Section: General Medicine

Original Research Article

ASSESSMENT OF THYROID DYSFUNCTION IN HIV PATIENTS ON HAART

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ABSTRACT

Background: Thyroid dysfunction is increasingly recognised among patients with Human Immunodeficiency Virus (HIV) infection, particularly in those receiving highly active antiretroviral therapy (HAART). These abnormalities may influence metabolic status, immunity and overall quality of life. Early identification of thyroid dysfunction can help in better clinical management of HIV patients. The objective is to determine the prevalence and pattern of thyroid dysfunction among HIV-positive individuals receiving HAART and to evaluate its association with CD4 count and HAART regimens.

Materials and Methods: This prospective cross-sectional observational study was conducted among 49 HIV-positive adults attending the ART centre at District Hospital, Chikkaballapura, between February 2024 and August 2025. Patients receiving HAART for at least one year were included. Clinical history, WHO staging and treatment details were documented using a structured case record form. Thyroid profile including serum thyroid stimulating hormone (TSH), free thyroxine (FT4) and free triiodothyronine (FT3) was assessed along with CD4 count and routine laboratory investigations.

Results: Most participants belonged to the 31–50 years age group, with nearly equal gender distribution. The majority were in WHO Clinical Stage I and II. TLD was the most commonly used HAART regimen. Thyroid dysfunction was more frequently observed among participants receiving TLD therapy, although no statistically significant association was found. A weak positive correlation was observed between CD4 count and TSH levels.

Conclusion: Thyroid dysfunction was commonly observed among HIV patients on HAART. Routine thyroid screening may aid in early diagnosis and appropriate management of endocrine abnormalities in these patients.

Keywords: Human Immunodeficiency Virus, HIV, HAART, Thyroid Dysfunction, Thyroid Stimulating Hormone, CD4 Count, Antiretroviral Therapy, Hypothyroidism, Endocrine Abnormalities.

INTRODUCTION

Human immunodeficiency virus (HIV) infection remains a major public health problem despite significant progress in diagnosis and treatment. The introduction of highly active antiretroviral therapy (HAART) has markedly reduced HIV-related morbidity and mortality and improved the survival of people living with HIV (PLHIV).[1] With increasing life expectancy, long-term complications such as metabolic and endocrine disorders are being recognised more frequently in HIV-infected individuals.[2] Among the endocrine abnormalities associated with HIV infection, thyroid dysfunction is commonly reported. Thyroid hormones are essential for normal metabolism, growth and maintenance of body functions. HIV infection can affect thyroid function through direct viral effects,

chronic inflammation, opportunistic infections, nutritional deficiencies and adverse effects of antiretroviral drugs.[3] Thyroid abnormalities seen in HIV patients include euthyroid sick syndrome, subclinical hypothyroidism, overt hypothyroidism and hyperthyroidism. Among these, subclinical hypothyroidism is reported to be the most common abnormality.[4] Several studies have shown that thyroid dysfunction is more prevalent in HIV-positive individuals than in the general population. The prevalence varies between 15% and 35% depending on disease severity, duration of infection and antiretroviral therapy status.[5] In many patients, thyroid abnormalities remain asymptomatic and are detected only through laboratory investigations. Therefore, thyroid dysfunction may often remain unnoticed in routine clinical practice.

Immune status plays an important role in the development of thyroid abnormalities in HIV infection. Studies have demonstrated that reduced levels of free triiodothyronine (FT3) and free thyroxine (FT4), along with elevated thyroid-stimulating hormone (TSH) levels, are more commonly seen in patients with lower CD4 counts.[6] Advanced HIV disease may also result in euthyroid sick syndrome due to altered peripheral metabolism of thyroid hormones during chronic illness.[7] The use of HAART has further influenced thyroid function in PLHIV. Although antiretroviral therapy improves immune function and decreases opportunistic infections, certain drugs may alter thyroid hormone metabolism and contribute to thyroid dysfunction.[8] Some studies have reported a higher prevalence of subclinical hypothyroidism among patients receiving long-term HAART. However, the association between specific HAART regimens and thyroid dysfunction remains unclear. Indian studies have also reported a significant burden of thyroid abnormalities among HIV-positive patients attending ART centres. Subclinical hypothyroidism and euthyroid sick syndrome are the most frequently observed abnormalities.[9] Lower CD4 counts, advanced disease stage and prolonged duration of therapy have been identified as possible risk factors. However, there is limited information regarding thyroid dysfunction among patients receiving newer first-line antiretroviral regimens in district-level healthcare settings. The symptoms of thyroid dysfunction such as fatigue, lethargy, constipation and weight gain often overlap with symptoms of chronic HIV infection and drug-related adverse effects. Hence, thyroid abnormalities may go undiagnosed unless appropriate biochemical screening is performed.[10] Early detection and management of thyroid dysfunction may help improve the quality of life and overall health status of PLHIV. Therefore, there is a need to evaluate thyroid dysfunction among HIV patients receiving HAART and to study its association with CD4 count and antiretroviral therapy. Such studies may help in identifying high-risk patients and developing appropriate screening strategies in routine HIV care.

