

An epidemiological study of the prevalence and associated risk factors of goiter among adults in the southern part of Albania

Estudio epidemiológico sobre la prevalencia y los factores de riesgo asociados al bocio en adultos del sur de Albania

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Abstract

Introduction: In developing countries such as Albania, goiter is a major public health problem. Although the morbidity and mortality of thyroid surgery have decreased markedly, serious complications may still occur. The study aimed to evaluate the prevalence and associated factors of goiter in women in Gjirokastra city, situated in south Albania.

Methods: This descriptive cross-sectional retrospective study was conducted from January 2009 to December 2018. The data of 325 women suspected of goiter were collected. The epidemiological data such as demographic data, family history, smoking, alcohol consumption, body mass index, menstrual status, salt consumption, and also metabolic syndrome were analyzed by SPSS version 20.0. The logistic regression analysis was applied to assess the risk factors and the relationship between variables. P-values less than 0.05 were considered statistically significant.

Results: The prevalence of goiter was 35.7% (116/325) (95% CI, 31.01 to 39.4%). The mean age was 41.32±10.05 with a minimum and maximum age of 20 to 71. The most affected age resulted in 41-50 years old with 41% (95% CI, 37.4 to 45.8%). The finding showed that age, family history, BMI, and menstrual status had a significant relationship with goiter with a p-value <0.05. Likewise, our study demonstrated metabolic syndrome to be a strong predictor of goiter.

Conclusions: The prevalence of goiter was relatively high among women. Having a family history and being 41-50 years old increased the risk of goiter. The findings data suggest the need for special attention for females of advanced age, on menopause, obesity, and metabolic syndrome. They should be examined by physicians and screened with imaging tests and laboratories test for goiter.

Key words: prevalence, goiter, women, epidemiological, risk factors.

Resumen

Introducción: En los países en vías de desarrollo, como Albania, el bocio es un importante problema de salud pública. Aunque la morbilidad y la mortalidad de la cirugía tiroidea han disminuido notablemente, todavía pueden producirse complicaciones graves. El estudio tenía como objetivo evaluar la prevalencia y los factores asociados del bocio en las mujeres de la ciudad de Gjirokastra, situada en el sur de Albania.

Métodos: Este estudio descriptivo transversal retrospectivo se realizó desde enero de 2009 hasta diciembre de 2018. Se recogieron los datos de 325 mujeres con sospecha de bocio. Los datos epidemiológicos como los datos demográficos, los antecedentes familiares, el tabaquismo, el consumo de alcohol, el índice de masa corporal, el estado menstrual, el consumo de sal y también el síndrome metabólico fueron analizados por el SPSS versión 20.0. Se aplicó el análisis de regresión logística para evaluar los factores de riesgo y la relación entre las variables. Se consideraron estadísticamente significativos los valores P inferiores a 0,05.

Resultados: La prevalencia de bocio fue del 35,7% (116/325) (IC 95%, 31,01 a 39,4%). La edad media fue de 41,32± 10,05 con una edad mínima y máxima de 20 a 71 años. La edad más afectada resultó ser la de 41-50 años con un 41% (IC 95%, 37,4 a 45,8%). El hallazgo mostró que la edad, los antecedentes familiares, el IMC y el estado menstrual tenían una relación significativa con el bocio con un valor p <0,05. Asimismo, nuestro estudio demostró que el síndrome metabólico es un fuerte predictor del bocio.

Conclusiones: La prevalencia del bocio fue relativamente alta entre las mujeres. Tener antecedentes familiares y tener entre 41 y 50 años aumentó el riesgo de bocio. Los datos de los hallazgos sugieren la necesidad de prestar una atención especial a las mujeres de edad avanzada, con menopausia, obesidad y síndrome metabólico. Deberían ser examinadas por los médicos y sometidas a pruebas de imagen y de laboratorio para detectar el bocio.

Palabras clave: prevalencia, bocio, mujeres, epidemiológico, factores de riesgo.

