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Thyroid status among children with psychiatric disease, in Tabuk City, the Kingdom of Saudi Arabia

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ABSTRACT

Background: The association between thyroid dysfunction and psychiatric disease is well studied. However, the literature regarding the association among children lacks. No researchers have investigated the same in Saudi Arabia. Therefore, this study aimed to investigate hypothyroidism and hyperthyroidism among children with psychiatric disease. *Methods*: This case-control study was conducted among 347 participants (100 children and 108 adults with psychiatric disease, and 139 healthy controls) at Alamal Hospital in Tabuk City, Saudi Arabia during the period from June 2020 to December 2020. All the participants (and the parents if applicable) signed written informed consent. A structured questionnaire was used to collect demographic data if already diagnosed with thyroid disease, the type of psychiatric and thyroid disease, family history of thyroid dysfunction and psychiatric disease if the thyroid disease was detected before the psychiatric abnormality, the subjective improvement of psychiatric disease after the introduction of thyroxine. *Results*: Thyroid disease was higher among children (37% vs. 14.4%, odd ratio, 3.49, 95% *CI*, 1.87-6.52) and adults with psychiatric disease (48.1% vs. 14.4%, odd ratio, 5.52, 95% *CI*, 3.02-10.12 (P-values<0.001). No significant statistical was found between children and adults with psychiatric disease (37% vs. 48.1%, P-value, 0.069, odd ratio, 0.63 95% *CI*, 0.36-1.10. Thyroid symptoms started before psychiatric disease in children compared to adults (65.8% vs. 32.4 %). *Conclusion*: Thyroid disorders were higher among patients with psychiatric disease, with no differences between children and adults. Further larger multicenter studies investigating thyroid disorders among individual common psychiatric diseases are recommended.

Keywords: hypothyroidism, hyperthyroidism, psychiatric disease, children, Saudi Arabia

1. INTRODUCTION

Thyroid disorders are amongst the common causes for pediatrics Endocrine referral and thyroid hormones are important in the physical and cognitive development of children. The role starts even early in intrauterine life as the maternal thyroxine help in the neurological development of the fetus because the fetal thyroid starts functioning in 18- 20 week of gestation, and there is an association between abnormal maternal thyroxine levels (high or low) with low IQ of her child (Korevaar et al., 2016). Thyroid diseases are common in children and adolescents, so it is critical to diagnose and treat thyroid disorders to ensure normal growth and development during childhood and adolescence period (Hanley et al., 2016). One of the most important systems that need thyroid hormones in its function is neurocognition and mental health (Barjaktarovic et al., 2017).

A close relationship was demonstrated between mood disorders and thyroid disease (Li et al., 2019). The interaction of psychiatric disorders and thyroid status is complex, thyroid disorder had been shown to present with psychiatric disease, while the latter may affect thyroid status. It is interesting to note that, supra-physiological doses of thyroxine therapy (300microgram/day) improved both depression and anxiety among patients with bipolar depression with no differences observed between men and women (Pilhatsch et al., 2019). A randomized controlled trial observed a positive effect of supra-physiological doses of thyroxine on both depressive symptomatology and brain glucose metabolism (Bauer et al., 2016). A recent study published in China among patients with first-episode and drug-naive depression concluded the association of thyroid disorder with suicidal attempts (Shen et al., 2019). Besides, attention-deficit/hyperactivity disorder (ADHD) is the most common neurodegenerative disorder among children, the etiology remained to be elucidated, and previous studies showed that maternal thyroid disorders are associated with this morbid disease. ADHD was associated with hyperthyroidism and hypothyroidism with two-thirds of patients diagnosed with ADHD before thyroid dysfunction. However, treatment of ADHD with pharmacotherapy did not affect thyroid dysfunction later in life (Drover et al., 2019; Chen et al., 2018).

A case-control study from India observed the association of ADHD with low T4 levels (Kuppili et al., 2017), another study found no association between a high thyrotropin stimulating hormone (TSH) and bipolar depression in childhood (Zepf et al., 2011), a recent study from the USA included 2479 children aged 10-18 years found an association of hyperthyroidism with bipolar depression, anxiety, and ADHD (Schneider Aguirre et al., 2019). A more recent study (Luft et al., 2019) showed that TSH was abnormal in 6% of hospitalized children for psychiatric dysfunction.

