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PREVALENCE OF GOITER AND ASSOCIATED FACTORS AMONG PREGNANT WOMEN ATTENDING ANTENATAL CARE AT PUBLIC HEALTH FACILITY IN BALE ZONE , SOUTHEAST ETHIOPIA

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Abstract

Introduction Goiter is grave public health concern, particularly in developing countries such as Ethiopia. The aim of this study was to assess the prevalence of total goiter rate and associated factors among pregnant women attending antenatal care in public health facilities in Bale Zone, Southeast Ethiopia.

Methods: An institution based cross-sectional study was carried out in Bale Zone from January to March, 2017. Data were collected by pretested structured interviewer-administered questionnaires from a total of 499 pregnant women who were identified through systematic random sampling. Pregnant were assess for goiter based on the criteria of the World Health Organization. Salt samples from pregnant women homes were tested for iodine levels using a rapid iodized salt test kit. Association between dependent and independent variables were computed by using bivariate and multivariable logistic regression. In the multivariate analysis, variables with a P-value of <0.05 were considered statistically significant.

The results: About 499 pregnant women were questioned yielding a response rate of 96.5%**.** In this study, the prevalence of total goiter of the among pregnant women was 39 % of which only 13.4 % was grade 2 goiter .The result of multivariate logistic regression showed that Mid-Upper Arm Circumference (MUAC)<21cm [AOR=3.6; 95 % CI (3.05-7.03)], Consuming cereal in 24 hours [AOR=1.3; 95 % CI (1.03-3.52)], inadequate dietary diversity [AOR=1.41; 95 % CI (1.91-2.24)], Illiteracy [AOR=3.51; 95 % CI (3.05-7.)] were significantly associated with goiter rate.

Conclusion: In this community prevalence goiter is major a public health concern.The problem can be minimize by increasing the consumption of foods with high bioavailable iodine, optimally diversified diet and use adequately iodized salt

Key Words: Goiter, pregnant women, Bale Zone

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Background

Mineral iodine is an essential micronutrient needed to ensure thyroid hormone works properly (1-3). These hormones include triiodothyronine (T3) and thyroxin (T4) which is play a crucial in the process of early growth and development of most organs, especially the brain. In humans, Central nerve system including brain the development occurs during early stage of conception and during infancy life (4-5). The major cause of goiter is inadequate dietary intake of iodine, Due in environments where the soil lacks iodine due to past glaciations, often compounded by the leaching effects of precipitation or flooding (6), Goiter may be aggravated by intake of natural goitrogens in staple foods such as cassava, which contains thiocyanate that inhibits thyroid iodide absorption and also deficiencies of selenium, iron, and vitamin A exacerbate the deficiency of iodine via different mechanism (7). Consumption of Inadequate of iodine in take leads to insufficient production of thyroid hormone, which unpleasantly affect the muscle, heart, liver, kidney and the developing brain. This disease collectively known as Iodine Deficiency Disorders (IDD)(8).

Iodine deficiency disorder can cause endemic cretinism which is the extreme clinical manifestation of severe hypothyroidism during fetal, neonatal and childhood stages of development (9-10). It is characterized by irreversible mental retardation, deaf-mutism, speech and hearing defects, psychomotor retardation, decrease human energy and working capacity with resultant decrease of the economic productivity of individual or decrease economic growth of world (11). In pregnancy goiter has been associated with adverse effects on mothers and on birth outcomes. Major consequence associated with goiter in pregnancy including congenital anomalies, stillbirth, spontaneous abortion, increased prenatal mortality, growth retardation, neurological cretinism, poor cognitive functions and delayed psychomotor developments (12).

