Thyroid dysfunction reduces the quality of life of patients infected with HIV. Overt hypothyroidism leads to the insidious onset of fatigue, weakness, dry skin, cold intolerance, slowed mentation, constipation, hoarse voice, paresthesia, bradycardia, and delayed relaxation of tendon reflexes. Overt hyperthyroidism is characterized by irritability, heat intolerance, sweating, warm moist skin, palpitations, tachycardia, fatigue, weight loss with increased appetite, diarrhea, tremor, muscle weakness, hyperreflexia, and lid retraction.

The consequences of subclinical hyperthyroidism include reduced bone mineral density and an increased risk of atrial fibrillation, the risk of which is proportional to the degree of thyroid hyperfunction. Furthermore, subclinical hyperthyroidism may precede overt hyperthyroidism. It is unclear why HIV-infected patients are susceptible to thyroid dysfunction, but HIV infection is regarded as a crucial factor. Furthermore, the influence of HIV infection on thyroid function changes with the course of the disease.

Asymptomatic, subtle abnormalities of thyroid function tests have been described in a small minority of patients with stable HIV infection. With the progression of the disease, a pattern of sick euthyroid syndrome may develop. The most frequent abnormalities in thyroid function tests are those associated with subclinical hypothyroidism.

The medications used to treat HIV infection are also a vital factor leading to abnormalities in thyroid function. Some reports have indicated that HAART increases the probability of thyroid dysfunction. stavudine has been suggested to directly affect the production and/or metabolism of thyroid hormones. Prolonged treatment with stavudine contributes to a decrease in free thyroxine (FT4) level.

A high prevalence of abnormalities in thyroid function tests among HIV infected adults has been noted in previous cross sectional studies. In addition, this thyroid dysfunction correlated with advancement of the infection in conjunction
with lowering CD4 cell counts. Subtle alterations in thyroid function tests are more common in HIV infection and at times detectable in the early phase of disease and as well as in late phases. The thyroid function changes are HIV specific and are consistent with an abnormal response to acute illness. However there is paucity of Indian studies that are needed to evaluate the thyroid dysfunction in HIV infected patients and their clinical correlation.

**AIDS-RELATED CONDITIONS THAT CAUSE THYROID DYSFUNCTION**

In patients with advanced HIV disease, a variety of systemic opportunistic conditions that infect or infiltrate the thyroid can decrease or increase T4 secretion. Cases of thyroiditis have been reported in association with *Pneumocystis jiroveci* infection, *Cryptococcus neoformans* infection, visceral leishmaniasis, and suppurative bacterial infection of the thyroid. These infiltrating conditions lead to destructive thyroiditis, which is usually accompanied by neck pain, thyroid enlargement, and increased thyroxine release. After treatment of the infection, thyroid function can return to normal, but it should be closely monitored until it does so. In addition, both lymphoma and Kaposi sarcoma can infiltrate the thyroid and impair function. Cytomegalovirus inclusions have frequently been reported from autopsy studies, but thyroid disease was rarely noted before death. Symptomatic thyroid infection or infiltration has always been uncommon, and in countries where HAART is available, it has become extremely rare.

**METHODOLOGY**

Study was included 60 HIV seropositive patients presenting to JLN Medical College and Hospital, Ajmer (Raj.) and registered at ART Centre JLN Hospital, Ajmer during the period of Jan, 2018 to Oct, 2019 after taking written consent of the patients and the relevant history, these patients are subjected to complete clinical examination.

**INCLUSION CRITERIA:**

1. Patients was attending medical outdoor, admitted in various medical wards and attending ART centre in JLN Hospital Ajmer.
2. Patients who had given written informed consent for study.

**EXCLUSION CRITERIA:**

1. Patients who were not willing for study.
2. Patients with comorbidities eg. T.B., diabetes, CKD, Malignancy.
3. Patients with known thyroid disorders.
4. Patients on drugs that cause thyroid abnormality.

Besides routine investigations, patients were subjected to specific microbiological, pathological and radiological investigations. CD4 Count (Flow cytometry), Thyroid function tests-TSH, free T4, free T3 and anti TPO antibodies were done in every patient. The data was collected on predesigned and pretested questionnaire/record sheet was compiled and master table was made on Excel accordingly. To fulfill the objectives of the present research, most appropriate statistical tools (percentages and chi square test for association) were applied to analyse the data and conclusions were drawn accordingly.

**RESULTS**

Table -1 : Age and gender distribution

<table>
<thead>
<tr>
<th>Age group</th>
<th>Female</th>
<th>Male</th>
</tr>
</thead>
<tbody>
<tr>
<td>No.</td>
<td>%</td>
<td>No.</td>
</tr>
<tr>
<td>25-35 years</td>
<td>14</td>
<td>66.7</td>
</tr>
<tr>
<td>36-45 years</td>
<td>7</td>
<td>33.3</td>
</tr>
<tr>
<td>46-55 years</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>56-65 years</td>
<td>0</td>
<td>0.0</td>
</tr>
</tbody>
</table>

Among the 60 patients included in our study, 39 patients were male accounting for 65% of the total cases. The remaining 21 patients were (35%) women.

