Original article

Screening of thyroid disorders in age and gender groups in a teaching hospital of Nowshera

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ABSTRACT

Background: In Pakistan 28.7% of the population had some degree of goiter. Out of those 40% of the nodules behaved hyperthyroidism based on the lower-than-normal values of thyroid stimulating hormones (TSH). Present study was designed as to determine the screening of thyroid disorders on the basis Thyroid Stimulating Hormone (TSH) in age and gender groups in a hospital-based study.

Patients and methods: This cross-sectional study was conducted in Qazi Hussain Ahmed Medical Complex Nowshera from March 2019 to Jan 2020. Total 392 cases, 167 (42.6%) males and 225 (57.4%) females were included. All patients referred to pathology laboratory for measurement of TSH levels irrespective of age and gender were included to measure incidence of hyper, hypo or euthyroid status. Exclusion criteria were patients taking medications or iodine supplementation. Numerical variables like age and TSH values were presented with Mean with SD, Median and range. Inferential statistics and correlation statistics (chi-Square, ANOVA, Mann-Whitney U test and Spearman correlation) were used to determine the difference of TSH values in gender and age groups.

Results: Mean age of the patients was 31±8.1 years. Mean TSH was 5.22±16.5 ng/ml. The difference of TSH values in the age categories using one way ANOVA statistics was insignificant (p = 0.15). Mann Whitney U Test confirmed that the distribution of TSH is the same across the categories of gender (p=0.001). Total 55 (14%) patients were hyperthyroid, and 23 (5.9%) mild hypothyroid and 30 (7.7%) hypothyroid. Chi square test showed the relation of gender with hypo and hyperthyroidism as statistically insignificant (p= 0.18, p=0.8) respectively. Spearman ranked correlation test showed a mild to moderate inverse correlation of hypothyroidism with increase in age categories (p=0.88, r=-0.47) and a moderate uphill correlation of hyperthyroidism with increase in age categories, again statistically insignificant (p= 0.31, r=0.51).

Conclusion: We observed a skewed distribution of TSH in our population. On the basis of the TSH values the thyroid disorders were categorized in hyper and hypothyroidism. There was a negative correlation of Hypothyroidsim (TSH<0.4) with age. While a positive correlation of age was noted with hyperthyroidism. While no significant relationship of hyper or hypothyroidism was noted in gender groups.

Keywords:

TSH estimation, Age, Gender, Thyroid disorders

INTRODUCTION

Globally one third of the world population lives in areas with iodine deficiency.[1] Where there is deficiency of iodine with intake of <50µg, an endemic goiter with prevalence of up to 80% have been reported and when intake further reduces to <25µg the chances of babies with congenital goiter have been reported. South East Asia, Latin America and central Africa are having population at risk of goiter. Nodular goiter can occasionally develop to thyrotoxicosis in population with age >40 years.[2] The South Asian population has higher prevalence of thyroid disorder due to iodine deficiency. A Thyroid disorder prevalence study from Pakistan (THYPAK) reported 28.7% of their study population with palpable goiter. They reported 50% of the population as euthyroid on the basis of screening test (Thyroid stimulating Hormone, TSH) and 40% of the nodules had behavior of hyperthyroidism with TSH <0.4mg/dl. The remaining nodule behaved as hypothyroid.[3]

Thyrotoxicosis is a hypermetabolic disorder results from hyper secretion of T3, T4 by the thyroid gland due to over activity of thyroid tissue. The incidence of hyperthyroidism in Pakistan is lower i.e. 2% as compared to higher rate of hypothyroidism. The major cause of hyperthyroidism is Graves disease in 90% cases.[4,5] On other hand hypothyroidism is due to deficiency of thyroid hormones confirmed with increase TSH and decreased T3, and T4.

Another thyroid prevalence study from Pakistan reported the frequency of hyperthyroidism as 32.5%

Conflict of interest: The authors declared no conflict of interest exist.

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and hypothyroidism as 31.8% in their study population.[6] The overall prevalence of thyroid disorder in Pakistan is from 5.1 to 5.8% with female predominance pattern, while the prevalence of subclinical and clinical hypothyroidism is from 4.1 to 5.4%. [7-9]

According to the American Thyroid Association, TSH accurately determines the thyroid functioning.[10] The rationale of the study was to determine the prevalence of hyperthyroidism and hypothyroidism in our population based on a TSH as screening tool which is cost effective. And to give recommendations to the competent authority to control the burden of thyroid disorders.

Present study designed to determine the screening of thyroid disorders on the basis Thyroid Stimulating Hormone (TSH) in age and gender groups.

