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Study on impact of patient related variables on CD₄ count and opportunistic infections in HIV seropositives

Divya Yedluri¹, Varoodha Kanneboina², Jyothsna Medarametla³, Prathyusha Suddapalli⁴.

¹Department of Pharmacy Practice, Chalapathi Institute of Pharmaceutical Sciences, Guntur

²Department of Pharmacy Practice, Chalapathi Institute of Pharmaceutical Sciences, Guntur

³Department of Pharmacy Practice, Chalapathi Institute of Pharmaceutical Sciences, Guntur

⁴Department of Pharmacy Practice, Chalapathi Institute of Pharmaceutical Sciences, Guntur

Corresponding Author: Divya Yedluri

Email id: divyayedluri9@gmail.com

ABSTRACT

Background

Opportunistic infections are the hallmark manifestations of AIDS. To decrease the incidence of OI's in PLHIV, there is a need to study the impact of all relevant factors which may be a key for the development of OI's.

Aim

To study the impact of patient related variables on CD₄ count and opportunistic infections in people living with HIV.

Methods and methodology

A Prospective Observational study was carried out at ART center. HIV patients who met inclusion criteria were informed consented and included in the study and relevant data was collected in a prior designed data collection form.

Results

A total of 214 patients having OI's were included among which 55.1% (n=118) were women and 44.9% (n= 96) were men. Most of the OI's occurred in the age group of 31- 40 yrs. (n=85; 39.17%) and when CD₄ count was between 100-350 cells/mm³. TB was the most common OI (n=115; 50%) followed by candidiasis (n= 110; 47.8%). When BMI was correlated with CD₄; it revealed that underweight was predominant (n=62; 79.49%) when CD₄ count was < 350 cells/mm³. Grade II anemia was most common (n=97; 49.24%) and most of the patients with OI's belong to upper lower class (n=179; 83.64%) according to KSES. Risk grading using JDPV scale reveals 107 (50%) patients fall under high risk category and 64 (29.3%) , 4 (1.87%) are with moderate and high risk respectively.

Conclusion

This study reveals that there is a positive relationship between BMI and CD₄ count and it also shows that the incidence of OIs is influenced by multiple factors which should be considered to provide appropriate care to the patient.

INTRODUCTION

Acquired Immunodeficiency Syndrome (AIDS) ranks third place for most of the deaths across the globe and its main manifestations are opportunistic infections. Opportunistic infections occur when person's immunity is significantly weak and have significant impact on quality of life and grossly effects health of HIV patients. OI's vary from region to region across the world based on demographics of the nation and epidemics within the community also play a significant role in its incidence and prevalence. Treatment to restrict the progression of disease using antiretroviral drugs of different mechanisms is of no use due to rapid mutations in genomic complex of HIV [1, 3, 5]. Though the prognosis has improved due to HAART in HIV but unfortunately therapeutic challenges still dominate the ART therapy which includes Drug Toxicities, Drug – Drug interactions, Resistance, Medication adherence which might not be able to totally prevent opportunistic infections. So, to prevent these opportunistic infections and progression of disease to AIDS there is a need to identify the factors involved in OI's occurrence [3]. By this identification of various parameters which are responsible directly or indirectly to opportunistic infections the prediction and prevention action plans can be developed which minimizes the morbidity and mortality due to opportunistic infections in HIV patients.

Aim

To study the impact of patient related variables on CD₄ count and opportunistic infections in people living with HIV.

Objectives

- To study the correlation between CD₄ count and opportunistic infections.
- To assess the impact of socioeconomic status, BMI and medication adherence on prevalence of opportunistic infections in HIV patients with low CD₄ count.

- To assess the medication adherence using Morisky et.al Medication Adherence Rating Scale.
- To categorize the patient's anaemic status according to WHO guidelines.

METHODS AND METHODOLOGY

Methods

- **Study Design:** A Prospective observational study.
- **Study Site:** Anti Retroviral Therapy (ART) centre in Government General Hospital.
- **Inclusion Criteria:** All HIV patients who are greater than 13 years and suspected to have opportunistic infections and/or who are diagnosed with any one of the opportunistic infections and consented for study are included.
- **Exclusion Criteria:** Terminally ill patients and patients who are unwilling to participate in this study are excluded.
- **Study Period:** A sample of requisite from 12/2016 (December) to 05/2017 (May).

