Factors Associated with Quality of Life Among People Living with HIV In India

by

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Abstract

Background: HIV/AIDS remains a primary global public health concern. However, Background: HIV/AIDS remains a primary global public health concern. However, antiretroviral therapy (ART) has transformed HIV from a fatal to a chronic health condition for those with consistent access to medication. Therefore, improving the quality of life (QoL) among people living with HIV in India (PLWH) is an important goal of HIV treatment and care. The primary aim of this study is to examine factors associated with QoL and different QoL domains among PLWH in India.

Materials and Methods: Data was obtained from a cross-sectional survey of 200 PLWH at a hospital-based government ART center in rural Bhimavaram, India. Data was collected through face-to-face interviews from July 2019 to December 2019. This study used sociodemographic characteristics, including age, gender, education, marital status, and other factors, including alcohol use, smoking, CD4 counts, current ART medication adherence, and quality of life (QoL). Multivariable logistic regression was conducted to examine the factors associated with the overall QoL and four QoL domains. The Institutional Ethics Committee at Shri Vishnu College of Pharmacy, Bhimavaram, approved the study protocol (IRB #SVCP/IEC/2021/4).

Results: The mean age of 120 participants was 30.5 (SD=5.5). Over 81% of the participants were married. The social domain had the highest mean score of 15.1 (SD = 1.86), followed by the environment and the psychological domain. The physical health domain had the lowest mean score of 11.57 (SD = 2.74). The multivariable logistic regression analysis showed that lower overall QoL is significantly associated with unmarried people. In addition, low levels of CD4 count were significantly associated with the lower psychological domain ($p<0.05$).

Discussion and Conclusion: The study finding suggests that interventions should include improving adherence to ART, supporting those with low CD4 counts, and improving physical health to improve the overall QoL. Such interventions include increased access to health care, increased physical activity, and improved nutrition. This study provides additional evidence to improve the overall QoL and to develop effective interventions, identify training needs, and inform policy to improve QoL and promote the well-being of PLWH in Bhimavaram.

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Preface

I want to thank my thesis advisor and committee chair, Dr. Ha Toan, for all the time, support, and guidance he provided me with to be able to finish my thesis in this short amount of time. Dr. Ha assisted me immensely in developing this paper. Not only did he provide me with unwavering support, but he also provided great amounts of expertise on the background of this topic.

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1.0 Introduction

1.1 Human Immunodeficiency Virus

The human immunodeficiency virus (HIV is a subtype of the human T-cell leukemia-lymphoma virus (HTLV), the RNA retrovirus that causes AIDS. HIV, also known as the human immunodeficiency virus, is a retrovirus that infects and kills immune system helper T cells. AIDS is caused by HIV-1 in the US and Central Africa, whereas HIV-2 affects people in West Africa and some regions of India. Patients with PLWH often show symptoms of a viral infection, such as fever, sore throat, and swollen lymph nodes, which can last up to two weeks. Combinational ART can prevent the development of AIDS and other long-term effects of HIV infection by stopping the virus from multiplying and suppressing the viral load, allowing the immune system to recover and overcome infections.[1] If untreated, the virus destroys and impairs the function of the immune cells, leading to immunodeficiency and eventually AIDS, which can be fatal and exposes the infected individual to opportunistic infections and cancers[6]. There is no effective cure yet, and it is thus a chronic infection for life.[1]

At the end of 2021, an estimated 38.4 million people were living with HIV (PLWH), and 650 thousand people had died due to the epidemic, according to UNAIDS data (Table 1).[2] Eastern and southern Africa have the highest prevalence rate of infection in more than 25 countries worldwide. The majority of PLWH are currently living in low and middle-income countries (LMICs), with an estimated 20.7 million (54%) in sub-Saharan Africa, 5.8 million in Asia and the Pacific (15%), 4.9 million (13%) in Western and Central Africa, and 2.2 million (6%) in Western and Central Europe and North America.[3] As per 2022 factsheet, since 2010, UNAIDS reports that

the number of new HIV infections has decreased by 32% and AIDS-related deaths have decreased by 52%, demonstrating a significant reduction in the epidemic.[4]