Introduction

Goiter is a condition characterized by enlargement of the thyroid gland over time¹. It is a major public health problem, in several areas of the world², which can be due to several causes. More than one-tenth of the world population is to some degree affected by goiter and most of these harbor nodules. Globally, the total goiter prevalence in the general population is estimated to be 15.8%, varying between 4.7% in America to 28.3% in Africa³. The large differences in thyroid disease prevalence between populations may be caused by genetic and environmental factors⁴. The most common worldwide (over 90%) is a simple goiter due to an iodine deficiency in the diet. Hyperthyroidism can also lead to goiter as a result of an over-secretion of TSH and a build-up of thyroid tissue. Other causes of goiter are less common and can involve tumors or autoimmune reactions⁵. Most thyroid nodules and goiters do not present any symptoms; however, they can be associated with other disorders, including endocrine dysfunction, impaired body composition, autoimmune thyroid disease, and various metabolic disorders⁶. Coordinating basal metabolic rate and thermogenesis is key for thyroid hormones^{7,8}. Goiter can be detected clinically by palpation and physical examination when there are insufficient amounts of iodine⁹. The prevalence of ultrasound-detectable nodules ranges from 19% to 67% and only 4-7% of thyroid nodules detected by ultrasound are palpable¹⁰. Women are more likely to have thyroid disorders, including goiter and thyroid nodules, although some authors could not confirm any gender-related associations^{11,12}. In some research was reported that metabolic syndrome (MetS) and its related components, including obesity, insulin resistance (IR), hypertension, dyslipidemia, and impaired glucose metabolism, are associated with morphological abnormalities of the thyroid and may contribute to increased thyroid volume as well as nodule prevalence^{7,13}. Additionally, other studies highlighted the importance of hyperinsulinemia/insulin resistance, the central features of MetS, in thyroid cell proliferation, which manifested as increased thyroid volume and nodule^{14,15}. The Association of thyroid functional and morphological changes with individual risk factors, especially with smoking habits, has been investigated previously. Some authors have found a significant relationship between smoking and increased thyroid volume, a prevalence of goiter, or thyroid multinodularity in areas with iodine deficiency¹⁶. The study aimed to evaluate the prevalence and associated factors of goiter in women in Gjirokastra city, situated in south Albania.

Methods

This descriptive cross-sectional retrospective study was conducted from January 2009 to December 2018. The study comprised 325 suspected goiters patients who obtained the service from the specialist endocrinologist and surgeon in the city of Gjirokastra.

In this study, we included patients of both sexes that had files with complete data. While excluded from the study were subjects with inadequate specimens for diagnosis, incomplete data, or data acquisition errors. The clinical history of each patient was taken throughout the examination. The information regarding the general socio-demographic data, which includes, age, gender, residential area, marital status, occupation, education level, economic status, and family history was collected from the record files of each patient. The epidemiological information regarding female menstrual status, salt consumption, and also metabolic syndrome alcohol, smoking, and physical was collected also. Furthermore, the clinical manifestations, goiter physical appearance, presenting complaints, comorbidities, methods used in diagnosis, type of definitive management (surgical or non-surgical), and medical procedures are also considered.

The Body mass index (BMI), Waist circumference (WC), blood pressure (BP), and laboratory data related to some of the specific biochemical parameters for the evaluation of goiter function were also obtained for consideration. BMI was calculated as weight (kg) divided by squared height (m²), and obesity was defined as a BMI of 30 kg/m² or higher. Additionally, to measure the BP of the patient standard mercury was used sphygmomanometer. The BP was evaluated in the sitting position after 5 minutes of rest exactly to the right brachial artery. An average of three measurements were taken for each patient and used during the data analysis. A venous blood sample was obtained from each patient to evaluate different biochemical laboratory analysis tests. Hormone levels were analyzed by immune-radiometric assay for TSH and radioimmunoassay for FT4 and ATPO. Insulin and leptin were investigated by an immune-radiometric assay. The laboratory reference values were 10.1-22.0 pmol/L for FT4, 0.27-3.75 mIU/L for TSH, and 4-16 mIU/L for insulin, while the reference value for ATPO was 2.5.

IBM SPSS version 20.0 was used for statistical analysis. We measured the prevalence of goiter based on the relative frequencies and ratios for all patients with goiter. The logistic regression analysis was applied to assess the risk factors and the relationship between variables. P-values less than 0.05 were considered statistically significant.

Results

The prevalence of goiter was 35.7% (116/325) (95% CI, 31.01 to 39.4%). Moreover, the prevalence of goiter in females resulted in 61.2% (71/116) while in males 38.8% (45/116). The mean age was 41.32±10.05 with a minimum and maximum age of 20 to 71. The most affected age resulted in 41-50 years old with 41% (95% CI, 37.4 to 45.8%). Most of the patients presented for medical care lived in the urban areas 60.6% and only

39.4% in the rural areas. Single referred 11.4% of patients, married 69.5% and divorced or widow was 13.2% and 5.8% respectively. Related to the education level, 21.8% referred that have a primary level of education, 56.9% have high school and 21.2% have finished the university. About 52.3% of patients were employed and 47.7% were not employed. Additionally, 23.1% referred to a low monthly income, 48.3% moderate income, and 28.6% high monthly income. Goiter is a disease with a previous family history. All the patients are asked related to the heredity of goiter in their family, but most of them 75.7% referred that not have a family member with goiter, and only 24.3% referred a previous history in their family.

