

## Pediatrics

**KEYWORDS:** Goiter,  
Prevalence, associated factors  
and school age children

## PREVALENCE OF GOITER AMONG PRIMARY SCHOOL CHILDREN IN DEBRE TABOR TOWN, NORTHWEST ETHIOPIA: A CROSS SECTIONAL MIXED STUDY



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**Article History***Received: 08.03.2019**Accepted: 21.05.2019**Published: 10.08.2019***ABSTRACT:**

**Background:** There are many explanations for children to underachieve at school such as nutritional, socio cultural, environmental and other factors. Iodine deficiency disorder is the major cause of avoidable brain damage in children resulting in academic deficit. Therefore, this study aimed to assess the prevalence of goitre and its associated factors among school age children.

**Methods:** A school based cross sectional quantitative study complemented with qualitative inquiry was used between March 01/2014 and May 30/ 2014. Two hundred and ninety-four school age children were systematically selected. The data were collected through face to face interviews using a pretested and structured questionnaire. Qualitative data were collected using interview guides. The data were entered into Epi-Info version 3.5, and cleaned and analysed using SPSS version 20. Descriptive summary of the data and logistic regression were used to identify possible predictors using odds ratio with 95% confidence interval and P-value of 0.05. Thematic analysis was used to analyse the qualitative data.

**Results:** The study revealed that the prevalence of goitre was 28.37%. Female students and students whose mothers did not know the prevention of goitre were more likely associated with the existence of goiter than their counterparts were; (AOR: 2.34; 95% CI = 1.10, 4.97) and (AOR: 5.93; 95% CI=2.07, 16.98) respectively. However, students whose mothers completed primary education and who were previously examined/screened for goitre existence were 79% and 99.97% less likely to acquire goitre than their counterparts were; (AOR: 0.21; 95%CI: 0.06, 0.74) and (AOR: 0.03; 95% CI=0.01, 0.17) respectively.

**Conclusions:** Prevalence of goitre is found to be high and iodine deficiency disorder is a severe public health problem. In this study, being female student and mother's lack of knowledge on the preventability of goitre increases the prevalence of goitre. Mother's completion of primary education and early detection of goitre were protective for goitre. Ensuring the consumption of iodized salt, promotion of education and early detection of goitre at the household level are highly recommended.

**Background**

Globally, Iodine deficiency disorder (IDD) results in more than 18 million babies being born mentally impaired in each year. IDD hinders brain development during infancy and childhood. In Ethiopia, it is estimated that over 35 million people are at risk of IDD and over 20 million people suffer from goiters (Total Goiter Rate of 26%) (Demographic, 2006). The total percentage of goiter among school children varies across regions (39.9% nationally) (Abuye et al., 2009). The most affected is southern nation nationalities and

peoples Region (56.2%), Oromia follows with 42% and Benishangul Gumuz (40.5%) and Amhara (29.1%) (Demographic, 2006). Goitrogens in food have been investigated in some studies and have been found to be important in certain geographic areas with endemics (>5%) for instance because of high intakes of thiocyanate from cassava. Furthermore, endemics have been described in many areas caused by goitrogens in drinking water that may contain various chemical compounds interfering with thyroid hormone synthesis (Delange, 1994).

There is clear evidence that the major damage caused by malnutrition takes place in the womb and during the first 2 years of life. This damage is irreversible and is linked to lower intelligence and reduced physical capacity, which in turn diminishes productivity, slows economic growth, and perpetuates poverty. Moreover, malnutrition passes from generation to generation because stunted mothers are more likely to have underweight children (Berhan and Berhan).

On the other hand, surgery has remained the mainstay of treatment for various thyroid diseases. Goiter is a public health problem with a prevalence rate as high as 38% in highland of Ethiopia (Abuye and Berhane, 2007). Recently, an overall prevalence of gross goiter of 22.8% has been reported from Sekota district in northern Ethiopia (Mekonen, 1996). A hospital-based study in Addis Ababa indicated that goiter and its complications are frequent causes of outpatient visits and admission. Goiter is as one of the top ten surgical conditions that necessitated admission for intervention (Berhan and Berhan).

Children under 15 years of age in highland regions are at significant risk of permanent physical and mental retardation and should be treated with iodine oil supplementation. In such areas, women of reproductive age and pregnant women are also targets for iodine oil supplementation to prevent cretinism in newborns (Berhan and Berhan, Bekele, 2007, Getahun et al., Mesele et al., Tebeb, 1993).

