



Awareness and Knowledge of Saudi Community about Cardiac Complications Resulting from Hyperthyroidism

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1.1. Abstract

Background: The misconceptions about thyroid disorders and the associated complications in many countries are a considerable concern. Thyroid disorders are amongst worldwide common endocrine disorders. Based on the World Health Organization, more than 190 million individuals have iodine deficiency disorders. Most importantly, hyperthyroidism alters the cardiovascular (CV) hemodynamic. **Methods:** A cross-sectional observational survey study that was carried out in Saudi Arabia using an online self-prepared questionnaire including socio-demographic data, disease manifestations, diagnosis, family history, and question regarding hyperthyroidism and CV complications. That was distributed, via a link to Google form, to the general public. Only completed surveys were included in the analysis. Data were represented in the form of frequencies (number of responders) and valid percentages for categorical variables. ANOVA test was utilized to compare means between different subgroups. All P values < 0.05 were considered statistically significant. **Result:** A total of 641 participants took part in this study and achieved a mean score of 4.7 (SD 1.5) of the total score obtainable regarding hyperthyroidism. Out of them, 51.3% did not perform thyroid hormones investigation or having family history of thyroid disorders (46.8%). Adequate knowledge was seen regarding the occurring of heart diseases as a complication of hyperthyroidism (80.5%) and preventing CV disease by treating hyperthyroidism (88.6%). 68.8% did not know which heart complications result from hyperthyroidism. There was a statistically significant relationship between the level of knowledge and age (p<0.001), sex (p=0.004), undergoing previous thyroid investigations (p=0.003) and being diagnosed with previous thyroid disease (p<0.001). Nationality and education had no significant effect on the knowledge level of the participants. **Conclusion:** In this study, the overall level of Knowledge about thyroid disorders in the community was limited. Better knowledge was found about CV complications of hyperthyroidism. Educational programs will have a positive influence of awareness on thyroid troubles and will help in early diagnosis of these disorders and prevent CV diseases.

Keywords: *Hyperthyroidism, Thyroid Disorders, Cardiac Complications.*

2. Introduction

2.1. Definition and epidemiology

Thyroid disorders are amongst worldwide common endocrine disorders. Based on the World Health Organization, more than 190 million individuals have iodine deficiency disorders^[1].

Hyperthyroidism prevalence is approximately 1.3% and it varies by age, sex, race/ethnicity, and geographically through variations in dietary iodine intake^[2,3]. Hyperthyroidism is 5 times more common in females than males and increases in older women^[4]. In younger women, Graves' disease is seen more frequently,

whereas in older women, toxic nodular goiter is seen more. Similarly, hyperthyroidism is more common in smokers^[5].

2.2. Manifestations of hyperthyroidism:

Most of the hyperthyroidism symptoms are not specific and can be easily confused with other medical conditions. The classic hyperthyroidism symptoms are including tremor, sweating, anxiety, weight loss, menstrual issues, increased bowel movements frequency, fatigue, and shortness of breath^[6,7]. The clinical sign and symptoms of hyperthyroidism are mainly not related to the high serum thyroid hormone concentrations.

Most importantly, hyperthyroidism alters the cardiovascular (CV) hemodynamics. CV manifestations are common in patients with hyperthyroidism [8]. Thyroid hormone has effects on myocardium, the peripheral circulation, and sympathetic nervous system [9]. Also, hyperthyroidism is associated with multiple CV disease such as atrial fibrillation, heart failure, pulmonary hypertension, and angina [10]. CV signs and symptoms can be corrected by treating hyperthyroidism. Congestive heart failure can be avoided by an early and effective management of hyperthyroidism [10].

2.3. Diagnosis and detection

Thyroid disorders are frequently under-diagnosed. There are several factors affecting early diagnosis and detection of hyperthyroidism. One of these factors is the poor knowledge and lack of awareness about these diseases which can lead patients to go undiagnosed [11]. Furthermore, there is limited data on the knowledge and awareness among cardiac complications resulting from hyperthyroidism patients [12].

In light of the above, the present study aimed to determine the degree of knowledge of hyperthyroidism and the associated CV disorders among the Saudi population to develop awareness and educational measures for assisting in the early diagnosis of such disorders and prevent CV complications.

