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Assessment of Public Knowledge Regarding the Differences between Hyperthyroidism and Hypothyroidism

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ABSTRACT

Background: Thyroid hormones play a pivotal role in the metabolism of human body. Changes of the thyroid gland activity manifest in nearly all body systems. Appropriate knowledge of the public about thyroid disorders and their manifestations is essential for early detection. **Objective:** The aim of this study was to assess public knowledge regarding the differences between hyperthyroidism and hypothyroidism in Tabuk city, Saudi Arabia.

Methods: A cross sectional study was conducted on 300 randomly selected adult residents in Tabuk city. An Arabic self-administered questionnaire was filled by the participants through a link or softcopy. The questionnaire included questions about socio-demographic data of the respondents and other questions to assess knowledge about the type and functions of thyroid gland, its disorders, factors affecting thyroid disorders, and their common manifestations. **Results:** Respondents with good knowledge of thyroid gland and its disorders constituted 52%, while 45% had poor knowledge**.** Good knowledge was demonstrated in questions about the type of thyroid gland (71.4%), and the most susceptible individuals to have the disorder (90.4%). Manifestations of hypothyroidism were also recognized by most respondents, particularly weight gain (76%) as well as fatigability and sleepiness (74.9%). Inadequate and poor knowledge was found as regards the functions of thyroid gland, causes of thyroid hormonal disturbances, and symptoms of hyperthyroidism. **Conclusion:** The knowledge of respondents about thyroid disorders is poor. Inadequate knowledge can result in increased number of undetected cases. Health education should be launched by the health authorities and distributed through all available channels of information. Good knowledge of the general population about thyroid disorders is expected to decrease the incidence of preventable disorders and increase the detection of subtle undiagnosed cases.

Keywords: thyroid; hyperthyroidism; hypothyroidism; knowledge; questionnaire.

INTRODUCTION

Thyroid hormones, thyroxin (T_4) and triiodothyronine (T_3), are essential for the synthesis of growth hormones, cell differentiation, and metabolism, and they are crucial for the growth and development[(1)]. Both iodine deficiency and iodine excess are known to interfere with thyroid hormone synthesis[(2,3)]. While severe iodine deficiency has been eliminated, the number of countries with iodine excess has increased over the past decade [(4)].Abnormal thyroid hormone levels may lead to hypo- or hyperthyroid states. Hypothyroidism is a common disorder that is potentially serious and usually passes clinically unnoticed. However, it can readily be diagnosed by laboratory testing of serum thyroid stimulating hormone (TSH) and free T_4. Its causes include autoimmune thyroiditis, dietary iodine deficiency, previous thyroid surgery or irradiation, intake of drugs such as lithium, and pituitary and hypothalamic disorders. Hypothyroidism can present with nonspecific constitutional and neuropsychiatric complaints and may end, in severe untreated cases, with heart failure, psychosis, and coma. Thyroxine replacement therapy is the usual treatment, and it is safe and effective; however, poor response to treatment may result from suboptimal dosing, patient noncompliance, and pregnancy [(5,6)].

Hyperthyroidism increases with age and is more frequent in women and in iodine-deficient areas. Commonly reported manifestations include palpitations, fatigue, anxiety, tremors, disturbed sleep, weight loss, heat intolerance, and sweating. Serum TSH has the highest sensitivity and specificity in the diagnosis of thyroid disorders, but serum free T_4 or T_3 can distinguish between subclinical and overt hyperthyroidism. The most common causes of hyperthyroidism are Graves' disease and toxic nodular goiter. In addition, it may result from thyroiditis or ingestion of excess thyroid hormones, and it may, sometimes, be iodine-induced. Treatment options vary according to the case, and they may include antithyroid drugs, β blockers, radioactive iodine therapy, and surgery. Thyroid storm is a special life-threatening condition that needs careful assessment and meticulous treatment[(7,8)]. Several studies from different countries reported high prevalence of thyroid diseases with higher rates of hypothyroidism than hyperthyroidism. Both overt and

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subclinical states are well documented. In Saudi Arabia, thyroid dysfunctions are the most common endocrine disorders. Moreover, thyroid cancer was reported as the second most common cancer among Saudi females with strikingly high incidence in the Hail region[9-11].

