.83% among primary school children aged 6-12 years with no significant differences between age and sex.(11). Mesele *et al* was found the prevalence of goiter to be 37.6%. Goiter of grade 1 was 28.6% and goiter of grade 2 was 9.1% (12). Misra *et al* was found prevalence of goiter 20.5% among the children examined in Panchmahal district in Gujarat, (13).

Our study revealed that goiter was commonly prevalence in females (13.5%) rather than males (4.5%), the approximate ratio was found to be 3:1, this finding may be due to the fact that iodine requirement for female is higher than male especially at the beginning of the pubertal age. This is related to the deference in sex hormones and pubertal growth pattern among boys and girls in higher age groups. This finding in agreement with deferent studies (6, 7, 12, 10) but on the other it was contradicted with Naresh et al finding, the sex differences had no impact on the prevalence of goiter as it was 5.1% and 4.6% in males and females respectively ($p < 0.063$). In addition, there was no impact of the age deference on the prevalence of goiter ($p < 0.066$) (11).

Furthermore, Elamin added that goiter was commonly more prevalent among females than in males with a ratio of 5:1 approximately. Results of this study showed that the majority of goitrous sample were females (76%), against (24%) of males. This is in agreement with which was stated by Hetzel, et al, which describe that the girls have a higher prevalence than boys,[7]. It was assumed that productivity among the people affected was reduced by 5-25 per cent. Little apparent progress had been made with USI. The Government of Sudan, UN multilateral agencies, international consultative groups, bilateral agencies, global and national non-governmental organizations and, increasingly, the private sector must work together to find innovative approaches to increase awareness of the broader social, public health and nutritional contexts, and to advocate for increased national and international funding,[8]

Finally, the study recommended that the ministry of health should take action for regular monitoring of the iodized salt and education of its nutritional value in the prevention of IDD.

CONCLUSION

The total prevalence of goiter among respondent was found to be high. Therefore, Shendi locality can be classified as endemic area for goiter. The relative proportion of goiter was higher between female to male 3:1, and the proportion increased with age. Regarding socio-demographic characteristic, the study showed that majority of respondent, their educational level was found to be (65.3%). Level of education may effect on goiter disease.

REFERENCES

1. World Health Organization. Global Database on Iodine Deficiency. Geneva. 2016. www.who.int/vmnis/iodine/en.
2. Izzeldin SH, Crawford MA, Ghebremeskel k. Salt fortification with iodine: Sudan situation analysis. Nutrition and health. 2009;20(1):21-30.

3. Madani AMM, Elnour AA, Saeed AM. Endemic goiter in the Sudan despite long-standing programmes for the control of iodine deficiency disorders. *Bulletin of the World Health Organization*. 2011;89:121-6.
4. Taga I, Oumbe VAS, Johns R, Zaidi MA, Yonkeu JA, Atosaar I. Youth of west-cameroon are at high risk of developing IDD due to low dietary iodine and high dietary thiocyanate. *African health sciences*. 2008;8(3):180-5.
5. Ogbera AO, Kuku SF. Epidemiology of thyroid diseases in Africa. *Indian Journal of Endocrinology and Metabolism*. 2011;15(Supp12):S82-8.
6. Elamin AI, Mohmoud ME. Epidemiology of goiter in Elfigaiga, River Nile State, Sudan. *Int J community Med Public Health* 2016; 3: 977-81.
7. Hetzel, B. S, Delange F, Dunn JT, Ling J, Mannar V. and Pandav CS. Editors. *Towards the Global Elimination of Brain damage due to iodine deficiency*. Oxford University Press. New Delhi 2004; pp. 9-11.
8. Bani I. Accelerating progress on salt iodisation in Sudan: time for action. *Disaster*. 2007;31 Supp11:S139-49.
9. faroug Bakhet Mohamed Ahmed, Isam Eldeen Bakhet Mohamed Ahmed. Goiter Incidence Among Basic Schools Children in Shendi Area – Northern Sudan. *Science Journal of Clinical Medicine*. 2015;4(6):117-120, doi: 10.11648/j.sjcm.20150406.11.
10. R Kamath, Vinod Bhat, RSP Rao, Acharya Das, Ganesh KS, Asha Kamath. Prevalence of Goiter in Rural Area of Belgaum District, Karnataka. *Indian Journal of Community Medicine*. January 2009; 34 (1): 48-51.
11. Makwana NR, Shah VR, Unadkat S, Shah HD, Yadav S. Goiter prevalence and current iodine deficiency status among school age children years after the universal salt iodization in Jamnagar district, India. *Thyroid Res Pract* 2012;9:40-4.
12. Mesele et al.: Prevalence and associated factors of goiter among rural children aged 6-12 years old in Northwest Ethiopia, cross-sectional study. *BMC Public Health* 2014 14:130.
13. Misra, S.L. Kantharia & J.R. Damor. Prevalence of goitre in 6 -12 years school-going children of Panchmahal district in Gujarat, India. *Indian J Med Res* November 2007; 126: pp 475-479.
14. Eskinder Wolka, Solomon Shiferaw, and Sibhatu Biadgilign. Epidemiological study of risk factors for goiter among primary schoolchildren in southern Ethiopia. *Food and Nutrition Bulletin*, 2014; 35 (1) : 20-27.
15. Habtamu Demelash Enyew, Ketema Gashaw Zemedkun, Addisu Melese Dagnaw. Prevalence of Goiter and Associated Factors Among Primary School Children Aged 6-12 Years Old in Goba Town, South East, Ethiopia. *International Journal of Nutrition and Food Sciences*. 2015; 4 (3): 381-387. doi: 10.11648/j.ijnfs.20150403.26

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