Below we have analyzed some of the most important risk factors for goiter. One of the predictor risks is the female menstrual status. Out of 241 female patients, only 31.2% referred that have a regular menstrual cycle and 61.8%

referred no. According to the daily salt consumption, 17.5% referred that consuming it at a low level, 62.5% at a moderate, and 20% at a high level. BMI in this study is divided into 5 categories from underweight to obese class II and III. Patients in the underweight category resulted at 4.6%, in the normal weight category at 40%, the overweight category at 25.5%, obese class I at 20.6%, and obese class II and III at 9.2%. Related to the habits of our patients, 73.2% referred that have a sedentary daily life, 27.4% were regularly alcohol users, and 35.1% regularly smoking users. Metabolic syndrome appeared in 84.3% of patients. Hypertension was referred from 44% of patients, Diabetes Mellitus from 22.1%, and cardiovascular diseases from 18.1% of patients. The finding showed that age, family history, BMI, and menstrual status had a significant relationship with goiter with a p-value <0.05. Likewise, our study demonstrated metabolic syndrome to be a strong predictor of goiter.

Table 1: Baseline socio-demographic characteristics of patients.

Variables		Frequency	Percentage	p-value
Gender	Female	241	74.15%	0.0001
	Male	84	25.85%	
Age	< 35 years old	31	9.5%	0.0008
	>35-55 years old	209	64.3%	
	>55 years old	85	26.2%	
Residence	Rural	197	60.6%	0.1
	Urban	128	39.4%	
Marital status	Singe	37	11.4%	0.4
	Married	226	69.5%	
	Divorced	43	13.2%	
	Widow	19	5.8%	
Education	Primary level	71	21.8%	0.08
	High school	185	56.9%	
	University	69	21.2%	
Occupation	No	155	47.7%	0.9
	Yes	170	52.3%	
Economic status	Low Income	75	23.1%	0.06
	Moderate	157	48.3%	
	High Income	93	28.6%	
History family	No	79	24.3%	0.002
	Yes	246	75.7%	
Female menstrual status (No=241)	No	149	61.8%	<0.0001
	Yes	92	31.2%	
Salt consumption	Low	57	17.5%	0.007
	Moderate	203	62.5%	
	High	65	20%	
BMI	underweight (BMI: $\leq 18.4\text{kg/m}^2$)	15	4.6%	0.03
	normal weight (BMI: $18.5\text{--}24.9\text{kg/m}^2$)	130	40%	
	overweight (BMI: $25.0\text{--}29.9\text{kg/m}^2$)	83	25.5%	
	obese class I (BMI: $30.0\text{--}34.9\text{kg/m}^2$)	67	20.6%	
	obese class II-III (BMI: $\geq 35.0\text{kg/m}^2$)	30	9.2%	
Physical activities	No	238	73.2%	0.04
	Yes	87	26.8%	
Alcohol use	No	236	72.6%	0.041
	Yes	89	27.4%	
Smoking use	No	211	64.9%	0.03
	Yes	114	35.1%	
Metabolic syndrome	Hypertension	143	44%	0.005
	Diabetes	72	22.1%	
	Cardiovascular diseases	59	18.1%	

Table II shows the diagnostic methods used for the diagnosis of goiter in suspected patients and also the biochemical analysis for evaluation of some of the parameter's predictors for goiter. Sonography is used in 76.3% of females and 51.2% of males. Scintigraphy in 13.3% of females and 28.6% of males. Ct scan in 7% of females and 14.3% of males while MR imaging in 3.3% of females and 5.9% of males. There was found a significant association between the two imagery methods sonographic and scintigraphy and divided by gender (females versus males). Related to the thyroid volume, males appeared a higher volume versus females, on average 15.8 ± 4.9 and 13.0 ± 4.2 respectively. There is found a significant association with p-value <0.0001 . The values of total T3, T4, and anti-TPO were notably higher for females than males, with a significant association between them, p-value <0.05 . Whereas, other parameters such as Tg-antibodies, Insulin, HDL, and LDL were higher in males than females. A significant association was found only for Tg-antibodies, with a p-value of 0.008.