Aim and objectives: The present study aims to evaluate thyroid dysfunction among HIV-positive patients receiving HAART and to determine its association with CD4 cell count and different ART regimens.

MATERIALS AND METHODS

The present prospective cross-sectional observational study was conducted to assess the prevalence and pattern of thyroid dysfunction among HIV-positive individuals receiving highly active antiretroviral therapy (HAART). The study was carried out at District Hospital, Chikkaballapura, a government tertiary care centre functioning under the National AIDS Control Programme, over a period of 18 months from February 2024 to August 2025. Adult patients aged 18 years and above with confirmed HIV infection and receiving HAART for a minimum duration of one year were included in the study after obtaining written informed consent. Individuals with pre-existing thyroid disorders, pregnancy, severe systemic illness, active opportunistic infections, pituitary disorders or those on medications affecting thyroid function were excluded to avoid confounding factors. Participants were recruited using purposive consecutive sampling from the ART centre and General Medicine outpatient department until the required sample size was achieved. Based on previous literature showing a prevalence of thyroid dysfunction of approximately 15% among HIV patients on HAART, the calculated sample size was 49 participants. Data were collected using a structured and pre-tested case record form. Information regarding demographic profile, duration of HIV infection, HAART regimen, WHO clinical stage and symptoms suggestive of thyroid dysfunction was documented. Detailed clinical examination and anthropometric assessment were also performed. Blood samples were collected under aseptic precautions for thyroid function tests, CD4 count and routine laboratory investigations. Thyroid profile included serum thyroid stimulating hormone (TSH), free thyroxine (FT4) and free triiodothyronine (FT3) wherever indicated. Laboratory investigations were performed using standardised methods with appropriate quality control measures. Participants were categorised according to thyroid status based on laboratory findings. The study remained purely observational without any therapeutic intervention.

Statistical analysis: Data analysis had been undertaken using SPSS version 23.0 after completion of data entry and validation. Quantitative variables such as age, CD4 count, TSH level and FT4 level had been summarised using mean and standard deviation. Qualitative variables including gender, thyroid status and HAART regimen had been expressed as frequencies and percentages. Associations between categorical variables had been

analysed using the chi-square test, while differences in mean values between two groups had been assessed using the unpaired t-test. A p-value of <0.05 had been considered statistically significant. Subgroup analysis had been performed to examine differences in thyroid dysfunction across HAART regimens, duration categories and CD4 strata.

Ethical Considerations: Ethical clearance for the study was obtained from the Institutional Ethics Committee before commencement of the research. Written informed consent was taken from all participants, and strict confidentiality of patient details was maintained throughout the study period. The study was conducted in accordance with standard ethical guidelines without causing any additional financial burden or harm to the participants.

RESULTS

The majority of study participants were in the 31–50 years age group, with the highest proportion observed among individuals aged 41–50 years (32.7%). Participants aged 20–30 years constituted the smallest proportion of the study population [Table 1]. The study population showed an almost equal distribution of males and females, with a slight predominance of male participants [Table 2]. Most study participants were classified under WHO Clinical Stage I and Stage II, indicating that the majority were in the early phase of HIV infection, whereas only a few belonged to Stage III [Table 3]. The majority of participants were on the TLD regimen, making it the predominant HAART therapy in the study population, while fewer patients were receiving TLE and ZLN regimens [Table 4]. Thyroid dysfunction was observed more frequently among participants on the TLD regimen; however, no statistically significant association was noted between the type of HAART regimen and thyroid status [Table 5]. The study showed a weak positive correlation between CD4 count and TSH levels, but the relationship was not found to be statistically significant [Table 6].

Table 1: Age Distribution of Study Participants

Variable	Category	Frequency (n)	Percent (%)
Age group	20 to 30	7	14.3
	31 to 40	15	30.6
	41 to 50	16	32.7
	51 to 60	11	22.4
	Total	49	100%

Table 2: Gender Distribution of Study Participants

Variable	Category	Frequency (n)	Percent (%)
Gender	Female	24	49
	Male	25	51
	Total	49	100%

Table 3: WHO Clinical Stage Distribution of Study Participants

Variable	Category	Frequency (n)	Percent (%)
WHO Stage	Stage I	25	51
	Stage II	18	36.7
	Stage III	6	12.2
	Total	49	100%

Table 4: Distribution of Current HAART Regimen among Study Participants

Variable	Category	Frequency (n)	Percent (%)
Current HAART regimen	TLD	28	57.1
	TLE	15	30.6
	ZLN	6	12.2
	Total	49	100%

