Risk factors for hypothyroidism in Saudi Arabia

Mohammad Eid M. Mahfouz (1)
Renad A. Altowairqi (2)
Raghad N. Alfeer (2)
Elaf K. Alghamdi (2)
Ghaida M. Alnofaei (2)
Reham H. Alziyadi (2)

(1) Department of surgery, College of medicine, Taif University, KSA
(2) Medical intern, college of medicine, Taif university, KSA

Corresponding author:
Dr. Reham H. Alziyadi
Medical intern, college of medicine, Taif university,
Kingdom of Saudi Arabia
tel.: 0568840046
Email: rehamalziyadi77@gmail.com

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Abstract

Background: There have been many studies recorded from different parts of the world that reflects the prevalence of hypothyroidism, and studies done in Saudi Arabia revealed a high prevalence among the population.

Materials and methods: A cross-sectional analysis was conducted using a validated online elf-administered questionnaire on 981 of the Saudi population. The questionnaire was circulated via social media and the study participants were a total of 981 participants. A pre-designed questionnaire was used to collect participant data; characteristics, hypothyroidism diagnosed, chronic diseases, obstetric history for women, having a family history of hypothyroidism, smoking, medication taken and eating certain foods.

Results: The prevalence of hypothyroidism was 20.6% and women who had DM who had exophthalmos or swollen neck or who were obese, smokers who had a family member who had been diagnosed with hypothyroidism and women who had previously been diagnosed with an ovarian cyst or elevated lactation who drank coffee, sugary foods and treats such as chocolate and doughnuts or soft drinks had a substantially higher percentage of those having hypothyroidism. Binary logistic regression analysis showed that the risk factors of being diagnosed with hypothyroidism for participants in the studies were developing ovarian cysts for women and having a hypothyroid family member.

Conclusion: There is a need to raise awareness of the Saudi population about risk factors of hypothyroidism.

Key words: Risk, factors, hypothyroidism, Saudi Arabia

Introduction

Hypothyroidism is a common endocrine disorder worldwide (1). It can result from a defect anywhere in the hypothalamic-pituitary-thyroid axis. In the vast majority of cases, it is caused by thyroid disease (primary hypothyroidism). Much less often, it is caused by decreased secretion of thyroid-stimulating hormone (TSH) from the anterior pituitary gland or by decreased secretion of thyrotropin-releasing hormone (TRH) from the hypothalamus (1) .

Primary hypothyroidism is characterized by a high serum thyroid-stimulating hormone (TSH) concentration and a low serum free thyroxine (T4) concentration, whereas subclinical hypothyroidism is defined biochemically as a normal free T4 concentration in the presence of an elevated TSH concentration. Secondary (central) hypothyroidism is characterized by a low serum T4 concentration and a serum TSH concentration that is not appropriately elevated.

In community surveys, the prevalence of overt hypothyroidism varies from 0.1 to 2 percent (1,2,3,4,5). The prevalence of subclinical hypothyroidism is higher, ranging from 4 to 10 percent of adults, with possibly a higher frequency in older women. However, there is an age-related shift towards higher TSH concentrations in older patients (1).

In 2019, there was a study published in Nigeria which included 354 T2DM and 118 non-diabetic persons. About 56.5% of the T2DM patients who participated in this study were females and 62.7% of the controls were females. The T2DM patients had significantly higher BMI than controls (27.6 ± 5.0 kg/m2 vs. 26.2 ± 3.8 kg/m2, p = 0.002). Mean HbA1c was significantly higher in T2DM patients than in the controls (7.8 ± 2.0% vs. 5.8 ± 1.2%, p = 0.001). Female gender, central obesity, DM nephropathy, HbA1c ≥7% and duration of DM >5years were significantly associated with thyroid dysfunction in T2DM patients in this study (2).

A study published in 2019 estimated that female gender, central obesity, DM nephropathy, above normal HbA1c, and duration of DM were risk factors of thyroid dysfunction in type 2 DM patients in this study (3).

