Assessment of Thyroid Profile in Children with Bronchial Asthma

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Article History: Received: 10.05.2023 **Revised:** 15.06.2023 **Accepted:** 20.06.2023

Abstract

Background: Bronchial asthma is becoming increasingly common, especially in youngsters, and this is a major public health issue. About 300 million individuals worldwide are affected by it. A suggested association was reported between bronchial asthma and thyroid disorders. The purpose of this research was to examine whether or not children with asthma are more likely to have thyroid problems.

Patients and Methods: Sixty bronchial asthmatic children participated in the current investigation in addition to 30 apparently healthy children. Assessment of the degree of asthma severity and detection for the presence of other atopic conditions were done. Assessment of the thyroid function with evaluation of anti-thyroid peroxidase (TPO) enzyme in addition to performing of different allergic skin tests in the asthmatic cases.

Results: In comparison to the control group, those with asthma had significantly greater levels of thyroid stimulating hormone and significantly lower levels of thyroid hormones overall. The TPO level was statistically significaly higher in the asthma group. Anti TPO enzyme levels were significantly inversely related to T3 levels. Anti TPO enzyme > 16.80 had a sensitivity of 73.3% and a specificity of 66.7% in detecting instances of atopic bronchial asthma.

Conclusion: A higher level of Anti TPO enzymes is indicative of an autoimmune component in bronchial asthma, and this is linked to hypothyroidism in the affected children. Thyroid disorders were more common when the underlying disease was more severe and the patient responded less well to treatment.

Keywords: Bronchial asthma, TPO, hypothyroidism, TSH.

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INTRODUCTION

Respiratory tract inflammation and hyperreactivity characterize the spectrum of diseases known as asthma [1]. An estimated 310 million people across the globe suffer from bronchial asthma, which accounts for 1-18% of all cases of asthma. [2].

It is estimated that yearly [3] 346,000 people die from asthma-related causes, making this condition a major global health problem. School-aged children in Egypt have a high prevalence (7.7%) of bronchial asthma. [4].

Dyspnea, wheezing, coughing, and/or a tight feeling in the chest are some of the respiratory symptoms reported by people with asthma. In advanced stages of the disease, these symptoms become more frequent and severe, along with a decrease in expiratory airflow and general lung function [5].

One definition of asthma is "a chronic inflammatory disease of the lungs" with a complex pathophysiology that includes interactions between the environment and genetics, leading to varying degrees of airway narrowing, inflammation, and even airway remodeling. Nearly 60% of cases of asthma in both children and adults can be attributed to allergies [6].

For a long time, T2-mediated mechanisms have been thought to be crucial in the etiology of asthma [7]. But there's more and more evidence to suggest that asthma that doesn't engage the Th2 pathway—known as non-T2 asthma—instead involves the Th1 or Th17 pathway—could play a significant part in the inflammatory mechanisms that contribute to this condition [8].

There may be links between autoimmune-related hypothyroidism and non-T2 asthma due to the fact that the two conditions share some of the same pathways, such as the Th17 pathway. Thyroid abnormalities, according to prior research, are a potential extra-respiratory comorbidity of asthma [9].

Autoantibodies associated with hyperthyroidism and hypothyroidism, both of which have an autoimmune basis, have been observed to be prevalent in individuals with asthma [10]. Asthma and newly diagnosed hyperthyroidism have been linked, according to a recent cohort study based on a real-world population [11].

The goal of this research was to examine whether or not autoimmune thyroiditis is associated with a higher risk of developing atopic asthma in Egyptian children because, despite a large body of research, there is still no consensus about the role of thyroid hormones in this process.

PATIENTS AND METHODS

This is a cross-sectional case control study that was conducted on patients presented to the Respiratory, Allergy and Clinical immunology outpatient clinics in Children's Hospital of Mansoura University, Egypt. From March 2022 to February 2023.

