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Correlation of Thyroid Antibodies (Anti-Thyroid Peroxidase and Anti-Thyroglobulin) with Pituitary and Thyroid Hormones in Selected Population Diagnosed with Various Thyroid Diseases

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Abstract: Background: Since the beginning of new millennium, researchers indentified that auto-immunity disorders especially that of thyroid gland is getting prevalent. Clinically it consists of poly-dimensional outcomes and mostly noted in females aged 30-50 yrs. Moreover, generic thyroid dysfunction such as sub-clinical or overt hyper and hypothyroidism are now a commonality in both developed and underdeveloped countries. Aim: The present study reported the assessment of correlation among antiTg and anti-TPO with thyroid hormones and thyroid stimulating hormone (TSH) in addition to relation with thyroid disease status. Materials and Methods: Anti Tg, anti-TPO, thyroid hormones and TSH were determined in 213 selected individuals, including 142 females (66.66%) and 71 males (33.33%) using electro-chemi-luminescence immunoassay (ECLi) technology on Elecsys 2010 and Cobas 6000 modular system e-601 (Roche, Diagnostics, Basil). Results revealed that Anti-TPO and antiTG were correlated well with each with R^2 of 0.7875, whereas individual comparison showed that antiTPO correlated well with TSH (R^2 0.7375) and T4 (R2 0.7445) and anti-Tg moderately with TSH (R^2 0.6184). T3 comparison with anti-TPO and anti-Tg manifested lower levels of regression correlation exhibited as antiTPO vs T3 = R^2 0.4386 and antiTg vs T3 = R^2 0.2516. In Conclusion: The outcome and resultant correlation suggested investigative significance of anti-thyroid antibodies. Additionally, it is in relation to the existence of elevated levels of TSH and thyroid hormones in patients with generic as well as autoimmune thyroid disorders.

Key words: Anti-Tg (Anti-Thyroglobulin Antibodies) · AntiTPO (Anti-Thyroid Peroxidase) · Electro-Chemi-Luminescence (ECL) Technology

INTRODUCTION

Sub-clinical or overt hyper and hypothyroidism, that generically known as thyroid dysfunctions and autoimmune thyroid disease, are now becoming widespread clinical features in developed and underdeveloped countries [1-5]. Furthermore, onset of overt endocrine dysfunctions is now more frequent affecting 5-10% of suspected patients [6]. Therefore, recent and past studies have emphasized the significance of thyroid auto-immunity disorders [3, 4]. Moreover, it occurrence is more consequential and mostly noted in females aged 30-50 yrs [1,7]. In addition, it was reported that its prevalence rate progressed with age of patients, in which 2-4% women and 1% of men are suspected to have full clinical symptoms [8]. In last decade, important diagnostic parameters such as, anti-thyroid antibodies, consisting of anti-Tg (anti-thyroglobulin antibodies) and antiTPO (anti-thyroid peroxidase) were introduced to assess the autoimmunity of thyroid disorder basis. Recent and past investigations have seen a trend of usage of anti-TG and antiTPO, in combination with thyroid hormones, to evaluate thyroid status of suspected individuals and to manage treatment regiments [1, 9].

The present study documented the assessment of correlation of antiTg and anti-TPO with thyroid hormones and thyroid stimulating hormone (TSH) in addition to relation with thyroid disease status.

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MATERIALS AND METHODS

Study Design and Patients: Anti Tg, anti-TPO, thyroid hormones and TSH were determined in 213 selected individuals, including 142 females (66.66%) and 71 males (33.33%). The study period was Dec 2012 to June 2014 and it's a prospective observational study. Average age of females was 44.20 ± 8.10 yrs and that of males 50.45 ± 6.20 yrs.

Inclusion Criteria: All of the individuals were either confirmed cases of thyroid disorders, or under-treatment, recently diagnosed cases, as well as those with overt/sub-clinical thyroid anomalies. Age, gender, occupation, locality, any other disease forms, pregnancy data were collected and correlated with the assessments, where applicable.