1.2 HIV in India

According to current estimates, there were 58,960 AIDS-related deaths in 2019 and 23.49 lakh PLWH deaths, a 66% decrease from 2010.[5] However, the number of PLWH has constantly decreased since 2003. After 2008, the number has remained below two million PLWH annually. The QoL for PLWH in India is complex and often challenging. Social stigma and discrimination that often accompany the diagnosis of HIV contribute to the poor QoL of PLWH in India.[5] While India has made considerable strides in addressing HIV/AIDS, it is estimated that there are 2.1 million PLWH, making it the third-highest population of people living with HIV in the world.[3] An analysis of the HIV infection rate in the Indian context revealed that the 15-49 age group is the most prevalent in India due to lack of access to health care and social support services, the impact of poverty and economic disparities, the lack of public awareness and knowledge about the disease, and the country's weak health care infrastructure all contribute to the poor QoL of PLWH in India.[5]

The National AIDS Control Organization (NACO) constituted to implement the program in 1992, launching India's first national AIDS control program (1992–1999). NACO established the National AIDS Control Program (NACP) to prevent and treat HIV/AIDS. The objective of NACP phase V is to end the HIV/AIDS pandemic as a public health concern by 2030 through universal viral load testing, community-based screening, and other means.

Table 1: HIV/AIDS prevalence

	UNAIDS (2021)	NACO (2019)
Living with HIV	38.4 million	23.48lakhs
Newly infected with HIV	1.5 million	69.22 thousand
AIDS-related deaths	650,000	58.96 thousand

(**Source: unaids.org & naco.gov.com)**

The prevalence of HIV in India is particularly high among disadvantaged populations such as sex workers, homosexual men, and people who inject drugs, who lack access to prevention, testing, and treatment due to social stigma and discrimination.[67, 68, 69, 70] The Indian government has responded by introducing the National AIDS Control Program and the Free Antiretroviral Therapy program. However, greater access to these services and greater awareness of the issue are still needed.[67]

1.3 Quality of Life

According to the World Health Organization (WHO), quality of life (QoL) of The World Health Organization (WHO) defines an individual's QoL as their subjective evaluation of their personal life within the context of their culture and values.[6] Individuals should strive to maintain optimum physical, mental, and social well-being that contribute to improved QoL. Health-related quality of life (HRQoL) is a significant aspect of QoL. The World Health Organization has used the WHOQOL-BREF to evaluate the HRQoL of PLWH, including environment, physical health, social, and psychological domains.[6]

1.3.1 Factors Related to Quality of Life among PLWH

With the advancement of ART, there has been a significant change in the PLWH's survival rate and improved QoL. Several studies found that there are a variety of factors that can affect the QoL among PLWH.[7, 8, 9,10, 11, 12, 13, 17, 47]

1.3.1.1 QoL and Sociodemographic Characteristics

QoL can be affected by various sociodemographic characteristics, such as, age, gender, race, ethnicity, and income. Many studies reported that those with age less than 45 years, male, being unmarried, and those with primary education are associated with better QoL[7, 8, 9,10,11]. A study in the UK comparing HRQoL among PLWH and the general population found that PLWH experienced significantly lower HRQoL than the general population[18]. Another study conducted among 450 PLWH at the ART center in Karnataka, India in 2019, revealed that factors like male and higher education are positively associated with QoL.[10] Reason for those with higher education had better QoL could be since they have better knowledge and understanding of HIV/AIDS and therefore, better manage their life.

Marital status has been also found to affect PLWH's QoL. For example, a study conducted in 2018 by Biraguma et al. among 794 PLWH in sub-Saharan Africa (SSA) indicated that being unmarried was linked to poor physical health related QoL.[17] In 2018, another cross-sectional study was conducted among 235 PLWH in North-East Ethiopia, which found that those aged 25-45 were more likely to have poorer QoL than those over 45 years.[52] Higher levels of education can also provide better knowledge and understanding of HIV/AIDS. Men are more likely to have higher incomes, which leads to better access to health care, food, and housing all of which can positively impact QoL.