The study included sixty asthmatic children with atopic asthma, aged 6-16 years. Asthma was diagnosed and the level of asthma control was evaluated in accordance with the most up-to-date recommendations for both by the Global Initiative for Asthma management and prevention (GINA, 2019 [12]). Serum samples were taken and skin testing was done after the patient had ceased taking antihistamines for at least 5 days. The study also included 30 healthy children without apparent evidence of personal and family history of allergic diseases as a control group.

The children with the following criteria were excluded; children with lung lesions, interstitial lung disease, or other respiratory diseases, children with connective tissue diseases, children with congestive heart failure requiring drug control, children who have chronic renal failure, children who have a family history of thyroid disease, and children who are currently receiving treatment that affect thyroid hormones, such as amiodarone hydrochloride, within the last 3 months and children who had been treated with systemic steroids for the previous four weeks prior to the trial.

PATIENT ASSESSMENT:

1. Collection of relevant medical history and Examination.
2. A skin-prick test employing a standard battery of aeroallergens and food allergens: house dust mite (HDM) (Dermophagoides pteronyssinus, D. farinae), Parietaria officinalis, grasses mould (Alternaria, Aspergillus), dog fur, cat fur, egg, bovine milk, wheat, fish, peanut, and soya bean. When a patient's wheal width increased by more than 3 mm in response to an allergen compared to a negative control (normal saline) and allergic asthma was diagnosed when a patient demonstrated either a clear clinical history of asthma or objective proof of an asthmatic reaction induced by allergen exposure.

Ink was used to stamp an allergen-filled stencil onto the forearm, and then a lancet was used to pierce the skin (Stallergenes, Cedex-France). Histamine chloride (10 mg/mL) served as the positive control, while the allergen diluent served as the negative control. After 15 and 30 minutes, the data were analyzed. When compared to the negative control, a positive result was indicated if the weal measured more than 3 millimeters in diameter.

The laboratory assessment included measurement of Total serum IgE (Values typical between 25 and 60 months are 81 kU/L, while those between 61 and 156 months are 101 kU/L), Eosinophilia percentage, Antithyroid peroxidase (anti-TPO) antibodies [N.V. <30 UI/mL; TG antibodies N.V. <100 UI/mL) over twice on a period of 2 months], TSH levels (by high specific solid-phase technique chemiluminescence immunoassays) and FT3 & FT4 levels by highs specific solid-phase technique chemiluminescence

immunoassays. TSH > 10 IU/ml was used to diagnose hypothyroidism.

After obtaining informed consent from all participants, five milliliters of blood were drawn from each participant's vein at 7:00 a.m. while they were fasting. One milliliter was placed in an EDTA tube for a complete blood count, and four milliliters in a plasma tube were centrifuged to separate the serum. The serum was then frozen at 70 °C for later analysis using an enzyme immune-assay (EIA).

STATISTICAL ANALYSIS:

SPSS version 26 for Windows® (Statistical Package for the Social Sciences) (IBM, SPSS Inc, Chicago, IL, USA) was used to enter codes, process data, and conduct statistical analyses. Quantitative (frequency) and percentage presentations of qualitative data were provided. To evaluate differences across groups, the Chi-Square test (also known as Fisher's exact test) was utilized. The Kolmogorov-Smirnov test was used to check for normalcy in numerical data. The data were displayed using a median and standard deviation.

The Chi-square (or Fisher's exact) test was utilized to evaluate differences between sets of individuals based on discrete categories. When comparing two groups using quantitative variables with a normal distribution, the independent samples (student's) t-test was employed, while the Mann-Whitney U-test was used when the data did not fit into a normal distribution .

If the quantitative data fell into a normal distribution, the Kruskal Wallis test was used to compare three or more groups; otherwise, the one-way analysis of variance (ANOVA) was utilized .

Pearson's or Spearman's correlation (r) was used to find the relationship between the numerical variables. Youden index J, the furthest point on the receiver operator characteristic (ROC) curve, is stated in terms of sensitivity and specificity, and was used to find the appropriate cutoff value of a quantitative variable to differentiate between groups. A p-value of less than 0.05 indicates statistical significance.

