

ORIGINAL ARTICLE**Prevalence and Associated Factors of Thyroid Incidentaloma among Adult People Attending Gondar University Hospital, Northwest Ethiopia****Temesgen Tadesse¹, Tigist Hailu¹, Assefa Getachew², Solomon M Abebe³****OPEN ACCESS**

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ABSTRACT

BACKGROUND: Incidentally discovered thyroid lesions have become highly common in the development and more frequent utilization of highly sensitive imaging modalities, like ultrasound. However, little is known about its prevalence and associated factors in Ethiopia. The aim of this study was to determine the prevalence of thyroid incidentalomas and associated factors through ultrasound (US) among adults attending Gondar University Hospital.

METHODS: A hospital-based cross-sectional study was carried out on 290 adults aged 15 years and above. Out of the adults who visited the hospital during the study, those who neither had history of thyroid disease, thyroid surgery, nor clinically palpable thyroid nodules were involved in the investigation. The participants were examined using a high frequency linear-array transducer (7 MHz). For comparing men and women, the unpaired t-test was used. Binary logistic analysis was used to identify the associated factors, and a *P*-value < 0.05 was considered statistically significant.

RESULT: The frequency of thyroid incidentaloma was found to be 33.4% (95% CI: 27.9, 38.9). Thyroid incidentaloma was detected in 42.4% of the females and 22.7% of the males (*P*<0.001). About 63% had single and 37% multiple thyroid nodules. About 25.8% had thyroid nodules greater than 1cm. In the multivariable logistic regression analysis, increasing age (AOR=5.96; 2.34, 15.15) and female sex (AOR=3.01; 1.73, 5.26) were significantly associated with thyroid incidentalomas.

CONCLUSION: The frequency of thyroid incidentaloma (TI) was found to be high in this study and much higher among older women. Solitary and small sized thyroid nodules were commonly seen in the study.

KEYWORDS: Thyroid nodule, thyroid incidentalomas.

INTRODUCTION

Iodine is the substrate used for thyroid hormone synthesis. Deficient or too much uptake of iodine can trigger a reactive growth of the thyroid gland tissue and lead to goiter and thyroid nodules. Thyroid

nodules, one of the most common thyroid diseases, and the associated risk factors have received much attention in medicine. Incidentally discovered thyroid lesions have become increasingly common with the development and more frequent utilization of highly sensitive imaging modalities throughout clinical practice in medicine (1,2).

The prevalence of thyroid incidentaloma (TI) varies with regions of the world, population studied, and methods used to detect thyroid nodule. Many factors have been reported for the variations, the most common of which are age, sex, and iodine intake. The reported prevalence of TI varied as the lowest rate in USA, 9.4% and the highest were reported in studies conducted in North America and Germany, (67-68%) (1-8).

Physical examination by palpation has low sensitivity in detecting thyroid nodules, and its detection rate also depends on the size of the nodules. Overall, the prevalence of thyroid nodule by palpation ranges from 2-7% in the general population from different countries in different studies. Thyroid nodules were best detected by high resolution US in a study done in Estonia. Physical examination detected 6.4% of the nodules less than 0.5cm in diameter while high resolution US and physical examination detection improved with increasing nodule size, but still only 48% of the nodules > 2cm were detected by palpation (5,6,9).

Female sex, increasing age, iodine deficiency and obesity are known risk factors for thyroid nodule development (1,10). Thyroid nodule detection suggests that the disease could be either benign or malignant. The rate of the detection of thyroid cancer ranges from 0.5-15% in different studies (11,12). Moreover, its prevalence also suggests the degree of iodine deficiency, and a follow-up of such magnitude will help assess the result of improvement in iodine uptake and intervention of iodine supplement (13).

A study done in Africa, it was found that dietary iodine deficiency was the major determinant of thyroid pathology, resulting in a spectrum of iodine deficiency disorders, including goiters, hypothyroidism and mental retardation (14). In line with this, the World Health Organization showed that goiters are present in

28.3% of the African population(15). A study done on prevalence of goiter among school children in Northeast Ethiopia also showed the burden which accounts for 62.1% prevalence of goiter (16).