Thyroid dysfunctions are easy to diagnose and when managed promptly may prevent psychiatric disorders alleviating the children and parents suffering. Psychiatric diseases may be stigmatizing. The prevention of mental disorders will be reflected in the whole community. Thyroid disorders are associated with mental disorders in the adult population. However, the association does not study in the young age group. To our best of knowledge, no researchers have assessed the rate of thyroid disease among children with psychiatric disease in the Kingdom of Saudi Arabia. Thus; we propose the current study in which we thought to assess the rates of hyperthyroidism and hypothyroidism among children with psychiatric disease in Alamal Psychiatry Hospital, Tabuk, Saudi Arabia.

2. SUBJECTS AND METHODS

This case-control study was conducted at Alamal Psychiatry Hospital, Tabuk, Saudi Arabia, during the period from June 2020 to December 2020. The Hospital was randomly chosen from the two tertiary care Hospitals in Tabuk City. Three hundred and forty-seven were included (100 children and 108 adults with psychiatric disease, and 139 healthy controls). The adults with and without psychiatric disease were matched for age and sex. The control subjects were chosen from the co-patients to minimize socioeconomic differences. All the participants signed a written informed consent (both the children and their parents when applicable), and then a one-on-one interview was conducted. A structured questionnaire was used to collect demographic data, if already diagnosed with thyroid disease, the type of psychiatric and thyroid disease, family history of thyroid dysfunction and psychiatric disease, if the thyroid disease was detected before the psychiatric abnormality, the subjective improvement of psychiatric disease after the introduction of thyroxine (therapeutic and supra-physiological if any).

Ethical consideration

Ethical clearance was obtained from the ethical committee of the University of Tabuk, ref. UT-104-04-2020, dated, 27/1/2020. All the participants signed a written informed consent and data were approached confidentially following the Declaration of Helsinki. Names were not recorded on the questionnaires. All questionnaires were kept safe.

Statistical analysis

The Statistical Package for Social Sciences (IBM, SPSS version 20, Chicago) was used for data analysis. The acquired data were presented as means± SD and percentages. The Chi-square test was used to compare the thyroid disease among children and adults with thyroid disease and the control subjects. A P-value of <0.05 was considered significant.

3. RESULTS

Out of the 100 children included (55% males, mean age, 9.01±5.02, and the duration of thyroid disease, 3.1±2.2), hyperactivity/attention deficit disorder was the commonest psychiatric disorder (17%) followed by anxiety in 15%, autism was diagnosed in 11%, mental slowness, appetite disorder, and depression were found in 15%, 15%, and 5% respectively. Hypothyroidism was evident in 22% and hypothyroidism in 15%, while chronic diseases were diagnosed in 18% (9% bronchial asthma and diabetes mellitus, hypertension, and epilepsy in 3% each). It is interesting to note that thyroid disease was diagnosed before psychiatric disease in 32.4% and the symptoms improved in 37.8% (Table 1).

Table 1 Characters of adults with thyroid disease

Character	No% (n=100)
Psychiatric diseases	
Depression	5 (5%)
Anxiety	17 (17%)
Mental slowness	15 (15%)
Hyperactivity/Attention deficit disorder	21 (21%)
Appetite disorders	15 (15%)
Autism	11 (11%)
Unspecified	19 (19%)
Thyroid disease	
Hypothyroidism	22 (22 %%)
Hyperthyroidism	15 (15 %%)
Chronic disease	
Diabetes mellitus	3 (3.0%)
Hypertension	3 (3.0%)
Bronchial asthma	9 (9.0%)
Epilepsy	3(3.0%)
Onset of symptoms	
Before psychiatric disease	12 (32.4 %)
After psychiatric disease	25 (67.6%)
Improvement in symptoms	14 (37.8%)
Family history of psychiatric disease	19 (19%)
Family history of psychiatric disease	36 (36%)
Sex	
Males	55 (55%)
Females	45 (45%)
Age (0.25-18)	9.01±5.02
Psychiatric disease duration	3.1±2.2

Regarding adults with psychiatric disease (53.7% women, aged, 31.34±9.30 years), the commonest psychiatric disease was anxiety (24.1%), followed by depression (13.9%), and phobia (10.2%) thyroid disease was reported in 48.1% (42.5 hypothyroidism), chronic diseases were reported in 19.4%, nearly two thirds (65.8%) reported thyroid symptoms before the psychiatric illness, and 46.3% showed improvement after thyroid treatment. Other patient's characters were depicted in (table 2).