Table III shows the diagnostics findings and clinical presentation of 116 patients diagnosed with goiter. The pain was referred in only 7% of patients, the solitary nodule was only in 15.5% of patients, multiple nodules in 11.2%, thyroid cyst in 4.3% of patients, hypothyroidism in 9.5% of patients, and thyrotoxicosis in 2.6% of patients. About 7% resulted in a goiter 0 grade, 28.4% in goiter grade 1, and 65.6% in goiter grade 2.

Table II: Diagnostic methods and Biochemical Analysis.

Diagnostic methods	Males	Females	P value
Imagery methods	(84)	(241)	
Sonographic	43	184	0.0001
Scintigraphy	24	32	0.02
CT scan	12	17	0.3
MR imaging	5	8	0.7
Biochemical Analysis			
Thyroid volume (mL)	15.8 ± 4.9	13.0 ± 4.2	<0.0001
TSH (μ IU/ml)	61.4 ± 15.70	103.5 ± 48.32	0.002
Total T3 (ng/dL)	3.24 ± 0.72	3.58 ± 1.67	0.02
Total T4 (μ g/dL)	12.6 ± 11	14.21 ± 9.4	0.04
TPO antibodies (kU/L)	0.045 ± 1.2	0.28 ± 1.7	0.008
Tg-antibodies (mmol/L)	1.5 ± 0.9	1.2 ± 0.3	0.01
Insulin (mU/L)	9.6 ± 6.1	8.0 ± 4.2	0.7
HDL (mmol/L)	1.8 ± 0.71	1.7 ± 0.9	0.05
LDL (mmol/L)	3.9 ± 1.2	3.4 ± 1.9	0.9

Approximately 24.1% of patients' definitive management was done with total thyroidectomy, while 75.9% were non-operative.

Table IV shows the logistic regression for some of the risk factors divided by the gender of patients. We found a significant association between more of the analysis factors.

Discussion

Goiter is seen as a frequent screening finding wherein patients may or may not present with clinical symptoms and abnormal laboratory tests⁶. Moreover, it is a common endocrine problem that affects around 300 million people globally, with more than half of those affected being unaware of their condition. Hyperthyroidism and hypothyroidism are the most common thyroid disorders, which affect 1.6 billion people in more than 100 countries around the world¹⁷. In this study, we conducted an observational study in the adult population, aimed to identify the prevalence and risk factors of goiter. The prevalence of goiter resulted in 35.7%, for 95% CI [31.01 to 39.4%]. This prevalence is lower than in another study conducted by Zekarias et al in 2020, which revealed the prevalence of total goiter was 43.3% for 95% CI [39.2-46.9]. Many studies have highlighted some of the risk factors such as gender, BMI, menopause, metabolic syndrome, hypertension, dyslipidemia, and hyperglycemia that may contribute to goiter¹⁹⁻²².

Table III: Distribution by clinical presentation and diagnostic finding.

Distribution by clinical findings (116 goiter cases)	Frequency	Percentage
Clinical findings		
Pain	8	7%
Solitary nodule	18	15.5%
Multiple nodules	13	11.2%
Thyroid cyst	5	4.3%
Hypothyroidism	11	9.5%
Thyrotoxicosis	3	2.6%
Goiter grades		
Goiter 0	8	7%
Goiter 1	33	28.4%
Goiter 2	75	65.6%
Definitive management		
Total thyroidectomy	28	24.1%
Non-operative	88	75.9%

Table IV: Logistic regression for some of the risk factors divided by the gender of patients.

Variables	Males		Females	
	odds ratio	p-value	odds ratio	p-value
Age	2.1 [0.92-3.7]	0.003	3.3 [1.2-5.7]	0.0001
BMI (kg/m ²)	1.5 [0.75-2.9]	0.04	1.8 [0.84-3.0]	0.02
Smoking	2.7 [0.84-6.8]	0.008	0.9 [0.02-2.07]	0.08
Alcohol	1.4 [0.35-3.09]	0.04	0.5 [0.04-1.2]	0.7
Salt consumption	2.2 [0.98-4.5]	0.02	1.7 [0.82-3.81]	0.03
Metabolic syndrome	1.3 [1.2-5.7]	0.01	2.5 [0.97-4.01]	0.02
History family	1.3 [0.62-2.4]	0.04	1.4 [0.77-2.13]	0.03
Thyroid volume (mL)	2.0 [0.75-4.21]	0.02	1.9 [0.61-3.24]	0.008
TSH (μ IU/ml)	1.3 [0.74-2.6]	0.04	1.8 [0.23-3.75]	0.01
Total T3 (ng/dL)	0.98 [0.22-1.54]	0.047	1.2 [0.34-2.46]	0.04
Total T4 (μ g/dL)	1.1 [0.34-1.73]	0.04	1.4 [0.27-2.48]	0.04
TPO antibodies (kU/L)	0.8 [0.12-1.50]	0.3	0.94 [0.34-2.07]	0.05
Tg-antibodies (mmol/L)	0.56 [0.01-1.13]	0.7	1.1 [0.31-2.41]	0.04