1.3.1.2 QoL and Substance use

Substance use has been found to be associated with QoL among PLWH. Studies have found that alcohol use disorder (AUD) is common among PLWH.[13, 17, 64] Alcohol use is associated with lower QoL, which in turn can negatively influence the physical and emotional well-being of the individuals.[50] Another study among 682 PLWH in Nepal found that patients with harmful alcohol use had poor HRQoL (e.g., physical, social relations, environment). [52] Those with a greater degree of tobacco and alcohol use were more likely to report lower levels in HRQoL.[11, 12, 13, 17, 47] Another study by Sun et al. conducted among 800 PLHIV in China in 2013 documented that alcohol consumption had poorer psychological and physical QoL. Such studies demonstrate that it is essential to consider the potential impact of alcohol consumption on the QoL of PLHIV.[12]

1.3.1.3 QoL and Social Support

Social support plays an essential part in understanding the well-being and QoL in PLWH. Previous studies have shown that social support can positively affect QoL among PLWH. [18, 19, 20] For example, in 2018, a research study of 97 PLWH in Ethiopia found that a lack of family support could lower the social relationship domain of QoL.[20, 21] Remor et al. also conducted a study of 100 PLWH in Madrid, which revealed that those with a low level of perceived social support experienced a lower QoL.[53] As demonstrated in 2019, social support positively influenced the QoL among 395 young men who have sex with men living with HIV in Zhejiang.[18] More recently, a study conducted in 2022 among PLWH suggested that improving social support may effectively enhance the QoL of PLWH.[19] For instance, family and friends can provide emotional support, which can help PLWH cope with HIV-related stigma, depression, anxiety which can improve their adherence to treatment leading to better QoL.

1.3.1.4 QoL and CD4 Counts

High CD4 count were significantly associated with better QoL among PLWH.[14,15,18, 45] A study among 450 PLWH in 2019 at the ART center in Karnataka, India, found that high CD4 count associated with better QoL.[10] In 2018, M. L. Ekstrand et al. conducted a study among 600 rural HIV-positive women in South India and found that a high CD4 count was associated with better QoL.[7] Another study conducted by Igumbor J. et al. in 2013 among 642 PLWH in South Africa revealed that a high CD4 count was associated with better QoL.[45] A study conducted in 2018 by Biraguma J. et al. involving 794 PLWH in sub-Saharan Africa (SSA) revealed that individuals with low CD4 count had poorer physical health related QoL.[17] The high CD4 count is an indicator of a healthy immune system in PLWH and thus is associated with better QoL.

1.3.1.5 QoL and ART Adherence

Adherence to ART is essential for the effective management of HIV, as well as for improving QoL. Studies have found that lower HRQoL is associated with less ART adherence among PLWH.[17] A study conducted in Southwest Ethiopia in 2018 found that among 307 PLWH, those with low adherence to ART had lower QoL than those with higher adherence. ART is the effective treatment for HIV, if not taken as prescribed, can lead to drug resistance and poorer health outcomes.[54, 55] Another study conducted in 2018 by Biraguma J. et al. among 794 PLWH in sub-Saharan Africa (SSA) reported that low medication adherence was associated with lower QoL.[17]

1.3.1.6 QoL and Tuberculosis

PLWH and TB are especially vulnerable, with a much higher risk of death and lower QoL. In 2019, a study conducted in northeastern Ethiopia on 434 HIV mono-infected and 143 TB/HIV coinfected individuals showed that the TB/HIV coinfected group had a lower QoL in all areas

compared to the HIV mono-infected group.[16] Another study reported that tuberculosis was significantly associated with lower psychological and physical health.[16, 27] The physical symptoms associated with TB can lead to increased fatigue, malaise, and reduced physical activity, which can lead to a lower QoL. In 2016, a study conducted among 520 PLWH in West Shoa Zone, Western Ethiopia, which revealed that TB/HIV coinfected patients experienced 2.0 times diminished environmental health QoL than HIV-infected patients.[9] The findings of the study conducted by Opollo et al. in 2020 among 850 PLWH from ten countries (Brazil, Haiti, India, Kenya, Malawi, Peru, South Africa, Uganda, Zambia, and Zimbabwe) revealed that advanced stages and severe TB symptoms, were significantly associated with poor HRQoL. Additionally, the study found that initiating ART and TB treatment could result in improved QoL.[44]

