

## Original Article

## Socio-demographic Profile and Baseline CD4<sup>+</sup> Count of Newly Diagnosed HIV Seropositive Patients Attending Linked ART Center at Dr RMLIMS Lucknow

Amit Kumar<sup>1</sup>, Anupam Das<sup>2</sup>, Manodeep Sen<sup>3</sup>, Jyotsna Agarwal<sup>4</sup>, Nikhil Gupta<sup>5</sup>, Mamta Thacker<sup>6</sup>

### Abstract

**Background :** HIV (Human Immunodeficiency Virus) is the most severe health problem in the World. The number of people infected with HIV has been increasing Worldwide.

**Aims and Objective :** To study the demographic characteristics and analyse the trend of baseline CD4<sup>+</sup> count in newly diagnosed HIV seropositive patients.

**Materials and Methods :** This prospective cross-sectional hospital-based study was conducted at the ART Centre of Dr RMLIMS Lucknow from January, 2021 to July, 2022. A total of 402 newly diagnosed HIV patients enrolled. Demographic data were collected, and all patients<sup>TM</sup> blood samples were subjected to CD4<sup>+</sup> count analysis using PIMA Analyzer.

**Results :** Out of a total of 402 newly diagnosed HIV patients, the majority were Male (73.4%, 295), Married (61.2%, 246), and 164 (40.8%) were between 18-29 years of age. Heterosexual transmission (47%, 189) was shown to be the most frequent method of HIV transmission. Most newly diagnosed patients presented late for HIV treatment care after their CD4<sup>+</sup> cell levels had dropped below 350 cells/ $\mu$ l (59.7% 240).

**Conclusion :** In the research setting, late presentation for HIV care continues to be a significant barrier. Programs need to enhance early detection of HIV in healthcare setups to optimise the impact of the “test and treat” policy intended to reduce morbidity and death associated with HIV. For the most significant impact, this initiative should concentrate on early and rapid diagnosis of HIV patients.

**Key words :** HIV, AIDS, CD4<sup>+</sup> count, Socio-demographic profile.

One of the most prevalent diseases Worldwide is HIV (Human Immunodeficiency Virus). The number of individuals diagnosed with HIV continues to rise Globally. In the past 30 years, over 60 million people have contracted the virus, resulting in more than 20 million deaths. The India HIV Estimation Report for 2021 states that the estimated national HIV prevalence among adults aged 15 to 49 was 0.21%<sup>1</sup>. The report also shows that the prevalence was slightly higher among males at 0.22% compared to females at 0.19%. According to estimates, the prevalence of HIV among adults in India has decreased from a peak of 0.54% between 2000 and 2010 to 0.21% in 2021<sup>1</sup>. India has an estimated 24.1 lakh HIV cases, ranking third Globally in prevalence. High-risk groups for HIV transmission include Female Sex Workers

<sup>1</sup>MD, Assistant Professor, Department of Microbiology, Autonomous State Medical College, Kanpur Dehat, Uttar Pradesh 209101

<sup>2</sup>MD, Professor, Department of Microbiology, Dr Ram Manohar Lohia Institute of Medical Science, Lucknow, Uttar Pradesh 226010 and Corresponding Author

<sup>3</sup>MD, Professor, Department of Microbiology, Dr Ram Manohar Lohia Institute of Medical Science, Lucknow, Uttar Pradesh 226010

<sup>4</sup>MD, Professor and Head, Department of Microbiology, Dr Ram Manohar Lohia Institute of Medical Science, Lucknow, Uttar Pradesh 226010

<sup>5</sup>MD, Associate Professor, Department of Medicine, Dr Ram Manohar Lohia Institute of Medical Science, Lucknow, Uttar Pradesh 226010

<sup>6</sup>MBBS, Medical Officer, Department of Medicine, Dr Ram Manohar Lohia Institute of Medical Science, Lucknow, Uttar Pradesh 226010

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### Editor's Comment :

- This study highlights that a substantial proportion of newly diagnosed HIV seropositive individuals present to ART Centre with low baseline CD4<sup>+</sup> counts, reflecting delayed diagnosis and entry into care.
- Strengthening early detection programs and community-based interventions is essential to improve immune status at presentation, reduce morbidity and enhance long-term treatment outcomes.

(FSWs) and their clients, truck drivers, homosexual men and Intravenous Drug Users (IVDUs). The HIV prevalence rate among IVDUs is significantly higher at 6.26% compared to other high-risk populations<sup>1</sup>.

An essential role in managing the HIV epidemic in India is played by the National AIDS Control Organization (NACO). Several ART centres in India have offered Anti-retroviral Therapy (ART) without charge since 2004<sup>2</sup>. Adopting the WHO 2010 recommendations, ART coverage increased from 3.57% in 2009 to 36% in 2015<sup>3</sup>. Between 2007 and 2011, more people had access to ART, which led to a 29% decrease in the number of people dying each year from AIDS-related causes.

