ABSTRACT

OBJECTIVE: To determine the frequency distribution of thyroid dysfunctions and its association with Alanine Transaminase (ALT) level in the local population of Peshawar city.

STUDY DESIGN: A Cross sectional study

PLACE AND DURATION OF STUDY: This study was carried out from 01” March 2014 to 31” June 2014 in Khyber Teaching Hospital (KTH), Peshawar and was approved by the ethical committee of KTH (letter no 21876/KTH/ P.S)

METHODOLOGY: The study population consisting of 137 individuals was divided into three groups as “H” (Hyperthyroid); “h” (Hypothyroid) and “N” (Normal control) for the study purpose. Serum T3 and T4 analysis was done for all the study population by competitive and TSH by sandwich ELISA technique. Serum ALT (Alanine Transaminase) was measured according to IFCC standard protocol.

RESULTS: The mean value of ALT of “H” (Hyperthyroid) group was higher (67.07± 187.1 IU/L) as compared to “N”) (53.33 ±33.32 IU/L) and “h” (Hypothyroid) (32.4± 34.93 IU/L) group. Significant positive correlation was found for ALT with age and TSH in the “N” group (p= 0.04) while negative correlation was observed in the “h” group. In “H” group no significant correlation was observed for ALT with other parameters.

CONCLUSIONS: The frequency of thyroid dysfunction was found to be higher in female as compared to male population. Derangement of serum ALT level was observed in both hyperthyroid and hypothyroid patients.

KEY WORDS: Hyperthyroidism, Hypothyroidism, Alanine Transaminase, Thyroid hormone.

HOW TO CITE THIS:

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INTRODUCTION

Thyroid hormones are involved in the normal functions of all important body organs including liver1. These hormones also regulate the Basal Metabolic Rate (BMR) of hepatocytes, and liver also regulate the endocrine function of the thyroid gland and is also involved in the metabolism of its hormones2. Normal serum levels of the thyroid hormones are necessary for normal liver functions and normal metabolism of bilirubin3. Thyroid dysfunction may disturb liver functions and vice-versa4. In thyroid dysfunctions abnormal liver tests are frequently observed and in severe a case it may cause liver damage5. The liver injury caused by hyperthyroidism in human is of two types i.e. Hepatitis and cholestasis. In a cross sectional study involving hyperthyroid patients it was found that 27% patients had elevated Aspartate Aminotransferase (AST) while 37% patients had higher Alanine Aminotransferase (ALT) in hepatitis injury caused by hyperthyroidism6 despite the fact these patients showed no other abnormal tests indicative of liver diseases. Liver failure is also observed in some patients suffering from severe thyrotoxicosis7. Some studies have also reported that hyperthyroidism may cause focal necrosis in some patients if left untreated which may lead to fatty cirrhosis8. Thyroid dysfunctions are more frequent in females than males. According to a WHO survey goiter is more prevalent in Pregnant Women (22.2%) than Non-pregnant Women (20.9%)4.

The data about the frequency distribution of thyroid dysfunction in the two genders and its association with ALT is limited from northern areas of Pakistan. The present study was conducted to find the frequency distribution of thyroid dysfunctions and its association with ALT level in the local population of Peshawar city.

METHODOLOGY

This hospital based cross sectional study was conducted from 01” March 2014 to 31” June 2014 on subjects visiting various outpatient departments of Khyber Teaching Hospital (KTH)
Peshawar Pakistan for thyroid screening. Approval of the study was given by the ethical committee of KTH (letter no 21876/KTH/ P.S). Purposive sampling technique was used to select the target population for this study. Forty five (45) Hyperthyroid (H) and 45 hypothyroid (h) patients from both sexes were included. The exclusion criteria were diseases like kidney, liver, bone, heart and diabetes. The control group (N: normal) consisting of 47 normal individuals in the same age group as the patients were randomly selected from the local population of Peshawar city. Data was collected from each patient on informed consent on a pre-designed pro-forma. All ethical principles were followed in accordance with international norms. Blood sample (5ml) was collected from each patient and was processed to obtain clear serum which was analyzed quantitatively for thyroid function tests by Elisa techniques (Biocheck ELISA kits) on Dia 710 micro plate reader(Made in Australia) and ALT according to IFCC standard protocols on chemistry autoanalyser (Erbamannhein Germany). The normal ranges values for TSH, T3, T4, and ALT were 0.4-6.0 μ IU/mL, 4.8-12.0 μg/Dl, 0.6-1.85 ng/mL & 5-45 IU/L respectively.

Statistical Analysis of the Data: The collected data was analyzed statistically on SPSS 21 software (SPSS Inc. Chicago, IL, USA). The mean values were obtained for all the variables and were expressed as Mean ±SD. The association between required parameters was tested by applying Pearson’s correlation analysis. A two-tailed p value<0.05 was considered statistically significant.

RESULTS

The total study population consists of 137 subjects. The mean age and gender of the study groups are presented in table - I.

<table>
<thead>
<tr>
<th>Group ID</th>
<th>Mean age±SD(years)</th>
<th>Male (%)</th>
<th>Female (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>N(N=47)</td>
<td>38.66±12.06</td>
<td>20.0</td>
<td>80.0</td>
</tr>
<tr>
<td>H(N=45)</td>
<td>34.40±12.26</td>
<td>40.0</td>
<td>60.0</td>
</tr>
<tr>
<td>h(N=45)</td>
<td>31.53±14.71</td>
<td>26.6</td>
<td>73.3</td>
</tr>
</tbody>
</table>

The percentage of male and female population in “N” group was 20% and 80% respectively while the percentage of male and female population in “h” group was 26.6% and 73.3% respectively. The percentage of male and female individuals in “H” group was 40% and 60% respectively.