High resolution ultrasound examination is currently the basic examination method for patients suspected of having nodular and diffuse thyroid disease. The use of ultrasound is generally considered the first choice for the evaluation of the thyroid nodule (TN), and it is especially useful in the detection of a small non-palpable thyroid. However, there is less data related to the detection of TN to see its burden across different age populations. In this study, we investigated the magnitude of TN and identified the independent associated factors of TN among a population over 15 years of age.

MATERIALS AND METHODS

Study area: The study was conducted at the University of Gondar Teaching Hospital that provides healthcare services to over 6 million inhabitants in Northwest Ethiopia. The hospital consists of different units including intensive care unit (ICU) with 18 beds, 13 wards with 510 beds, outpatient and radiology departments, and a diagnostic laboratory. The Radiology Department has a postgraduate programme with a total of 19 residents and 3 senior radiologists, with five fully equipped ultrasound, 3 x-ray, and 2 CT scan machines.

Study design and period: A hospital-based cross-sectional study was carried out at Gondar University Hospital for a period of 7 months, April to November in 2015.

Study population: The study population were all patients over 15 years of age who visited the University of Gondar Teaching Hospital for ultrasound examinations during the study period. Individuals with history of thyroid disease, thyroid surgery, or palpable TN were excluded.

Sample size and sampling: The sample size was determined using single population proportion by assuming the prevalence of thyroid incidentaloma to be 22% (taken from a study done at a university college hospital, Ibadan, Nigeria 2013) with a 0.5 margin of error on the final sample of

290. All patients who came for ultrasound examinations in the Radiology Clinic at the University of Gondar Teaching Hospital during the study period were included.

Data collection: Socio-demographic data and data on other independent variables believed to be related to thyroid diseases were collected from each participant by using an interview-based self-structured questionnaire.

A comprehensive standard neck ultrasound examination was performed on all subjects by the principal investigator using SONOSCAPE (SSI-8000 SERIES, China) machine with a 7MHz transducer. All patients were examined in supine position with hyper extended neck, using a high frequency linear-array transducer (7 MHz), which provided adequate penetration, and a high resolution image. Scanning was done in both transverse and longitudinal planes. Real time imaging of thyroid lesions was performed using both gray-scale and color doppler techniques. The imaging characteristics of a mass (location, size, shape, margins, echogenicity, contents and vascular pattern) were identified.

Data management and analysis: The collected data were checked for completeness and cleaned by consistently checks. The statistical Package for Social Sciences for Window (SPSS), version 20, was used to enter and analyze the data, summarized using frequency distributions and two way tables. Data were presented as mean \pm standard deviation for continuous variables and percentages for categorical variables. Comparison between men and women used the unpaired t-test. Pearson correlation coefficient (r) was used to show the correlations between the measured gray scale ultrasound findings and age. P-value < 0.05 was considered statistically significant.

Ethical clearance was obtained from the Ethical Review Committee of the College of Medicine and Health Sciences, the University of Gondar. Official permission and informed written consent were obtained from each participant, and permission letter was also obtained from the University of Gondar Teaching Hospital. All the information obtained from each participant was kept confidential.

RESULTS

Altogether, 290 patients were screened. The mean (\pm SD) age of the participants was 37.1(\pm 15.3), with a range of 15–85 years. The median age of the study participants was 34.5 years with inter quartile range of 23 years. Among these, 132(45.5%) were males while 158(55.5%) females. In terms of residence, 176(60.7%) lived in urban and 114(39.3%) in rural areas (Table 1). The frequency of thyroid incidentaloma was found to be 33.4%(95% CI: 27.9, 38.9). The proportion was detected in 42.4% of the females and 22.7% of the males ($P < 0.001$) (Table 2).