IDDS is a serious public health problem in many parts of the world. More than 1.5 billion people are at risk for iodine deficiency with an estimated 655 million suffering from goiter(13). More than 57 million African children suffer from Iodine deficiency disorder (14). A study carried out in Ethiopia in 2011 revealed that about 50,000 prenatal death, and 685.000 babies were born with mild and severe iodine deficiency disorder (15). Ethiopia endorsed a universal salt iodization program with the goal of reaching more than 90% coverage (16-17). This is the most cost effective for prevention of iodine-deficient (18). However only 23% of the

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households of Ethiopia are access to adequate iodized salt (19) . Furthermore, stable diet of Ethiopian is mainly composed of cereal (Teff, maize, sorghum, millet) and tubers and roots (ensete, sweet potatoes) etc which contain thiocyanate that inhibits thyroid iodide iodine absorption (20). Thus, exploring the prevalence of total goiter rate among pregnant utmost significance, although there is a scanty of literature on this issue particularly among pregnant women of Ethiopia specifically in our study area. Thus, this study aimed to assess the prevalence of goiter and associated factors among attending antennal care in public health facilities Bale Zone, Southeast Ethiopia

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Method and Materials

Study design and study setting

A facility based cross-sectional study was done in Bale Zone, Southeast Ethiopia from January-March, 2017 . The Bale Zone is found in Oromia Regional State at 430 km away from Addis Ababa the capital city of Ethiopia. Land with an altitude of 300–4,377 m and, it receives rain twice a year (in two seasons), with downfalls ranging from 800 to 900 mm on average. The main sources of food include cereal crops, fruit, vegetable and animal products. According to the Bale Zone Finance and Economic Development 2017 report, the total population of zone is 1,757,383 out of these females were 896,265 . The antenatal coverage was 64% .

Study Population and Sampling Procedures

The study population consists of pregnant women who are attending antenatal care in selected health facility during the data collection period. The sample size was determined using a single population proportion by using assumption: 95% level of confidence, margin of error of 0.05, proportion of iodine deficiency disorder 89 %(21) and non-response rate: 10%. Considering a design effect of two, the final sample sizes became 517**.** Health institution was selected using simple random sampling method .Total pregnant women who were attending antenatal care in the previous three months at the selected health facility were checked. Based on the client load of the health facility, the sample of the study was allocated proportionally. Then the study subjects were selected using systematic random sampling.

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Data Collection tool and Data quality control

Questionnaire was adopted from WHO and EDHS (5). The English version of the questionnaire was translated into Afan-Oromo (the native language of the study area) then translated back to English by English language and public health experts to ensure consistency. The variables addressed in this study were socio demographic, feeding habit, pregnancy related trimesters (I, II& III). Data were collected by pretested structured interviewer-administered questionnaire and nutritional status of pregnant women assessed by MUAC. A total of five data collectors (2 health officers, 2 clinical nurses) and one supervisor (health officer) were recruited and participated in the study. Data were collected by health professionals after they had been taking training. The training largely focused on equipping the trainees on the objective of the study, technique of inter-view, collection of samples, and maintaining of ethical issues. The data collection tool was pretested on 5 % of the study subjects out of the selected health facilities. During the pretest, the acceptability and applicability of the procedures and tools were evaluated. Moreover during data collection field supervisors were checked the consistency and completeness of collected data in the field & on the daily basis. The investigators were coordinating the overall activities

Measurements

A physical examination was executed among pregnant women to identify the presence and absence of goiter in accordance with the criteria of WHO (4). The Pregnant women neck was observe/ inspect and then palpated for abnormal masses. Goiter was considered to be absent if no palpable or visible goiter was present (grade 0), whereas goiter was considered to be present when a pregnant women had grade 1 or grade 2 goiter, or both (5).

Data Processing and Analysis

After each questionnaire checked for completeness, the data were entered into a data base using Epi Info version 7 statistical packages and then transferred to Statistical Package for Social Sciences (SPSS) version 21 for analysis. Initially data was presented using descriptive statistics, including frequencies and proportions. A bivariate analysis was used to see the crude effect of each independent variable on Goiter. Variables with a P-values of <0.2 were entered into the multivariable logistic regression analysis. Both Crude Odds Ratio (COR) and Adjusted Odds

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Ratio (AOR) with a corresponding 95 % Confidence Interval (CI) were computed to show the strength of the association. In the adjusted analysis, a P-value of <0.05 was used to determine statistical significance.