Therefore, the current study was conducted to assess public knowledge regarding the differences between hyperthyroidism and hypothyroidism in Tabuk city, Saudi Arabia.

METHODS

Ethical consideration:

Participants were informed about the study objectives andmethodology. Subjects, who agreed to fill the questionnaire, implied that they agreed to participate in the study. The study didn't show any physical, psychological, social, legal, economic, or any other risks to the study's participants. The study conserved participants' privacy. Investigators were responsible for keeping the security of the data. All participants' data were not used for any other purpose outside this study.

The study was done after approval of ethical board of University of Tabuk.

Study design: This is a cross-sectional study.

Study population: The study included 300 adult, residents of Tabuk city, Saudi Arabia.

Setting and duration:

The study was carried out in Tabuk city in the Northwestern of Saudi Arabia, which is located 2200 feet above sea level and has a population of 534,893 (2010 census) [12]. Data collection took place during the period from15/10/2017 to 1/11/2017.

Sampling technique and data collection instrument: Participants were randomly selected and were requested to fill an Arabic self-administered questionnaire through a link or soft copy. The questionnaire consisted of two parts: (1) socio-demographic information and (2) knowledge about the type and functions of thyroid gland, its disorders, factors affecting thyroid disorders, and their common manifestations. Some questions aimed to evaluate the prevalence of thyroid diseases among the respondents.

Scores were assigned to the respondents replies: 0 for no, I don't know or wrong choice; and 1 for yes or correct choice. Total score for Knowledge was computed by summing the individual scores for questions 5 to 14 and 22 to 30.

Statistical analysis

Data analysis was carried out using SPSS version 22. Categorical variables were summarized as frequencies and percentages, and association between variables was tested using Pearson's Chi square or Fisher-Freeman-Halton Exact Tests as appropriate. A p-value of < 0.05 was considered statistically significant.

RESULTS

In this study, 300 residents of Tabuk City responded to the questionnaire. Most of the respondents aged 20 to 35 years (61%), were women (83.8%), and had high education (74.5%). Employed respondents constituted 41.6%, while the unemployed and students represented 34.4% and 19.1% respectively (**Table 1**).

Questions that were concerned with type and functions of thyroid gland and the potential causes for its disorders were analyzed. The areas of knowledge that most respondents showed good knowledge included the following: thyroid is a ductless gland (71.4% of respondents), women are more susceptible to thyroid disorders (90.4%). Inadequate knowledge was demonstrated as regards the functions of thyroid gland (only 61.2% responded correctly), good effect of iodine-rich food (68.3%), as well as the effect of thyroid dysfunction on brain development (44.7%), blood cholesterol (54.6%), and heart (48.6%). Also, effects of sport, smoking and heredity on thyroid function were recognized only by small percentages of respondents (41.2%, 24%, and 33.6% respectively) (**Table 2**).

We assessed also the respondents' knowledge about symptoms of hypo- and hyperthyroidism. As regards hyperthyroidism, the knowledge of the respondents was poor as only half the respondents approximately identified the common manifestations of the disease. The intolerance to hot weather and menstrual disturbances with hyperthyroidism were the least identified (50.7% and 44.3%). Manifestations of hypothyroidism were recognized by a higher percentage of respondents, particularly weight gain (76% of respondents), fatigability and sleepiness (74.9%), and dryness of skin and hair (64.2%) (**Table 3**).

Respondents who had thyroid disorders represented 20.8%. Among those, hypothyroidism was the most prevalent (72.3%), followed by hyperthyroidism (20.5%) then thyroid cancer (7.2%). Most affected respondents had the disease for 20 – 35 years (63.4%), consulted physicians (67.8%), and were taking medications (80.8%). Among those who were not diagnosed previously with the disease,

35.2% suspected having thyroid disorders. The cause for this suspicion was appearance of some symptoms, particularly weight gain (45.1%) (**Table 4**, **Figure 1**). The median knowledge score was 11. The respondents were divided into two groups: those above 11 had good knowledge and those with a score of 11 or less had poor knowledge. Analysis showed that 52% of respondents had good knowledge; 45% had poor knowledge; and 3% of respondents provided incomplete answers to the questionnaire so the score was not calculated for them (Figure 2). Respondents with good knowledge had a significantly higher percentage in age group"20 – 35" than those with poor knowledge (66.2% versus 55.1%; p = 0.01). Sex, education, and occupation had no significant effect on the knowledge level of the respondents (p = 0.051, 0.282, and 0.765 respectively) (**Table 5**).