METHODOLOGY

This study was conducted from December 2016 to May 2017 in ART Centre at Government General Hospital, Guntur. Patients with HIV are screened for opportunistic infections and patients who are diagnosed with opportunistic infections are included. Informed consent was obtained from each and every patient. History was collected from patients in the data collection form. Patient laboratory details like hemoglobin, CD₄ count and disease specific reports are collected. Patients height, weight are recorded to calculate BMI. Medication adherence was assessed using Morisky et al., Medication Adherence Scale (MMAS) Questionnaire. Socioeconomic data was collected by Kuppaswamy's Socio-Economic Scale. The data was represented in Microsoft excel spreadsheet. Data was analysed and results were drawn.

RESULTS

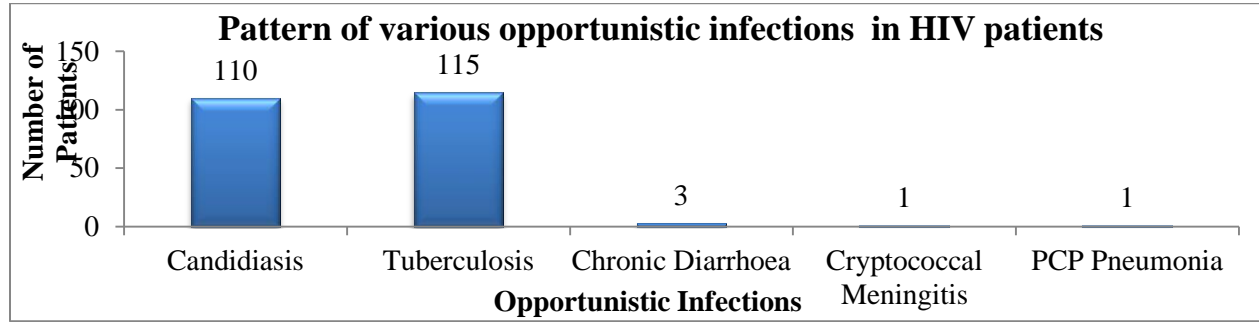


Figure 1: Pattern of Opportunistic Infections in HIV Patients

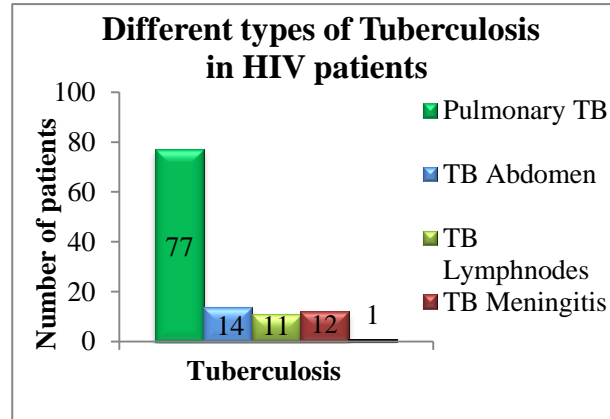
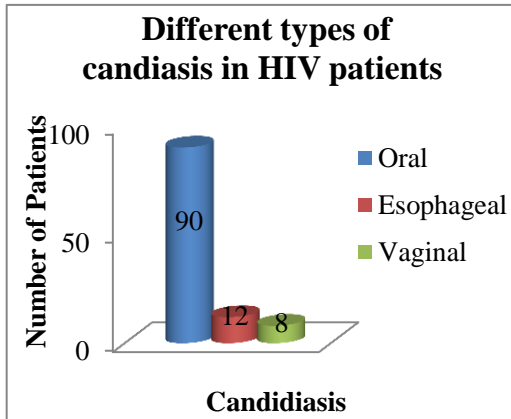


Table 1: Distribution of opportunistic infections in patients with different CD₄ count ranges