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Results

Socio-demographic characteristics of the study subjects

Out of 517 sample pregnant women about 499 pregnant women participated in the study giving a response rate of 96.5 %. The majority of the pregnant women were Oromo in ethnicity 365 (73.1 %) and Muslim 272 (54.5 %) in religion. One hundred and sixty (38.3%) of the women had no formal education and half of them were house wives. About 308 (61.7 %) were literate. More than 60% of the pregnant women had a family size with more than five children.

About one-third of the pregnant women had a monthly income of less than 500ETB (table1).

Table 1:- Socio demographic characteristic among pregnant women attending antenatal care at Public health facilities in Bale Zone, Southeast Ethiopia, 2017 Ethiopia, 2017(n=499)

Variables		Frequency	Percentage
Age in years	18-24	223	44.7
	25-34	233	46.7
	>=35	43	8.6
Marital status	Married	484	97.%
	Divorced	11	2.2 %
	Widowed	4	0.8%
Religion	Orthodox	183	36.7
	Muslim	272	54.5

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	Protestant	44	8.8
Nationality	Oromo	365	73.1
	Amhara	89	17.8
	Tigre	12	2.4
	Gurhage	17	3.4
	Kembata	11	2.2
	Other*	5	1%
Educational status	No formal education	191	38.3%
	Literate	308	61.7%
Occupational status	Housewife	253	50.7%
	Government employee	167	33.5%
	Merchant	65	13.%
	Laborers	14	2.8%
Family size	$\leq$ 5	191	38.3%
	> 5	308	61.7%

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Income ETB**	< 500	151	30.3%
	500-1500	179	35.9%
	>500	58	11.6%
	Unknown	111	22.2%

** Ethiopian birr

Obstetric history, Dietery pattern, Goiter ,iodized salt and Nutritional status.

More than 2/3 of house hold our study area were not get adequately iodized salt (≥ 15ppt) .The diet of the majority of these pregnant women was largely based on cereals 433 (86.8 %) and legumes (78.3 %). However, only a few, (4.8 %) of them ate fish in the 24 hours prior to the survey. Goiter was higher among pregnant women with a family size of five or more. About 42.9% of participants had MUAC of less than 21cm suggesting under nutrition (Table 2).

Table 2:- Obstetric History, iodized salt, Goiter and Nutritional Status Among Pregnant Women Attending Antenatal Care At Public Health Facilities In Bale Zone, Southeast Ethiopia, 2017. (N=499)

Variables		Frequency (%)	
Trimester	I	209	41.9%
	II	220	44.1%
	III	70	14.0%

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Gravida	<=2	212	41.8%
	>2	287	57 .5%
goiter	0	301	60.3
	1	128	25.6
	2	67	13.4
MUAC	<21cm	214	42.9%
	≥21cm	285	57.1%
Iodized salt	< 15ppt	340	68.2
	≥15	159	31.8
Dietary diversity	<4	298	60%
	≥4	201	40%

UIC: Urine iodine concentration MUAC: mid-upper arm circumference

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Factors associated with iodine deficiency

Logistic regression analysis was computed to identify predictors of Iodine deficiency among pregnant women. The variables which had P-values less than 0.2 in bivariate regressions were exported to a multivariable regression. The multivariable logistic regression analysis variables such as inadequate dietary diversity, consuming cereal in 24 hour, MUAC <21mm, illiteracy, were associated with iodine deficiency (Table 3).

Table 3:- Factors associated with goiter in logistic regression analysis among pregnant women attending antenatal care in public health facilities, Bale Zone, South east Ethiopia, 2017(N=499).

Variables		Goiter		Crude OR (95%CI)	Adjusted OR (95% CI)
		Yes	No		
Family size	< 5	96	95	. 658(457-.947)	**
	> 5	185	123	1	1
Consuming cereal in 24 hours	Yes	250	183	1.557(.926-2.618)	1.303(1.0330-3.515)*
	No	31	35	1	1
Consuming egg in past 24 hours	Yes	71	75	.637(.432-.939)	**
	No	21	143	1	1

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MUAC	< 21	161	50	4.22(2.83-6.17)	3.631(3.05-7.03)*
	>21	120	164	1	
Educational status	Illiterate	120	165	.616(.426-.892)	1.72(1.12-2.63)*
	Literate	122	64	1	
Dietary diversity	<4	168	111	1.43(1.003-2.048)	1.41(1.91-1.24)*
	>=4	113	107	1	

**: p> 0.05 Have no association *: p< =0.05 Have association

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Discussion

In this study, the prevalence of the total goiter rate among pregnant women was 39 %of which 25.6% is type 1 and 13.4 is type 2 goiter . This prevalence is much higher than the cut-off point of the WHO goiter classification (5.0%) (22).