3. Subjects and Methods

3.1. Study design

This cross-sectional study is a questionnaire-based assessment of general population in Saudi Arabia distributed during 2020, to evaluate and their level of knowledge and their awareness of CV complications of hyperthyroidism. All individuals who agreed to participate from all age groups and both sexes were included in the study.

3.2. Data collected

A self-prepared questionnaire was developed. The questionnaire was divided into four parts:

1. Demographic characteristics including age, gender, nationality, residency, and educational level.
2. Questions regarding family history and previous diagnosis of thyroid diseases.
3. Questions regarding knowledge of hyperthyroidism, discontinuation of hyperthyroidism drugs and the extent of the relationship of hyperthyroidism to heart diseases.

3.3. Sample size

The sample size was estimated using the Raosoft calculator with a confidence level of 95%; a sample size of 641.

3.4. Statistical methodology

Data were statistically described in terms of frequencies (number of cases) and valid percentages for categorical variables. Comparison of two means between the groups was done using One-way analysis of variance (ANOVA). P values less than 0.05 were considered statistically significant. All statistical calculations were done using computer program IBM SPSS (Statistical Package for the Social Science; IBM Corp, Armonk, NY, USA) release 21 for Microsoft Windows.

3.5. Ethical considerations:

During the research activities, each studied participant was informed about the study topic and objectives with stressing from our team on confidentiality of the collected data and sample results, and also on getting a written consent to share in the study.

4. Results

4.1. Demographic data:

A total of 641 individuals were contributed in the study. Approximately one third of the response aged from 20 to 29 (35.1%) then from 40 to 49 (29.3%). Out of them, 501 (78.2%) were female. Ninety-six percent of the participants were Saudi. The majority of participants had Bachelor degree (68.5%). Majority of participants were from Jeddah (53.8%). Demographics, education, nationality and residency characteristics of the participants are presented in table 1.

Table 1: Demographic data of participants

Demographic data		Count N=641	Percentage
Age group	Less than 15 years	13	2.0
	15 to 19	26	4.1
	20 to 29	225	35.1
	30 to 39	84	13.1
	40 to 49	188	29.3
	50 to 59	97	15.1
	60 years or more	8	1.2
Gender	Male	140	21.8
	Female	501	78.2
Nationality	Saudi	618	96.4
	Non-Saudi	23	3.6
Educational level	Primary	1	0.2
	Intermediate	28	4.4
	Secondary	130	20.3
	Bachelor	439	68.5
	High education	43	6.7
Residency	Jeddah	345	53.8
	Makkah	145	22.6
	Altaif	141	22.0
	Others	10	1.6

4.2. Thyroid investigations

Participants were asked about their thyroid hormone investigations. Fifty-one percent of them did not perform thyroid hormones investigation. From those who performed thyroid analysis, the highest motive to perform analysis was to ensure general health

(21.4%). Only 8.3% of participants were diagnosed by a doctor of hyperthyroidism. Out of those who were diagnosed with thyroid troubles, the highest percentage was diagnosed at age from 20 to 29 years old (2.4%). More details are shown in table 2.

Table 2: Thyroid diagnosis among participants

Thyroid diagnosis		Count N=641	Percent
Have you ever performed tests to measure the level of thyroid hormones?	Yes	312	48.7
	No	329	51.3
What motivated you to perform these tests?	I did not perform any thyroid tests	293	45.7
	comprehensive tests that I did to ensure your health	137	21.4
	I made it at a special request from your doctor	92	14.4
	the appearance of thyroid symptoms	73	11.4
	It was suggested to you by one of your relatives / friends.	13	2.0
	Other	33	5.1
Have you been diagnosed by a doctor with hyperthyroidism?	Yes	53	8.3
	No	588	91.7
When was the first time you were diagnosed with hyperthyroidism?	I have not been diagnosed	557	86.9
	15 to 19	18	2.8
	20 to 29	27	4.2
	30 to 39	17	2.7
	40 to 49	17	2.7
	50 to 59	5	0.8

4.3. Family history of thyroid disorders

Among participants, 46.8 % did not have family history of thyroid disorders, while family history of hypothyroidism was reported in

32.6%. Hyperthyroidism family history was reported in 14.5% and 5.6% had both hypo and hyperthyroidism diseases (figure 1).

