Khalij Libya Journal of Dental and Medical Research. 2026;10(3):245-248
https://doi.org/10.47705/kjdmr.26309
eISSN:*2708-888X*

Original article

Risk Factors of Goiter in Libyan Women

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Abstract
Goiter, an abnormal enlargement of the thyroid gland, is among the most common endocrine disorders seen in clinical settings globally. Although iodine deficiency is considered the main cause, the development of goiter is affected by a complex interaction of genetic factors and environmental influences. Goiter prevalence differs markedly among populations, with some areas showing greater incidence due to dietary and environmental influences. A case-control study was done to determine the relationship between thyroid goiter in female Libyan patients and demographic, environmental, and lifestyle-associated factors. In addition, we investigated whether these factors increased the risk of goiter in the study population. We developed our questionnaire and interviewed 45 randomly selected Libyan female patients and 45 normal females. The questionnaire included demographic variables, thyroid ultrasound reports, dietary habits, and type of salt usage. The data were then analyzed using univariate and Multivariate analyses. Among all the factors investigated, logistic regression analysis indicates that two factors independently predict goiter in this research: a positive family history and an increased number of pregnancies (p-values 0.04 & 0.03), respectively. The surgical history ($p < 0.001$) and history of hypertension ($p = 0.01$) demonstrate a correlation with goiter cases, yet they are not independent risk factors. Neither dietary habits nor lifestyles are linked to the risk of goiter.
Keywords. Thyroid, Goiter, Risk Factors.

Received*: 04/06/26*
Accepted*: 02/08/26*
Published*: 10/08/26*

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Introduction

Goiter, an abnormal enlargement of the thyroid gland, is one of the most common endocrine illnesses observed in clinical settings worldwide. Goiter development is influenced by a complex interplay of genetic and environmental variables, even though iodine shortage is thought to be the primary cause worldwide [1].

In addition to iodine consumption, various non-nutritional elements have been linked to goitrogenesis. Reproductive background, such as the number of births and the use of oral contraceptives, is especially noteworthy because of the stimulating influences of estrogen and human chorionic gonadotropin (hCG) on thyroid development [2]. Additionally, the clustering of goiter in families indicates a genetic element, with a positive family history acting as a reliable risk factor across multiple epidemiological research studies [3]. Chronic comorbidities, especially hypertension and metabolic syndrome, have been associated with thyroid volume, likely via mechanisms related to insulin resistance and ongoing low-grade inflammation [4]. Given the complex etiology and the notable clinical presentation of multinodular goiter in this population, this study was designed to identify key demographic, clinical, and reproductive determinants associated with goiter in a cohort of Libyan females. We specifically aimed to evaluate the varying effects of reproductive history, family background, surgical history, and comorbid conditions between goiter patients and healthy controls, while accounting for potential confounding dietary influences.

Material and methods

Study Population and data collection

Ninety Libyan female participants, 45 goiter cases and 45 normals, all 18 years of age or older, from the surgical, medical, and outpatient departments of Albieda Hospital participated in the case-control study. Each participant filled out a comprehensive questionnaire that included demographic information (such as age and gender), lifestyle (such as salt intake and dietary habits, including iodine intake), and
medical history (such as hypertension, diabetes mellitus, thyroid disease, and any surgical procedures, medications, and family history of thyroid diseases. In addition, patients were asked for recent ultrasound documents of the thyroid (thyroid size, nodule characteristics (if present), and overall thyroid structure).

Statistical Analysis

Statistical results of demographic characteristics indicators were presented as mean [for continuous variables, or numbers (percentages) for categorical variables. Mann-Whitney U tests and Chi-square tests were used to estimate the

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https://doi.org/10.47705/kjdmr.26309
eISSN:2708-888X

significant differences of demographic characteristics and basic information between case and control groups according to the data distributions.
Associations between the risk factors and thyroid goiter were evaluated by logistic regression models, and odds ratios (ORs) and 95% confidence intervals (95% CIs) were calculated to estimate the risk of thyroid goiter.
The data analyses were conducted with SPSS 21.0 (IBM, Chicago, USA). P values below or equal to 0.05 meant that the test was statistically significant.