CD ₄ COUNT	No. Of patients	OPPORTUNISTIC INFECTION							Commonest
		CNS	MSS	RESP.	GIT	HAEM.	GUT		
<50	17	3	0	9	8	0	0	PTB	
50-100	22	4	0	6	11	1	1	Oral candidiasis	
100-200	58	2	0	27	25	3	1	PTB	
200-300	58	3	0	21	31	5	2	Oral candidiasis	
>350	59	1	1	14	39	1	4	Oral candidiasis	

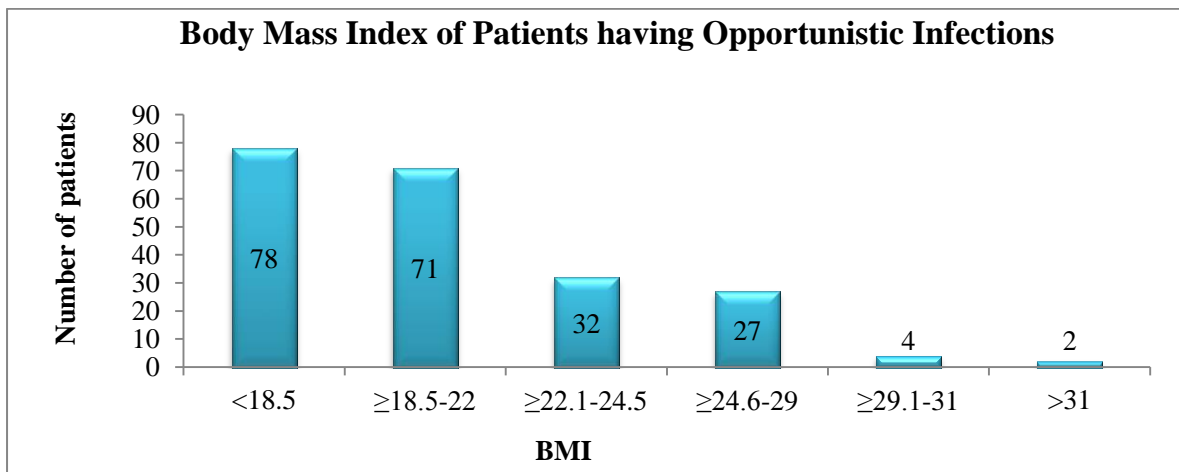


Figure 4: Classification of patients having opportunistic infections based on their Body Mass Index

Table 2: Comparison of BMI and CD₄ counts

CD ₄ COUNT	No. of patients with CD ₄	Body Mass Index (in kg/m ²)					
		<18.5	18.5 to 22	22.1 to 24.5	24.6 to 29	29.1 to 31	>31
<50 cells/μl	17	9	5	2	1	0	0
50 to 100 cells/μl	22	10	7	3	2	0	0
101 to 200 cells/μl	58	21	24	8	4	1	0
201 to 350 cells/μl	58	22	19	7	7	2	1
>350 cells/μl	59	16	16	12	13	1	1
Total no of patients with BMI	214	78	71	32	27	4	2