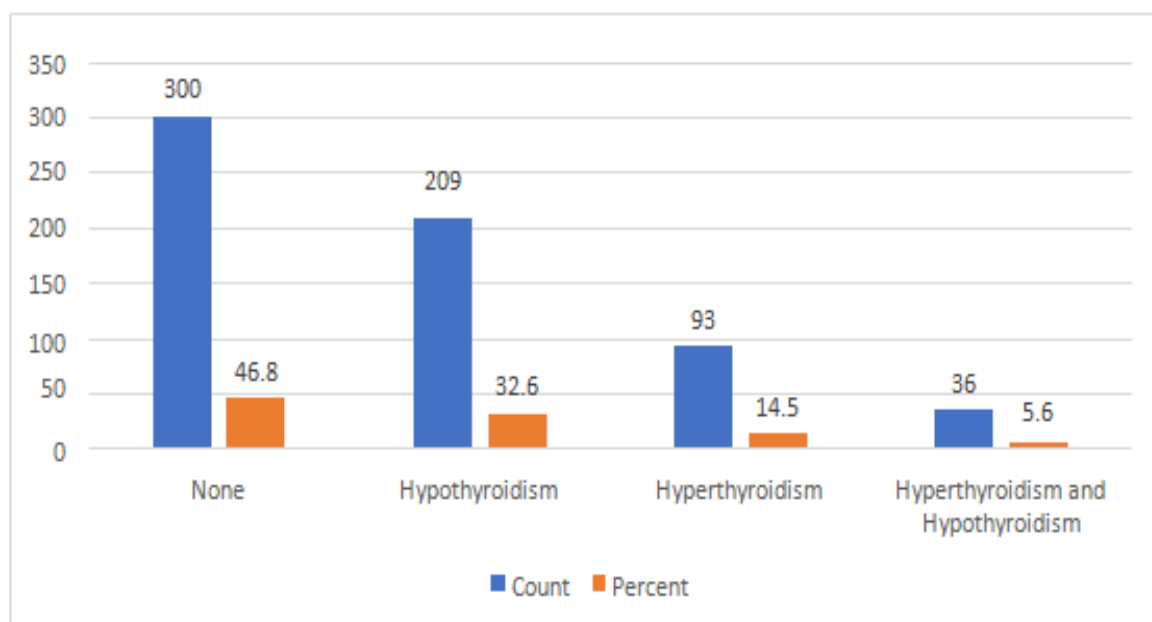


Figure 1: Family history of thyroid disorders among participants

4.4. Assessing Knowledge about hyperthyroidism

Based on the results regarding the general knowledge regarding thyroid disease, respondents showed adequate knowledge for overactive thyroid gland definition (74.6%), unintentional weight loss as a symptom of hyperthyroidism (67.4%), not stopping using hyperthyroidism medication without consulting a doctor (76.1%) as well as not stopping it in pregnancy (76.4%). Moderate knowledge was found regarding hyperthyroidism is being genetically transmitted (55.2%). A poor knowledge was reported regarding symptoms of hyperthyroidism. Concerning respondents'

knowledge about cardiac complications; respondents showed sufficient knowledge regarding the occurring of heart diseases as a complication of hyperthyroidism (80.5%); however, 68.8% did not know which heart complications could result from hyperthyroidism. The majority of participants believed that treating hyperthyroidism could prevent CV disease (88.6%). Moreover, the overall mean knowledge score regarding thyroid disorders was 4.7 (SD 1.5).

Table 3 presents the descriptive statistics of the knowledge regarding thyroid disease.