Following WHO recommendations, India implemented “test and treat” in 2017, making anyone testing positive for HIV eligible for treatment regardless of their CD4<sup>+</sup> count<sup>4</sup>. CD4<sup>+</sup> counts are used to monitor HIV disease progression and ART effectiveness<sup>5</sup>. Point of Care (POC) CD4<sup>+</sup> test devices have accelerated therapy initiation and

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improved linkage to care for ART programs<sup>6</sup>. CD4<sup>+</sup> cell count is the most accurate assessment of a patient's immune condition. The risk of opportunistic infection significantly increases when it falls below 200 cells/ $\mu$ l<sup>7</sup>. The CD4<sup>+</sup> cell count test remains critical in making diagnostic decisions, particularly for patients with advanced HIV disease<sup>8</sup>.

## MATERIAL AND METHODS

This prospective cross-sectional hospital-based study was conducted with the combined effort of the ICTC section of the Department of Microbiology and the ART Centre of the Department of Medicine of Dr Ram Manohar Lohia Institute of Medical Sciences, Lucknow. A total of 402 newly diagnosed HIV seropositive patients registered in the linked ART Centre from January, 2021 to July, 2022 were included who were ART-naïve. Patients under the age of 18, patients with prior ART experience, and registered patients referred from other facilities were all excluded from the analysis. All patients' blood samples were subjected to CD4<sup>+</sup> count analysis using PIMA Analyzer. Demographic data were collected by questionnaire to patients on preformed patient proforma sheet. The questionnaire asked about sexual behaviours, potential modes of transmission, and Socio-demographic information (age, gender, level of education, occupation status, and place of residence) to calculate the risk variables. We define late presentation as patients presenting for HIV treatment with a baseline CD4<sup>+</sup> count <350 cells/ $\mu$ l.

The data generated in this study were analysed by R-4.2.1 statistical software to interpret significant outcomes. Quantitative variables were evaluated using the One-Way ANOVA followed by a Post-hoc test, while qualitative data was analysed using the Chi-square test. Means or medians were reported, depending on the distribution of the continuous variable. The differences were statistically significant when the obtained p-value was less than 0.05.

## RESULTS

A total of 402 HIV seropositive patients were analysed during the study period. 164 (40.8%) patients were between aged 18 and 29. The study population had a mean age of 33.21 $\pm$ 9.35 years, with the mean age of newly diagnosed male patients 33.29 $\pm$ 9.27 years and for female patients 33.00 $\pm$ 9.63 years. In our study, males contributed to 73.4% of patients. Regarding education, most patients had only completed Primary school (130; 32.3%). Most of the study subjects were Unemployed (23.1%). The Heterosexual route (189; 47%) was the most common route of HIV transmission. An overview of the Socio-demographic profile of the study population is presented in Table 1.

Variable	Category	Number of patients	Percentage (%)
Gender	Male	295	73.4
	Female	107	26.6
Age	18-29 years	164	40.8
	30-39 years	126	31.3
	40-49 years	83	20.6
	50-59 years	29	7.2
Residence	Rural	233	58.0
	Urban	169	42.0
Marital Status	Married	246	61.2
	Single	128	31.8
	Widowed	22	5.5
	Divorced	6	1.5
Education Status	Graduate	105	26.1
	Secondary Education	79	19.7
	Primary Education	130	32.3
	Illiterate	88	21.9
Mode of Transmission	Heterosexual	189	47.0
	Blood Transfusion	21	5.2
	MSM	24	6.0
	Injection Drug use	72	17.9
	Unsafe Injection	7	1.7
	Unknown	89	22.1
	Occupation	Agriculture	18
Business	72	17.9	
Laborer	68	16.9	
Service	86	21.4	
Student	43	10.7	
Unemployed	93	23.1	
Truck Driver	22	5.5	

Baseline CD4<sup>+</sup> counts of newly diagnosed HIV patients mainly were 0-200 cells/ $\mu$ l (141; 35.1%) followed by 200-349 cells/ $\mu$ l (99; 24.6%). Only 17.9% of patients have a baseline CD4<sup>+</sup> count >500 cells/ $\mu$ l. Most Males (36.3%) and Females (31.8%) had a baseline CD4<sup>+</sup> count of <200 cells/ $\mu$ l. There is no significant difference between absolute CD4<sup>+</sup> count and gender among HIV patients. Table 2 outlines the distribution of baseline CD4<sup>+</sup> count among HIV-positive patients.