Results

In this study, 90 participants, 45 had goiter, and the other 45 were normal (control). All participants were female. The average ages of the cases and controls were 45.29 years and 44.44 years, respectively. The majority of the cases were from Albida and Alqubba. Among the goiter cases, multinodular goiter is the prevalent form, accounting for 75.6% of cases (Table 1).

Table 1. Goiter type distribution (Cases Only)

Type of Goiter	Count	Percentage
Multinodular Goiter	34	75.6%
Diffuse Goiter	11	24.4%

Table 2 compares goiter and control groups in terms of demographic data and baseline characteristics; goiter patients differ from normal in aspects of reproductive and hormonal history, family history, surgical history, and comorbid conditions like hypertension. In the goiter group, the number of pregnancies presents a statistically significant result (p = 0.03). The goiter group displays a significantly higher median parity (6, IQR 4–7) in contrast to the control group (4, IQR 2–6). Oral Contraceptive Usage (OCP): Although the goiter group exhibited a greater percentage of OCP users (33.3% compared to 22.2%), this disparity was not statistically significant (p = 0.24).

Table 2. Demographic and Baseline Characteristics (45 Cases vs 45 Controls)

Characteristic	Normal (n=45)	Goiter (n=45)	p-value*
Age range (mean)	56 – 33 (44.44)	79 – 18 (45.29)	
Positive Family history, n (%)	25 (55.6%)	33 (73.3%)	0.04
Iodized salt use, n (%)	4 (8.9%)	3 (6.7%)	0.70
Milk/dairy ≥2x/day, n (%)	35 (77.8%)	36 (80.0%)	0.80
Fish ≥1x/week, n (%)	19 (42.2%)	17 (37.8%)	0.67
Meat ≥3x/week, n (%)	27 (60.0%)	24 (53.3%)	0.52
Eggs ≥3x/week, n (%)	28 (62.2%)	29 (64.4%)	0.83
Nuts ≥1x/week, n (%)	15 (33.3%)	16 (35.6%)	0.82
Bottled water use, n (%)	22 (48.9%)	18 (40.0%)	0.40
Number of pregnancies, median (IQR)	4 (2–6)	6 (4–7)	0.03
Oral contraceptive use, n (%)	10 (22.2%)	15 (33.3%)	0.24
Hypertension, n (%)	2(4.4%)	18 (40%)	0.01
Diabetes n (%)	0 (0%)	2 (4.4%)	0.161
Other Chronic Illness	10 (22.2%)	6 (13.3%)	0.267
History of Surgery	6 (13.3%)	25 (55.6%)	<0.001

The goiter group exhibits a notably greater prevalence of positive family history (73.3%) than the controls (55.6%), resulting in a p-value of 0.04. Hypertension: A notable and highly significant difference is noted (p = 0.01), with 40.0% of the goiter group experiencing hypertension versus just 4.4% of the control group. History of surgery (notably higher in the goiter group) (55.6% vs 13.3%) (p < 0.001). A significant majority of goiter patients (55.6%) have a surgical history, while only 13.3% of those in the normal group do; the surgeries vary (after thyroidectomy) with Caesarean Section, Tonsillectomy, and Cholecystectomy (11%, 7%, 7%).
Regarding dietary habits, such as the consumption of iodized salt, dairy products, fish, meat, eggs, nuts, and bottled water, there are no statistically significant differences between the two groups. In addition, we do not find an association between goiter and Diabetes Mellitus and those with Other Chronic Illnesses (rheumatoid arthritis, bronchial asthma, irritable bowel syndrome).
Logistic regression analysis (Tables 3 and 4) indicates that two factors independently predict goiter in this research: a positive family history and an increased number of pregnancies. The surgical history and hypertension demonstrate a correlation with goiter cases, yet they are not independent risk factors. Neither dietary habits nor lifestyles are linked to the risk of goiter.