Table 2 Characters of adults with and without psychiatric disease with thyroid disease

Character	No% (n=108)
Psychiatric diseases	
Depression	15 (13.9%)
Anxiety	26 (24.1%)
Bipolar illness	04 (3.7%)
Hyperactivity/Attention deficit disorder	06 (5.6%)
Obsession	0.2 (1.8%)
Phobia	11 (10.2%)
Suicidal ideation	01 (0.9%)
Post-traumatic disorder	02 (1.8%)
Alzheimer disease	01 (0.9%)
Unspecified	40 (37.0%)
Thyroid disease	46(42.5%)
Hypothyroidism	controls 2, and
Hyperthyroidism	18 respectively
	06 (5.6%)
Chronic disease	
Diabetes mellitus	9 (8.3%)=12
Hypertension	03 (2.7%)=6
Bronchial asthma	07 (6.5%)=19
Irritable bowel syndrome	01 (0.9)=0
Psoriasis	01 (0.9)=0
Onset of symptoms	
Before psychiatric disease	34 (65.8%)
After psychiatric disease	18 (34.2%)
Improvement of symptoms	
Yes	22 (42.3%)
No	30 (57.7%)
Sex	
Males	50 (46.3%)
Females	52 (53.7%)
Age	31.34±9.30

In the present study, the adult patients with and without psychiatric disease were matched for age (31.34±9.30 vs. 31.34±9.30, P-value, 0.790) and sex (53.7% and 48.9% were women, P-value, 0.456). Chronic diseases were reported in 19.4% and 26.6% respectively, while thyroid disease with higher among those with the psychiatric disease with a highly significant statistical difference, P-value, 0.000) (Table 3).

In the current survey, no significant statistical was found between children and adults with psychiatric disease (37% vs. 48.1%, P-value, 0.069, odd ratio, 0.63 95% *CI*, 0.36-1.10. However, thyroid disease was higher among children (37% vs. 14.4%, odd ratio, 3.49, 95% *CI*, 1.87-6.52, P-value, 0.000) and adults with psychiatric disease (48.1% vs. 14.4%, odd ratio, 5.52, 95% *CI*, 3.02-10.12, P-value, 0.000 with high significant statistical differences (Table 4 & figure 1).

Table 3 A comparison between adults with and without psychiatric disease

Character	Adults with psychiatric disease	Controls	P-value
Sex			
Males	50 (46.3%)	71 (51.1%)	0.456
Females	58 (53.7%	68 (48.9%)	

Thyroid disease	52 (48.15%)	20 (14.39%)	<0.001
Chronic disease	21 (19.4%)	37 (26.6%)	
Age	31.34±9.30	31.10±9.63	0.790

Table 4 A comparison between children and adults with psychiatric disease and adults control subjects.

Character	Patients adults (n=108)	Control (n=139)	Odd ratio, 95% CI	P-value
Thyroid disease, adults/controls	52 (48.15%)	20 (14.39%)	5.52 (3.02-10.12)	<0.001
Thyroid disease, children/controls	37 (37.00%)	20 (14.39%)	3.49 (1.87-6.52)	<0.001
Thyroid disease, children/adults	37 (37.00%)	52 (48.15%)	0.63 (0.36-1.10)	0.069