Most newly diagnosed patients arrived for HIV treatment after their CD4<sup>+</sup> levels had dropped below 350 cells/ $\mu$ l (59.7%). In our study, 183 (62.0%) Male patients and (57; 53.3%) Females had presented with CD4<sup>+</sup> count <350 cells/ $\mu$ l. Eighty-four (51.2%) out of 164 HIV seropositive patients between 18 to 29 years of age were shown with CD4<sup>+</sup> count <350 cells/ $\mu$ l. Rural areas provided most patients (143; 61.4%) with CD4<sup>+</sup> counts below 350 cells/ $\mu$ l. The mean CD4<sup>+</sup> count of the study group was 318.66 $\pm$ 233.52 cells/ $\mu$ l. HIV-positive individuals between 18 and 29 had statistically significantly higher mean CD4<sup>+</sup>

	Male (n= 295) Number (%)	Female (n=107) Number (%)	Total (n=402) Number (%)
>500 cells/ $\mu$ l	52 (17.6)	20 (18.7)	72 (17.9)
350-499 cells/ $\mu$ l	60 (20.3)	30 (28.0)	90 (22.4)
200-349 cells/ $\mu$ l	76 (25.8)	23 (21.5)	99 (24.6)
0-200 cells/ $\mu$ l	107 (36.3)	34 (31.8)	141 (35.1)

counts than those between 50 and 59 ( $p=0.002$ ). Females had higher mean CD4<sup>+</sup> counts than Males ( $340.60\pm 246.21$  cells/ $\mu$ l versus  $310.71\pm 228.66$  cells/ $\mu$ l). Married and Divorced patients had mean CD4<sup>+</sup> counts of  $246.96\pm 213.41$  cells/ $\mu$ l and  $270.67\pm 171.72$  cells/ $\mu$ l respectively. Table 3 displays the correlation between Socio-demographic characteristics and CD4<sup>+</sup> counts.

## DISCUSSION

This study's data analysis showed that Males contributed to 73.4% of our ART Centre. An observational study was done at PGIMER, Chandigarh, by Sehgal, *et al* among 622 HIV-infected patients, which showed Male predominance among the study subjects<sup>9</sup>. In contrast to a study conducted by Oo S, *et al* in South Africa, most newly diagnosed patients were Female<sup>10</sup>. In our study, the ratio of males to females was 2.7:1, higher than that found in the studies of Toshniwal, *et al* and Kumar, *et al*<sup>11,12</sup>. The population's impact may cause differences in the male-to-female HIV patient ratio in a given place. Overall, 59.7% of patients had a late presentation for HIV care; most were from Rural areas (61.4%). In Rural areas, more stigma may be associated with HIV infection, preventing people from disclosing risk factors and discouraging them from getting tested<sup>13</sup>.

In this study, we analysed the CD4<sup>+</sup> count and found that the baseline CD4<sup>+</sup> count at registration in the ART Centre was  $318.66\pm 233.52$  cells/ $\mu$ l. Our analysis also discovered that adult participants had lower mean CD4<sup>+</sup> counts at ART initiation than younger participants. This finding is

similar to the results of another study conducted by Shastri S, *et al*<sup>14</sup>. One explanation is that older people, even when they contract the infection at a younger age, experience a delayed diagnosis. Females had higher mean CD4<sup>+</sup> counts than males. One possible explanation for Females' higher average CD4<sup>+</sup> counts is that they tend to seek care and undergo HIV testing earlier. Expanded testing programs during pregnancy and partner testing programs initiated after a spouse test positive for HIV may contribute to this. Using a CD4<sup>+</sup> count of 350 cells/ $\mu$ l as cut off for late presentation for HIV care, 59.7% of patients presented late for HIV treatment. In a study conducted by Shastri, *et al*, it was found that 65% of HIV-positive patients had a CD4<sup>+</sup> count below 350 cells/ $\mu$ l<sup>14</sup>. This indicates that many HIV-positive individuals in India do not receive medical attention and treatment until the illness has progressed.

Late initiation of Anti-retroviral Therapy (ART) leads to worse outcomes and higher medical expenses. Furthermore, untreated patients may contribute to the spread of HIV for several years. Heterosexual contact is the most common method of transmission Worldwide, particularly in poorer nations. In this study, it was found that 47% of HIV transmissions occurred through heterosexual contact. This aligns with the national-level statistics provided by NACO<sup>1</sup>. Most studies have found a correlation between high levels of education and knowledge about HIV/AIDS, meaning that persons with greater levels of education also tend to be more knowledgeable of the disease's transmission, prevention of infection, and control. In our study, the educational status of newly diagnosed HIV patients showed that most

Table 3 — Baseline CD4<sup>+</sup> cell counts of the study population concerning Socio-demographic variables of patients