1.3.1.7 QoL and Mental Health

Depression is a common mental health issue that can significantly impact QoL among PLWH. Yen et al. (2020) conducted a study among 565 HIV-infected MSMs at Taipei City Hospital HIV clinics and found that physical, psychological, social, and environmental HRQoL was significantly negatively correlated with depression.[56] Additionally, depression can lead to increased isolation and loneliness and can cause individuals to withdraw from their social networks, which can further impact their QoL. Another study conducted by Sun et al. (2020) found that depression negatively impacted the QoL in a study among 111 PLWH in Shanghai, China.[57] A reported by Tran et al. (2017), among 482 PLWH living in the north of Vietnam, showing that high levels of depression is associated with poor QoL.[58]

1.3.2 Impact of HIV on Indian Quality of Life

In India, several studies have found that compared to the general population, PLWH had significantly lower overall QoL as well as specific QoL domains (e.g., physical, psychological, and social functioning). [7, 10 25, 26, 27, 61, 62, 63, 65]

1.3.2.1 QoL and Sociodemographic Characteristics

In India, several studies found that sociodemographic characteristics such as income level, education level, gender, caste, religion, and occupation are associated with QoL.[7, 10] For example, a study conducted among 220 PLWH in India, reported that those with age less than 45 years, secondary level education, and who were married were more likely to experience a decreasing in the overall QoL. As reported by Shriharsha et al. (2019) there was a negative correlation between QoL and HIV positive family history compared to HIV negative family history [7, 10]. This is likely because certain demographic factors can influence individual's access to resources and health care, as well as their ability to cope with their illness. In other study among 249 PLWH in western Maharashtra, the results showed that females were significantly associated with poor QoL.[26, 27] Another study in Jammu and Kashmir State of India showed that PLWH aged above 50 led to a better QoL. Furthermore, it revealed that PLWH with a duration of illness of 2 to 4 years, who were males, and being married were more likely to have a better QoL.[25, 61, 62]

1.3.2.2 QoL and Substance Use

Alcohol use is a major issue among many PLWH in India, and it has been found to be negatively associated with QoL. A study in 2019 at the ART center in Karnataka, India, among 450 PLWH showed that those with a history of alcohol use reported a poorer QoL compared to

those without such a history.[10] Another study by Srivastava et al. in 2013 among 65 PLWH at a tertiary care hospital in Delhi confirmed poor QoL in patients with alcohol dependence before intervention. Regular follow-up with the family members in the outpatient setting enables the patients to achieve complete abstinence, thereby improving their QoL.[64] A study conducted by Olickal et al. in Puducherry, South India, involving 316 PLWH, has demonstrated that alcohol use is correlated with a decreased QoL.[65]

1.3.2.3 QoL and Social Support

Social support also affects QoL among PLWH. A study about the impact of perceived social support on QoL among 109 PLWH in India documented that social support (from family/friends/others) was associated positively with QoL physical functioning ($p = 0.001$).[15] Another study among PLWH attending an ART center in Delhi, India, revealed that those with better social support were more likely to report better overall QoL.[59] Social support can also help PLWH better manage their illness and cope with the associated stigma and discrimination. The study also indicated that addressing social support and QoL are essential to care components. Another study conducted by Wani et al. in 2020 among 460 PLWH in Jammu and Kashmir, India, found that most patients had lower social support and self-esteem, which was positively correlated with their QoL.[24] Additionally, in 2017, a study among 109 PLWH attending an ART center in New Delhi showed that better social support could result in better QoL.[25,63]

1.3.2.4 QoL and CD 4 Counts

A higher CD4 counts can lead to improved QOL. A study among PLWH reported that higher viral load and lower CD4 count are more likely to have lower QoL.[20] In a study of 109 PLWH in India, Subramanian et al. (2021) discovered that those with higher CD4 counts

experienced a greater QoL.[15] A study by Anuradha et al. (2021) found that among 109 PLWH who attended an ART center in Delhi, India, had reported that higher CD4 counts were associated with higher QoL.[59] Consequently, higher CD4 counts can lead to improved QoL by reducing the risk of developing complications, improving overall health, and increasing access to treatment. In 2013, another study among 255 PLWH receiving antiretroviral therapy at a tertiary care hospital in Mysore found that those with higher CD4 counts had a better QoL.[64, 66]