A study published in The Egyptian Journal of Hospital Medicine (2018) estimated that the prevalence of hypothyroidism in Arar city in Saudi Arabia was 25.5% (116/454); females were more affected than males as 57.7% of the cases were female, most of them aged 21-60 years old and 40% of the cases had a family history of the disease. 64.7% of the cases were on medical treatment but only 16% of them responded, while surgical treatment was found in only 8% of the cases (4).

In 2018, there was a study that included 186 individuals who underwent laparoscopic sleeve gastrectomy. Results of this study demonstrated that the levels of TSH decreased significantly in patients who underwent LSG and that the decrease was independent of the changes in BMI. (5)

A Chinese study done in 2017 estimated that the prevalence of hypothyroidism was 10.1% (overt hypothyroidism: 1.5%subclinical hypothyroidism: 8.7%). Females (12.1%) had a higher percentage when compared to males (7.5%). In addition to the increased odds with older age and female gender, current or previous smoking history, salty taste preference and a frequent seafood intake tended to be associated with reduced risk of hypothyroidism (6).

In 2016, there was a longitudinal retrospective cohort study that included 8,412 residents enrolled in the Fernald Medical Monitoring Program. Headache disorders were present in about 26% of the residents and new onset hypothyroidism developed in ~7%. The hazard ratio for the development of new onset hypothyroidism was 1.21 for those with headache disorders (7).

In 2013, there was a study published in North India that included 1,000 pregnant women enrolled in a prospective observational study. The mean (SD) age of study subjects was 25.6 (11.1) years and mean (SD) gestational age was 10.3 (3.4) weeks. One hundred and forty-three (14.3%) subjects had TSH values more than 4.5 mIU/L above the cutoff used for definition of hypothyroidism. Out of these, 135 had normal free T4 and were therefore labeled as subclinical hypothyroidism and 7 had low free T4 suggestive of overt hypothyroidism. TPO Ab was positive in 68 (6.82%) of total, 25 (18.5%) of subclinical and 5 (71%) of overt hypothyroid patients (8).

In 2011, there was a study that included 293 patients with chronic HCV who received Interferon; Hypothyroidism was the most frequent thyroid disorder in them, especially during the first cycle of α-interferon. Genotype 1 virus was associated with a risk two times higher for developing the illness (9).

And in 2010, there was study for a total of 1,170 type 2 diabetic patients. There were 127 type 2 diabetic patients with SCH and 200 euthyroid type 2 diabetic patients. Those with more severe than moderate non-proliferative diabetic retinopathy were classified as having sight-threatening diabetic retinopathy (STDR). The trend for severe retinopathy was significantly higher in the SCH group than in the euthyroid group ($\chi 2 = 20.43$, $P = 0.000$). SCH was associated with greater prevalence of diabetic retinopathy, especially STDR odds ratio (10).

This study aimed to assess risk factors of hypothyroidism among the population of Saudi Arabia.

Methodology

Study design and time frame: a cross sectional study using an online self-administered validated questionnaire was done from May 2020 to January 2021.

Sample size and participants: the questionnaire was distributed through social media and a number of 981 respondents were the study participants.

Study instrument: a predesigned questionnaire was used to collect data about participants; characteristics, being diagnosed with hypothyroidism, having chronic diseases, obstetric history for women, having a family history of hypothyroidism, smoking, medication taken and eating certain foods.

Data Analysis: Data was analyzed using SPSS version 25. Qualitative data was expressed as numbers and percentages, and Chi- squared test ($\chi 2$) was applied to test the relationship between variables. A p value less than 0.05 was considered statistically significant.

Ethical considerations: Ethical approval was obtained from the research ethics committee of Taif university; an electronic consent was collected from those who agreed to participate in the study.

Results

Table 1 shows that 26.4% of the participants had an age ranging from 31-40 years, 59.7% were females, 60.3% were from the western region, and 63% were married. Figure 1 shows that 20.6% of the participants were diagnosed with hypothyroidism.

Table 2 shows that 8.5% of the participants had DM. For women diagnosed with hypothyroidism, 71.7% were diagnosed after the second pregnancy or more, 17.1% were using birth control pills, and 24.1% were diagnosed with elevated lactation. Of the participants, 34.9% had a family member who had been diagnosed with hypothyroidism. 7.5% of the participants had exophthalmoses, 10% had swollen neck, 35.1% were obese and only 1.9% of the participants were eating sea food more than twice a week. 20.1% of the participants were smokers, of them 55% were smoking cigarettes. Table 3 shows that 96.6% of the participants were not taking any medication.