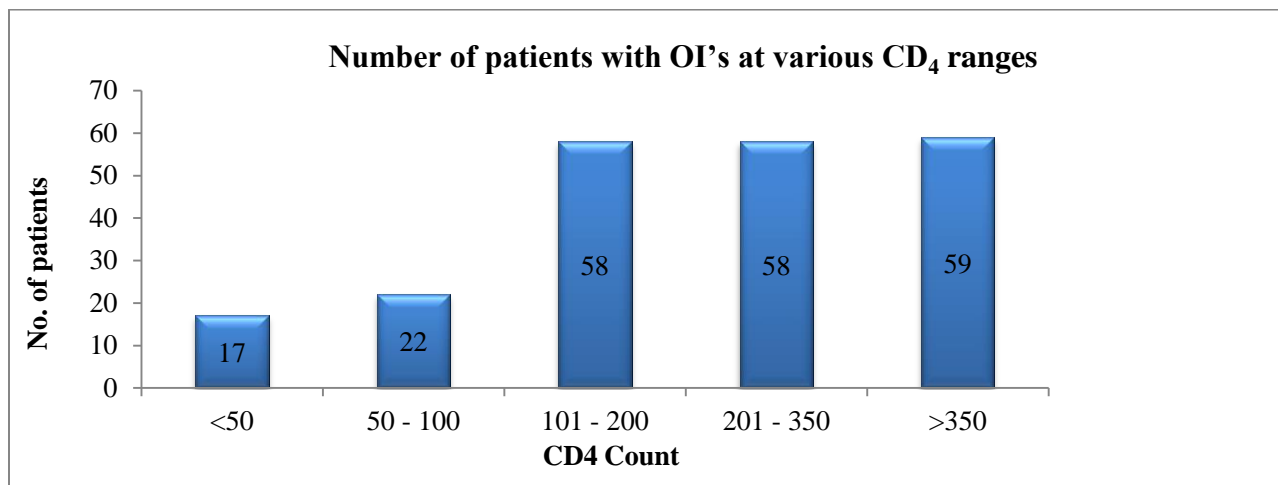


Figure 5: Number of patients with OI's at various CD₄ ranges.

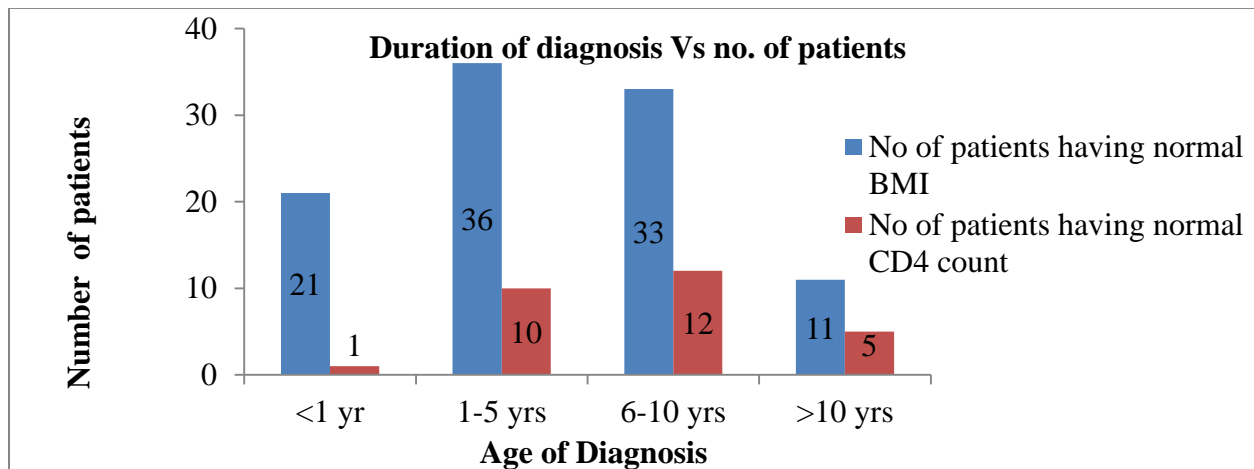


Figure 6: Duration of diagnosis Vs number of patients

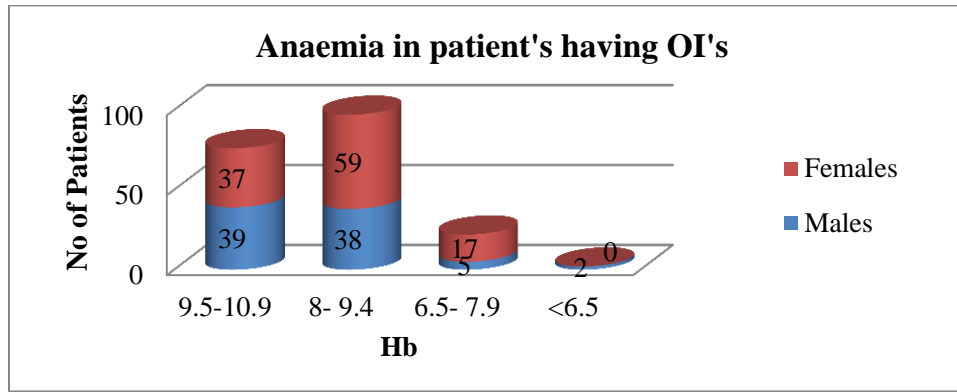


Figure 7: Anaemia in patient's having OI's.