Table1: The socio-demographic characteristics of adult people who visit Radiology Clinic at Gondar University Referral Hospital Northwest Ethiopia, 2015

Variables		Frequency	Percent
Sex	Male	132	45.5
	Female	158	54.5
Age	15-24	66	22.8
	25-34	79	27.2
	35-44	58	20
	45-54	39	13.4
	>54	48	16.6
Residence	Urban	176	60.7
	Rural	114	39.3

In our study, there was a significant difference in the mean age of the individuals with nodules (42.2 ± 15.4 years) and without nodules (34.6 ± 14.7 years) ($P = 0.00$), and the frequency of thyroid incidentalomas increased with age with significant difference among different age groups ($P = 0.00$) (Graph.1). However, TI was equally common among individuals of all residences ($P = 0.145$) (Table 2). Family history of thyroid disease was reported in 14(4.8%) participants and radiation exposure in only 3(1%). Thyroid incidentaloma was high in participants with family history and no iodized salt use though not statistically significant ($P = 0.139$ and $P = 0.206$, respectively).

Table 2: Adjusted socio-demographic and predisposing variables associated with thyroid incidentaloma in Gondar, Northwest Ethiopia (2015)

Variable	Frequency	Percentage
Sex		
Male	132	45.5
Female	158	54.5
Age in year		
15-24	66	22.8
25-34	79	27.2
35-44	58	20
45-54	39	13.4
>55	48	16.6
Residence		
Urban	176	60.7
Rural	114	39.3
Religion		
Christian	272	93.8
Muslim	18	6.2
Marital status		
Married	153	52.8
Single	85	29.3
Divorced	29	10
Widowed	23	7.9

*- P-value <0.0

About 63% (61 out of 97) of individuals in the study had single nodule and 37% (36 out of 97) multiple nodules. The proportion of single and multiple nodules of thyroid gland in different age groups is given in Figure 2. The number of nodules increased as age increased. About 18.6% (18 out of 97) of individuals had TNs in more than one location, 39.2% (38 out of 97) only in the right lobe, 38.1% (37 out of 97) only in the left lobe, and 4.1% (4 out of 97) only in the isthmus. In 18(6.2%) patients, nodules were found in more than one location (Figure 3). About 25.7% (25 out of 97) individuals in the study had TNs of more than 1cm, and 74.2% (72 out of 97) had smaller than 1cmTNs.

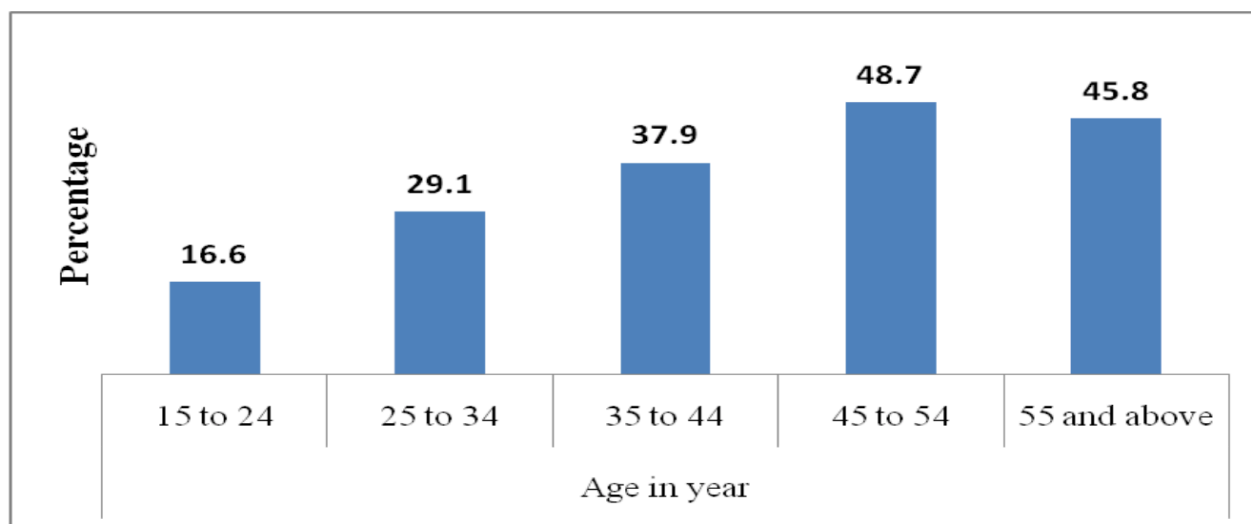


Figure 1: Percentage of individuals with thyroid nodules among adult people attending Gondar University Hospital, Northwest Ethiopia, 2015