ETHICAL CONSIDERATION:

Written consent from the legal patients' guardians contributed to the study was obtained and approval from Mansoura medical ethics Committee (MMEC) of faculty of medicine (IRB Code: MS. 20.10.1)

RESULTS

According to **table (1)**, the mean age among patients group was 9.94±3.08 years ranged from 6 to 17 years as compared to 10.60±2.22 among control group ranged from 6 to 15 years with no significant difference.

Males versus females were 65% vs. 35% and 46.7% vs. 53.3% among patients and control groups, respectively. 80% were from urban residence as compared to 63.3% among control group with no statistical difference p value >0.05.

Mean heart rate was statistically significantly lower among patients group 78.08±9.99 as compared to 83.06±9.59 among control group p value ≤0.05 while patients and control groups were matched regarding weight and height.

Table (2) shows the most common complaints among children with atopic bronchial asthma. Among this group, 96.7% of them suffered from shortness of breath & dyspnea, 98.3% had cough and 91.7% with wheezes.

Most of cases (93.3%) had fatigue, 98.3% showed increased sensitivity to cold, 95.0% suffered from dry skin, 48.3% showed weight gain & puffy face, 78.3% with hoarseness of voice, 76.7% had muscle weakness and 78.3% showed skin eczema.

Allergic rhinitis was presented in 98.3% of children, 5% of them had neck goiter, 93.3% complained from eye conjunctivitis, 43.3% had history of cow milk allergy and 20% had thyroid disease.

Regarding frequency of diurnal attacks, 8.3% of children showed daily attacks, 35% had more than one attack per week and 56.7% had less than one attack per week while 11.7% had daily nocturnal attacks, 51.7% had more than one attack per week and 36.7% had less than one attack per week.

Skin test result among children with atopic bronchial asthma showed that, the most common allergen was mixed mites representing positive skin test among 38.3% of children followed by 31.7% for strawberry, mixed pollens & house dust while the least common allergen was mushroom which was positive in only one case.

Table (3) shows that the mean T3 and T4 showed statistically significant lower level among patients' group. Median TSH was higher among patients' group, median = 2.44 ranged from 0.79 to 9.34 as compared to median=1.98 ranged from 0.1 to 5.29 in control group.

Anti TPO enzyme was higher among patients' group, median = 18.56 ranged from 5 to 600 as compared to median=16.35 ranged from 5 to 29.93 in control group with statistically significant difference.

Table 4 demonstrates that patients who experienced seasonal changes had significantly lower levels of anti TPO enzymes while higher levels was observed among patients with skin eczema, eye conjunctivitis and thyroid disease.

Table (5) indicates that, there was statistically higher anti TPO enzymes level among patients with daily diurnal attacks as compared to diurnal attacks less than once per week.

Anti TPO enzymes level was higher among patients with daily nocturnal attacks as compared to nocturnal attacks more than once per week and nocturnal attacks less than once per week. The levels of anti-TPO enzymes were much greater among non-responder to inhaled B2 agonist group median = 21.38 ranged from 16.28 to 600 as compared to

median=17.82 ranged from 5 to 37.73 among responder group.

There was a statistically significant inverse relationship between Anti TPO enzyme level and T3 levels, as shown in **Table 6.** (r=-0.257, p=0.047). Increased Anti TPO enzyme level was associated with decreased T3 level.

Table (7) showing that, the area under the curve was 0.678 with 95% CI from 0.65 to 0.79. The best cut-off value considering anti TPO enzyme in prediction of children with atopic bronchial asthma was 16.8 with 73.3% sensitivity, 66.7% specificity, 81.5% PPV,55.6% NPV and 71.1% total accuracy as observed in **Figure (1)**.