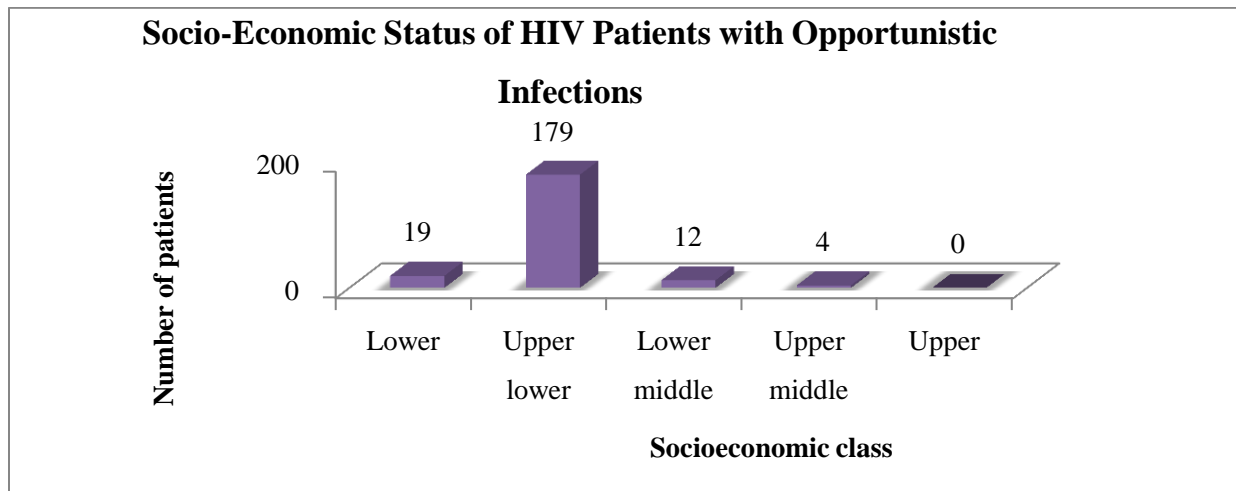


Figure 8: Socioeconomics status of HIV patients having Opportunistic infections using Kuppuswamy's Socioeconomic Scale(KSES)