Goiter is a public health problem. When community's awareness towards associating factors is high, the solution to iodine deficiency disorder is relatively simple and inexpensive. Adding iodine to salt provides protection from brain damage due to iodine deficiency for the whole population, helping people and country reach their full potential. The impacts pass through generation to generation (Kidane and Woldegebriel, 2006).

The damage is irreversible and is linked to lower intelligence and reduced physical capacity, which in turn diminishes productivity, slows economic growth, and perpetuates poverty (Kidane and Woldegebriel, 2006). On the other hand, thyroid swellings on school age children are common in the mountainous areas including Ethiopia, where the altitude ranges are 1,500-2,000 meters or more above sea level (Macro and Measure).

In Ethiopia, it is estimated that over 35 million people are at risk of IDD and over 20 million people suffer from total goiter rate (TGR of 26%). Nationally, the total percentage of goiter among school-children is 39.9%, which is the highest one among any other age groups while 36% is among biological mothers of school children. The prevalence varies across regions and people living in mountainous areas and warm places suffer from iodine deficiency disorders than other places (Tenpenny et al., 2009).

This study tries to answer the research questions such as; Is/Are the socio demographic variables increase(s) the prevalence of goiter among school children in the study area. Does the knowledge of parents of school children affect the utilization of iodine? How the parents of schoolchildren are practicing iodized salt for the prevention of IDD? What type of salt they are currently used and how much the schoolchildren are affected by IDDs? With the assumption of the prevalence, as well the deficiency of iodine is higher in highland areas than low lands.

Determining the prevalence of goiter and its associated factors helps policy makers and administrators for early detection, timely intervention and prevention of further complications. Since there are few studies done in Ethiopia and no researches were found in Debre Tabor town, this study is used as a baseline for health professionals to focus on the prevention aspects of public health problems in community and school health nursing. The objective of this study was to determine the prevalence of goiter and identify associated factors among school age children at Gafat governmental primary School, Debre Tabor town, Northern Ethiopia.

## METHODS

### Study settings

A school based cross sectional quantitative study supplemented with qualitative inquiry was used to assess the extent of goiter and associated factors among school age children from March 01 to May 30/ 2014 in Debre Tabor town primary schools. Debre Tabor is located at a distance of 666km away from Addis Ababa, the capital city of Ethiopia; and 103 kilometres away from Bahir Dar, the capital of Amhara Regional State. According to south Gondar administrative health office report of 2011, the total population of Debre Tabor town administration was estimated to be 68,739 (35,127 females and are 33,612 males). Of them, 10,019 females are estimated to be between 15 to 49 years of age and 1570 are pregnant. The town has one Zonal Hospital, three Health centers, three private clinics and potable water coverage of 67%. The potential health service coverage of the town is greater than 51%. Currently, in all six governmental schools 8415 (4281 males and 4104 female) students are attending their education. The town has primary education coverage of 92.2% in all six governmental primary schools. Gafat, which is the selected primary school, is found in Northern west direction from the center of the town. The school has 1932 (1020 are females and 912 males) students (Macro and Measure).

The study was supplemented by qualitative approach to explore in more detail the underling behaviours, attitudes, perception, and culture that impact goiter existence and due to sensitivity of the subject matter and complexity of genuinely reporting goiter existence issues from children's mother's perspectives.

### Source population and study population

All students in Gafat governmental primary school were the source population. All selected students in Gafat governmental primary school were the study populations.

### Sample size determination

For qualitative study: Sample size was determined until the occurrence of redundancy and saturation of data. For quantitative study: The sample was calculated using single population proportion formula.

$$n = (Z_{\alpha/2})^2 p(1-p) / d^2$$

Where;  $n$  = the minimum sample size needed,  $Z$  = Reliability Coefficient with 95% confidence level of  $Z_{\alpha/2} = 1.96$ ,  $P$  = Prevalence of goiter on school age children ( $P$ ) = 29% from previous data of Amhara region (Abuye et al., 2007), and  $d$  = the required size of standard error allowed. Then,  $n = (1.96)^2 (0.29 \times (1-0.29)) / (0.05)^2 = n = 316$ , adding 10% allowance for data incompleteness and non-response, the sample was found to be 348. The final sample size was determined by population correction formula since the total population of governmental primary schools in the study area was less than 10,000. Accordingly, the total number of students enrolled during the survey was 294.