Exclusion Criteria: Care was taken that none of the patients had any history of operations, malignancies, liver or renal disease, interferon therapies or β-blockers usage.

Blood Collection: Six milliliters whole blood was collected from each patient and 50 healthy individual in Clot-activated tubes (Red Top). Serum was separated and stored at -20°C. Where needed, dilution and aliquots were prepared to get actual quantization of all parameters.

Analytical Determinations: Anti-Tg, Anti-TPO antibodies, tri-iodothyronine (T3), tetra-iodothyronine (T4) and TSH were measured using electro-chemi-luminescence technology on Elecsys 2010 (Roche Diagnostics, Basil) as well as Cobas 6000 modular system e-601 (Roche, Diagnostics, Basil), where applicable, with normal references ranges of <115 IU/ml, < 34 IU/ml, 0.8-2.00 ng/ml, 5.1-14.1 µg/ml, 0.27-4.2 µIU/ml, respectively. AntiTg and TSH analysis was performed by two step sandwich ECL immunoassay, whereas antiTPO, T3, T4 and TSH by competitive ECL immunoassay.

Statistical Analysis: All data was statistically analyzed by SPSS ver 13 (USA) through Student's t-test, paired and by using regression correlation analysis R^2 among thyroid hormones and thyroid antibodies. Data considered to be significant when $P < 0.05$ and presented as Mean ± SD.

RESULTS

A total of 213 patients were selected for present study, of which 142 were females and 71 males. This selected group was finalized through screening of 360 patients over a period of two years to ensure that only those who fall within our criteria of abnormal thyroid functions were considered and assessed. All individual that were selected were diagnosed with thyroid disorders, most of which exhibited markedly elevated anti-thyroid antibodies. Regression correlation analysis showed strong linearity of compared parameters. Both auto-antibodies correlated with each other generating R^2 of 0.7875. Therefore 78.75% data compatibility was manifested among both parameters and linearity in results as well (Fig. 1). When antiTPO was compared with TSH, R^2 correlation data showed compatible linear-relationship of 0.7375. This depicts significant correlation of thyroid antibodies with changes in TSH levels (Fig. 2). Interestingly, anti-Tg data comparison with TSH exhibited a slight lower level of correlation, R^2 0.6184. However, it still suggests that relation is marked and moderately linear (Fig. 3). Comparative analysis of antiTPO with T4 also manifested strong regression correlation of R^2 0.7445 (Fig. 5) whereas anti-Tg vs T4 at a lower level R^2 0.5823 (Fig. 6). T3 comparative grouping with antiTPO and antiTg showed lower levels of regression correlation as compared to TSH and T4, with antiTPO vs T3 = R^2 0.4386 (Fig. 4) and that of antiTg vs T3 = R^2 0.2516 (Fig. 7). In summary the strongest regression correlation of > 70% was noted in the group compared, antiTPO vs TSH and antiTPO vs T4, whereas antiTg exhibited strong correlation with TSH only at > 60%. Moderately virtuous correlation of > 25% to < 60% was noted among rest of the parameters.