Table 1: Socio-demographic data of the respondents

		N	%
Age (Years)	Respondents	290	100.0
	< 20	14	4.8
	20 - 35	177	61.0
	36 - 50	84	29.0
	> 50	15	5.2
Sex	Respondents	290	100.0
	Female	243	83.8
	Male	47	16.2
Educational level	Respondents	290	100.0
	Primary	6	2.1
	Intermediate	20	6.9
	Secondary	48	16.6
	High	216	74.5
Occupation	Respondents	288	100.0
	Housewife	1	0.3
	Student	55	19.1
	Unemployed	99	34.4
	Retired	13	4.5
	Employed	120	41.7

Table 2: Knowledge about thyroid gland, its functions, and causes of thyroid disease

		N	%
5- Thyroid is a ductless (endocrine) gland	Respondents	290	100.0
	Yes	207	71.4
6- Who is more susceptible to have thyroid dysfunctions?	Respondents	291	100.0
	Children	8	2.7
	Men	12	4.1
	Women	263	90.4
	Elderly	8	2.7
7- Functions of thyroid include	Respondents	289	100.0
	Enhancing metabolism	101	34.9
	Regulation of heart beats	6	2.1
	Growth and development of fetal neurological system	5	1.7
	All of the above	177	61.2
8- Foods that have a good effect on thyroid function include	Respondents	290	100.0
	Protein-rich food	22	7.6
	Carbohydrate-rich food	25	8.6
	Iodine-rich food	198	68.3
	None of the above	45	15.5
9- Thyroid dysfunction affects brain development	Respondents	291	100.0
	Yes	130	44.7
10- Thyroid dysfunction affects blood cholesterol level	Respondents	291	100.0
	Yes	159	54.6
11- Thyroid dysfunction results in heart diseases	Respondents	288	100.0
	Yes	140	48.6
12- Does sport affect thyroid dysfunction?	Respondents	291	100.0
	Yes	120	41.2
13- Is there a confirmed relationship between smoking and thyroid disturbances?	Respondents	288	100.0
	Yes	69	24.0
14- Thyroid dysfunctions are hereditary	Respondents	289	100.0
	Yes	97	33.6

Table 3: Knowledge of respondents about symptoms of hyper- and hypothyroidism.

		N	%
22- Loss of weight despite good appetite is a symptom of hyperthyroidism	Respondents	267	100.0
	Yes	157	58.8
23- Insomnia and lack of sleep are symptoms of hyperthyroidism	Respondents	271	100.0
	Yes	162	59.8
24- Increased heart rate is a symptom of hyperthyroidism	Respondents	270	100.0
	Yes	153	56.7
25- Inability to stand hot weather and wearing light clothes in cold weather are symptoms of hyperthyroidism	Respondents	270	100.0
	Yes	137	50.7
26- Oligomenorrhea and amenorrhea are symptoms of hyperthyroidism	Respondents	271	100.0
	Yes	120	44.3
27- Sudden increase of weight is a symptom of hypothyroidism	Respondents	271	100.0
	Yes	206	76.0
28- Fatigability and sleepiness are manifestations of hypothyroidism	Respondents	275	100.0
	Yes	206	74.9
29- Skin and hair dryness are symptoms of hypothyroidism	Respondents	274	100.0
	Yes	176	64.2
30- Feeling cold in hot weather is a symptom of hypothyroidism	Respondents	275	100.0
	Yes	158	57.4