Table (1): Socio demographic and clinical data among patients and control groups

Demographic data	Patients group (n=60)	Control group (n=30)	p value
Age (years)			
Mean ± SD	9.94±3.08	10.60±2.22	0.301
Min-Max	6-17	6-15	
Gender			
Male	39 (65.0%)	14 (46.7%)	0.096
Female	21 (35.0%)	16 (53.3%)	
Residence			
Urban	48 (80.0%)	19 (63.3%)	0.087
Rural	12 (20.0%)	11 (36.7%)	
Vital signs (HR) (beat/min) Mean ± SD	78.08±9.99	83.06±9.59	**0.026***
Weight (kg) Mean ± SD	41.66±16.97	38.16±10.81	0.307
Height (cm) Mean ± SD	135.98±16.90	129.37±10.60	0.054

Table (2): Clinical manifestations among children with atopic bronchial asthma

Complaints	Patients group (n=60)	
Clinical manifestations		
Shortness of breath	58 (96.7%)	
Cough	59 (98.3%)	
Wheezes	55 (91.7%)	
Seasonal variations	57 (95.0%)	
Fatigue	56 (93.3%)	
Increased sensitivity to cold	59 (98.3%)	
Dry skin	57 (95.0%)	
WT gain	29 (48.3%)	
Puffy face	29 (48.3%)	
Hoarseness of voice	47 (78.3%)	
MS weakness	46 (76.7%)	
Skin eczema	47 (78.3%)	
Nose allergic rhinitis	59 (98.3%)	
Neck goiter	3 (5.0%)	
Eye conjunctivitis	56 (93.3%)	
GIT (Cow milk allergy)	26 (43.3%)	
Thyroid disease	12 (20.0%)	
Diurnal attacks		
Daily	5 (8.3%)	
>1/W	21 (35.0%)	
<1/W	34 (56.7%)	
Nocturnal attacks		
Daily	7 (11.7%)	
>1/W	31 (51.7%)	
<1/W	22 (36.7%)	
Skin test		
Mixed mites	23	38.3
Strawberry	19	31.7

Mixed pollens	19	31.7
House dust	19	31.7
Grasses	18	30.0
Mixed molds	16	26.7
Cotton dust	16	26.7
Milk	14	23.3
Chocolate	13	21.7
Fish	13	21.7
Wheat	13	21.7
Goat	12	20
Cat epith	12	20.0
Banana	11	18.3
Wool	11	18.3
Mango	10	16.7
Pigon	10	16.7
Dog hair	6	10.0
Aspergellus fumigatus	6	10.0
Egg	5	8.3
Rabbit	3	5.0
Straw	2	3.3
Feather	2	3.3
Mushroom	1	1.7

Table (3): Thyroid hormones and anti TPO enzyme among patients and control groups

Thyroid hormones and anti TPO enzyme	Patients group (n=60)	Control group (n=30)	p value
T3 Mean ± SD	183.86±34.63	208.44±51.71	**0.009***
T4 Mean ± SD	10.09±1.71	11.26±1.46	**0.002***
TSH Median (Min-Max)	2.44 (0.79- 9.34)	1.98 (0.1- 5.29)	**0.022***
Anti TPO enzyme Median (Min-Max)	18.56 (5- 600)	16.35 (5- 29.93)	**0.006***

Table (4): Association between anti TPO enzymes level and symptoms among children with atopic bronchial asthma