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Table 3. Univariate Logistic Regression (45 Cases vs 45 Controls)

Predictor	Odds Ratio (95% CI)	p-value
Age	1.25 (0.92 – 1.70)	0.15
Family history (positive)	2.20 (1.01 – 4.80)	0.047
Iodized salt	0.73 (0.15 – 3.48)	0.69
Milk/dairy	1.14 (0.43 – 3.01)	0.79
Fish	0.83 (0.37 – 1.86)	0.65
Meat	0.76 (0.34 – 1.69)	0.50
Eggs	1.10 (0.48 – 2.52)	0.82
Nuts	1.11 (0.48 – 2.56)	0.81
Bottled water	0.70 (0.31 – 1.58)	0.39
Number of pregnancies (per 1)	1.16 (1.02 – 1.32)	0.03
Oral contraceptive	1.75 (0.70 – 4.38)	0.23
Hypertension	3.22 (0.73 – 14.20)	0.12
Diabetes Mellitus		
Negative (ref)	1.00	
Positive	1.27e7 (0.00-∞)	0.997
Other Chronic Illness		
Negative (ref)	1.00	-
Present	0.50 (0.19-1.35)	0.170
History of Surgery		
No (ref)	1.00	-
Yes	6.5 (2.37-17.82)	<0.001

Table 4. Multivariate Logistic Regression

Predictor	Adjusted OR (95% CI)	p-value
Age (per 10 years)	1.18 (0.85 – 1.64)	0.33
Family history (positive)	2.07 (1.02 – 4.21)	0.045
Number of pregnancies (per 1)	1.14 (1.01 – 1.29)	0.03
History of Surgery		
No (ref)	1.00	-
Yes	6.88 (2.39-19.86)	<0.001
Hypertension	2.89 (0.58 – 14.40)	0.20

Discussion

The current study identifies the factors linked to goiter in a group of Libyan women. Our findings show that although there are no significant differences in dietary habits and lifestyle factors between cases and controls, specific reproductive and clinical characteristics clearly distinguish the two groups.

In this study, an increased number of past pregnancies (higher parity) significantly predicts goiter ($p = 0.03$), Pregnancy results in a condition of relative iodine insufficiency and elevated metabolic requirements, causing thyroid activation. This is frequently influenced by the thyrotropic action of hCG, especially during the first trimester, along with the resulting increased levels of thyroxine-binding globulin (TBG) [2]. Repeated pregnancies can cumulatively result in chronic hyperstimulation of the thyroid gland, encouraging hyperplasia and ultimately causing multinodular goiter, which was the most common type in our case group (75.6%). Our results are agree with Rotondi et al., who showed that in regions with moderate iodine deficiency, women with non-toxic multinodular goiter exhibited a statistically significantly greater parity rate compared to healthy controls [8]. Another finding is the strong correlation between a positive family history and the occurrence of goiter ($p = 0.04$), which continued to be an independent risk factor in the logistic regression analysis. This emphasizes the genetic predisposition to thyroid conditions, indicating that common genetic variants influencing thyroid hormone production, autoimmune responses, or growth factors are significant [3]. Our findings are consistent with the results of Singer et al., who discovered that individuals with a positive family history of goiter had a 4.1 times higher risk of developing goiter ($p < 0.001$) [9].

The data additionally show a significant link between goiter and a surgical history ($p < 0.001$), as well as hypertension ($p = 0.01$). The regression analysis showed they were not independent predictors. The significant link to hypertension replicate with multiple studies. Zheng et al. discovered that hypertension was significantly associated with the occurrence of thyroid nodules and goiter among Chinese women [10]. A different study indicated a significant occurrence of hypertension among patients with thyroid nodules [13]. Rendina et al. showed that metabolic syndrome is a distinct risk factor for multinodular non-toxic goiter [2]. The connection between thyroid volume and blood pressure has also been

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eISSN:2708-888X

noted in earlier studies [4]. The elevated frequency of previous surgeries in the goiter group is complicated. Our study revealed that there were no notable differences in lifestyle and dietary habits, such as iodized salt consumption, among the groups. Although the absence of correlation may indicate that environmental iodine levels are fairly consistent throughout the study group [6].

Conclusion

In summary, this research reveals that high parity and a positive family history are notable and independent risk factors for goiter among Libyan females, highlighting the critical significance of reproductive health history and genetic screening. Although hypertension and surgical background exhibit a strong link to the disease, they seem to be outcomes or related comorbidities instead of primary independent factors.

Conflict of Interest

There are no financial, personal, or professional conflicts of interest to declare.

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