Table 3: Participants' Knowledge about hyperthyroidism

4.5. Knowledge about hyperthyroidism			Count N=641	Percent
1	What does an overactive thyroid gland mean?	A condition in which the thyroid gland produces a large amount of the hormone thyroxine	478	74.6
		A condition in which the thyroid gland produces a large amount of the hormone cortisol	109	17.0
		A condition in which the thyroid gland produces a large amount of the hormone melatonin	54	8.4
2	Do you think hyperthyroidism can be transmitted genetically?	Yes	354	55.2
		No	287	44.8
3	What are the symptoms of hyperthyroidism?	Unintentional weight loss even when there is an increased appetite	432	67.4
		Rapid heartbeat	253	39.5
		Fine, brittle hair	253	39.5
		Increased sweating	228	35.6
		weight gain and face swelling	205	32.0
		Tremor	203	31.7
		Irregular heartbeat	161	25.1
		Excessive sensitivity to heat	160	25.0
		Muscles weakness	142	22.2
4	Can you stop using hyperthyroidism medication without consulting a doctor if your tests are normal? (If you are not affected, would you advise a hyperthyroid patient to stop using the drugs if his tests are normal?)	Yes	153	23.9
		No	488	76.1
5	Can you stop using hyperthyroidism medication during pregnancy without consulting a doctor because you think they cause congenital defects? (If you are not affected, would you advise a hyperthyroid patient to stop using the drugs if his tests are normal?)	Yes	151	23.6
		No	490	76.4
6	Do you think that heart disease may occur as a result of hyperthyroidism?	Yes	516	80.5
		No	125	19.5
7	What are the heart complications resulting from hyperthyroidism?	Myocarditis / Pericarditis	71	11.1
		Atrial Fibrillation / Congestive Heart Failure	129	20.1
		I Don't Know	441	68.8
8	Do you think that treating hyperthyroidism can prevent cardiovascular disease?	Yes	568	88.6
		No	73	11.4
Total score (Mean ± (SD))		4.7 (1.5)	Min-Max	(0-7)

4.6. Overall Knowledge of hyperthyroidism

In Table 4, the differences in the level of knowledge in relation to the demographic characteristics of the respondents as well as the previous history of thyroid diseases were discussed in details. It was found that the knowledge of the participants was statistically significant with variables such as; gender (p=0.004), age

(p<0.001), undergoing previous thyroid investigations (p<0.003), and being diagnosed with thyroid disease (p<0.001). Meanwhile nationality and educational level did not show a significant difference when compared to the overall knowledge score (all p>0.05).

Table 4: Statistical differences between the mean knowledge score and demographic characteristics and diagnosis of hyperthyroidism among participants

		Mean	SD	Minimum	Maximum	P-value
Nationality	Saudi	4.7	1.5	0.00	7.00	0.510
	Non-Saudi	4.9	1.3	2.00	7.00	
Gender	Male	5.0	1.5	1.00	7.00	0.004*
	Female	4.6	1.4	0.00	7.00	
Age group	<15 years	4.7	1.3	2.00	6.00	<0.001*
	15 to 19	5.1	1.1	2.00	7.00	
	20 to 29	5.2	1.4	1.00	7.00	
	30 to 39	4.5	1.3	2.00	7.00	
	40 to 49	4.4	1.5	0.00	7.00	
	50 to 59	4.2	1.4	0.00	6.00	
	≥60 years	3.9	1.4	2.00	6.00	

Educational level	Primary	6.0	0.5	6.00	6.00	0.387
	Intermediate	4.3	0.9	2.00	6.00	
	Secondary	4.8	1.3	1.00	7.00	
	Bachelor	4.7	1.5	0.00	7.00	
	High education	4.7	1.3	2.00	7.00	
Previous lab investigation	Yes	4.9	1.4	1.00	7.00	0.003*
	No	4.6	1.5	0.00	7.00	
Diagnosis of hyperthyroidism	Yes	4.1	1.5	0.00	7.00	<0.001*
	No	4.7	1.4	0.00	7.00	

(*) $P < 0.05 = \text{Statistically significant}$

5. Discussion

Thyroid disorders are amongst the most underdiagnosed health problems, and the lack of community knowledge about the disease is considered an issue [11]. Awareness can benefit many individuals who have thyroid disease and are unaware of their problem [13].

Very little is known about the level of knowledge about hyperthyroidism and its complications on CV system [12]. Most of the studies were conducted on the knowledge of the all thyroid diseases (hypo and hyperthyroidism) or on hypothyroidism alone, the risk factors and the diagnosis [11,12,14].

In this cross-sectional study, it was designed to determine the degree of knowledge of hyperthyroidism and its CV complications, the diagnosis and past medical history among the Saudi community to develop awareness programs for tackling the problem of early detection of hyperthyroidism disorders.

In the current study, we provide information on patterns of community-based level of awareness among Saudi population regarding thyroid disorders. The total number of participants was 641 among which 78.2% were females. The respondents were classified into 7 age groups; most of them were in the 20 to 29 (35.1%) years old group. 68.5% of the respondents had Bachelor degree.