Symptoms	Positive	Negative	P value
Shortness of breath	18.56 (5.00- 600)	18.19 (14.96- 21.43)	0.621
Cough	18.76 (5.00- 600)	14.96 (14.96- 14.96)	0.214
Wheezes	18.37 (5.00- 600)	21.43 (14.96- 27.42)	0.841
Seasonal variations	18.25 (5.00- 600)	33.54 (24.53- 34.92)	**0.029***
Fatigue	18.31 (5.00- 600)	21.95 (17.64- 102.40)	0.224
Increased sensitivity to cold	18.76 (5.00- 600)	17.64 (17.64- 17.64)	0.751
Dry skin	18.76 (5.00- 600)	16.67 (13.61- 33.54)	0.553
Weight gain	19.45 (12.03- 67.21)	18.25 (5.0- 600)	0.796
Puffy face	20.07 (12.03- 102.4)	17.82 (5.00- 600)	0.510
Hoarseness of voice	18.77 (5.00- 600)	16.96 (13.69- 37.53)	0.501
MS weakness	18.16 (5.00- 600)	19.48 (15.63- 102.40)	0.228
Skin eczema	19.45 (13.94- 600)	14.55 (5- 33.54)	**0.002***
Allergic rhinitis	18.76 (5.00- 600)	12.03 (12.03- 12.03)	0.10
Neck goiter	21.35 (12.03- 22.06)	18.37 (5.00- 600)	0.773
Eye conjunctivitis	19.09 (13.61- 600)	12.76 (5- 16.67)	**0.003***
Cow milk allergy	18.22 (12.03- 600)	19.09 (5.00- 102.40)	0.493

Table (5): Association between anti TPO enzymes level and frequency of diurnal, nocturnal attacks

Attacks	Anti TPO enzymes Median (Min-Max)	P value
Diurnal attacks Daily >1/W <1/W	 27.42 (13.61 -600) **a** 20.19 (15.84-102.4) 17.52 (5- 34.92) **a**	**0.039***
Nocturnal attacks Daily >1/W <1/W	 33.54 (17.46-600) **ab** 18.77 (5-102.4) **a** 18.05 (12.03-25.09) **b**	**0.012***
Responder **Non responder**	17.82 (5- 37.73) 21.38 (16.28- 600)	**0.012***
ab: similar letters indicate significant difference between groups		

Table (6): Correlation between different clinical parameters, thyroid hormones and anti TPO enzyme

Variables	Anti TPO enzyme	
	R	p
Age, years	-0.022	0.867
HR, Beat/min	-0.088	0.504
Weight, Kg	-0.107	0.414
Height, cm	0.000	0.999
T3	-0.257	**0.047***
T4	0.085	0.518
TSH	0.119	0.366

Table (7): Receiver operating characteristics curve (ROC) curve for prediction of children with atopic bronchial asthma by anti TPO enzyme

AUC	95% CI	Cutoff	Sensitivity	Specificity	PPV	NPV	Accuracy
0.678	0.65-0.79	16.80	73.3%	66.7%	81.5%	55.6%	71.1%

AUC: area under the curve, CI: confidence interval, PPV: positive predictive value, NPV: Negative predictive value

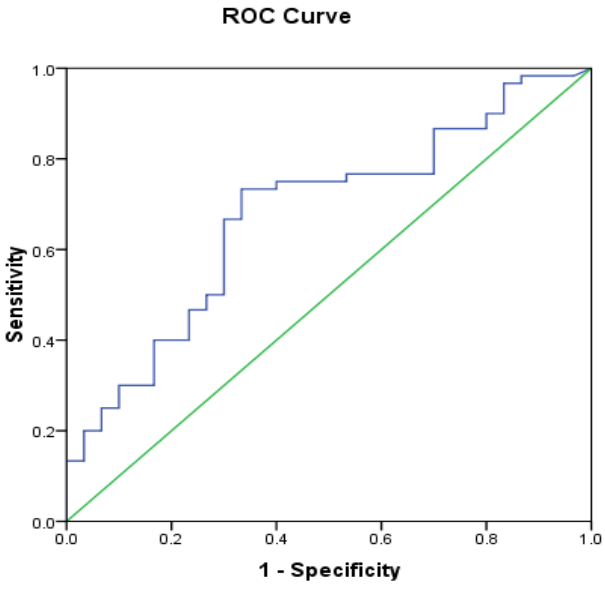

Figure (1): ROC curve for prediction of children with atopic bronchial asthma by anti TPO enzyme

DISCUSSION

The current research aimed to determine whether or not children with asthma were more likely to experience thyroid abnormalities than a control group of children without asthma. Sixty kids with asthma and 30 kids who looked healthy served as the study's control group.