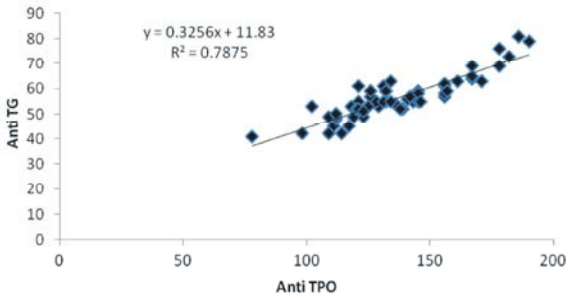

Fig. 1: Comparative analysis of Anti TPO vs Anti TG

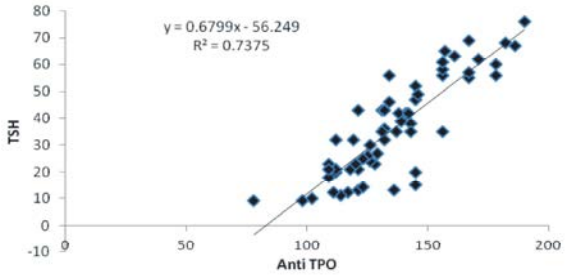

Fig. 2: Comparative analysis of Anti TPO with TSH

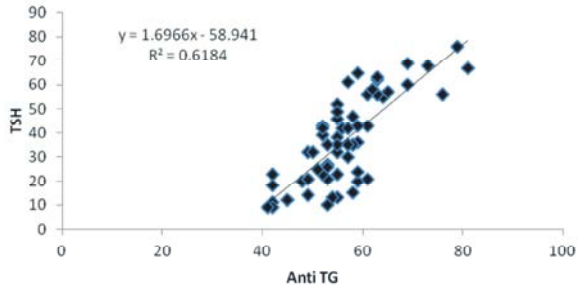

Fig. 3: Comparative analysis of Anti TG with TSH

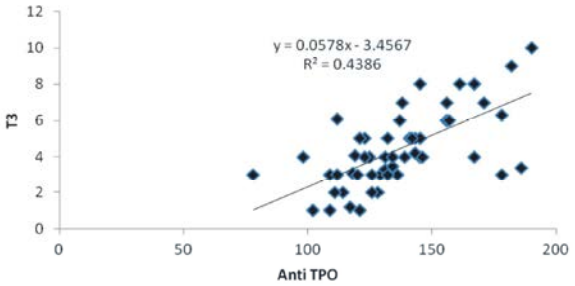

Fig. 4: Comparative analysis of Anti TPO with T3

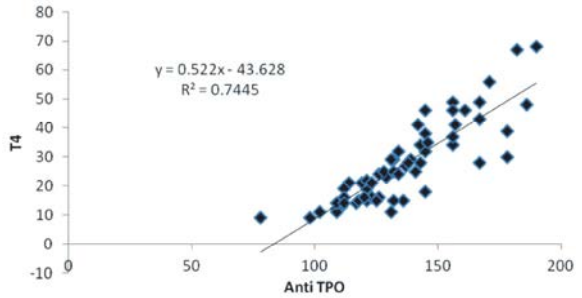

Fig. 5: Comparative analysis of Anti TPO with T4

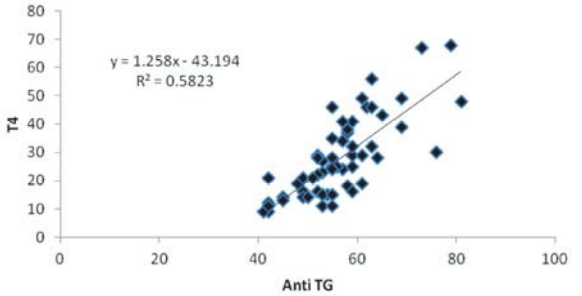

Fig. 6: Comparative analysis of Anti TG with T4

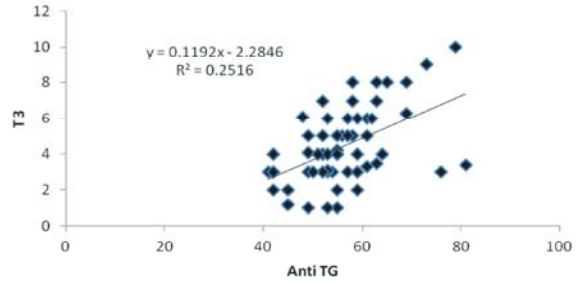

Fig. 7: Comparative analysis of Anti TG with T3

DISCUSSION

It is documented that 10% normal population exhibited antiTPO, in addition to its existence in 30% elderly [10]. Moreover several recent and previous studies mentioned occurrence of antiTPO in sub-clinical hypothyroidism [4,6]. This existence of antiTPO causes suspicions of developing overt hypothyroidism in the later stage of the individuals [6].