Data on the characteristics of nodules were available for 97 patients, according to which

11(3.8%) had anechoic nodule, 2(0.7%) had markedly hypo echoic, 30(10.3%) had hypo

echoic nodule, 3(1.0%) had hyper echoic and 29(10%) had both hypo- and hyper-echoic or heterogeneous nodules. On the other hand, 53(54.6%) of the nodules were round and 44(45.4%) oval with solid consistency in 56(57.7%), cystic in 11(11.3%) and mixed in 30(30.9%). The majority of the thyroid nodules had well defined margins (76%) while 21.9% had

ill-defined margin. As to calcification, 17.5% had microcalcifications, 3.1% had macro and 4.1% had rim calcifications. The rest 75.3% of the thyroid nodules had no calcification. Most of the nodules (68%) had a peripheral type of blood flow and 5.2% predominantly central flow, 4.1% in mixed flow and 22.7% no flow on color doppler studies.

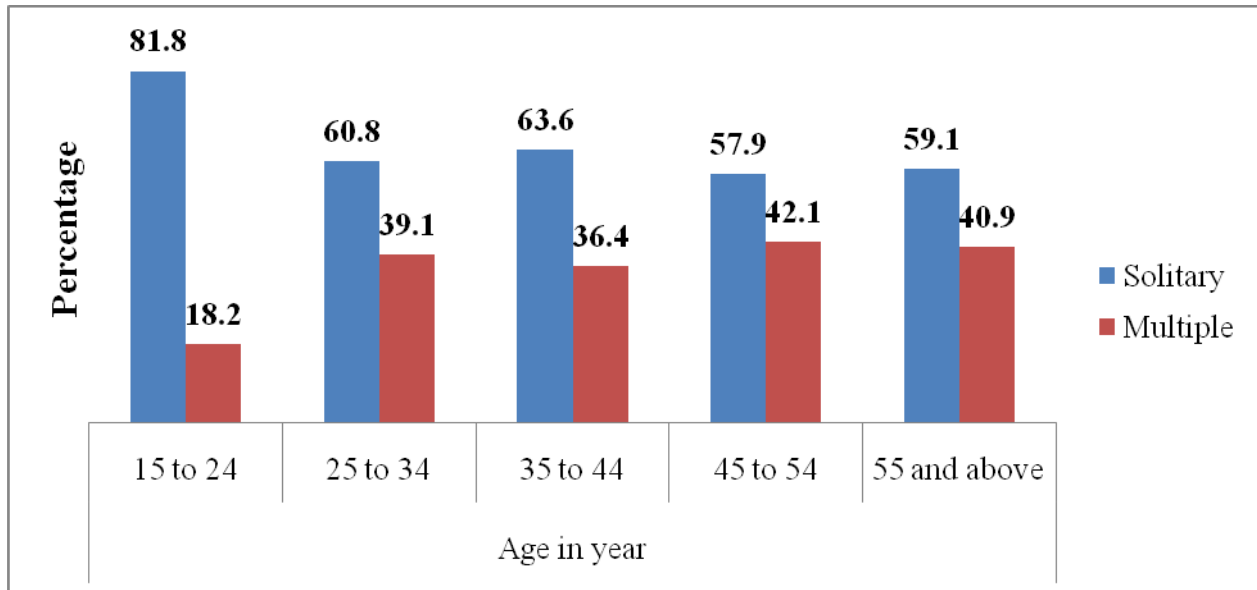


Figure 2: percentage of individuals with solitary and multiple nodules among adult peoples attending Gondar University hospital Northwest Ethiopia, 2016

After controlling the number of important independent variables, the multivariable logistic regression analysis showed that increasing age and female sex were significantly associated with thyroid nodules. The odds of thyroid nodules were 6 times higher among individuals who were aged 55 years and above than those aged 15 to 25 years (AOR=5.96; 2.34, 15.15). Occurrence of thyroid nodules was 3 times higher among females than males (AOR=3.01; 1.73, 5.26).