Table 4 shows that participants who had DM, those who had exophthalmos or swollen neck, those who were obese, a smoker, who had a family member diagnosed with hypothyroidism, and women who had previously been diagnosed with an ovarian cyst or elevated lactation had a significantly higher percentage of those who had hypothyroidism (p=< 0.05).

Table 5 shows that participants who were drinking coffee, eating sugary foods and sweets, such as chocolate and doughnuts or soft drinks had a significantly higher percentage of those who had hypothyroidism (p=< 0.05).

Table 6 shows that binary logistic regression analysis revealed that having ovarian cyst for women and having a hypothyroid family member were risk factors of being diagnosed with hypothyroidism among study participants.

Discussion

The prevalence of hypothyroidism among studies participants was 20.6%. Previous studies found a high prevalence of hypothyroidism among the Saudi population. Saudi Arabia has been studying the prevalence and types of thyroid disorders (11,12). Hypothyroidism has been reported to be 47%. A recent Saudi study done in 2019 revealed a similar prevalence as observed in the present study, where prevalence of 29.1% was found (13).

This study found that a significantly higher percentage of those who had hypothyroidism were participants who had DM, who had exophthalmos or swollen neck, who were obese, smokers, who had a family member diagnosed with hypothyroidism, and women who had previously diagnosed with ovarian cyst or elevated lactation.

It was found that diabetes mellitus and thyroid dysfunction are the most common endocrine diseases seen in the adult population (14), while insulin or thyroid hormones metabolism can result in functional abnormalities of one sort or another. The American Diabetes Association (ADA) was encouraged by the strong link between diabetes and thyroid diseases to propose that people with diabetes must be regularly checked for thyroid dysfunction (15).

Previous studies have shown that morbidly obese people show a high prevalence of overt and subclinical hypothyroidism, accounting for 19.5 percent (16, 17), showing the relationship between obesity and hypothyroidism. Furthermore, the relationship between smoking and hypothyroidism present in this study has been reported previously. In the general population, smoking has been identified as a risk factor for thyroid dysfunction, particularly when smoking is highly prevalent (18,19).

In the present study, by doing binary logistic regression analysis, women having ovarian cyst and participants having a hypothyroid family member were at risk of having hypothyroidism. The same result was revealed from previous studies (20,21,22, 23).

Limitations

The cross-sectional design used could reveal the relationships between variables but not the causal relationships.

Table 1. Distribution of the participants according to socio demographic characteristics

Socio demographic Characteristics	Descriptive	
	Frequencies	Percentage
Age group		
10-13	3	0.3%
14-17	9	0.9%
18-22	114	11.6%
23-30	246	25.1%
31-40	259	26.4%
41-50	185	18.9%
51-60	128	13.1%
61-70	31	3.2%
71-80	5	0.5%
Gender		
Female	586	59.7%
Male	395	40.3%
Region		
North	24	2.4%
South	53	5.4%
East	98	10%
West	592	60.3%
Middle	214	21.8%
Marital status		
Single	309	31.5%
Married	618	63%
Divorced	39	4%
Widower	15	1.5%

Figure 1. Percentage distribution of the participants according to hypothyroidism prevalence