For the qualitative inquiry, six in depth interviews (IDIs) were conducted with mothers of selected school age children. Additionally, four focus group discussions (FGDs) with mothers of selected school age children were conducted.

### Sampling technique and procedure

A systematic random sampling technique was used to select the study participants from all school age children and learning in the school. The school was selected by lottery method. The study samples were proportionally allocated to the student's size of each class. In order to develop a sampling frame, the baseline enumeration of the total classes in the school was conducted. Students from age 6-12 years were selected from each selected educational level. Then, a systematic random sampling technique was used to select the eligible students from the sampling frame. Students were listed from lower to upper educational level based on their age. After calculating  $K$ , every 4<sup>th</sup> student was enrolled through systematic random sampling technique. For quantitative study, structured questionnaire was used. Students who lived with their parents for at least six months in the study area before the survey were included in the study. Students who live without parents or assistants, those who were critically ill and mentally retarded, who did not attend at least four days per week, above 12 years of age, mothers who were willing to give written consent for herself but unwilling to include her child and vice versa, two or more students within one family were excluded. The participants for IDIs and FGDs were selected purposively from the study area.

### Data Collection

Data were collected by two nurse interviewers using a pretested structured questionnaire at working hours. The questionnaire was translated to local language (Amharic) by experts in both languages and was translated back to English by another person to ensure consistency and accuracy. The data collection process was closely supervised by two medical doctors and the principal investigator. The data collectors and supervisors were recruited based on previous experience on data collection and fluency in the local language. In addition, training was given for two consecutive days on how to interview, handling ethical issues and maintaining confidentiality and privacy. The pre-test study covered 29 subjects from different schools, which become out of the main study two weeks before the commencement of the main data collection.

Pre-test was conducted to familiarize enumerators with the administration of the interview process and for ensuring consistency. Debriefing sessions were held with the pre-test field staff and the questionnaires were modified based on lessons drawn from the pre-test. Completed questionnaire crosschecked daily for inconsistencies and completeness.

The qualitative data were collected using semi-structured interview guides designed for selected mothers. Discussions were held for FGDs and IDIs discussants in Amharic until the point of saturation was reached. The discussion and palpation of thyroid gland enlargement were moderated by two female health officers. The discussions were tape recorded with permission from the participants. The transcribed data were compared to the notes taken during IDIs and FGDs.

### Variables

Prevalence of goiter was the outcome variable in this study. The explanatory variables were sociodemographic characteristics, knowledge of goiter prevention, family perception about goiter and treatment of goiter.

### Operational definitions

**Goiter:** Thyroid gland enlargement, which has lateral lobes with a volume greater than the terminal phalanges of the thumb of the person.

**Prevalence of goiter:** Both old and new cases of goiter among school age children.

**Endemic goiter:** The prevalence of goiter greater than 5% among school age children.

**Governmental primary school:** Governmentally financed and managed by an educational institution, which provides education from grade 1 up to 8.

### Data processing and analysis

Data were first checked manually for completeness and then coded, entered and cleaned by EPI-Info 3.5.3 statistical software. Then the data were exported to SPSS windows version 20 for data checking, cleaning and logistic regression. Cleaning was done by calculating frequencies and sorting. Bivariate analysis between dependent and independent variables was performed using binary logistic regression.  $P < 0.25$  was used as criteria to select candidate variables for multivariate analysis. Multivariable logistic regression analysis was done to adjust for possible confounding variables.  $P$ -value  $< 0.05$  with 95 % confidence interval (CI) for OR (odds ratio) was used in judging the significance of the associations. Results were presented in text, tables and charts.

The qualitative data were transcribed verbatim, typed in words, and translated back into English by the investigators and analyzed using thematic analysis. The main thematic areas of the qualitative data were identified, coded, and significant quotes were also noted in the text.

### Ethical considerations

Ethical clearance and approval was obtained from Addis Ababa University, Health Sciences College, School of Nursing and Midwifery. After giving official letter written from School of Nursing, permission was obtained from Debre Tabor town education administrative office. Written consent sheet was prepared and read to the participants to obtain both written and verbal consents. Consent was made for gathering qualitative data from the mother. On the other hand, consent was also made with each mother to collect quantitative data on behalf of her child. Participating was not the sense of duty of the study subjects and any secret information was maintained confidential.