In this regard, it was well established that antiTPO is an important diagnostic tool regarding autoimmune thyroid disorders, generic thyroid disease, overt conditions and assessment of treatment progress and clinical outcomes [1, 10-12]. Thus, clinicians, scientists, researchers, after assessing the diagnostic and clinical significance of antiTPO and anti-Tg, suggested that antiTPO is a probable indicator of pathogentic reasoning [1]. Similarly other studies suggested that antiTPO correlations were proportionally associated with autoimmune based thyroiditis [13], in addition to having high anti-Tg level as well [14].

The present study, reported and described the correlation studies among thyroid antibodies viz antiTg and AntiTPO, thyroid hormones viz T3 and T4 and thyroid stimulating hormone, TSH. It was noted that very strong correlation existed among antiTPO vs TSH and antiTg vs T4 followed by antiTg vs TSH. Moderate to low correlation was exhibited when antiTPO and antiTg were compared with T3.

A previous study regarding positive regression correlation of antiTPO observed that around 64.45% of the patients that have tested for TSH and manifested elevated levels also exhibited markedly high antiTPO concentrations[1]. The study concluded that those patients with high TSH should have got their anti TPO necessarily tested for the diagnosis of autoimmune hypothyroidism. Our study also showed a very strong positive TSH level with antiTPO in the selected groups of male and female patients.

For diagnostic significance and correlation of anti-Tg, a past study observed that only 15.4% selected population showed positivity [4]. However another recent study [9] reported a positive correlation (R = 0.51) of TSH with anti-Tg, in similarity to our findings, where antiTg is proportionally correlated with TSH (R2 = 0.6184) and with T4 as well (R2 0.5823). This longitudinal study assessed the relationship of anti-TPO and thyroid hormone levels in patients of naso-pharyngeal carcinoma with radiation-induced hypothyroidism [9]. They noted elevated level of both antiTg and anti-TPO in addition to positive correlation between TSH and antiTg and a negative correlation between fT4 and anti-TPO [9].

Previous studies also emphasize in establishing community-based reference for fT4 and TSH in relation to prevalence of anti-Tg and anti-TPO [15]. It was also noted in recently reported study that antiTg and antiTPO positive/linear correlation existed more strongly in females than males [4] and that also in females over the age of 50 yrs. Correlation was also reported between ultra-sound, antiTPO and euthyroid Hashimoto thyroiditis in consecutive patients of both genders [16, 17]. Interestingly, more of female patients exhibited the correlation than male patents. A recent study examined the possibility of anti-TPO correlation with vitiligo [18]. However, none of the patients' showed signs of thyroid diseases, but did have elevated levels of antiTPO, suggesting possibility of overt-thyroid disorder [18].

CONCLUSION

In conclusion, the present study describes the assessment and correlation of antiTg and anti-TPO with thyroid hormones, T3 and T4 and thyroid stimulating hormone (TSH) in addition to relation with thyroid disease status in 142 female and 71 male patients. It was noted that both antibodies correlated well with R^2 of 0.7875, whereas individually, antiTPO correlated well with TSH (R^2 0.7375) and T4 (R^2 0.7445) and anti-TG moderately with TSH (R^2 0.6184). T3 comparison with antiTPO and antiTg manifested lower levels of regression correlation as with antiTPO vs T3 = R^2 0.4386 and that of antiTg vs T3 = R^2 0.2516. Patients that were included in present study were diagnosed with thyroid disorders (mainly hypothyroidism and few cases of hyperthyroidism), or under-treatment, newly diagnosed cases, as well as those with overt/sub-clinical thyroid anomalies. Data suggested investigative significance of anti-thyroid antibodies in relation to the existence of elevated levels of TSH and thyroid hormones.

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