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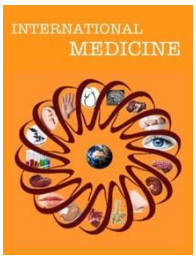

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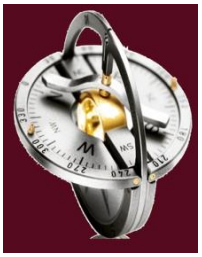

Original Research

Role Of Serum Albumin Level Compared to Cd4+ Count as A Marker of Immunosuppression in HIV/Aids Patients

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Abstract

Introduction: The study was conducted with 61 participants, which may not be representative of the broader HIV-positive population. A larger sample size would provide more robust statistical power and generalizability. The study did not stratify patients based on ART duration or regimen, which could impact albumin levels. Investigating the effect of different ART protocols on albumin would provide additional insights. ***Material & Methods*** : Study will include MINIMUM 61 HIV/AIDS patients presenting to K C GENERAL HOSPITAL A detailed history , clinical examination and laboratory investigations including Haemoglobin, Total And Differential WBC Counts, Hematocrit , Liver Function Tests with Serum Albumin Level , Renal Function Tests, CD4+ Cell Counts, Urinary Albumin & HIV ELISA AND WESTERN BLOT. Repeat measurements on 3rd month follow up include Albumin, CD4+ cell count, Haemoglobin, Total and Differential WBC counts. ***Result*** : This study aimed to evaluate the role of serum albumin levels compared to CD4+ counts as a marker of immunosuppression in HIV/AIDS patients. A total of 61 HIV-positive patients were included in the study, and statistical analysis revealed a strong positive correlation between serum albumin levels and CD4+ counts ($r = 0.713$, $p < 0.01$). Given its affordability and accessibility, serum albumin could serve as an effective prognostic marker, particularly in resource-limited settings where CD4 testing is not always available. However, factors such as malnutrition and liver disease should be considered when interpreting albumin levels. ***Conclusion*** : The study also highlights the limitations of using albumin as a standalone marker, emphasizing the need for a comprehensive clinical approach. Future research should focus on validating these findings through larger, multi-center studies and exploring the impact of ART on albumin levels. In conclusion, while serum albumin shows promise as a supplementary marker for immunosuppression in HIV/AIDS patients, further investigation is required to fully establish its role in clinical practice.

Keywords: *Serum albumin, CD4+ count, HIV/AIDS, immunosuppression marker, antiretroviral therapy (ART).*

Introduction

HIV is a lentivirus that causes acquired immunodeficiency syndrome (AIDS), a disorder in which the immune system gradually deteriorates, leaving the body susceptible to serious infections and malignancies including Kaposi sarcoma1.

In 1981, the U.S. Centers for Disease Control and Prevention (CDC) reported that 26 previously healthy homosexual men in New York and Los Angeles had cases of Kaposi's sarcoma (KS), with or without Pneumocystis jiroveci pneumonia, and five previously healthy homosexual men in Los Angeles had an unusual occurrence of Pneumocystis jiroveci pneumonia (formerly P. carinii). This marked the first identification of AIDS in the United States2.

Sex workers in Chennai, Tamil Nadu, were the first people in India to be officially diagnosed with HIV/AIDS in 1986. The National Institute of Virology (NIV) and the Indian Council of Medical Research (ICMR) shortly after verified the virus's existence in the nation. To assist stop its spread, the government responded by establishing the National AIDS Control Programme (NACP) in 1987. HIV infections had spread to other states by the early 1990s, posing serious public health issues. Preventive measures and awareness campaigns were implemented to address this. India's response to the pandemic was greatly influenced by these early findings, according to a report by Solomon et al. (1987).

Approximately 42.3 million people have died from HIV globally, making it a serious public health concern. All nations are still experiencing the virus's spread. An projected 39.9 million people were HIV positive by the end of 2023, with the WHO African Region housing 65% of these persons. In the same year, there were over 1.3 million new HIV infections and about 630,000 deaths linked to HIV-related causes. HIV has no known cure, but with the development of efficient preventive techniques, diagnosis, treatment, and care–including the control of opportunistic infections–it has become a chronic illness that can be managed. People with HIV have been able to live long, robust lives as a result3.