## RESULTS

### Socio-demographic characteristics

Out of 294 children, 289 systematically selected participants have responded to the questionnaire making a response rate of 98.3%. Two hundred and eighty nine mothers were studied with their respective children. Among all study subjects, 219 (75.8%) school age children mothers were married and only 13 mothers (4.5%) were single. Regarding to religious status, the majority of them were Orthodox Christian (69.9%) and 27% were completed primary level of education. The distribution of the mothers by occupational status showed that 46.7% were housewives followed by 25.3% mothers who engaged in a particular business generating job (Table 1).

### Prevalence of goiter

The status of goiter among school age children was evaluated by health professionals through physical examination. The present

study showed that 82 (28.37%) children had goiter. About 67.2% males and 32.8% females had grade 1 goiter respectively. On the other hand, among children who had grade 2 goitre, 61.1% and 38.9% are females and males respectively (Table 2).

From 289 children, 52.7% whose ages were 11-12 years did not have goiter while 47.3% whose ages were 6-10 years did not also have goiter. Thirty-seven (57.8%) whose ages were 11 and 12 years had grade 1 goiter. On the other hand, 27 children (42.2%) whose ages were 6-10 years had grade 1 level of goiter. Ten (55.6%) children whose ages were 11-12 years and 8 children (44.4%) whose ages were 6-10 years had grade 2 goiter statuses respectively (Table 3).

### Knowledge of mothers about Goiter

Of the 289 mothers participated in the study, 124 (42.9%) heard about goiter and 165 (57.1%) have no idea about it. Similarly, only 98 (33.9%) heard about iodized salt and 191 (66.9%) have not heard about it. On the other hand, only 12 (4.2%) children were screened previously for the existence of goiter and 277 (95.8%) children were not screened. Two hundred and nineteen (75.8%) women are using non-iodized salt, only 20 (6.9%) mothers are using iodized salt and 50 (17.3%) mothers did not know which type of salt they are using (Table 4).

### Factors Associated with Goiter

Binary and multiple logistic regression models were performed to identify the factors associated with goiter. Variables, which were identified to have significant association at a  $p$  value less than 0.05 with goiter in the bivariate regression model, were entered into multiple logistic regression models. In multivariate logistic regression model, females (AOR=2.34; 95% CI= 1.10, 4.97), mothers level of education (AOR=0.21; 95% CI=0.06, 0.74), screened for early detection of goiter (AOR=0.03; 95% CI= 0.01, 0.17), and children whose mothers did not know about preventability of goiter (AOR=5.93; 95% CI=2.07, 16.98) were significantly associated with goiter (Table 5).

### Qualitative results

Before conducting FGD, we assessed the availability of iodized salt on supermarkets and shops. Few merchants have packed iodized salt, which weighs 400 gm. One pack of iodized salt costs around five Ethiopian Birr. Formation of FGD began with eight group members and warmed discussions were carried out freely. Saturation and redundancy of data occurred at the end of the fourth group discussion. From the discussion, detail information was obtained on availability of iodized salt and its cost, perception, beliefs, cultural influence on the benefits of iodine, time of adding in the watt and ways of practicing.

### Does the availability of iodized salt affect your utilization?

Most women did not identify what iodized salt is, but the availability was expressed as "powder and packed salt" for iodized salt while non-iodized salt was named as "common non-powder salt" for common language and understanding. Almost all said that even if they preferred to use iodized salt with diet, its availability in the town is inadequate. Because of this, they all use common non-iodized salt. *"I believe that the inaccessibility of iodized salt in the town might be due to the cost of iodized salt is not affordable unlike the common non-iodized salt. Women are interested in paying for in a low cost"* said a 35-year married woman from FGD 1.

### Perception and cultural influences about the understanding of the benefits of iodine

Participant's poor perception towards taking iodized salt is one factor for understanding the benefit of adding iodine in the diet. They perceived that goiter is a natural problem that passes from one family to another family. Most participants do not know the function of iodine in the body. Some believed that taking iodine in diet would prevent the occurrence of goiter in their children after mass-media promotion by FMOH. Nevertheless, they have been culturally influenced to use non-iodized salt. This is because of the common family related problem of goiter.