In the present study, less than half of participants (48.7%) performed thyroid investigations. The highest motive to perform analysis was to ensure general health (21.4%) then doctor's recommendation (8.3%). In prior studies [11,14,15], most of the respondents did not undergo thyroid gland investigations (25.2 & 37.9 & 47.1 %) and the highest reason also was for routine check (39.2%) [14] or doctor's suggestions (20.1% & 73.02) [11,15].

In the present study, we also analyzed the family history of thyroid disorders. Nearly half of participants did not have family history of thyroid disorders (46.8 %), while family history of hyperthyroidism were the lowest reported thyroid disorders than hypothyroidism. Similarly to our results, in other studies conducted, Saudi Arabia; 52.1 to 59.3% of individuals did not have a family history of thyroid diseases [14,15]. Hyperthyroidism was the least disease detected (12.5%). In another study conducted at India, only 18% of respondents had a family history of thyroid disorders (hyper or hypothyroidism) [11].

As seen in our study, our participants have a limited level of the overall knowledge regarding thyroid disorders where the overall mean knowledge score was 4.7 (SD 1.5). Poor knowledge of thyroid troubles is a concern in Saudi Arabia and in many countries [11,12,14,15]. Unlike women in Selangor, most of them have good knowledge and awareness [16].

The findings of the study further indicated adequate general knowledge regarding what is hyperthyroidism (74.6%), and unintentional weight loss as a symptom of hyperthyroidism (67.4%). Our results were in accordance with another study conducted among Saudi people [12]. Loss of weight despite good

appetite is a symptom of hyperthyroidism (79.7%). In contrary to our results concerning high awareness about not stopping using hyperthyroidism medication without consulting a doctor (76.1%) and stopping them in pregnancy (76.4%), 27 % of respondents among the Riyadh population thought that stopping treatment of hyperthyroidism when the investigations were normal and in pregnancy due to harm of the fetus [15].

Knowledge of cardiac complications resulting from hyperthyroidism is an important aspect. Most of conducted studies that assessed the community knowledge of thyroid diseases, did not evaluate the CV complications. As seen in our study, a better knowledge of the CV complications was reported. The current study showed 80.5% agreed on the occurring of heart diseases as a complication of hyperthyroidism; nevertheless, 68.8% of them did not know which cardiac complications could result from hyperthyroidism. The number of participants increased (88.6%) who believed that treating hyperthyroidism could prevent CV disease. Our results were better than another study conducted among Saudi people [12]. Only 59% believed that thyroid dysfunction results in cardiac diseases.

In our study, moderate knowledge was found regarding hyperthyroidism is being genetically transmitted (55.2%). Different reported knowledge was found among Saudi population. In one study, 42.1% thought it is genetic [12] and among Riyadh population, only 19.3% though thyroid dysfunction can be genetically transmitted [15]. At the same time, a general poor knowledge in the present study was found regarding symptoms of hyperthyroidism.

Study results further exhibited that there was an association between some of socio- demographic characteristics and level of knowledge and awareness of hyperthyroidism such as gender, age group and undergoing previous thyroid investigations and being diagnosed with thyroid disease.

Our results were in consistent with Alyahya, A., et al., study in 2021 conducted in Eastern Province, Saudi Arabia [14]. They reported that having a previous history of thyroid disease, those undergoing thyroid tests and being female had a significant value on better knowledge of thyroid disease. Additionally, in accordance to our results, Canaris et al. study conducted in Michigan, showed an association higher level between that a higher level of knowledge about the thyroid troubles and the prevalence of these disorders [13]. On the other hand, Almuzaini et al showed that age and gender had no significant effect on the knowledge level of thyroid troubles [12].

Furthermore, the current study shows that there is no significant difference between educational level and overall knowledge score. Similarly, Almuzaini et al revealed that education was not significantly associated with the level of knowledge of the participants [12].

6. Conclusion

Our results show a limited knowledge and awareness among Saudi population regarding hyperthyroidism which may delay the diagnosis. However, more knowledge was seen regarding CV complications resulting from hyperthyroidism. Educational programs and on thyroid disorders and CV complications for the general population is needed.

Ethics approval

Institutional research ethics board approval was acquired before conducting any study-related procedures. A statement was included at the beginning of the questionnaire clarifying that the participation in this study is voluntary and that collected data will be anonymous and will only be used for this study.

Conflicts of Interest

The authors have no conflicts of interest to declare.

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