According to epidemiological statistics, the number of new HIV infections worldwide peaked in 1996 at an estimated 3.5 million (3.2 million to 3.8 million).

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By 2008, there were around 30% fewer new HIV infections than there had been at the epidemic's height twelve years prior4.
Globally, there were an estimated 39.9 million HIV-positive individuals in 2023 (with estimates ranging from 36.1 million to 44.6 million). In the same year, between 1 million and 1.7 million people (about 1.3 million people) contracted the virus for the first time. In 2023, around 630,000 individuals (ranging from 500,000 to 820,000) lost their lives to AIDS-related causes. Between 27 million and 31.9 million people, or 30.7 million people, were taking antiretroviral treatment by the end of the year. An estimated 88.4 million individuals (ranging from 71.3 million to 112.8 million) have been infected with HIV since the start of the pandemic, while 42.3 million people (ranging from 35.7 million to 51.1 million) have lost their lives to AIDS-related causes5.

Materials and Methods

Study will include MINIMUM 61 HIV/AIDS patients presenting to K C GENERAL HOSPITAL

STUDY DESIGN: Cross sectional study
A detailed history , clinical examination and laboratory investigations including Haemoglobin, Total And Differential WBC Counts, Hematocrit , Liver Function Tests with Serum Albumin Level , Renal Function Tests, CD4+ Cell Counts, Urinary Albumin & HIV ELISA AND WESTERN BLOT. Repeat measurements on 3rd month follow up include Albumin, CD4+ cell count, Haemoglobin, Total and Differential WBC counts.

Statistical Analysis: Descriptive Statistics: Mean and Standard Deviation for variables; Analytical Statistics: $\chi 2$ test, Independent Student T Test; Pearson Coefficient: Correlation between albumin and CD4+ cell counts.

INCLUSION CRITERIA
Age >18 years HIV/AIDS patients attending ART center having CD4 count ranging from 1 to 500

EXCLUSION CRITERIA
1) Preexisting hepatobiliary disease causing decrease in albumin level
2) Preexisting renal diseases/chronic kidney disease causing decrease in albumin levels
3) Preexisting gastrointestinal disease causing decrease in albumin levels
4) Any clinical evidence of congestive cardiac failure5)Any h/o burns in last 21 days.6)Pregnant ladies on ART

METHODS
Participants in the research had to be HIV-positive or accidentally diagnosed and admitted to the ART Center and Internal Medicine department's wards and outpatient department (OPD) at K C General Hospital. After obtaining their informed permission, patients who met the inclusion and exclusion criteria underwent a thorough history and clinical examination.

RESULTS

Table 1:- Distribution Of Subjects According To Age Group

	Frequency	Percent
21-30yrs	4	6.6
31-40yrs	19	31.1
41-50yrs	17	27.9
51-60yrs	14	23.0
>60yrs	7	11.5
Total	61	100.0