This finding is also higher than the study conducted Bishoftu health facilities among Pregnant Women Visiting (23) .A possible reason for the differences may be time, sample size and our study was conducted in an over-grazed and mountainous environment which is highly exposed to soil erosion, However, the prevalence of current study was lower than the finding reported in a study conducted in Tigray (71.4%) (24). This may be because our study was undertaken after universal salt iodization was launched in Ethiopia. This could be because iodized salt has both preventive and corrective effects for goiter and also the main solution for eradicating IDD. The WHO has recommended that 90% of the households in a population should be able to obtain iodized salt with an iodine level $\geq$ 15 ppm for the effective elimination of IDD (22). However, in this study, only 31% had adequate salt, with an iodine level $\geq$ 15 ppm.

Pregnant women who consumed green leafy vegetables in the last 24 hours preceding the date of data collection were 1.3 times more likely to develop goiter than their counterparts. Our study demonistrated that the high prevalancce of goiter may be due the majority of pregnant women in study area their diet based on cereal (millet, sorghum) and dark green leafy vegetables (cassava, cabbage). These food or diet contain thiocyanate and isothiocyanate that inhibit the uptake of iodine to the thyroid follicular cells and also facilitate the thyroid peroxidase enzyme that cause iodine deficiency by acting directly on the thyroid gland, or indirectly by altering the regulatory mechanisms of the thyroid gland (10 ,20, 25).

In this study pregnant women with no formal education were 1.7.times more likey to have goiter than those who had formal education. It has also been demonstrated by other studed that better educated pregnant women are more likely to consume food with high dietary diversity whereas illiterate mothers have less ability to understand the adverse consequences of goiter and effect of consumption of an undiversified diet (26). A study conducted in Denmark demonstrated that the prevalence of goiter was less among those with a higher education level (27-28). Study carried out in Istanbul among school children showed that those children who had educated caregivers had a lower prevalence of goiter than their counter parts (28). In France, a study

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conducted among adults revealed that as the educational level increases the prevalence of goiter was decreased (29). It is possible that educated pregnant women are more likely to purchase iodized salt and consume food with higher iodine level.

Conclusion and Recommendation

Conclusion

In this study, the prevalence of goiter was high, suggesting a significant public health problem. Inadequate dietary diversity, cereal consumption in the previous 24 hours, illiteracy and under-nutrition (MUAC<21cm) were significantly associated with goiter. The problems could be combated through increasing consumption of foods with high bioavailable iodine, optimal diversified foods. Use adequately iodized salt.

Abbreviations

AOR: Adjusted odds ratio; CI: Confidence interval; COR: Crude odds ratio; DHS: Demographic and Health Survey Report; IDDs: Iodine deficiency disorder; WHO: World Health Organization

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Availability of data and materials

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The datasets supporting the conclusions of this article are available upon request from the corresponding author, Mr. Sintayehu Hailu.

Author Contributions

SH conceived and designed the study, performed analysis and interpretation of the data. SH, prepared the manuscript. KB, critically reviewed the manuscript. All authors read and approved the final manuscript.

Competing Interests

The authors declare that they have no competing interests

Ethics approval and consent to participate

Ethical approval was obtained from the Ethical and Review committee of the Madda Walabu University. A support of letter from the University was provided to the zonal health office and then communicated to health centers and hospitals. Health center and hospital managers wrote a letter for participants. Written consent was obtained from the participants. All participants had the right to withdraw from the study at any time, without any precondition or disclosure. Moreover, the confidentiality of information obtained was guaranteed by all data collectors and investigators by using code numbers rather than personal identifiers and by omitting the name of the respondents during the data collection procedure.

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