1.3.2.5 QoL and ART Adherence

Poor medication adherence can lead to a decrease in QoL due to worsening a person's condition, which can lead to physical and emotional suffering. Some studies reported poor medication adherence, associated with lower QoL.[7, 23] Another study conducted by Ekstrand et al. in 2018 among rural women living with HIV in South India revealed a correlation between decreased ART adherence and a decreased QoL due to worsening of a person's condition, in turn leading to physical and emotional suffering.[14]

1.3.2.6 QoL and Tuberculosis

The QoL for people living with both tuberculosis (TB) and HIV is affected by the combined effects of both diseases. In advanced stages, HIV can cause opportunistic infections and eventually lead to AIDS-related illnesses such as tuberculosis, contributing to lower QoL.[16, 29, 31] A review conducted by Carvalho, M. V. D. F. et al. in 2021, which includes 15 studies, showed that HIV-TB coinfection is more associated with lower QoL than monoinfection.[30] The HIV-TB coinfection can lead to more severe complications such as increased hospitalization, mortality, and a greater risk of drug resistance, resulting in a lower QoL. Jha DK. et al., in 2019, conducted a study at the

ART center Mangalore over six months among 104 PLWH. HIV-TB coinfected patients had a lower mean score in all domains than only PLWH.[28]

1.3.2.7 QoL and Mental Health

Another study found that psychosocial factors were strongly associated with depression. Previous study among 362 PLWH at a government ART clinic in Kolkata, India, underlines the need for partner status-specific mental health services and programs to address the mental health needs of PLWH that reported high levels of depression and anxiety, reported lower QoL.[7, 14, 23, 48] This finding underlines the need for partner status-specific mental health services and programs in India to address the mental health needs of PLWH. [48] Subramanian A. et al. 2021 conducted a study among 109 PLWH in India and found that those with lower levels of depression had higher levels of QoL n terms of physical functioning.[15] In 2019 study conducted by Shriharsha et al. at the ART center in Karnataka, India revealed a significant negative correlation between the QoL and depression among 450 PLWH.[10] In 2011, a study conducted by Timilsina and Regmi in Kathmandu, Nepal among 154 people living with HIV/AIDS and TB-HIV coinfection found that depression was 3.86 times more likely to have a negative impact on their QoL.[60]

Overall, HIV/AIDS has had a devastating impact on the QoL in India. It has caused a significant loss of life and decreased health and economic opportunities for those affected by the disease. Governments, healthcare providers, and civil society organizations need to continue to work together to reduce the spread of HIV/AIDS and provide support to those affected by the disease.

1.3.3 Management of Quality of Life among PLWH

Studies showed that enhancing HIV management among people helps improve aspects of life development and QoL among PLWH.[32, 33, 34] They are identifying the adverse drug effects among people and supportive medication practices related to the quality of living practices.

Demographic factors and addictive behaviors have impacted the QoL. According to studies, improving HIV management among PLWH improves aspects of life development and QoL. A study by the National AIDS Control Organization of India in 2013 found that while the vast majority of PLWH are living productive and healthy lives, there is a significant lack of QoL among PLWH. The study found that PLWH experiences a wide range of QoL problems, such as social isolation, reduced self-esteem, and a decreased ability to participate in activities they enjoy.[32, 33] This study suggests that healthcare providers working with PLWH should focus on improving QoL while considering the cultural differences between India and other countries when providing care. There is a need for healthcare teams to have a better understanding of HIV QoL in India to provide better care to patients.[32, 33, 34]

Community health services in India aim to improve the health and well-being of PLWH by providing affordable, accessible, and reliable health services. In India, community health services in PLWH include health promotion, health education, health care, and health monitoring. They include health promotion and education, immunization and vaccine programs, family planning services, and health care for the homeless and marginalized.[34] There is no nationally representative data on providing community health services to people living with HIV in India. However, a report by the National Aids Control Organization (NACO) in 2009 found that only a tiny proportion of PLWHs in India received care from community health workers (CHWs).[34]

Despite India's efforts to improve the QoL of PLWH, there are still many challenges. PLWH often faces discrimination in access to healthcare, education, and employment [35]. Access to antiretroviral therapy (ART) is limited, with only half of those in need receiving the treatment.[3] In addition, there are socioeconomic challenges such as poverty, gender inequality, and a lack of education which can limit access to healthcare and prevent individuals from accessing the support they need. [3] The Indian government has implemented several initiatives to improve access to ART, including a national initiative to provide free ART to all those in need.[3] The government has also taken steps to reduce stigma and discrimination, including enacting legislation to protect the rights of PLWH.[35] It is essential to reduce stigma and discrimination, increase access to ART, and address socioeconomic issues such as poverty and gender inequality.