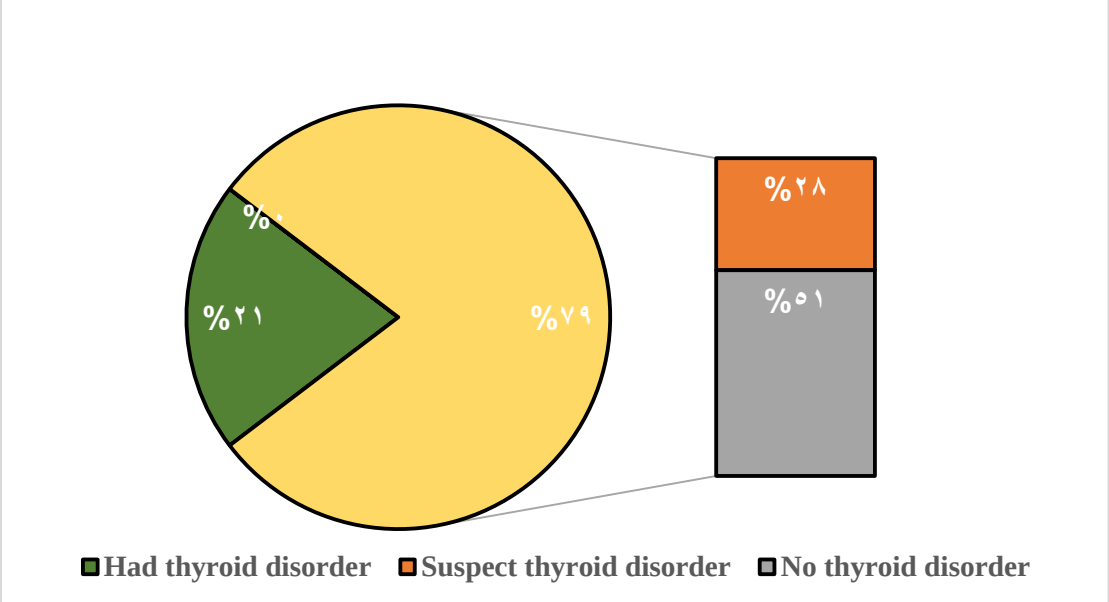

Figure 1: Respondents status as regards the presence or absence of thyroid disorders.

Table 4: Respondents who had or suspect thyroid disease.

		N	%
15- Do you have a thyroid disease?	Respondents	289	100.0
	No	229	79.2
	Yes	60	20.8
16- If yes, what is the complaint?	Respondents	83	100.0
	Hypothyroidism	60	72.3
	Hyperthyroidism	17	20.5
	Thyroid cancer	6	7.2
17- At which age this problem started?	Respondents	82	100.0
	1 – 12 years	4	4.9
	12 – 20 years	7	8.5
	20 – 35 years	52	63.4
	>35 years	19	23.2
18- Do you consult doctor for treatment?	Respondents	87	100.0
	No	28	32.2
	Yes	59	67.8
19- What are the treatments you take?	Respondents	78	100.0
	Dietary	15	19.2
	Medications	63	80.8
20- If Q15 answer was NO, do you suspect that you have thyroid disease?	Respondents	230	100.0
	No	149	64.8
	Yes	81	35.2
21- Why do you suspect?	Respondents	113	100.0
	A relative had the disease	19	16.8
	Weight loss	2	1.8
	Laziness	1	0.9
	Increased weight	51	45.1
	Symptoms appeared	40	35.4