Figure1:- Graph Showing Distribution Of Subjects According To Age Group

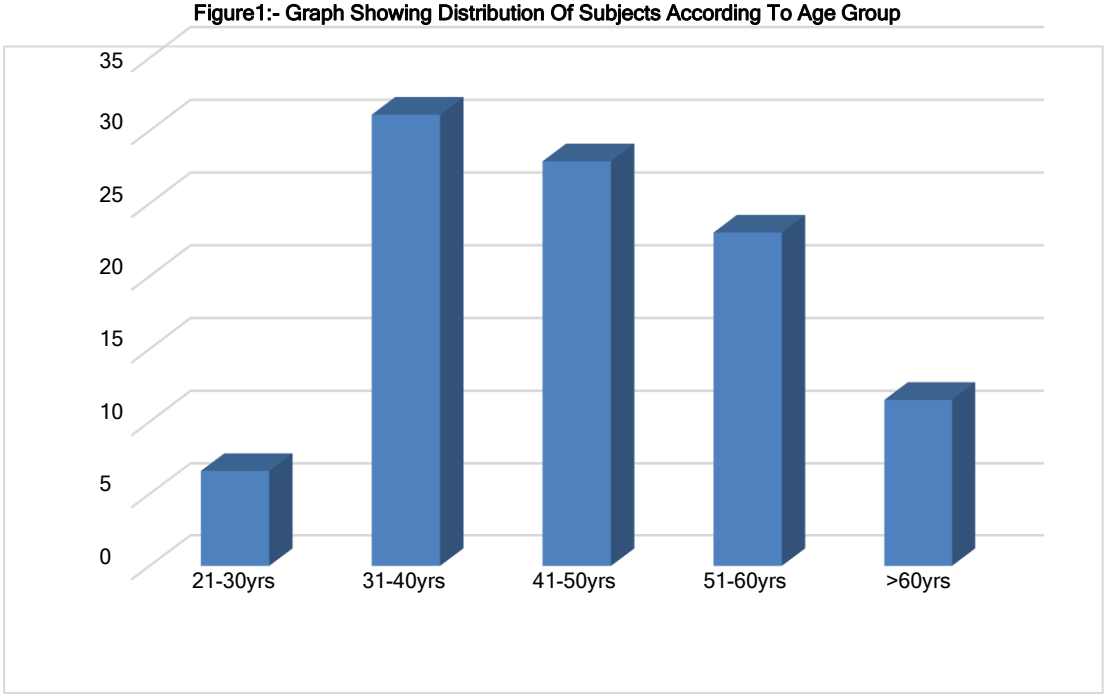

Table 2:- Distribution Of Subjects According To Sex

	Frequency	Percent
Female	26	42.6
Male	35	57.4
Total	61	100.0

Figure 2:- Graph Showing Distribution Of Subjects According To Sex

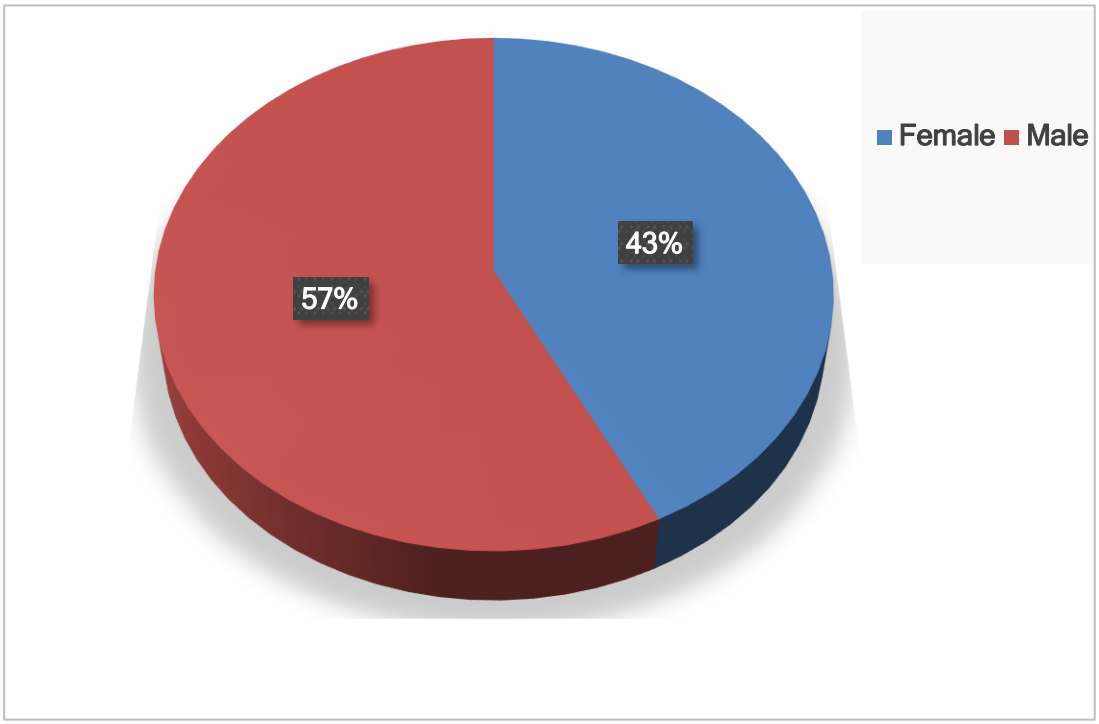

Table 3:- Distribution Of Subjects According To Ses

	Frequency	Percent
Lower	9	14.8
Middle	52	85.2
Total	61	100.0

Figure 3: - Graph Showing Distribution of Subjects According to Ses

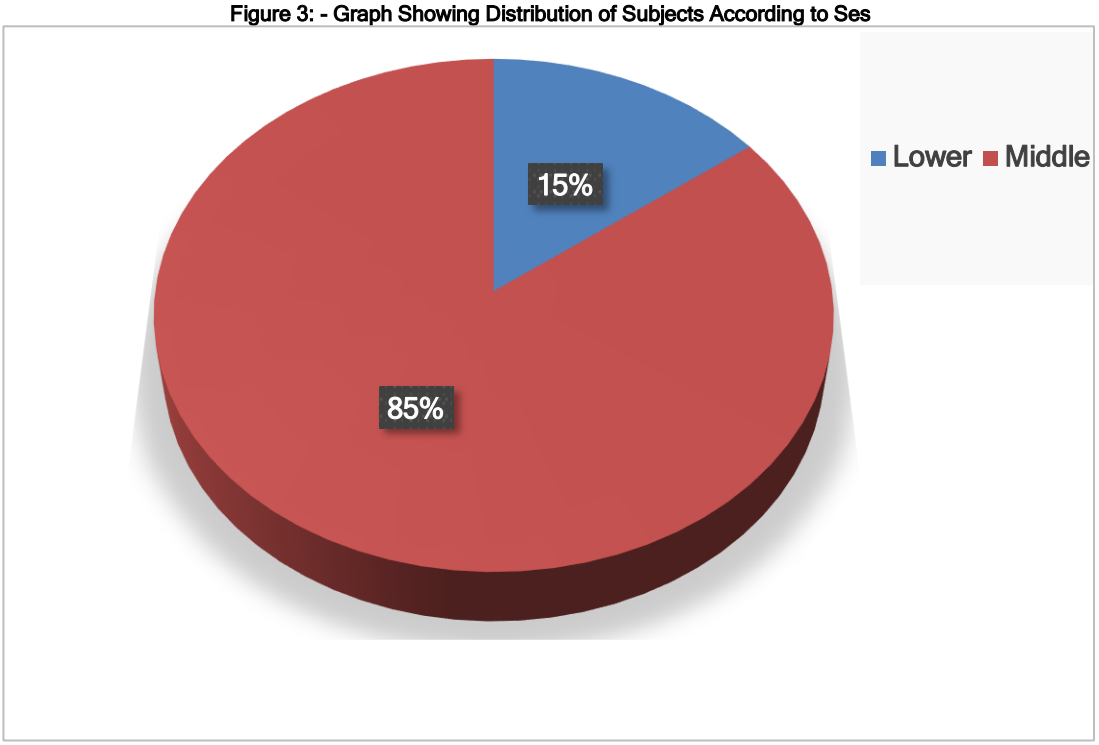

Table 4:- Distribution Of Subjects According To Tb

	Frequency	Percent
No	58	95.1
PTB	2	3.3
EPTB	1	1.6

Figure 4:- Graph Showing Distribution Of Subjects According Totb

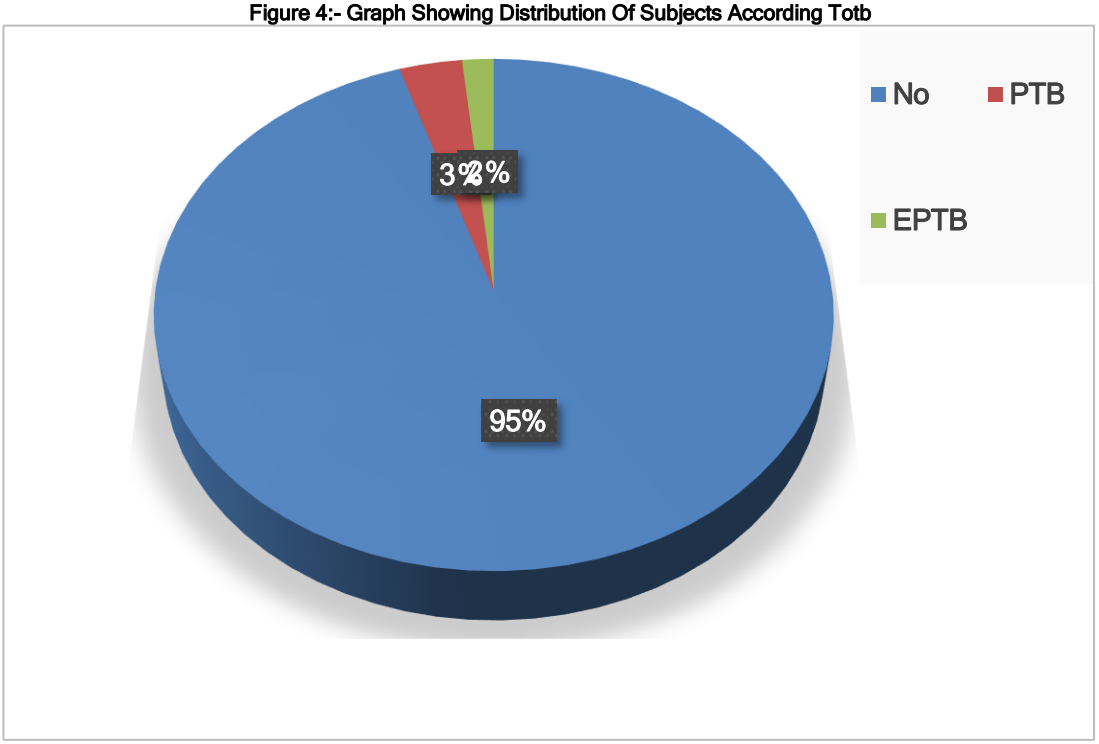

Table 5:- Distribution Of Subjects According To Signs

	Frequency	Percent
Pallor	1	1.6
Edema	11	18
Lymphadenopathy	1	1.6

DISCUSSION

Several studies have suggested that albumin could serve as a useful marker of HIV disease progression in resource-limited settings. In the present study, the relationship between serum albumin and absolute CD4+ cell count was studied in 61 HIV/AIDS patients who presented to K.C. General Hospital, Bengaluru.

Our study found a statistically significant positive correlation between serum albumin levels and CD4+ cell counts, indicating that albumin could be a potential alternative marker for immunosuppression. This aligns with findings from Mehta et al. (2006) and Oluwami et al. (2006), who demonstrated that serum albumin levels decrease as HIV progresses. Furthermore, Feldman et al. (2003) found that hypoalbuminemia was associated with a three- fold increased risk of mortality among HIV patients.