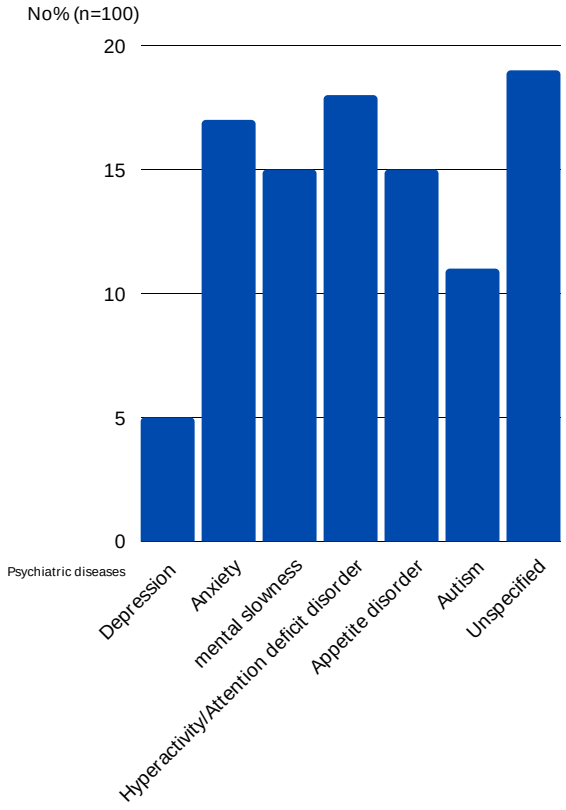

Figure 1 Pattern of Psychiatric diseases among children

4. DISCUSSION

In the present study, thyroid dysfunction was commoner among patients with psychiatric disease. No differences were found between children (odds ratio, 3.49, 95% *CI* 1.87-6.52) and adults (odd ratio, 5.52, 95% *CI*, 3.02-10.12). The present findings were in line with a recent study published in Germany (Hirtz et al., 2020) and found a higher psychiatric disease among children with overt hypothyroidism. Seigmann et al., (2018) concluded the findings of higher rates of hypothyroidism among adult patients with psychiatric disease in their review and meta-analysis and were supported by the current data. Regarding the association of hyperthyroidism with psychiatric disease, the matter was discussed controversially. Zader et al., (2016) assessed mental disorders among children with hyperthyroidism in the United States of America and found higher rates (ranging from 1.7 to five times for

ADHD and suicide respectively). Our findings supported Zader and colleagues' observations. However, the present findings are not in agreement with (Hirtz et al., 2020) who conducted a cross-sectional study among the general populations in Germany and found no association. A plausible explanation is that we assessed patients with psychiatric disease and followed in a tertiary psychiatric care center, while Hirtz and colleagues assessed the general population.

Our findings of higher thyroid disease among adults with psychiatric disease supported the previous literature (Riguetto et al., 2019; Abraham et al., 2007). The association of thyroid disorders and psychiatric disease is thought to be mediated by hypothalamus-pituitary disorders, serotonin, and catecholamine signaling (Hage et al., 2012; Bunevicius et al., 2010). The symptoms of thyroid disorders appeared after psychiatric diagnosis in more than two-thirds (67.6%) of children with psychiatric diseases in contrast to adults (34.2%). The results imply that the screening for thyroid disorders might be of help among children with psychiatric disease. The current data showed that 37.8-42.3% of patients with psychiatric disease improved after treatment, a previous study showed an improvement in depression following thyroxine treatment (Krysiak et al., 2017), another study observed persistence in quality of life deterioration after thyrotoxicosis treatment (Cramon et al., 2016). The association between ADHD and thyroid disorders lacks (Drover et al., 2019), in the present study, 36% of children with the psychiatric disease are either ADHD or autism.

5. CONCLUSION

Thyroid disorders are commoner among children and adults with psychiatric disease, psychiatric disease developed before thyroid disorder in two thirds and one third in children and adults respectively. Nearly two-thirds of patients showed persistence of symptoms after thyroid treatment. Psychiatrists may need to screen for thyroid disorders among children with psychiatric disease. Further multi-center studies assessing thyroid disease among different psychiatric diseases are recommended.

Limitations

The study was limited by the small sample size, the reliance on a self-reported interview, and the fact that it was conducted at a single tertiary center. Thus, generalization to the Kingdom of Saudi Arabia cannot be insured.

Informed consent

Written & Oral informed consent was obtained from all individual participants included in the study. Additional informed consent was obtained from all individual participants for whom identifying information is included in this manuscript.

Funding

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Conflicts of interest

The authors declare that there are no conflicts of interests.

Ethical approval

The study was approved by the Medical Ethics Committee of Tabuk University (ethical approval code: UT-104-04-2020).

Data and materials availability

All data associated with this study are present in the paper.

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