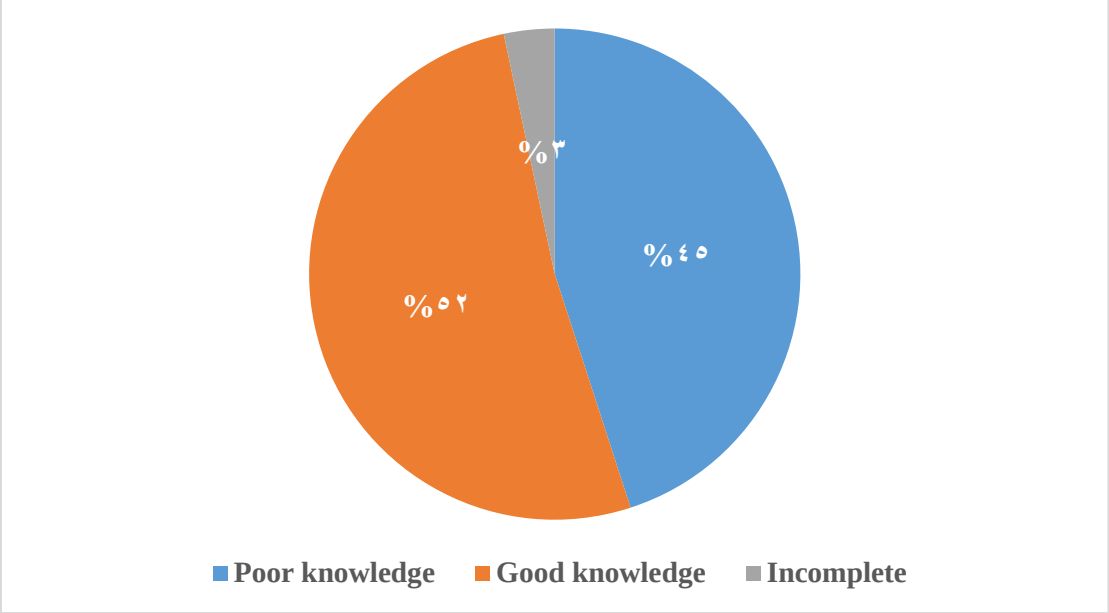

Figure 2: The knowledge of the respondents as regards thyroid disorders.

Table 5: Sociodemographic factors of the respondents with inadequate and adequate knowledge.

		Knowledge				p
		Poor knowledge		Good knowledge		
		N	%	N	%	
1-Age	< 20	11	8.1%	3	1.9%	0.010*
	20 - 35	75	55.1%	102	66.2%	
	36 - 50	39	28.7%	45	29.2%	
	> 50	11	8.1%	4	2.6%	
2- Sex	Female	107	79.3%	136	87.7%	0.051
	Male	28	20.7%	19	12.3%	
3- Educational level	Primary	2	1.5%	4	2.6%	0.282
	Intermediate	13	9.6%	7	4.5%	
	Secondary	24	17.8%	24	15.5%	
	University	96	71.1%	120	77.4%	
4- Occupation	Student	0	0.0%	0	0.0%	0.765
	Unemployed	80	59.3%	88	57.5%	
	Retired	0	0.0%	0	0.0%	
	Employed	55	40.7%	65	42.5%	

*significant

DISCUSSION

Thyroid hormones play a pivotal role in the metabolism of human body. Changes of the thyroid gland activity manifest in nearly all body systems. Appropriate knowledge of the public about thyroid disorders and their manifestations is essential for early detection. The aim of study: to assess public knowledge regarding the differences between hyperthyroidism and hypothyroidism in Tabuk city, Saudi Arabia. To the best of the authors' knowledge, this is the first study to investigate this point.

We found that 52% of respondents had good knowledge, while 45% had poor knowledge about thyroid gland and its disorders. Good knowledge was demonstrated in questions about the type of thyroid gland (endocrine; by 71.4% of respondents), and the most susceptible individuals to had disorders (women; by 90.4% of respondents). Manifestations of hypothyroidism were also recognized by most respondents, particularly weight gain (76% of respondents) as well as fatigability and sleepiness (74.9%). Weight gain and fatigability and weight gain

were the most frequent symptoms of hypothyroidism; and appear even in subclinical or mild cases [13,14].

However, the respondents' knowledge was inadequate as regards the functions of thyroid gland, and causes of thyroid hormonal disturbances. Only 61.2% responded correctly to the functions of the gland, and the foods that affect its function (68.3%). Moreover, effects of sport, smoking and heredity on thyroid function were recognized only by small percentages of respondents (41.2%, 24%, and 33.6% respectively). Knowledge about the causes of thyroid disorders, particularly the preventable causes such as iodine deficiency, is of the utmost importance to decrease the incidence of the disease.