In the current investigation, Patients, on average, had an age of 9.94±3.08 years ranged from 6 to 17 years as compared to 10.60±2.22 among control group ranged from 6 to 15 years that was not different enough to be measured statistically.

Contrary to the findings of Ismaeil et al. who included 25 children of them were suffering from bronchial asthma and 25 healthy children. The study revealed that mean age of control group is greater than that of the case group with the presence of notable dissimilarity amongst the case and control groups ($p<0.05$) [13]. The difference could be explained as the mean age in this study was lower in the two study groups as compared with our current study.

In the current study, males versus females were 65% vs. 35% and 46.7% vs. 53.3% among patients and control groups, respectively. In the subset of people with asthma, men accounted for a greater proportion.

This also agreed with Ismaeil et al. who hat asthma prevalence was more common in males (17=68%) than females (8=32%) [13].

The current results supported by research from Archea et al. who determined the rate of asthmatic conditions found in adulthood in Cairo in a study conducted on 140 asthma patients, revealing that the incidence of asthma was 55% among male patients, higher than that in female patients [14].

This was in agreement with GINA who reported that bronchial asthma is more common in males compared to females [15]**.** Sex-related differences in the prevalence of asthma was explained as In children under the age of 14, being a male is a risk factor for developing asthma. This gender gap closes as children age, and by maturity, asthma is more common among women than males. It is unclear what causes these gender-based distinctions [16].

In the present investigation, cases of asthma were more prevalent in the urban population (80%).

This agreed with a cross sectional study in El-Minofiya Asthma was shown to be 14% more common in cities than in rural areas [17].

On the other hand, in Oropeza-Province, Bolivia, 2584 children were given the standardized ISAAC questionnaire, and the results suggest that the prevalence of asthma symptoms is higher in rural areas (12.4% vs. 9.2%) than in urban areas [18].

The variation could be explained due to differences in geographic regions and climatic differences.

In the current study, Mean T3 and T4 showed statistically significant lower level among patients' group.

Landyshev et al. found that people with bronchial asthma experience biphasic alterations in their thyroid function, hence these results are at odds with their hypothesis. Patients with mild bronchial asthma were also observed to acquire hypofunction of their thyroid glands as their condition worsened to the point of paroxysmal exacerbation [19].

Thyroid hormone levels in asthmatics were within the reference range, hence the findings of Biscaldi et al., who found greater FT3 and T4 levels in a control group than in asthmatics, did not indicate an association between asthma and alterations in thyroid function. [20].

In a large based study that included a total of asthma group consisted of 95,321 asthma patients, while the control group consisted of the same number of individuals who did not have asthma. In the asthma and non-asthma groups, the incidence of new-onset hypothyroidism was 8.13 and 6.83 per 100,000 individuals per year, respectively. The adjusted hazard ratio for asthmatics developing hypothyroidism was 1.217% higher than in the non-asthmatic group. (95% confidence interval, 1.091–1.357) [21].

In a previous study, Asthma attacks were more frequent in those with poor thyroid function. All patients in this group reported the recurrence of asthma episodes for at least 24 hours, occurring anywhere from three to two and a half times per week, and occurring equally as often during the day as they did during the night [22].

This contradicted the findings of Ismaeil et al., who found that free T3 and T4 levels were lower in the asthmatic cases compared to the control group [13].

These results disagreed with findings of Abd EL Aziz and colleagues (2010) who studied that Thyroid function tests (FT4, FT3) did not differ significantly between the test and control groups in 40 individuals (20 with bronchial asthma and 20 with allergic rhinitis) [10].

Furthermore, our findings contrast a study by Lindberg et al., in which the authors discovered no link between T3 and T4 and bronchial asthma in a sample of 140 kids with various allergy types and 370 kids aged 11-13 who were healthy controls [23].

Liu et al., authors of a new cohort study, found that mothers with hypothyroidism may increase their children's chance of developing asthma [24].