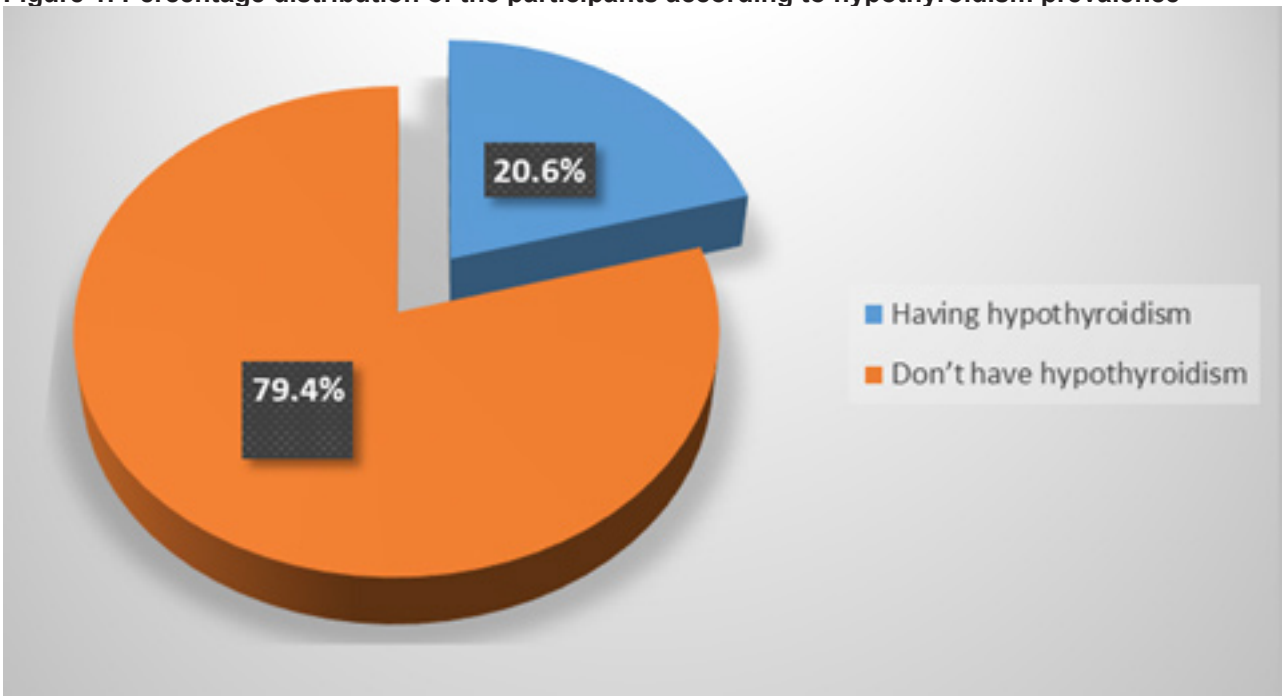

Table 2. Distribution of the participants according to chronic diseases, obstetric history for women, having a family history of hypothyroidism and smoking

Statement		Frequencies	Percentage
Do you have diabetes?	No	858	87.5
	Yes	83	8.5
	I don't know	40	4.1
"Women Only" When were you diagnosed with hypothyroidism?	During pregnancy	32	21.1
	After pregnancy, from 1 to 3 months	11	7.2
	After the second pregnancy or more	109	71.7
"Women only" Do you use birth control pills?	No	422	82.9
	Yes	87	17.1
"Women only" Have you previously been diagnosed with an ovarian cyst?	No	419	78.2
	Yes	117	21.8
"For Women Only" Have you ever been diagnosed with elevated lactation?	No	403	75.9
	Yes	128	24.1
Do you have a family member who has been diagnosed with hypothyroidism	No	550	56.1
	Yes	431	43.9
Do you have exophthalmoses?	No	907	92.5
	Yes	74	7.5
Do you have a swollen neck?	No	883	90
	Yes	98	10
BMI level	Underweight	54	5.5
	Normal	339	34.6
	Overweight	242	24.7
	Obese	344	35.1
How often do you eat seafood?	More than twice a week	19	1.9
	Less than twice a week	67	6.8
	More than twice a month	106	10.8
	Less than twice a month	278	28.3
	More than twice a year	290	29.6
	Less than twice a year	158	16.1
	I never take it	63	6.4
Smoking	Yes	197	20.1
	No	784	79.9
Smoking type	Cigarettes	127	55.0%
	Shisha	91	39.4%
	Tobacco	13	5.6%

Table 4: The relationship between hypothyroidism and chronic diseases, obstetric history for women, having a family history of hypothyroidism and smoking