The most common cause of primary thyroid disease is dietary iodine deficiency. Iodine is an essential component in the structure of thyroid hormones. Other common causes of primary thyroid disease include autoimmune destruction (Hashimoto's thyroiditis), radiation-induced thyroiditis, postsurgical hypothyroidism, antithyroid drugs, and infiltrative disease [15]. Hereditary factors affect the susceptibility to develop thyroid disorders. Genetics play a prominent role in both determination of thyroid hormone and thyrotropin (TSH) concentrations, and susceptibility to autoimmune thyroid disease [16].All thyroid disorders are more common in women than men. Hyperthyroidism was seen in more women than men (5:1 ratio). The overall prevalence of hyperthyroidism is approximately 1% and may increase to 5% in older women [17]. Smoking induces mild changes in the form of a decrease in TSH and an increase in thyroid hormones. Additionally, smoking has a significant influence on Graves' hyperthyroidism; increasing the risk of disease development, reducing the effectiveness of treatment, and inducing relapse [18]. In addition, poor knowledge of the respondents was revealed about the effect of thyroid dysfunction on brain development (44.7%), blood cholesterol (54.6%), and heart (48.6%). Thyroid function regulates a wide range of metabolic parameters. Thyroid function significantly affects lipoprotein metabolism as well as some cardiovascular disease risk factors[19-21]. Increasing TSH level has been associated with a linear increase in total cholesterol, low-density lipoprotein cholesterol and triglycerides, as well as a linear decrease in high-density lipoprotein cholesterol levels [22]. Knowledge about the effects of thyroid disorders can motivate the general population to seek medical care if the disease is suspected; and in the first place to recognize its symptoms when encountered by oneself or family members.

In this study, only half the respondents recognized the common symptoms of hyperthyroidism. Skin and hair dryness in hypothyroidism were also identified by 64.2% only. The scalp and body hair of hypothyroid adults is commonly dry, coarse and brittle, and may be subject to high rates of loss; up to 50% of hypothyroid adults have diffuse or partial alopecia. Dryness of skin in hypothyroidism results from the combined effects of peripheral cutaneous vasoconstriction, diminished epidermal sterol biosynthesis, diminished sebaceous gland secretion, and hypohidrosis [23,24]. Inadequate knowledge about the common manifestations of thyroid disorders can result in increased number of undetected cases among the population, as patients do not recognize the presence of disease, consequently do not seek medical care or receive treatment. This can affect seriously the quality of life of the patients. Alterations in appearance in hypothyroidism, accompanied by fatigability and sleepiness, affect the normal activity of the individuals and their psychological status.

In the present study, respondents who had thyroid disorders represented 20.8%. Among those, hypothyroidism was the most prevalent (72.3%), followed by hyperthyroidism (20.5%) then thyroid cancer (7.2%). Most affected respondents had the disease for 20 – 35 years (63.4%), consulted physicians (67.8%), and were taking medications (80.8%). Among those who were not diagnosed previously with the disease, 35.2% suspected having thyroid disorders. The prevalence of thyroid disorders among the respondents is higher than the rates reported both in KSA and worldwide. The Whickham survey found that thyroid dysfunction affected 6.6% of adults [25]. **Rallison *et al.*[26]** reported that the prevalence of hyperthyroidism was 1.1%, hypothyroidism 3%, while thyroid enlargement affected 15% of the population. In Saudi Arabia, 7% of the populations had hypothyroidism [27].Thyroid cancer is the second most common cancer among Saudi women; representing 11.5% of cancers in 2014 in Saudi women and 4.2% in Saudi men[9].

In the current study, respondents with good knowledge had a significantly higher percentage in age group"20 – 35" than those with poor knowledge. Sex, education, and occupation had no significant effect on the knowledge level of the respondents. This indicates that education may be defective in some points that are concerned with endocrine glands and its disorders. The high prevalence of thyroid disorders among the population of KSA calls for a change in the educational curricula of schools to increase awareness of the new generations about the common health problems in Saudi community and how to prevent them. The significant effect of age, mainly in age group 20 -35, may be attributed to the tendency of youth in this age

period to seek information from the Internet, so they may have collected more data about the thyroid and its disorders.

CONCLUSION

The respondents' knowledge about thyroid disorders is poor. Inadequate knowledge can result in increased number of undetected cases. Health education should be launched by the health authorities and distributed through all available channels of information. Good knowledge of the general population about thyroid disorders is expected to decrease the incidence of preventable disorders and increase the detection of subtle undiagnosed cases.

Points of strengths:

The study included adequate sample size. It is one of the first studies to address the knowledge of general population about thyroid disorders.

Limitations:

This study depended on recall for questionnaire filling, so it was subject to recall bias. In addition, it was confined to only one city and its results cannot be generalized to other regions or countries.

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