*"I know a mother and a daughter who had goiter and live nearby my house. Unlike us, they commonly use packed iodized salt with watt but both a mother and a daughter develop goiter. From this, I point out that goiter cannot be prevented through iodine," said a 25-year old lady from FGD4.*

#### **When do you add iodized salt in watt?**

On the other hand, all participants believed that adding iodized salt is crucial at the beginning of watt preparation. This is due to malpractice of adding non-iodized salt in diet. This is scientifically approved that the function of iodine will be lost due to heat. Because of this, iodine should be added at the end of watt preparation. The entire participants explained, as they do not know the right time of adding salt in watt and coffee. This confirms that there is clear knowledge and skill gap on utilization of iodized salt in the study area.

*"I would prefer to add salt at the begging of watt preparation than at the end. It might have a negative impact on all my family and neighbours," said a 39-year-old widowed woman from FGD3.*

Surprisingly, some women preferred to use iodized salt for ultimate use. The reason the mentioned was, its natural powder form could give good taste. In addition, only a few mothers said that iodized salt is added at the end of vegetable preparation. Since its form is a powder, they can easily distribute over ready-made vegetables. This might be essential to maintain the function of iodine.

#### **How could you control the quality of iodized salt?**

Cooking problem is another major reason for the failure of control of iodine-deficiency disorders by iodized salt. Since recipe and cooking procedures vary from one household to another, it is difficult to know the overall iodine loss during cooking. During discussion, participants said that there is very little or no information is available. These might be due to lack of knowledge of the public health significance of iodine-deficiency disorders and the importance of iodized salt for its control among parents of school age children.

*A 42 years old woman said from FGD 3," the quality of iodized salt is expressed when a small amount of salt has the ability to maximize wot taste during food cooking"*

#### **How could you determine the quantity salt during food cooking?**

It is almost expected for cooking food to contain salt. You could just have control over the quantity of the salt intake rather than trying to avoid it completely. Focus group discussants argued that the permissible quantities of salts in cooking food would have to be learnt intensely.

*"The permissible amount of salt content that it should contain is just about a single teaspoon for each food cooking. Similarly, there are measures that are discreet for different items which are important for the cooks to be aware of its quantity and the quantity differs from individual to individual", said a divorced 33 years' woman from FGD 2.*

#### **Do you think that family size will affect your iodized salt utilization?**

The majority of the study subjects had 4-6 numbers of children. Having large numbers of families in a single house is one reason to prefer non-iodized salt. They mentioned non-iodized salt is affordable and used for a long period as compared with iodized salt in such families than those who have small family size.

*A 46 years' mother in FGD 2 and whose family size is 12, said, "even if I heard about the advantages of iodized salt in Ethiopian Television program, it is very difficult to pay 5 Ethiopian Birr for only one pack of iodized salt. I use more than one pack of iodized salt per week. However, the common non-iodized salt may serve for at least three weeks with the same cost".*

To sum up the qualitative findings of this study, availability of iodized salt, cost affordability, perception, cultural beliefs, malpractice of foods cooking, information and skill gap are clearly observed factors on iodized salt utilization in the study area (Dile et al.).

#### **DISCUSSIONS**

The present study showed that 28.37% of school age children had goiter. This result was lower than studies conducted in Goba (50.6) (Enyew et al.) and at the national level (39.9%) (Abuye and Berhane, 2007). Totally, 67.2% males and 32.8% females had grade 1 goiter. Similarly, 61.1% females and 38.9% males had grade 2 goiters. Females were more likely affected by goiter than males between ages 6-12 years. This might be due to the trap system of mammary glands for iodine is similar to that of thyroid gland. The breasts effectively compete with thyroid gland for ingested iodine. This distribution of iodine to both breast and thyroid gland in pubertal girls explains why goiter is more common in girls than pubertal boys. The growth of a goiter in young girls shows the deficient spreading of iodine to both breast and thyroid tissue (Delange, 1994, Tenpenny et al., 2009).

In addition, the present study revealed that the prevalence became high when the ages were increased. Of the participants, 57.8% whose ages were 11-12 years and 42.2% whose ages were 6-10 years had grade 1 goiter. Similarly, 55.6% whose ages were 11-12 years and 44.4% whose ages were 6-10 years had grade 2 goiters. This result was consistent with studies conducted in Haiti (Tenpenny et al., 2009) and Thailand (Thurlow et al., 2006). This might be due to the fact that Ethiopia especially Debre Tabor is a mountainous country and poor soil preservation over a long period contributed to the leaching away of the iodine-rich soil layer and exposing of the iodine poor layer beneath (Enyew et al.).

This study revealed that female sex, mother's education, previous screening for goiter and lack of knowledge about prevention of goiter were the major factors.