Table 5: Association Between HAART Regimen and Thyroid Dysfunction

HAART Regimen	Normal Thyroid (n)	Abnormal Thyroid (n)	Total (n)	Chi-Square	df	p-value
TLD	7	21	28	2.087	2	0.352
TLE	7	8	15			
ZLN	2	4	6			
Total	16	33	49			

Table 6: Correlation Between CD4 Count and TSH Levels

Variables Compared	Correlation Coefficient (ρ)	p-value	N
CD4 count vs TSH (mIU/L)	0.082	0.574	49

DISCUSSION

The present study was conducted to evaluate thyroid dysfunction among HIV-positive patients receiving highly active antiretroviral therapy (HAART) and to study its association with clinical profile, immune status and treatment-related factors. Due to the widespread availability of antiretroviral therapy, HIV infection has now become a chronic manageable condition with improved survival. As patients are living longer, long-term endocrine and metabolic complications are being increasingly identified during follow-up. Thyroid dysfunction is one such important complication which may remain unnoticed because many symptoms are nonspecific and overlap with manifestations of HIV infection, chronic illness and drug-related adverse effects. This prospective cross-sectional observational study was carried out at District Hospital, Chikkaballapura. A total of 49 HIV-positive adults receiving HAART for more than one year were included after obtaining written informed consent. Demographic details, duration of HIV infection, duration and type of HAART regimen, WHO clinical stage and laboratory findings were systematically documented. Thyroid profile assessment included serum thyroid stimulating hormone (TSH), free triiodothyronine (FT3) and free thyroxine (FT4). CD4 count and routine biochemical investigations were also evaluated.

The majority of participants belonged to the 31–50 years age group, indicating that most patients were middle-aged individuals on long-term treatment. Male and female participants were almost equally distributed in the study population. Most patients belonged to WHO Clinical Stage I and II, showing that the majority were clinically stable and not in advanced stages of HIV disease. Body mass index assessment revealed that most participants had either normal weight or were overweight, whereas only a few were underweight. This suggests that the study population mainly represented stable treatment-experienced HIV patients rather than severely debilitated individuals that agree with earlier studies.[11-14] The mean duration since HIV diagnosis and duration on HAART also reflected prolonged disease exposure and long-term treatment. The present study showed a high prevalence of thyroid dysfunction, with abnormal thyroid status observed in 67.3% of participants. This prevalence was considerably higher compared to findings from several PubMed-indexed studies, where thyroid dysfunction among HIV patients generally ranged from 14% to 25%. The higher prevalence in the present study may be related to chronic HIV infection, prolonged antiretroviral therapy, metabolic changes and local population-related factors.

The thyroid hormone profile demonstrated relatively preserved FT3 and FT4 levels, while TSH values were comparatively elevated. This pattern suggests that subclinical thyroid dysfunction was the predominant abnormality in the present cohort. Similar findings have been reported in earlier studies where subclinical hypothyroidism was found to be the commonest thyroid disorder among HIV patients on HAART.[15-19] TLD was the most commonly used HAART regimen among study participants, followed by TLE and ZLN. Thyroid abnormalities were more commonly observed among patients receiving TLD therapy. However, no statistically significant association was found between HAART regimen and thyroid dysfunction. This finding suggests that thyroid abnormalities may occur across different treatment regimens and are not confined to any single HAART combination. Correlation analysis between CD4 count and TSH levels showed only a weak positive relationship which was not statistically significant. This observation indicates that thyroid dysfunction in long-term treated HIV patients may not depend only on present immune status and may involve multiple factors such as chronic inflammation, immune dysregulation and prolonged treatment exposure.

An important observation in the present study was the significant difference in TSH levels between normal and abnormal thyroid groups. Similar results were reported in earlier studies.[20-22] TSH emerged as the most sensitive biochemical marker for identifying thyroid dysfunction. This supports the usefulness of TSH-based screening during routine HIV follow-up, especially in resource-limited healthcare settings. The findings of the study have important clinical implications. Thyroid dysfunction was identified even among clinically stable HIV patients with relatively preserved CD4 counts. Since symptoms of thyroid dysfunction may mimic features of HIV infection or treatment-related side effects, routine thyroid screening may help in early diagnosis and timely management. Early detection and treatment of thyroid abnormalities may improve metabolic health, treatment tolerance and quality of life in HIV-positive individuals receiving HAART. The study had certain limitations including relatively small sample size and cross-sectional design. Thyroid function was assessed only at a single point of time, and additional investigations such as viral load and thyroid autoantibody profile were not included. Despite these limitations, the study provides useful preliminary evidence regarding the burden of thyroid dysfunction among HIV patients receiving long-term HAART.

CONCLUSION

The present study demonstrated that thyroid dysfunction is a common endocrine abnormality among HIV-positive individuals on HAART. Elevated TSH was the predominant biochemical finding, while no significant association was observed with CD4 count or specific HAART regimen. The study highlights the importance of

routine thyroid function assessment as part of comprehensive HIV care for early detection and better management of endocrine complications.

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