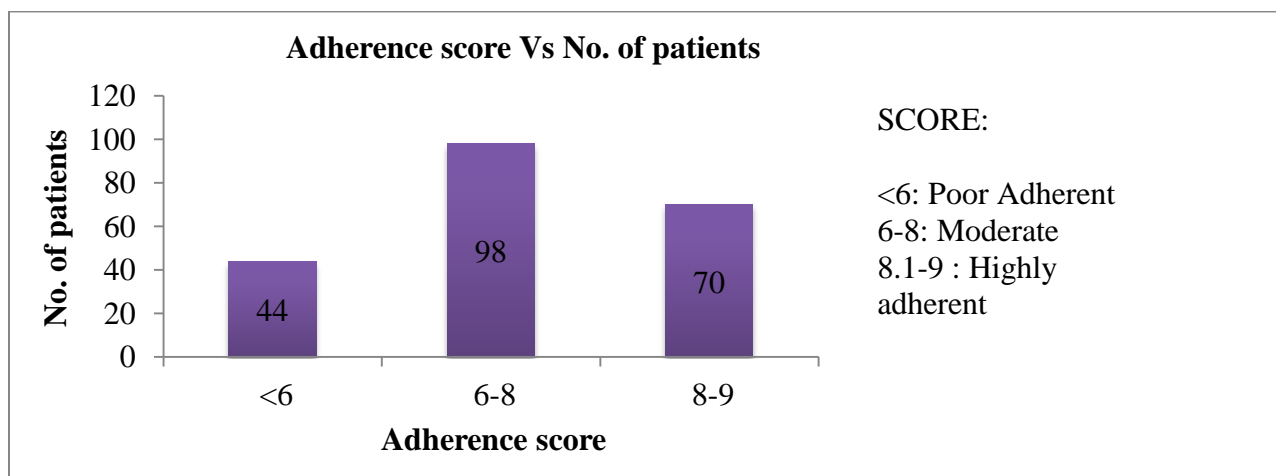


Figure 9: Adherence score Vs Number of patients

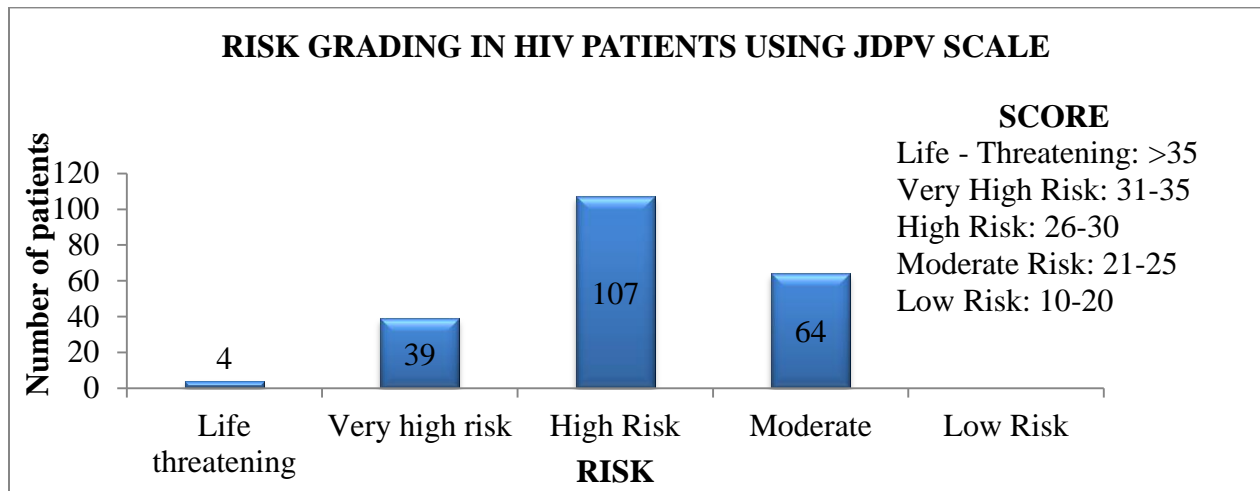


Figure 10: Severity Grading Using JDPV Scale

JOINT DISEASE PREDICTION AND VACTINICATION SCALE

PARAMETER	SCORE				PATIENT'S SCORE
	18-30 yrs	31-40 yrs	41-60 yrs	>60 yrs	
AGE	3	4	2	1	
GENDER	Transgender	Men	Women		
	4	2	3		
BMI (in kg/ m²)	≤ 18.5	18.6 -24.9	25- 29	>30	
	4	2	3	1	
MONTHLY INCOME(in Rs)	<6000	6000-10000	11000-15000	>15000	
	4	3	2	1	
HIV DIAGNOSED	< 1 yr	1-5 yrs	6- 10 yrs	> 10 yrs	
	3	1	2	4	
CD₄ COUNT (cells/mm³)	≤ 100	101-350	350-500	> 500	
	4	3	2	1	
HAEMOGLOBIN (in gm/dl)	≥ 11	9.5 -10.9	8-9.4	6.5- 7.9 <6.5	
	1	1	2	3	4

	YES				4
On ART	NO				1
ART DURATION (if applicable)	< 1yr	1- 5 yrs	6-10 yrs	> 10 yrs	
	4	2	1	3	
ADHERENCE SCORE	< 6	6.1 - 8	8.1- 9		
	4	3	2		
					TOTAL SCORE:
LIFE THREATENING: >35					HIGH RISK: 26-30
VERY HIGH RISK: 31-35					MODERATE RISK: 21-25
LOW RISK: 10-20					