In the present study, female students were 2.34 times more likely associated with the existence of goiter than male students (AOR= 2.34; 95% CI = 1.10, 4.97). The finding of this study is in line with studies conducted in Goba (Enyew et al.), Gamogofa (Kebede and Adinew), Haiti (Tenpenny et al., 2009), and Saudi Arabia (Stamler et al.). This might be due to the fact that there is a physiological difference that increases the demand for extra iodine and the loss of iodine from the female body (Tenpenny et al., 2009).

The study also found that students whose mothers completed primary education were 79% less likely to acquire goiter (AOR: 0.21; 95% CI: 0.06, 0.74). The finding of this study is in line with the studies conducted in the gamogofa zone (Kebede and Adinew) and Dabat district (Abebe et al.). This might be due to the fact that education improves communication with partner, women's status in the community and the influence of education on women's decision making (Worke et al.).

Similarly, children who were previously examined/screened for goiter existence were 99.97 % less likely to acquire goiter than their counterparts (AOR= 0.03; 95% CI=0.01, 0.17). The finding of this study is in line with the report of 3 cases (Koibuchi et al.). This may be due to the fact that a diagnosis of malignancy would have to be made without delay because of the suspicion of papillary carcinoma in cases in which sonography of the neck revealed an irregularly shaped hypo echoic nodule with echogenic dots or spots (Koibuchi et al.).

Finally, students whose mothers did not know the prevention of goiter were nearly 6 times more likely to acquire goiter than their counterparts (AOR=5.93; 95% CI=2.07, 16.98). This might be due to the poor understanding of the mothers about the benefits of taking iodized salt with watt as daily requirement, presence of iodine in salt

and whether it associates with goiter or not. Some were used when the amount of non-iodized salt was inadequate for maximizing its taste. Only few mothers did understand the benefit of its use after mass media promotion of Federal Ministry of Health, but the problem laid on ways of practicing. On the other hand, the majority of the study subjects had inadequate information regarding to the prevention of goiter, functions of iodized salt and its utilization. They mentioned as goiter is a family related problem and some said that goiter is common in geographically iodine deficient areas.

However, this study does have some inherent limitations. First, the study related to mother's perception on prevention of goiter is much sensitive and might result in social desirability bias, which could underestimate or overestimate an outcome of interest. In addition, this study did not include the participants from rural areas, which might be good to get new factors, which could make the study reach, and suggested to be studied in the future. Finally, considering factors from the service providers' side and structural barriers would have been important.

### CONCLUSIONS

Prevalence of goiter is found to be high and iodine deficiency disorder is a severe public health problem. In this study, being female and mothers lack of knowledge on the preventability of goitre increases the prevalence of goitre. Mother's completion of primary education and early detection of goitre were protective for goitre. Ensuring the consumption of iodized salt, promotion of education and early detection of goitre at the household level are highly recommended.

### Declarations

#### Competing Interests

We declare that there are no any competing interests

### Acknowledgements

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### List of Abbreviations

AAU: Addis Ababa University, AOR: Adjusted Odds Ratio, CI: Confidence Interval, COR: Crude Odds Ratio, EHNRI: Ethiopian Health, Nutrition, and Research Center Institute, EPDRF: Ethiopian People's Democratic Republic Front, ICCIDD: International Council for the Control Iodine Deficiency Disorder, ID: Identification Number, IDD: Iodine Deficiency Disorder, Km: Kilo meter, MOH: Ministry of Health, TGR: Total Goiter Rate, TSH: Thyroid Stimulating Hormone, UNICEF: United Nation International Children's Economic Fund, USI: Universal Salt Iodization. WHO: World Health Organization.

### Availability of Data and Material

The datasets generated during the current study are available from the corresponding author on reasonable request.

### Consent for Publication

Consent for publication is available and could be sent to the editors on request.

### Ethics Approval and Consent to Participate

This study was approved by Debre Tabor University ethics committee, and written informed consent was obtained from all study subjects.

**Table 1:** Socio-demographic characteristics of parents of school age children at Gafat governmental primary school, Debre Tabor town, Northern Ethiopia, March 01/2014 - May 30/2014.