Majority of the patients were in the age group between 25-35 years - 31 patients (51.66% of study population) were in this group.

Women were more in number in younger age group (25 - 35) whereas there were no women in the elderly age group (≥46).

| Table – 2 : Correlation of CD4 count with thyroid parameters |
|-------------|--------|--------|--------|
| CD4 count at Baseline | T3 | T4 | TSH (mIU/L) |
| r value | p value | r value | p value | r value | p value |
| Baseline | 0.01 | 0.08 | 0.03 |
| 6 months | 0.01 | 0.07 | 0.11 |
| 12 months | 0.07 | 0.20 | <0.01 |

Negative correlation (-0.01) was found between CD4 count at baseline and FT3 baseline while positive correlation was found with FT4 baseline (0.08) and TSH baseline (0.03) but there was no statistically significance found in this correlation.

Positive correlation were found between CD4 count at 6 months with FT3 6months (0.01), FT4 6months (0.07) and TSH 6months (0.01) but there was no statistically significance found in this correlation.

Negative correlation (-0.07 and -0.34) were found between CD4 count at 12 months and FT3 12 months and TSH at 12 months while only positive correlation was found with FT4 12 months (0.20) but there was no statistically significant correlation found between CD4 count at 12 months with FT3 12 months and FT4 at 12 months while statistically significant correlation found between CD4 count at 12 months with TSH 12 months (p<0.01).

Graph -1 : Scatter plot showing correlation between CD4 count and TSH level at 12 months

Table – 3 : Association between type of ART drug regimen and thyroid dysfunction

<table>
<thead>
<tr>
<th>Type of ART regimen</th>
<th>Normal thyroid function</th>
<th>Abnormal thyroid function</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>No.</td>
<td>%</td>
<td>No.</td>
<td>%</td>
</tr>
<tr>
<td>TDF+3TC+EFV</td>
<td>21</td>
<td>40.4</td>
<td>5</td>
</tr>
<tr>
<td>AZT+3TC+NVP</td>
<td>31</td>
<td>39.6</td>
<td>3</td>
</tr>
</tbody>
</table>

The predominant drug regimen was with Zidovudine, lamivudine and nevirapine, in both thyroid normal and abnormal group, but there was no statistical correlation between these different drug regimens and the thyroid status.

**DISCUSSION**

Among the total 60 HIV seropositive patients under study, most of the patients (53/60; 88.3%) were from 25-45 years age group; majority (31/60; 51.67%) being from 25-35 years age group and mean age of the patients under study being 36.73 ± 8.21 years. The study population included 39 male (65%) and 21 female (35%) HIV seropositive patients on HAART.
Maximum number of male and female patients were from 25-35 years age group followed by 36-45 years age group. Mean age in present study is comparable to study group of Madeddu et al. Similar age group is noted in the study done by Beltran et al.

Negative correlation (-0.01) was found between CD4 count at baseline FT3 but there was no statistically significance found in correlation of FT3, FT4 & TSH. Positive correlation were found between CD4 count at 6 months with FT3, FT4 & TSH but there was no statistically significance found in this correlation. Negative correlation (-0.07 and -0.34) were found between CD4 count at 12 months and FT3 and TSH at 12 months while only positive correlation was found with FT4 at 12 months (0.20) but there was no statistically significant correlation found between CD4 count at 12 months with FT3 12 months and FT4 at 12 month while statistically significant correlation found between CD4 count at 12 months with TSH 12 months (p<0.01). According to Dev N et al Significant correlation was observed between CD4 count and, free triiodothyronine, and free thyroxine levels (r = -0.86, r = 0.77, and r = 0.84, respectively, p < 0.0001 for all).

In present study, no statistical significant association (P > 0.05) could be established between selection of drug regimen and thyroid abnormalities at different points of time. Afhami et al. also found no significant association between those drug regimens and thyroid abnormalities. Madge et al., in their cohort study, reported that neither HAART regimen nor specifically stavudine use was significantly associated with either overt hypothyroidism or subclinical hypothyroidism which was in contrast to the findings of correlation detected between stavudine use and thyroid abnormalities by Madeddu et al.

The correlation between duration of drug regimen and thyroid dysfunction was of no statistical significance (P > 0.05) and this is in accordance with the findings of Quirino et al. who found no statistically significant relationship between the condition and drugs or CD4 cell count and reinforced by Afhami et al. with no association between duration of ART and thyroid dysfunction.

CONCLUSION

The present study concluded that thyroid dysfunction occurs significantly in HIV patients on HAART. The prevalence of thyroid dysfunction in the study population was 13.3% (8/60). Subclinical hypothyroidism was the most common thyroid abnormality observed (8/60; 10.0%) followed by overt hypothyroidism (2/60; 3.33%). There was statistically significant correlation (negative) between CD4 cell count and thyroid abnormality. 88.3% patients were from 25-45 years. Maximum number of male and female patients were from 25-35 years age group followed by 36-45 years age group. Mean age in present study is comparable to study group of Madeddu et al. Similar age group is noted in the study done by Beltran et al.

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