		Number of patients with CD4 <sup>+</sup> cell count <350 cells/ $\mu$ l (%)	Number of Patients with CD4 <sup>+</sup> cell count >350 cells/ $\mu$ l (%)	Mean $\pm$ SD CD4 <sup>+</sup> count	Median CD4 <sup>+</sup> count (IQR)
Gender	Male	183 (62.0)	112 (38.0)	310.71 $\pm$ 228.66	275.00 (150.00 -421.00)
	Female	57 (53.3)	50 (46.7)	340.60 $\pm$ 246.21	340.00 (139.00 -442.00)
Age	18-29 years	84 (51.2)	80 (48.8)	374.93 $\pm$ 267.73	342.00 (184.00- 495.00)
	30-39 years	74 (58.7)	52 (41.3)	293.98 $\pm$ 197.86	284.00 (135.00- 426.00)
	40-49 years	58 (69.9)	25 (30.1)	283.02 $\pm$ 204.54	251.00 (150.00- 370.50)
	50-59 years	24 (82.8)	5 (17.2)	283.02 $\pm$ 204.54	251.00 (150.00- 370.50)
Residence	Rural	143 (61.4)	90 (38.6)	319.98 $\pm$ 240.35	284.00 (151.00- 434.00)
	Urban	97 (57.4)	72 (42.6)	319.98 $\pm$ 240.35	284.00 (151.00- 434.00)
Marital status	Married	154 (62.6)	92 (37.4)	304.61 $\pm$ 218.31	274.00 (136.00- 426.00)
	Single	68 (53.1)	60 (46.9)	352.11 $\pm$ 256.80	318.00 (183.75- 465.00)
	Widowed	14 (63.6)	8 (36.4)	294.27 $\pm$ 262.82	212.00 (77.00- 390.50)
	Divorced	4 (66.7)	2 (33.3)	270.67 $\pm$ 171.72	230.50 (159.25- 334.00)
Education Status	Graduate	63 (60.0)	42 (40.0)	301.33 $\pm$ 188.23	292.00 (151.00-397.00)
	Secondary Education	57 (72.2)	22 (27.8)	282.33 $\pm$ 225.66	231.00 (128.00-359.50)
	Primary Education	75 (57.7)	55 (42.3)	331.28 $\pm$ 228.47	302.00 (173.75-444.00)
	Illiterate	45 (51.1)	43 (48.9)	353.33 $\pm$ 287.98	347.00 (150.50-498.00)
Occupation	Agriculture	15 (83.3)	3 (16.7)	212.83 $\pm$ 129.38	199.00 (125.75-263.25)
	Business	47 (65.3)	25 (34.7)	299.04 $\pm$ 195.50	262.50 (143.00-389.25)
	Laborer	37 (54.4)	31 (45.6)	360.18 $\pm$ 262.90	296.00 (169.00-518.00)
	Service	63 (73.3)	23 (26.7)	242.50 $\pm$ 175.02	219.50 (98.00-354.00)
	Student	20 (46.5)	23 (53.5)	395.07 $\pm$ 256.59	395.00 (221.00-494.50)
	Unemployed	47 (50.5)	46 (49.5)	387.62 $\pm$ 371.98	327.00 (197.50-448.50)
	Truck Driver	11 (50.0)	11 (50.0)	327.55 $\pm$ 181.52	347.00 (179.00-453.25)

patients were reported to be educated till the Primary level (32.3%), and 21.9% were found to be illiterate. These findings are similar to the study conducted by Deshpande JD, *et al* and Jayaram, *et al*<sup>15,16</sup>. Lower education and lack of awareness about safe sex could contribute to higher prevalence in this group. However, Cauldbeck, *et al* observed no trends in education level concerning the seropositivity of HIV patients<sup>17</sup>. Housewives comprised 64.5 % (69/107) of newly diagnosed female HIV patients. A high percentage of Housewives was found in the study by Vyas N, *et al*<sup>18</sup>. A survey by Mehra, *et al* showed that Housewives rarely heard of HIV / AIDS ( $p=0.002$ )<sup>19</sup>. These women are at a higher risk of behaviours associated with HIV infection if they are in a position of financial dependence on their Male counterparts.

### Limitation :

The study's analysis of delayed ART's effect on HIV-positive patient outcomes was hindered due to the unavailability of follow-up data, which is one of its limitations.

### CONCLUSION

Many patients came from Rural areas, with low literacy levels and working as labourers. Thus, awareness and literacy improvement are necessary. Most HIV-positive patients were Men, often married, serving as a link between the general public and high-risk groups. Husbands are more likely to spread an infection to their wives. The heterosexual route was the most common transmission mode; thus, focusing on barrier techniques and increasing Information, Education and Communication (IEC) was essential. Improving patient tracking and referrals between health facilities can reduce baseline CD4+ cell count testing wait times.

### Ethical Consideration :

The Institutional Ethics Committee (IEC) of Dr Ram Manohar Lohia Institute of Medical Sciences, Lucknow, Uttar Pradesh, India, had approved undertaking the proposed research study under IEC no. 139/20 communicated vide letter no. 177/20/RMLMS/2021 dated January 14, 2021.

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