In the current study, median TSH was higher among patients' group, median = 2.44 ranged from 0.79 to 9.34 as compared to median=1.98 ranged from 0.1 to 5.29 in control group. The cases group had considerably higher TSH levels.

This agreed with Oppedal's et al. study on 90 asthmatic patients and found significant relationship was found between TSH and asthma control questionnaire (ACQ) results [25].

These results disagreed with findings of EL Aziz and coworkers (2012) examined 40 patients (20 with bronchial asthma and 20 with allergic rhinitis) and observed a statistically insignificant distinction in thyroid function tests (TSH) between the test and control groups [10].

Also, while Lindberg et al. (2004) showed no correlation between TSH and bronchial asthma in a sample of 140 kids with various allergy types and 370 kids without allergies between the ages of 11 and 13, our data show the contrary. [23].

In the current study, anti TPO enzyme was higher among patients' group, median = 18.56 ranged from 5 to 600 as compared to median=16.35 ranged from 5 to 29.93 in control group with statistically significant difference.

This came in accordance with Abd EL Aziz and colleagues (2010) who showed that Patients with allergic disorders have significantly greater anti-TPO antibody levels than healthy controls ($p < 0.01$) [10].

This matched the findings of Fekri et al., who measured in a cross-sectional study, thyroid function and anti-thyroid peroxidase antibody (anti-TPO Ab) were compared between 100 women with asthma and 100 women serving as a control group. Serum anti-TPO Ab levels in asthmatic women were significantly higher (74±13.6 IU/ml) than those in the control group (45.24±10.56 IU/ml). Even after controlling for age and body mass index, the association between asthma and anti-TPO Ab (>50 IU/ml) remained statistically significant (OR=3.3, P<0.01). [26].

Within the same line, Patients with bronchial asthma and/or allergic rhinitis are more likely to have thyroid auto-antibodies, as shown by Amino et al [27].

This is because IL4, IL5, and IL13 (associated in asthma and other allergy illnesses) activate B cells to manufacture thyroid antibodies, which in turn reduce thyroid hormone synthesis and secretion due to the Th2 response-enhanced antibodies [28].

This disagreed with Ismaeil et al. who demonstrated no association between anti-TPO Ab and anti-TG Ab on one hand and bronchial asthma on the other hand ($p>0.05$) [13]

Anti TPO enzyme level was found to have a statistically significant inverse relationship with T3 levels in the current investigation, ($r=-0.257$, $p=0.047$). Increased Anti TPO enzyme level was associated with decreased T3 level.

This came in accordance with Abd EL Aziz et al. (2010) who showed that anti-TPO antibody levels did not significantly correlate with the TSH level of either patients with bronchial asthma ($r = 0.13$, $p > 0.05$) or allergic rhinitis ($r= 0.11$, $p > 0.05$) [10].

In the current study, the area under the curve was 0.678 with 95% CI from 0.65 to 0.79. The best cut-off value considering anti TPO enzyme in prediction of children with atopic bronchial asthma was 16.8 with 73.3% sensitivity, 66.7% specificity, 81.5% PPV,55.6% NPV and 71.1% total accuracy.

No previous studies have previously reported the best cutoff point of any of the tested thyroid functions in identifying the cases with asthma. This is a main strength point in the current study as it could provide early non-invasive diagnostic biomarkers in diagnosis of asthma.

Despite the findings of the current study, the validity of those findings may be compromised by some caveats. The study's two key flaws are its limited sample size and the fact that it was conducted at a single location. These restrictions include the study's cross-sectional design.

CONCLUSIONS

Bronchial asthma is a common condition with a great impact on the health system and quality of life. Bronchial asthma is associated with hypothyroidism among the affected children which is mostly due to autoimmune component evidence by higher level of Anti TPO enzymes. The prevalence of thyroid disorders increased with the disease severity and associated with less response to treatment.

Declaration of interest: Nil.

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