1.4 Public Health Significance

HIV has become a long-term chronic health condition, and many PLWHs, with the advancement of ART, are now living longer, healthier lives. Therefore, improving PLWH's QoL has become important.[34] Early HIV testing, diagnosis, treatments, and improved healthcare services may improve the QoL of PLWH. This study can contribute to a better understanding of how HIV affects various aspects of life, such as physical and mental health, overall well-being, and QoL in PLWH, families, and communities. This study can help us understand the main factors influencing the QoL of PLWH in India and what other factors affect their lifestyle. This study's results could provide critical evidence on policy-making and effective interventions in PLWH, making it more applicable to understanding the significance of various policies and providing awareness of medication adherence and a safe environment.

1.5 Essay Aims

The primary aim of this research is to assess quality of life and associated factors among PLWH in India. The specific objectives are:

1. To assess the overall QoL and different QoL domains
2. To examine the effect of social demographic factors on PLWH's QoL
3. To investigate the association between ART adherence, tuberculosis, CD4 counts and PLWH's QoL

2.0 Methods

2.1 Study Design and Setting

A six-month cross-sectional study was conducted between July 2019 and December 2019. In government hospitals, two hundred individuals were enrolled from a pool of 6,000 PLWH at an ART center in Bhimavaram, Andhra Pradesh, India. This hospital provides primary and specialized health care to the PLWH in Bhimavaram from two towns to 14 villages. PLWH arrived at the hospital's outpatient clinic for treatment and was approached and informed about the study. A case report or data collection form was designed to record patients' demographics and characteristics from their medical records. Data on the secondary infection, the type of ART regimen, the percentage of medication compliance, the duration of HIV infection, education, and baseline CD4 counts were all part of the history collected using electronic medical records.

2.1.1 Study Participants

2.1.1.1 Inclusion Criteria

- Participants over the age of 18 years
- PLWH being on ART at the ART center lived in Bhimavaram

2.1.1.2 Exclusion Criteria

- Pregnant women
- History of any co-morbidities such as liver failure, kidney disease, or heart disease

2.1.2 Interview Approach

Two research coordinators and a pharmacist, trained on the screening and data collection technique oversaw recruiting the participants for the study. The patients were approached at the outpatient clinic in the government hospital to participate in the study. The particulars of the study were explained, including any potential risks, benefits, and costs. After responding to the study process-related questions, the patients were asked to sign a consent form. They were given the option to join or not join the study, and if they chose not to participate, their decision was respected. Once they agreed and signed the consent forms, the researchers started interviewing them using a questionnaire. Face-to-face interviews lasted for 5–10 minutes in a private room for each patient.

2.1.3 IRB Approval

The Institutional Ethics Committee (IEC) at Shri Vishnu College of Pharmacy, Bhimavaram, approved the study protocol (IRB #SVCP/IEC/2021/4). The study was started after obtaining clearance from the institutional ethical committee. All the information collected from the participants was strictly used only for research purposes, and confidentiality was maintained.

2.2 Measures

2.2.1 Dependent Variable

2.2.1.1 Quality of Life

Quality of life was assessed using (WHOQOL-BREF) the World Health Organization Quality of Life-BREF (WHOQOL-BREF). WHOQOL-BREF is a self-administered questionnaire that assesses the subject's QoL over the previous four weeks.[6] The WHOQOL-BREF is a 26-item multiple-choice questionnaire. It has one item assessing general QoL, one assessing overall health related quality of life (HRQoL), and 24 questions assessing four specific QoL domains. The four specific QoL domains are physical, psychological, social, and environmental. Domain I (Physical Health) has seven questions, Domain II (Psychological) has six questions. Domain III (Social Relationships) has three questions. Domain IV (Environment) has eight questions. The domain of physical health covers issues like pain and discomfort, energy and fatigue, and sleep. The psychological domain includes issues, such as, positive feelings, negative feelings, learning and concentration, bodily image, and self-esteem, while the social domain includes issues like personal relationships, practical social support, and sexual activity. The environmental domain covers issues such as financial resources, healthcare availability, opportunities for acquiring new information and skills, leisure opportunities, and transportation.