Statement		Diagnosed with hypothyroidism		Total	X^2	*p*
		No	Yes			
Do you have diabetes?	No	701	157	858	**26.868**	**<0.001**
		81.7%	18.3%	100.0%		
	Yes	48	35	83		
		57.8%	42.2%	100.0%		
	I don't know	30	10	40		
		75.0%	25.0%	100.0%		
Total		779	202	981		
		79.4%	20.6%	100.0%		
"Women Only" When were you diagnosed with hypothyroidism?	During pregnancy	8	24	32	0.537	0.765
		25.0%	75.0%	100.0%		
	After pregnancy, from 1 to 3 months	2	9	11		
		18.2%	81.8%	100.0%		
	After the second pregnancy or more	21	88	109		
		19.3%	80.7%	100.0%		
Total		31	121	152		
		20.4%	79.6%	100.0%		
"Women only" Do you use birth control pills?	No	293	129	422	1.802	0.179
		69.4%	30.6%	100.0%		
	Yes	54	33	87		
		62.1%	37.9%	100.0%		
Total		347	162	509		
		68.2%	31.8%	100.0%		
"Women only" Have you previously been diagnosed with an ovarian cyst?	No	304	115	419	12.320	<0.001
		72.6%	27.4%	100.0%		
	Yes	65	52	117		
		55.6%	44.4%	100.0%		
Total		369	167	536		
		68.8%	31.2%	100.0%		
"For Women Only" Have you ever been diagnosed with elevated lactation?	No	295	108	403	11.939	<0.001
		73.2%	26.8%	100.0%		
	Yes	73	55	128		
		57.0%	43.0%	100.0%		
Total		368	163	531		
		69.3%	30.7%	100.0%		
Do you have a family member who has been diagnosed with hypothyroidism	No	479	71	550	45.182	<0.001
		87.1%	12.9%	100.0%		
	Yes	300	131	431		
		69.6%	30.4%	100.0%		
Total		779	202	981		
		79.4%	20.6%	100.0%		

Table 4: The relationship between hypothyroidism and chronic diseases, obstetric history for women, having a family history of hypothyroidism and smoking (continued)

Do you have exophthalmoses?	No	734	173	907	16.931	<0.001
		80.9%	19.1%	100.0%		
	Yes	45	29	74		
		60.8%	39.2%	100.0%		
Total		779	202	981		
		79.4%	20.6%	100.0%		
Do you have a swollen neck?	No	734	149	883	74.683	<0.001
		83.1%	16.9%	100.0%		
	Yes	45	53	98		
		45.9%	54.1%	100.0%		
Total		779	202	981		
		79.4%	20.6%	100.0%		
BMI level	Underweigh t	51	3	54	56.363	<0.001
		94.4%	5.6%	100.0%		
	Normal	305	34	339		
		90.0%	10.0%	100.0%		
	Overweight	185	57	242		
		76.4%	23.6%	100.0%		
	Obese	236	108	344		
		68.6%	31.4%	100.0%		
Total		777	202	979		
		79.4%	20.6%	100.0%		
Smoking	No	608	176	784	8.240	0.004
		77.6%	22.4%	100.0%		
	Yes	171	26	197		
		86.8%	13.2%	100.0%		
Total		779	202	981		
		79.4%	20.6%	100.0%		

Table 3. Distribution of the participants according to medication taken

Factor	Frequencies	Percentage
Amiodarone	10	1.0%
Lithium	4	0.4%
Interferon	3	0.3%
Philippic acid "Depakene"	13	1.3%
Alimtuzumab for "multiple sclerosis"	4	0.4%
I don't use any of it	952	96.6%