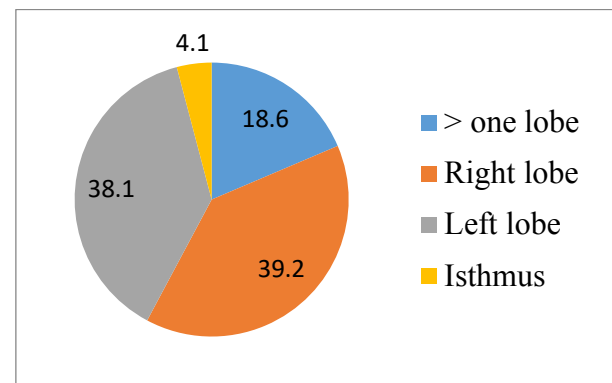


Figure 3: percentage of thyroid nodules in different lobes among adult peoples attending Gondar University hospital Northwest Ethiopia, 2016

DISCUSSION

In this study, the frequency of thyroid incidentaloma was found to be high and higher among women and the elderly. More than one-third of them had multiple thyroid nodules, and a quarter had thyroid nodules greater than one cm. Old age and female sex were important associated factors of thyroid incidentalomas.

The frequency of thyroid incidentaloma in our study was higher than those of studies in many countries across North America, Europe, and Asia. For instance, in one US study, the prevalence of TI was 9.4%, California (13.4%), Iran (13.6%), Poland (14.8%), Pakistan (21%) and Finland (27.35%). Like ours, a high prevalence (68%) of TI was reported from Germany and 49% from Beijing. This difference in prevalence across countries could be due to iodine insufficiency of the regions (2-4,6,7). A study done in sub-Saharan Africa showed lower prevalence rate, 28.3%, of thyroid incidentaloma compared with our study, but it has comparably increased prevalence of nodules in older age and being female (12).

The frequency of TI increased with age, and there was a significant difference in the mean age of individuals with nodules and without nodules in our study. This is comparable with the study done in Karachi, Pakistan that found individuals with nodules were 48.8 ± 14.8 and those without nodules 39.25 ± 14.8 years older (3). The prevalence of the location of thyroid nodules (TNs) in one lobe (right, left or isthmus) was found to be high (81.4%) in our study. However, a study done in Pakistan noted that 61% of the individuals had unilateral TNs (3).

Brander et al. in his study in Finland done in 1991 reported a frequency of 70% of nodules smaller than 1cm which is in line with our finding that found nodules <1cm in 74.2% of the cases (2).

It is important to classify TNs as single or multiple. A study done in Pakistan by Zuberi et al. showed the risk of thyroid malignancy was more in multiple nodules (17). The difference in the frequency of single nodules (62.5%) and multiple nodules (37.5%) in our study was similar with the finding by Taheri et al. and Brander et al. Taheri et al. reported that single nodules were more common among Iranians in that 61% of

individuals had single nodules (2,3). A study by Brander et al. (Finland) supported Taheri *et al.* As the prevalence of single and multiple nodules in their population was 57% and 22%, respectively. ($P=0.722$). Female sex and old age were significantly associated with thyroid nodules which is in line with other findings in sub-Saharan Africa, Shanghai and Karachi (3,6,12).

The strength of this study is that it showed the prevalence of incidental thyroid nodules which is a common entity in Africa and specifically in Ethiopia where there are very few studies done in the area. Therefore, this research plays its own role to the population and to other upcoming studies in the area of interest.

The study, being institution-based, may not represent the general population. We used small sample size which may not be adequate enough to have a better statistical power to show the association between independent and dependent variables. Moreover, since the study is cross-sectional, it does not show casual relationship with outcome. The other limitation of the study was that we did not include thyroid function test and fine needle aspiration cytology so that secretion status of hormones and rate of malignancy in the nodules were not studied.

In conclusion, the frequency of thyroid incidentaloma was found to be generally high and higher among women and older participants. More than one third of them had multiple thyroid nodules, and a quarter of them had thyroid nodules greater than 1cm. Single nodule and small size were more common than multiple and larger nodules. Increasing age and female sex were important factors associated with thyroid incidentalomas. Further investigations are recommended on the correlation of ultrasound and biopsy results. Additionally, studies which sample the general public could help to identify the correct status of thyroid incidentalomas if Ethiopia is to continue as iodine deficient area.

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