Each facet has two to eight items. The questions were asked based on the range scale (1–5), where one indicates very poor, three is neutral, and five is very good.[6] The higher the score, the better the QoL.

2.2.2 Independent Variables

2.2.2.1 Social Demographics

Sociodemographic data, such as age, gender, education level, history of smoking and alcohol use, and marital status was collected.

- Age: categorized into 18–25 years, 26–44 years, 45–59 years, and >60 years.
- Education: categorized into illiterate, primary, secondary, and college.
- Gender: classified as female or male.
- Alcohol and smoking: assessed a yes/no.
- Marital status: classified as married or unmarried.

2.2.2.2 ART Adherence and CD4 Count

Medication adherence was assessed by asking participants how many pills remained after their monthly follow-up visit. The pill count method calculates the medication adherence rate by dividing the number of dosage units dispensed by the prescribed number of dosage units per day multiplied by the number of days between two visits. Adherence was categorized as low (less than 90%) or high (more than 90%). The baseline CD4 counts was obtained from medical records and classified as low (350 cells/mm3) or high (> 350 cells/mm3).

2.2.2.3 Tuberculosis

Tuberculosis status was obtained using electronic medical records. (EMR). Patients with positive sputum test results and an abnormal chest CT scan indicative of tuberculosis were included. Information on the year of TB testing during which they tested positive was collected.

The data on the history or status of medication use was not collected. In the analysis, the TB variable was classified into "smear negative" and "smear positive."

2.3 Data Analysis

The descriptive analysis was conducted to describe participants' demographic characteristics and other clinical variables. Mean and standard deviation (SD) were used to describe relevant variables. The association between overall QoL and specific QoL domains and independent variables such as ART adherence, CD4 counts, and tuberculosis history was conducted using multivariate logistic regression, adjusting for demographic and socioeconomic factors (e.g., age, education, and marriage). The data were considered statistically significant if the p-value was less than 0.05.

3.0 Results

3.1 Participants Characteristics

Table 2 describes the sociodemographic data of the study population. Most PLWH 120 (58%) belonged to the 25–44 age group, and 163 (81.5%) were married. The mean age of the study population was 30.5 (SD = 5.5). Over 104 (50%) were illiterate, and most were women. In terms of use of alcohol and smoking, 76% of the participants reported using alcohol, 84% reported smoking, and 15% reported having a history of smear-positive tuberculosis. Thirty-one (15%) of the 200 participants have a history of smear-positive results, 108 (54%) have less than 350 cells per mm3, and 189 (94%) have good ART adherence.

Table 2: Social demographics and clinical characteristics

Variables	Frequency (200)	Percentage (%)
Age (Mean ± S.D = 30.5 ± 5.5)		
18-25	25	12.5
26-44	120	58
45-59	48	24
>60	7	3.5
Gender		
Female	104	52.0
Male	96	48.0
Marital status		
Married	163	81.5
Unmarried	37	18.5
Education		
Illiterate	104	52
Primary (1-10)	42	21
Secondary (11-12)	39	19.5
College (Above 12)	15	7.5

Alcohol		
Yes	153	76
No	47	24
Smoking		
Yes	169	84
No	31	16
Tuberculosis		
Yes	31	15
No	169	85
CD4 Cell count		
Below 350	108	54
Above 350	92	46
Medication adherence		
Below 90%	12	6
Above 90%	189	94
Year of diagnosis		
2016	47	23.5
2017	38	19
2018	61	30.5
2019	54	27
Status of Tuberculosis		
Latent Tb	21	68
Active TB	10	32

3.2 Overall QoL and QoL Domains

Figure 1 depicts the average scores for overall QoL and the four QoL domains. The mean score of overall QoL was 25.67 (SD = 0.47). The social domain had the highest mean score of 15.1 (SD = 1.86), followed by 13.28 (SD = 1.48) for the environment domain, 11.93 (SD = 3.20) for the psychological domain, and 1.57 (SD = 2.74) for the physical health domain.