PATIENTS AND METHODS

A total of 392 cases referred to Pathology Department of Qazi Hussain Ahmed Medical Complex Nowshera, 167 (42.6%) males and 225 (57.4%) females were included in a cross-sectional study after approval by Hospital Ethical Committee via letter No 78/ERC/NMC- Dated 7th of Jan 2019. Inclusion criteria were all patients referred to pathology laboratory of Qazi Hussian Ahmed Medical Complex Nowhsera for TSH levels irrespective of age and gender. Exclusion criteria were patients taking medications or iodine supplementation. Sampling size was of 392 was calculated on the anticipated proportion of average thyroid disorders of 29.5%, 95% confidence level and at absolute precision of 5%, including 10%drop out, as reported by THYPAK study from Pakistan.[3] About 2 ml blood was drawn from each individual, by veni-puncture under aseptic condition. Blood in gel bottles was stored for TSH analysis. Then blood was centrifuged.

TSH was measured using by electro-chemiluminescence immunoassay using Roche Cobas E360 hormonal Chemistry Analyzer. Definition of thyroid disorders on the basis of TSH was done as per anticipated values reported in literature.[3,9] Hyperthyroidism was labelled if values were between 0-0.39ng/ml, Euthyroidism if value between 0.4-4 ng/ml, mild hypothyroidism/subclinical 4.1-9.9 ng/ml and hypothyroidism was labelled if values >10 ng/ml.

All the data was entered in SPSS version 25. Descriptive statistics were used for measuring central tendency values for the numerical variables like age and TSH values. While inferential statistics were used to the difference of TSH values in both gender using Mann-Whitney U test for skewed Numerical data, two groups (gender) and being independent variables.

Chi square test was used to determine the relationship between the two group of hypothyroidism and hyperthyroidism and gender and hypothyroidism& hyperthyroidism with age categories. Spearman ranked test was used to show correlation of the age categories with hypothyroidism and hyperthyroidism (Categorical variables).

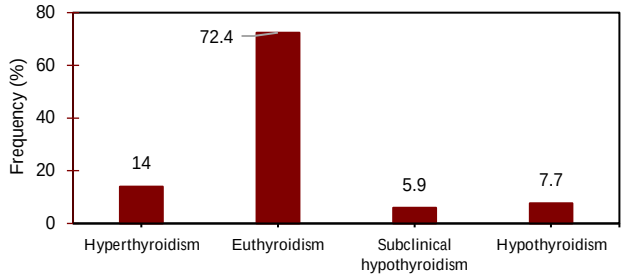

Figure 1. Classification of thyroid disorders on the basis of TSH

RESULTS

Out of 392 sampling 167 (42.6%) were males and 225 (57.4%) were females. Mean age with standard deviation was 31years±8.1 (range 12-72 years). Mean TSH was 5.22 ±16.5ng/ml (range 0.00 to 121.2 ng/ml) (Figure 1). Out of total 55 (14%) cases had hyperthyroidism with TSH <0.4, 23 (5.9%) mild/subclinical hypothyroidism 30 (7.7%) hypothyroidism and 284 (72.4%) cases had euthyroidism (Figure 1).

The age categories were made to find the TSH distribution in different age categories and it was observed that 285 (72.7%) were in the age range 25-40 years of age, followed by 73 (18.6%) in the age range 12-25 years age.

The data was distributed in skewed pattern. Hence non-parametric test was used to see the difference of TSH distribution in both genders. Mann Whitney U Test to test the null hypothesis that "the distribution of TSH is the same across the categories of gender".

Table 1. Relationship of hypo and hyperthyroidism within gender categories

Thyroid disorders	Gender		Total	p-value
	Male	Female		
Hyperthyroidism				
TSH <0.4	23	32	55	0.899
TSH >0.41	144	193	337	
Hypothyroidism				
TSH <4.1	140	99	333	0.198
TSH >4.1	17	36	53	

Table 2. Correlation of hypo and hyperthyroidism with age categories

Thyroid disorders	Age groups (years)				Total	p-value
	12-25	26-40	41-55	>55		
Hypothyroidism						
TSH <4.1 ng/ml	65	242	25	7	339	0.397
TSH >4.1ng/ml	8	43	2	0	53	
Hyperthyroidism						
TSH <0.4ng/ml	12	40	3	0	55	0.64
TSH >0.4ng/ml	61	245	24	7	233	

Table 3. Spearman correlation of age categories with hyper and hypothyroidism

Thyroid disorders	Spearman correlation
Hypothyroidism	
Correlation coefficient	**-0.47**
Sig. (2-tailed)	0.885
N	392
Hyperthyroidism	
Correlation coefficient	0.51
Sig. (2-tailed)	0.318
N	392

And the result was that the null hypothesis is retained at (p= 0.135).

In order to find the probability of TSH disorders in gender groups using Logistic binary regression analysis with an odds ratio of 0.99, mean no preference for gender (p=0.87, OR=0.99). Classification of thyroid disorders on the basis of TSH was done as per anticipated values for each category quoted in related literature.[3,9]

To see relationship of gender with hypo and hyperthyroidism based on the TSH data, Chi square test was used. The relationship of gender with hyperthyroidism was insignificant (p=0.84) (Table 2). In category of hypothyroidism, the relationship of gender with hypothyroidism was not statistically significany (p=0.18). Though it is apparently evident from male to female ratio (1:2.1) from table that hypothyroidism is more common in the females as compared to males butstatistically not significant (Table 1).

