A COMPARATIVE STUDY ON HYPER AND HYPOTHYROIDISM CONDITIONS IN NELLORE DISTRICT WOMEN

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INTRODUCTION

Hyper and hypothyroidisms are the disorders of thyroid gland. Thyroxines (T4), triodo thyronine (T3) are the two hormones produced and released by thyroid gland upon the release and stimulation of thyroid stimulating hormone (TSH) from pituitary gland. Most of T3 is made by other tissues by metabolizing T4 into T3 (JL Jain). Hyperthyroidism called thyrotoxicosis is a clinical condition caused by the over production of thyroid hormones. Perhaps 23% of females shall be affected with hyperthyroidism, with a sex ratio of 5:1 among the age groups between 20 and 60 years. Hyperthyroidism causes Grave’s disease (inherited), toxic multinodular goiter and solitary toxic nodule. Uncommon causes are acute thyroiditis, post - partum thyroiditis, gestational thyroiditis, and exogenous iodine, dry - amiodarone, pituitary tumors and metastatic differentiated thyroid carcinoma. Symptoms such as palpitation heat tolerance, nervousness, insomnia, and breathlessness, light or absent menstrual periods, fatigue, fast heart rate, trembling hands, muscle weakness, worm moist skin and hair loss are observed (Biondi et al., 1993).

Hypothyroidism is defined as a deficiency of thyroid activity caused by low production of thyroid hormones in the body. Occurrence of mild and severe forms, are observed in 2- 15% of the population (David Cooper, 2005; Davidson and Morris, 2001). In hypothyroid patients, occurrence of an ovulation and menstrual disturbances particularly hemorrhagic are observed. Women are affected more often than men and both sexes are affected more frequently with increasing age (Burts et al., 1998).

Several factors influence the hypothyroidism. They may be goitrous and non-goitrous. The goitrous may be primary, secondary and peripheral resistance to thyroid hormones (Ver Skalicka et al., 2009). Goiters are classified in to toxic and non - toxic (Davidson et al., 1988). The following shall describe the details.

To elucidate the effect of natural agents experiments were conducted from the collected samples and the data were analyzed to make the conclusions on the population of coastal area.

MATERIALS AND METHODS

The required reagent kits were obtained from CDR and Omega chemical companies, Chennai and Hyderabad for analysis of T3 and T4 by ELISA.

Blood was collected from 500 female employees in the south coastal area, Nellore district, Andhra Pradesh. Serum was separated from the blood. Quantitative determination of triiodothyronine and thyroxine concentration was performed using micro plate enzyme immune assay (EIA) (Sujatha et al., 2006). (Anthony Fanci, 1998) In this assay procedure the patient serum was added along with TSH antibody horse radish peroxidase conjugate to the antibody coated wells. Reaction between the two antibodies and native TSH antigen forms a sandwich complex that binds with the coated well. After attaining the equilibrium, the antibody bound fraction was separated from unbound antigen by denaturation. The activity of the enzyme was quantified by the addition of reaction with an enzyme substrate 3, 3’ , 5’, 5’- tetra methyl benzidine and hydrogen peroxide. The peroxidase enzyme acts on H2O2.
to evolve nascent oxygen, which oxidize the colourless substrate to a yellow coloured end product. The intensity of colour produced was measured spectrophotometrically at 450 nm. Using the above principle the following protocols were adopted to estimate \( T_3 \), \( T_4 \) and the procedure for the estimation of \( T_3 \), \( T_4 \) and TSH were performed as earlier reports (Sujatha et al., 2006).

**RESULTS**

The normal levels of serum \( T_3 \), \( T_4 \), and TSH are 0.7-2.10 ng/dL, 4.6-11.7 μg/dL and 0.3 – 0.6 μIu/mL respectively, in females. The values given in the Table 1 are mean ± standard deviation. The serum \( T_3 \) values observed in females were ranged from 1.79 - 2.99 ng/dL. The serum \( T_4 \) levels were ranged from 12.83 to 14.18 μg/ dL. And the serum TSH levels were ranged from 0.153 to 0.21 μIu/mL in the age groups of <30 to > 60. The values of \( T_4 \) are higher in the age group of > 60. The \( T_3 \) values are almost similar in all age groups.