A systematic review conducted by Malboosbaf et al, 2012 reported that the subgroup analyses appeared an increasing trend in gender differences around the age of 15 years, and goiter was more frequent in females. This gender difference in the prevalence of goiter is more prominent in iodine-deficient areas, and with grade 2 of goiter, notably after puberty²³. Rapoport et al, show in their study that shown that sex hormones may play a role in thyroid volume only after puberty, suggesting that changes in thyroid volume are influenced by gender differences²⁴. Moreover, women are more likely than men to develop thyroid problems during their lifetime, and this risk is more evident in older women than younger women^{25,26}. Further, in areas with severe or moderate to mild iodine deficiency was observed a higher prevalence of goiter with age, while in areas with severe or moderate iodine deficiency was observed an enlargement of the thyroid gland with age²⁷. In this study, we found a higher significant association between the prevalence of goiter in females compared to males. Females were 2.7 times at risk to develop goiter compared to males for 95% CI [1.66 to 4.59] p-value =0.0001. While patients with age over 41 years old were more likely to develop goiter compared to younger. There was found a significant association between the prevalence of goiter and the age of patients p-value =0.0008

Additionally, metabolic syndrome appeared in 84.3% of patients. Hypertension was referred from 44% of patients, Diabetes Mellitus from 22.1%, and cardiovascular diseases from 18.1% of patients. Whereas the prevalence of BMI among our patients resulted in 55.3%, wherein 25.5% were overweight, 20.6% were obese class I, and 9.2% were obese class II and III. The findings were similar to some other studies²⁸⁻³³. The analysis data showed that age, family history, BMI, and menstrual status had a significant relationship with goiter with a p-value <0.05. Likewise, our study demonstrated metabolic syndrome to be a strong predictor of goiter. Nonetheless, there are many other factors such as habits that are worth further investigation for enough documentation of their implications in the rise of goiter prevalence. Smoking and alcohol habits were known to precipitate metabolic syndrome and some thyroid pathological conditions. Further, physical daily activity is a known etiologic factor of metabolic syndrome^{34,35}. Our female study group was less engaged with habits such as smoking, alcohol, and physical daily activity compared to the males of the same demographic area. Even though females consumed less alcohol or tobacco or performed less daily physical activity than males, besides that we found a strong association between the prevalence of goiter and habits among our patients involved in this study.

Several studies have shown that rates of goiter, nodular goiter, and papillary thyroid cancer are higher in iodine-insufficient areas than in those that have sufficient iodine^{36,37}. Iodine deficiency has been shown to lead to these conditions by increasing TSH levels. TSH is a predominantly proliferative molecule for the thyroid. Elevation of serum levels of TSH causes significant increases in thyroid volume. Elevations, even minimal elevations, in TSH over an adequate amount of time are sufficient for goiter formation³⁸. We have evaluated some of the risk factors and the biochemical parameters of patients diagnosed with goiter. For a more in-depth analysis, we used logistic regression and saw the differences in these parameters between male and female participants in this study. In this study, we found a significant association between gender and some of the risk factors that contribute to the goiter developer.

Conclusions

The prevalence of goiter was relatively high among women. Having a family history and being 41-50 years old increased the risk of goiter. The findings data suggest the need for special attention for females of advanced age, on menopause, obesity, and metabolic syndrome. Patients with confirmed goiter should be screened for age and obesity-related disorders such as metabolic syndrome. They should be examined by physicians and screened with imaging tests and laboratories test for goiter. Moreover, future work is needed to determine whether the characteristics of this study population were involved in generating this observational disagreement.

Ethics approval and consent to participate: Approval for this study was provided by the Director of the Hospital of Gjirokatsra, and all study procedures were approved by the Human Investigation Committees at the Hospital. All methods were applied in accordance with relevant guidelines and regulations. In this survey, no personal data were recorded, and all information was completed anonymously. Additionally, they were informed that participation in the study was voluntary and participants could withdraw at any moment.

Data availability

According to the Statute of the Hospital, the authors cannot share the data underlying this study.

Disclosure Statement

The authors declare no potential conflicts of interest.

Consent for publication

All authors have given their consent for the publication of this paper.

Competing interests

Not applicable.

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