HIV infection is characterized by a progressive decline in CD4+ T-cell count, which serves as a key indicator of immune suppression. Traditionally, CD4+ counts have been the standard marker for assessing disease progression and guiding treatment. However, frequent CD4 testing may not always be feasible in resource-limited settings due to cost constraints and the need for specialized laboratory equipment. In such cases, alternative markers such as serum albumin levels can provide a valuable and cost-effective tool for evaluating immune status.

Serum albumin is a major plasma protein synthesized by the liver, playing a crucial role in maintaining oncotic pressure and transporting various substances. Its levels are influenced by multiple factors, including nutrition, liver function, chronic inflammation, and infections. Several studies have identified a decline in albumin levels in HIV/AIDS patients, correlating with disease severity and increased mortality risk.

In our study, we observed that patients with lower CD4+ counts tended to have significantly lower serum albumin levels. This suggests that albumin levels could serve as an indirect indicator of immune suppression, particularly in settings where CD4+ testing is not readily available. Additionally, albumin levels may reflect nutritional status, which is often compromised in HIV patients due to chronic inflammation and metabolic changes.

Previous research has established that hypoalbuminemia is associated with poor clinical outcomes in HIV/AIDS patients. Studies by Sudfeld et al. (2013) and Graham et al. (2007).

Conclusion

The findings of this study suggest that serum albumin levels correlate strongly with CD4+ counts in HIV/AIDS patients, reinforcing its potential as a cost-effective alternative marker of immunosuppression. Given the financial and infrastructural constraints in many low- resource settings, albumin can serve as an adjunct marker for monitoring HIV disease progression, especially where CD4 testing is not readily available. However, it should not replace CD4+ counts but rather complement them in clinical decision-making.

The strong correlation between albumin and CD4+ counts highlights the potential utility of albumin in assessing disease severity and guiding treatment interventions. While albumin testing is widely available and affordable, it is important to account for potential confounders such as malnutrition and liver dysfunction when interpreting results.

Future research should focus on a larger, multi-center study with a longitudinal design to validate these findings and explore the role of albumin in predicting treatment outcomes. Additionally, investigating the impact of ART on albumin levels could provide further insights into its prognostic value.

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