From the Table 1, it is known that < 30 to > 60 years, serum \( T_3 \) and \( T_4 \) levels are increased than normal values. But the levels of TSH are reduced to less than normal. In females the serum \( T_3 \) and \( T_4 \) values were ranged from 0.66 - 1.35 ng/ dL and 3.44 - 6.69 μg/dL (Table 2). And the serum TSH levels were ranged from 12.94 - 39.95 μIu/mL in between the age groups of < 30 and > 60. Thus, the values of \( T_4 \) are none in the age groups of < 30. Whereas the \( T_3 \) values observed are almost similar in all age groups except in old age i.e., > 60. From the values of Table 2 it is known that < 30 to > 60 years of age \( T_3 \) and \( T_4 \) levels are appeared to be normal. But the levels of TSH are increased than normal.

**DISCUSSION**

The thyroid gland utilizes iodine to make thyroid hormones. An excess of iodine intake may cause hyperthyroidism. Iodine induced hyperthyroidism is usually seen in patients, who already have an underlying abnormal thyroid gland. Certain medications, such as amiodarone (Cordarone), which is used in the treatment of heart problems, contain a large amount of iodine and may be associated with thyroid function abnormalities (Seth et al., 1984). The data showed in the Table 1 provide evidence that the female employees of Nellore may be consuming more of iodinated salt.

Hyperthyroidism can be suspected in patients with tremors, excessive sweating, smooth velvety skin, fine hair, a rapid heart rate and an enlarged thyroid gland. Puffiness around the eyelids. In all cases, a blood test is needed to confirm the diagnosis (Ekins, 1990). The main tool for the detection of hyperthyroidism is measurement of serum TSH levels. As mentioned earlier, TSH is secreted by pituitary gland. In the presence of excessive amounts of thyroid hormone TSH is “down-regulated” and the levels of TSH falls in an attempt to reduce the production of thyroid hormone. Thus, the measurements of TSH result in low or undetectable levels in cases of hyperthyroidism with one exception. If an excessive amount of thyroid hormone is due to a TSH- secreting pituitary tumor, then the levels of TSH will be abnormally high. This uncommon disease is known as “secondary hyperthyroidism” (Klein et al., 1994). The blood test conducted on female employees revealed that they contain high amounts of \( T_3 \) and \( T_4 \). From Table 1 it is known that <30 to >60 years, \( T_3 \) and \( T_4 \) levels are increased than normal values. But the levels of TSH are reduced to less than normal values. Therefore, the females who showed hyperthyroidism did not have any problem with pituitary gland. According to our results, approximately 9% of females of Nellore district of Andhra Pradesh were prone for hyperthyroidism (Table 1).

In this case study, lymphocytic thyroiditis is mostly observed in women after their delivery. Our results showed that 8% of women were prone to lymphocytic thyroiditis. Here hyperthyroid phase can last from 4 to 12 weeks and it is often followed by hypothyroid phase that can last up to 6 months (Klein et al., 1994). Our results showed that, women participated in this case study are mostly childless. Normally they tend to show, regulated function, but additionally due to their employment stress, \( T_3 \) and \( T_4 \) levels are in elevated state.

Hypothyroidism is a condition, where low thyroid output observed is due to low intake of iodine. In case of hypothyroidism, measurement of basal serum TSH is necessary, for its diagnosis (Venderpump, 1995). Hypothyroidism is commonly seen in people where thyroid failure is observed accordingly to laboratory’s reference population. In thyroid patients, levels of serum TSH are increased in primary hypothyroidism. Where as in secondary hypothyroidism, TSH levels are either normal or undetectable. Patients rarely having secondary hypothyroidism will secrete TSH which is immuno active but not bioactive. According to our results there is an elevation of serum TSH in hypothyroid patients. In early hypothyroidism levels of serum \( T_3 \) is abnormal and serum \( T_4 \) is normal. This shows that concentrations of serum \( T_3 \) are not reliable for the diagnosis of primary hypothyroidism. Because, compensatory hyper secretion of TSH leads to relative increase of \( T_3 \) secretion. In