Characteristics	Frequency	Percent (%)
<b>Current age of the mother/caretaker</b>		
<20		
20-34		
>34		
<b>Marital status</b>		
Single	13	4.5
Married	219	75.8
Divorced	30	10.4
Widowed	27	9.3
<b>Religion</b>		
Orthodox	202	69.9
Muslim	49	17.0
Protestant	21	7.3
Catholic	17	5.9
<b>Educational status of mothers</b>		
Illiterate	51	17.6
Read and Write	38	13.1
Primary education	78	27.0
High school	73	25.3
Above high school	49	17.0
<b>Educational status of fathers</b>		
Illiterate	20	6.9
Read and Write	14	4.8
Primary education	39	13.5
High school	108	37.4
Above high school	108	37.4
<b>Occupational status of mothers</b>		
Gov. employee	49	17.0
Non.gov. employee	14	4.8
Self-work	73	25.3
House wife	153	52.9
<b>Occupational status of fathers</b>		
Government employee	124	42.9
Non-government employee	19	6.6
Self-employee	68	23.5
Merchant	78	27.0
<b>Family size</b>		
1-3	17	5.9
4-6	196	67.8
>7	76	26.3

**Table 2:** Goiter status among school age children by sex in Gafat governmental primary school, Debre Tabor town, Northern Ethiopia, March 01/2014 - May 30/2014

Characteristics	Frequency	Percent (%)
<b>Absent (Grade 0)</b>		
Male	114	55.1
Female	93	44.9
<b>Grade 1</b>		
Male	21	32.8
Female	43	67.2
<b>Grade 2</b>		
Male	7	38.9
Female	11	61.1
<b>Present</b>		
Male	28	34.15
Female	54	65.85

**Table 3:** Goiter status of school age children by age in Gafat primary school, Debre Tabor town, Northern Ethiopia, March 01/2014 - May 30/2014.

Characteristics	Frequency	Percent (%)
<b>Absent (Grade 0)</b>		
6-10	98	47.3
11-12	109	52.7

<b>Grade 1</b>		
6-10	27	42.2
11-12	37	57.8
<b>Grade 2</b>		
6-10	8	44.4
11-12	10	55.6
<b>Present (Grade 1 and 2) Age</b>		
6-10	35	12.11
11-12	47	16.26

**Table 4:** Knowledge of goitre among school age children's mothers at Gafat governmental primary school, Debre Tabor town, Northern Ethiopia, March 01- May 30/ 2014.

Characteristics	Frequency	Percent (%)
<b>Source of information about goiter</b>		
Health professionals	14	4.8
Mass media	46	15.9
Books/magazines	275	95.2
Husband	273	94.5
Friends/relatives	257	88.9
Others	285	98.6
<b>Perception for detection of goiter</b>		
Visible on neck	212	73.4
Has pain	7	2.4
Through examination	44	15.2
No idea	26	9.0
<b>Perception on treatment of goiter</b>		
Yes	211	73.0
No	24	8.3
Don't Know	54	18.7
<b>Did You Know factors for goiter and other problems?</b>		
Yes	43	14.9
No	17	5.9
Don't know	229	79.2
<b>-Actions to be taken for goiter treatment</b>		
Use traditional treatment	25	8.7
Visit health institution	212	73.4
Go to religious places	13	4.5
Nothing	39	13.5
<b>Is Goiter preventable*</b>		
Yes	120	41.5
No	51	17.6
Don't know	118	40.8
<b>Participation of children*</b>		
Likes to play	247	85.5
Dislikes to play	20	6.9
Don't know	22	7.6

**Table 5:** Factors Associated with goiter status of school age children in Gafat governmental primary school, Debre Tabor town, Northern Ethiopia, March 01/2014 - May 30/ 2014.

Characteristics	COR (95% CI)	AOR (95 %CI)
Sex	1.00	1.00
Male	2.36(1.39,4.03)	2.34(1.10, 4.97)
Female		
<b>Educational status of mothers</b>		
Illiterate	1.75(0.76, 4.03)	1.12(0.31, 4.02)
Read and write	1.63(0.66, 4.00)	1.57(0.39, 6.35)
Primary completed	0.29(0.11, 0.75)	0.21(0.06, 0.74)
High school completed	1.22(0.56, 2.70)	0.98(0.31, 3.07)
Above high school	1.00	1.00
<b>Previously screened for existence of goiter</b>		
No	1.00	1.00
Yes	0.12(0.03, 0.45)	0.03(0.01, 0.17)
<b>Goiter is preventable</b>		
Yes	1.00	1.00
No	3.38(1.67, 6.83)	5.93(2.07, 16.98)
I don't know	1.48(.81, 2.68)	1.98(0.85, 4.61)

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