An attempt was made to observe age categories and to find the relation of different age categories with hyper and hypothyroidism. Data was analyzed in cross tabulation hypothyroid category with age categories and applied chi-square test. All age categories were insignificantly related with hypothyroidism (p=0.39) and hyperthyroidism ((p=0.64) (Table 2).

Data was further analyzed to look for quantitative correlation of age categories with Hypothyroidism using spearman ranked correlation test and found that a moderate downhill (negative) correlation of hypothyroidism with increase in age, with insignificant p-value (p=0.88, r=-0.47) which states that younger age at more risk of hypothyroidism as compared to the older age. A similar observation was sought out for age categories with Hyperthyroid using spearman ranked correlation test and found a moderate uphill (positive) correlation of hyperthyroidism with increase in age without reaching at statistically significant level (p=0.31, rho=0.51) (Table 3).

DISCUSSION

Endocrine disorders are common, particularly of thyroid gland disorders especially in our region. Some of the endocrine glands in the human body directly respond to metabolic glands, while other are under the control of hormones released by the pituitary gland like for thyroid gland, where it functions under the control of pituitary gland that release signal through thyroid stimulating hormone (TSH).[11] The most important chemical marker in thyroid disorder is TSH, a low TSH profile results in hyperthyroidism while a high value of TSH is a hall mark of hypothyroidism.[12] In present study we observed the mean TSH with standard deviation was 5.22ng/ml±16.5. The study observed 55 (14%) cases with hyperthyroidism, 23 (5.9%) mild/subclinical hypothyroidism 30 (7.7%) hypothyroidism 284 (72.4%) Euthyroidism. These figures are less than what observed in Thyroid prevalence study (THYPAK) from Pakistan (hyperthyroidism in 32.5% cases and hypothyroidism in 31.8%.[3] An earlier study also reported thyroid disorders in 29% cases with 17% of the cases with sub-clinical to typical types of hypothyroidism that was lower than our findings.[13] The observed male to female ratio in thyroid disorder in this study (1:2.1) coincides with previous findings of 75.8% *vs*. 24.2% of thyroid abnormality in female gender as compared to male gender.[6] However, this difference was statistically insignificant at 95% confidence in both the interventions referred above. The higher number of females were noted in both hyperthyroid and hypothyroid categories. Most probable explanation for female dominance could be lactation and pregnancy where in the basic metabolic rate is increased that leads to the stimulation of thyroid gland to produce hormones.[3,14] In this study when regression analysis was applied to find the Odds ratio

for exposure of specific gender, statistically insignificant p of 0.87 and OR of 0.99 were found. More hypothesis testing tests like Chi-square test were used to find the correlation of hyperthyroidism and hypothyroidism in gender groups and a statistically insignificant were noted for both hyper and hypothyroidism (p=0.89, p=0.19) respectively. It was observed that 285 (72.7%) of the cases were in the age range 25-40 years, followed by 73 (18.6%) in 12-25 years of age. Earlier studies have reported that thyroid hormone production, metabolism and action changes with age.[3,15] Thyroid prevalence study (THYPAK) reported the median age as 34 years[3] that matches with our finding of 30 years. Though it was observed that higher number of cases in the 3rd and 4th decade but using Chi-square test to see the correlation of age categories with TSH levels, results could not reach the statistical significance level for both hypo and hyperthyroid in age categories (p=0.39, p=0.64) respectively. Previous study from Lahore reported that the effect of age and gender was insignificant in all thyroid hormones T3, T4 and TSH with insignificant p-values using ANOVA (p=0.64).[16] These correlates well with findings of this study that the difference of TSH values in the age categories using one way ANOVA statistics was insignificant with a (p= 0.15). To dig out further spearman ranked correlation test was used in this study to see the correlation between age ascending categories with hyper and hypothyroidism. It was found that there was a moderate downhill negative (inverse) correlation of an increase in age with hypothyroidism (rho=- 0.47) however no such relation was noted for hyperthyroidism in age categories. This inverse relation means hypothyroidism favor younger age in our population.

The limitation of this study was the low sample size. Studies executed with larger sample size are recommended. The way forward we suggest that future studies should concentrate on large population with representation of all sectors to have a better outcome to predict/suggest the findings for decision making by the competent authorities to prevent thyroid disorders. Furthermore we could not measure the record of T3, T4, and free T3 that was necessary to label patients as hyperthyroidism. But as this was a screening study so we relied only on the values of TSH.

CONCLUSION

We observed a skewed distribution of TSH in our population. On the basis of the TSH values the thyroid disorders were categorized in hyper and hypothyroidism. There was a negative correlation of Hypothyroidsim (TSH <0.4) with age. While a positive correlation of age was noted with hyperthyroidism. While no significant relationship of hyper or hypothyroidism was noted in gender groups.

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