<table>
<thead>
<tr>
<th>Age group</th>
<th>No</th>
<th>Levels</th>
<th>TSH(μIu/mL)</th>
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</thead>
<tbody>
<tr>
<td>Normal values</td>
<td></td>
<td>T3 (ng/dL)</td>
<td>T4 (μg/dL)</td>
</tr>
<tr>
<td>Below 30 yr</td>
<td>10</td>
<td>1.79±0.596</td>
<td>13.27±2.89</td>
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<td>30-40</td>
<td>10</td>
<td>2.02±0.795</td>
<td>13.97±3.35</td>
</tr>
<tr>
<td>40-50</td>
<td>07</td>
<td>2.26±0.92</td>
<td>14.18±0.85</td>
</tr>
<tr>
<td>50-60</td>
<td>10</td>
<td>2.62±0.49</td>
<td>12.83±0.57</td>
</tr>
<tr>
<td>Above 60</td>
<td>09</td>
<td>2.99±0.55</td>
<td>13.96±1.98</td>
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Table 1: The levels of hyperthyroidism showing the thyroxine and thyroid stimulating hormones in females of coastal area of Nellore district

<table>
<thead>
<tr>
<th>Age group</th>
<th>No</th>
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<tbody>
<tr>
<td>Normal Values</td>
<td></td>
<td>T3 (ng/dL)</td>
<td>T4 (μg/dL)</td>
</tr>
<tr>
<td>Below 30 yr</td>
<td>10</td>
<td>1.35±0.32</td>
<td>6.69±1.80</td>
</tr>
<tr>
<td>30-40</td>
<td>10</td>
<td>1.03±0.37</td>
<td>5.31±1.67</td>
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<tr>
<td>40-50</td>
<td>09</td>
<td>0.98±0.38</td>
<td>5.06±1.66</td>
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<tr>
<td>50-60</td>
<td>10</td>
<td>1.08±0.64</td>
<td>5.32±2.68</td>
</tr>
<tr>
<td>Above 60</td>
<td>09</td>
<td>0.66±0.21</td>
<td>3.44±1.02</td>
</tr>
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Table 2: The levels of hypothyroidism showing the thyroxine and thyroid stimulating hormones in females of coastal area of Nellore district
hypothyroidism, TRH stimulation test assess TSH secretory mechanism. Increased response for this test is seen in hypothyroidism. Here, increased levels of creatine phosphokinase (CPK), aspartate transaminase, and lactate dehydrogenase (LDH) are observed (Savin et al., 1979). Some patients who appear clinically euthyroid displayed laboratory evidence of early thyroid failure (Dermott et al., 2001). In mild cases, serum TSH and its response to TRH administration are increased. While serum T3 and T4 levels are normal, respectively. This is due to TSH induced hyper secretion of T3 and more efficient conversion of T4 to T3. Sub clinical hypothyroidism is seen in patients with Hashimoto’s disease and those with Grave’s disease who have been treated with surgery or 131I treatment (Klein et al., 1994). Measurement of serum reverse T3 concentration is useful to differentiate between “low T3 syndromes” from intrinsic hypothyroidism. Accordingly to this in low T3 syndrome, T3 is increased (Ohey et al., 2006). Measurement of thyroid radioactive iodine uptake is little useful to differentiate between normal and hypothyroid states. The increased serum cholesterol levels are observed in hypothyroidism of thyroid origin but not pituitary (Tannis et al., 1996).

In Hashimoto’s disease, high titer of anti thyroid antibodies (TPO Ab) or anti-Tg antibodies are observed. In some patients with autoimmune thyroid disease also develop circulating antibodies against T3 and T4 as observed by RIA. Normal and abnormal TSH could not be distinguished. But immunoradiometric or chemiluminescent techniques, using monoclonal antibodies are helpful in diagnosis of hypo and hypertensions.

In conclusion, women are more affected than men and both sexes are affected frequently with increasing age. It is seen in people who predisposed to thyroid failure, included in laboratory’s reference population (Wada et al., 1982). Among 500 females of coastal area, 9% of them showed hyperthyroidism and 10% have definitely hypothyroidism. The data showed in Table 1 provide evidence that the female employees of Nellore may be consuming more of iodinated salt. Screening for congenital hypothyroidism is definitely worthwhile because it is relatively common (1 in 4000 births) and can cause brain damage if untreated. In these cases, TSH measurement is very specific and sensitive. Our results on coastal females revealed that the unknown causes may be influencing the elevation of hypothyroidism and suggests that supplementation of iodine to salt may help the hypothyroidic patient to get the normal work.

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