The mean values of T3, T4, TSH and ALT are shown in table - II.

<table>
<thead>
<tr>
<th>Group ID</th>
<th>T3 Mean±SD</th>
<th>T4 Mean±SD</th>
<th>TSH Mean±SD</th>
<th>ALT Mean±SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>N(N=47)</td>
<td>1.6±0.27</td>
<td>124±25.95</td>
<td>1.55±1.63</td>
<td>53.33±33.32</td>
</tr>
<tr>
<td>H(N=45)</td>
<td>3.75±0.91</td>
<td>190.6±47.05</td>
<td>0.03±0.02</td>
<td>67.07±187.1</td>
</tr>
<tr>
<td>h(N=45)</td>
<td>0.87±0.37</td>
<td>64.13±42.96</td>
<td>37.40±16.77</td>
<td>32.4±34.93</td>
</tr>
</tbody>
</table>

It was concluded from the mean values of all the three groups that the mean value of ALT of “H” was higher (67.07±187.1 IU/L) as compared to “N” (53.33±33.32 IU/L) and “h” (32.4±34.93 IU/L) group.

The Pearson’s correlation of ALT with the different components of thyroid function tests was evaluated. The results are presented in table - III.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Group ID</th>
<th>Group variable</th>
<th>Age</th>
<th>T3</th>
<th>T4</th>
<th>TSH</th>
<th>ALT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>r(p)</td>
<td>r(p)</td>
<td>r(p)</td>
<td>r(p)</td>
<td>r(p)</td>
</tr>
<tr>
<td>ALT</td>
<td>N(n=47)</td>
<td>0.27(0.33)</td>
<td>0.29(0.30)</td>
<td>0.34(0.22)</td>
<td>0.54(0.04)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>H(n=45)</td>
<td>0.02(0.95)</td>
<td>0.23(0.42)</td>
<td>0.39(0.16)</td>
<td>0.11(0.70)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>h(n=45)</td>
<td>-0.16(0.56)</td>
<td>0.26(0.35)</td>
<td>0.30(0.27)</td>
<td>-0.38(0.16)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Correlation is significant at the < 0.05 level (2-tailed).
** Correlation is significant at the < 0.01 level (2-tailed).

ALT showed a significant positive correlation with TSH in the “N” group (p=0.04). It showed a non-significant negative correlation with age and TSH in the “h” group.
DISCUSSION

Thyroid diseases are the commonest endocrine disorders throughout the world including Pakistan\textsuperscript{15}. Different prevalence rate of thyroid dysfunction has been reported by several studies done around the world. Thyroid diseases are the common health problems in northern Pakistan with highest frequency in females (5.1%) than in males\textsuperscript{16}. Peshawar is the most populated city of Khyber Pakhtun Khwa inhabited by almost 1.8 million people beside Afghan refugees. But there is no authentic data about the prevalence rate of thyroid dysfunctions from this city. We conducted the present study to find the frequency distribution of thyroid dysfunction in the local population of Peshawar city of Khyber Pakhtun Khwa and its association with ALT level.

We found a higher prevalence rate of hyperthyroidism (60%) and hypothyroidism (73.3%) in female as compared to male in our study population. This finding is in accordance with other studies conducted locally\textsuperscript{17} or internationally from India, Saudi Arabia, and Greece\textsuperscript{18}. A population based study from India reported higher prevalence rate of hypothyroidism in female (11.4%) than male (6.2%)\textsuperscript{19}. Similar reports have been published from Nepal, where thyroid dysfunction is found to be more prevalent in Nepali females (42.85%) than in males (30.04%)\textsuperscript{20}. The association between the thyroid and liver is well established. Thus dysfunction of one may impair the physiology of the other. Excess of both T3, T4, if not controlled with appropriate treatment, will cause abnormality in liver function in patients\textsuperscript{21,22}. The results of our study show, how a small change in the serum level of TSH, T3, T4 change the level of serum ALT in the study population.

We found significant differences in the ALT level in all the three study groups. ALT level was found higher in “H” group (hyperthyroid group) and lower in “h” group (hypothyroid group) than the N group (Control group). These results of our study are consistent with earlier similar studies reported in the literature\textsuperscript{23}. Biscoveanu et al analyzed the medical records of 30 patients suffering from Grave’s disease and observed abnormal levels ALT, AST, ALP, GGT and bilirubin. It was observed in this study that about 37% patients had at least one abnormal liver function test\textsuperscript{24}. Thyroid diseases are also believed to cause liver injuries with not fully understood mechanism\textsuperscript{25} and elevation of liver enzymes, ALT, AST and ALP\textsuperscript{26}. There is no significant study reporting a correlation between abnormal ALT level and thyroid hormone levels, while we observed a very significant positive correlation between ALT and TSH in N group (\(p = 0.04\)). No significant correlation was observed for ALT with TSH, T3, and T4 in “H” & “h” groups. According to our view it is the first, report from this part of northern Pakistan where thyroid dysfunction is more frequent in women than men. Despite our best effort we could not find any study from literature survey. The findings of this study will help in understanding the complex interactions between the two important organs of our body. The study recommends a multisystem treatment régime for patients suffering from either thyroid or liver diseases. The study has some limitations among which are illiteracy in the area limiting the collection of authentic data, lack of finance to widen the scope of the data and small sample size involving patients from one hospital. More over only ALT level was measured while AST and ALP were not measured due to lack of finances. Further studies involving large sample size will yield better results for understanding the intricate relationship of thyroid and liver.

CONCLUSIONS

The frequency of thyroid dysfunctions was found to be higher in female population as compared to male. Derangement of serum ALT level was observed in both hyperthyroid and hypothyroid patients.

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