Table 5: Relationship between hypothyroidism and participants' eating

Statement		Diagnosed with hypothyroidism		Total	X^2	*p*
		No	Yes			
Cruciferous vegetables like kale, cauliflower, cabbage, and broccoli	No	612	157	769	0.067	0.796
		79.6%	20.4%	100.0%		
	Yes	167	45	212		
		78.8%	21.2%	100.0%		
Total		779	202	981		
		79.4%	20.6%	100.0%		
Soy or its products	No	720	184	904	0.396	0.529
		79.6%	20.4%	100.0%		
	Yes	59	18	77		
		76.6%	23.4%	100.0%		
Total		779	202	981		
		79.4%	20.6%	100.0%		
Coffee	No	174	31	205	4.741	0.029
		84.9%	15.1%	100.0%		
	Yes	605	171	776		
		78.0%	22.0%	100.0%		
Total		779	202	981		
		79.4%	20.6%	100.0%		
Milk	No	410	100	510	0.628	0.428
		80.4%	19.6%	100.0%		
	Yes	369	102	471		
		78.3%	21.7%	100.0%		
Total		779	202	981		
		79.4%	20.6%	100.0%		
Gluten (found in barley, oats, and wheat)	No	589	141	730	2.842	0.092
		80.7%	19.3%	100.0%		
	Yes	190	61	251		
		75.7%	24.3%	100.0%		
Total		779	202	981		
		79.4%	20.6%	100.0%		
Fats and fries	No	376	99	475	0.035	0.851
		79.2%	20.8%	100.0%		
	Yes	403	103	506		
		79.6%	20.4%	100.0%		
Total		779	202	981		
		79.4%	20.6%	100.0%		
Sugary foods and sweets, such as chocolate and doughnuts	No	386	71	457	13.371	<0.001
		84.5%	15.5%	100.0%		
	Yes	393	131	524		
		75.0%	25.0%	100.0%		
Total		779	202	981		
		79.4%	20.6%	100.0%		

Table 5: Relationship between hypothyroidism and participants' eating (continued)

Soft drinks	No	462	146	608	11.451	<0.001
		76.0%	24.0%	100.0%		
	Yes	317	56	373		
		85.0%	15.0%	100.0%		
Total		779	202	981		
		79.4%	20.6%	100.0%		
Canned and frozen foods	No	590	158	748	0.545	0.461
		78.9%	21.1%	100.0%		
	Yes	189	44	233		
		81.1%	18.9%	100.0%		
Total		779	202	981		
		79.4%	20.6%	100.0%		
Fruits and starchy plants such as sweet potato, cassava, peaches, strawberries	No	468	122	590	0.026	.873
		79.3%	20.7%	100.0%		
	Yes	311	79	390		
		79.7%	20.3%	100.0%		
Total		779	201	980		
		79.5%	20.5%	100.0%		
Nuts and seeds such as millet, pine nuts, and peanuts	No	478	124	602	0.007	0.932
		79.4%	20.6%	100.0%		
	Yes	301	77	378		
		79.6%	20.4%	100.0%		
Total		779	201	980		
		79.5%	20.5%	100.0%		
Foods that contain extra fibre from beans, legumes, and vegetables	No	480	119	599	0.392	0.531
		80.1%	19.9%	100.0%		
	Yes	299	82	381		
		78.5%	21.5%	100.0%		
Total		779	201	980		
		79.5%	20.5%	100.0%		

Table 6: Binary logistic regression analysis of risk factors of hypothyroidism among studied participants

Variable	B	WALD	p-value	Odds' ratio
Diabetes	0.33	0.43	0.5	0.71
Smoking	0.54	0.31	0.57	0.57
Having ovarian cyst for women	1.35	4.47	0.03	3.86
Having elevated lactation for women	0.04	0.006	0.93	0.95
Having a hypothyroid family member	1.23	5.75	0.01	3.42
Having exophthalmos	0.33	0.11	0.73	1.391
Having swollen neck	.36	2.34	0.12	3.93
Drinking coffee,	0.62	1.21	0.27	1.87
Drinking sugary foods and sweets, such as chocolate and doughnuts	0.75	1.85	0.17	2.13
Drinking soft drinks	0.55	0.89	0.34	0.57

Conclusion

The present study showed a prevalence of hypothyroidism among studied participants of 20.6%. Participants who had DM, who had exophthalmos or swollen neck, who were obese, a smoker, who had a family member diagnosed with hypothyroidism, and women who had previously been diagnosed with an ovarian cyst or elevated lactation, those who were drinking coffee, sugary foods and sweets, such as chocolate and doughnuts or soft drinks had a significantly higher percentage of those who had hypothyroidism. Binary logistic regression analysis found that having ovarian cyst for women and having a hypothyroid family member were risk factors of being diagnosed with hypothyroidism. The study calls for raising awareness of the Saudi population about preventable risk factors of hypothyroidism. Future studies that include a larger national sample is recommended.

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