DISCUSSION

A total of 214 patients having opportunistic infections were included in the present study. The mean age of patients was found to be 38.28 yrs with a standard deviation of ± 9.76 . Majority of patients were in the age group between 30 - 40 years. This is similar to the results of study done by Kumar A et al., 55.1% patients were women and 44.1% were men. Gender distribution reveals that women (n=118; 55.1%) are more prone to opportunistic infections when compared to men (n=96; 44.9%). This is comparable to the results of Damtie et al., which might indicate female gender is an independent risk factor for OI's occurrence [13]. When the upper and lower limits of CD₄ counts at which OIs occur were compared in both of the genders; men were found to have low CD₄ counts when compared to women. This may be due to individual risk factors like anemia, low BMI. This study also reveals that in geriatric HIV seropositives, CD₄ counts are lower. This might be due to other co-morbidities. Though CD₄ counts appears to be above prescribed range in patients who fall in the age group of 41-60 years there is an occasional flair of OIs which may be attributable to advanced clinical stage or disease progression (Fig 5). In our study TB (n=115; 50%) (Fig 1) was the most common OI which is comparable to the study of Ghate et al., (29%) [25]. Other major OI in the current study was candidiasis (47.8%) followed by chronic diarrhoea (1.3%), cryptococcal meningitis (0.43%), PCP (0.43%). 33.4% of OIs are related to

respiratory tract leading to mortality in most of the cases. GI related OIs were commonly present at all CD₄ ranges.

Our study reveals that there is a positive relationship between CD₄ and BMI i.e., as the CD₄ count is decreased gradually there is a steep decline in BMI (Table 2). When the duration of diagnosis is between 1-10 years most patients were having normal BMI and CD₄ counts but decreased significantly after this period. This is due to ART which helps to maintain CD₄ count. Progressive decline be attributable to advanced clinical stage, age of the patient, drug resistance and drug toxicities. By observing CD₄ counts at various durations since diagnosis, it was observed CD₄ count was well maintained up to 13 years which shows ART was effective to prolong the lifespan of PLHIV (People Living with HIV). Grade II anaemia was predominantly seen in patients and it also depicts that every individual with OI have some degree of anemia (Fig 7). This, if unmanaged at appropriate time, may lead to rapid advancement in clinical stage which may lead to ART failure requiring therapy switch or substitution. There is an acceptable relationship between adherence and BMI. When mean BMI values and adherence score were compared, mean BMI value increased gradually from poor adherent to highly adherent patients. Incidence of OI's was high in poorly and moderately adherent patients when compared to highly adherent patients [27-33]. All these parameters are brought together to assess HIV patients individual risk for developing

opportunistic infections using a suitable scale. Joint Disease Prediction and Vaccination Scale (JDPV) was developed and validated by implementing in opportunistic infections having patients (Annexure I). All the patients fall above or with in moderate risk categories and this reveals that JDPV Scale (Fig. 10) is strong enough to identify the individual patient risk.

CONCLUSION

In conclusion our study demonstrates that though CD₄ count appears to be above the prescribed range, presence of opportunistic infections indicate that once HIV infection happens immunosuppression is a must, the scales tip towards predisposition to infection. GI related opportunistic infections are commonly seen in majority of patients irrespective of CD₄ count. Anaemia is the major concern to be addressed in order to maintain and improve overall health. Usually CD₄ count is the only predictor used for assessing patient's risk for developing opportunistic infections. But there are certain other factors which influence incidence of opportunistic infections. Thus, there is a necessity for development of a predictive scale which is easily

reproducible, commonly applicable and user friendly. Joint Disease Prediction and Vaccination Scale (JDPV) is an outcome to fulfill this requirement and enhance quality of care provided to HIV patients. By applying JDPV scale, risk for developing opportunistic infections can be duly assessed and appropriate risk minimization plan can be implemented to prevent the morbidity and mortality due to opportunistic infections.

FUTURE PROSPECTUS

- Our study reveals there was a positive relationship between CD₄ count and Body Mass Index of patient, but the reason for association can't be clearly established due to inadequate sample size. Thus, there is a need for further studies to explain this association in detail.
- JDPV scale was analyzed for its efficacy in limited sample, for its further improvement need to be studied in a large sample size.
- Scale is confined to adult and elderly population. So, future studies concentrating on pediatric population should be encouraged.
- Opportunistic infections are mostly seen in women compared to men and reasons need to be investigated in future studies.

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