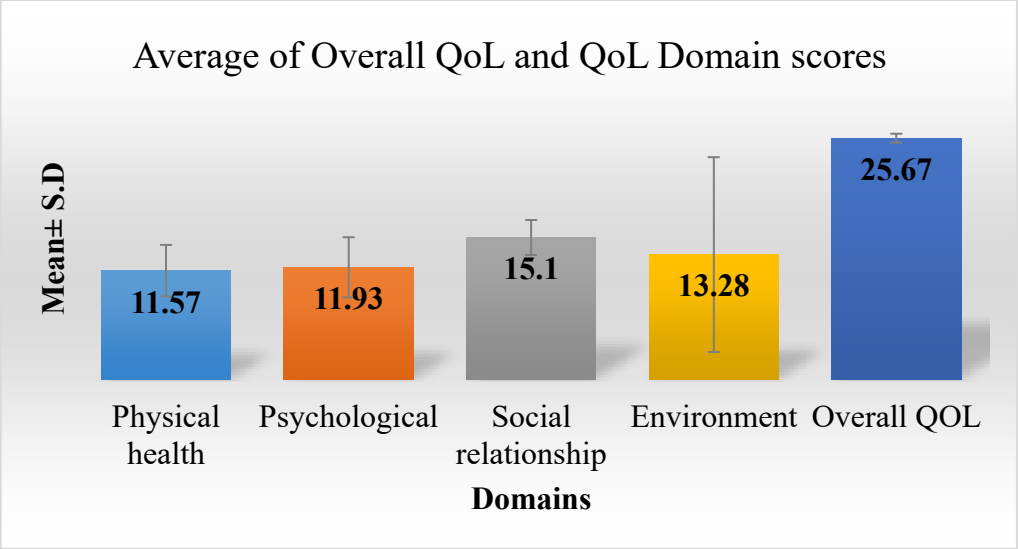

Figure 1: Individual scores of overall QoL and QoL domains

3.3 Subcategories of QoL Domains

Table 3 shows the average scores of each specific item in each domain. The score range is between 1 (poor performance) and 5 (excellent performance). As can be seen, in domain 1, the lowest mean scores were 2.58 in energy (SD = 0.99), ability to perform daily living activities, and sleep, whereas pain and discomfort had the highest mean score of 3.57 (SD = 1.31). In the psychological domain, the mean of self-esteem is 2.69 (SD = 0.95), and the mean of positive feelings is 2.50 (SD = 1.05), resulting in the lowest mean scores, indicating little to moderate satisfaction. In contrast, in social relationships, social support is highly affected. This study resulted in the lowest mean social support scores of 2.68 (SD = 1.81) in the social relationships domain. The mean score of opportunities for acquiring new information and skills was found to be 2.36 (SD = 1.40). Home environment (SD = 3.05) was the most highly satisfied

category in the environment domain, with a mean score of 4.18. In the environmental domain, however, the mean scores for freedom, physical safety, and security were lower.

Table 3: Average scores of subcategories based on individual QoL domains

Domains	Mean (SD)
Physical health (Domain 1)	
Pain and Discomfort	3.575 (1.31)
Medical Treatments	2.915 (1.16)
Energy	2.585 (0.99)
Discomforts	3.265 (0.97)
Sleep	2.7 (1.03)
Ability to Perform Daily Living Activities	2.62 (0.98)
Capacity for Work	2.6 (0.98)
Psychological (Domain 2)	
Positive Feelings	2.50(1.05)
Self–Esteem	2.695 (0.95)
Thinking, Learning, Memory, and Concentration	2.605 (1.03)
Bodily Image and Appearance	3.205 (0.99)
Satisfy with You	2.605 (0.98)
Negative Feelings	4.285 (1.00)
Social Relationships (Domain 3)	
Personal Relationships	3.74 (0.69)
Social Support	2.68 (1.81)
Sexual Activities	3.775 (0.69)
Environmental health (Domain 4)	
Freedom, Physical Safety and Security	2.79 (1.02)
Physical Environment	3.76 (0.67)
Financial Resources	2.99 (0.87)
Opportunities for Acquiring New Information and Skills	2.36 (1.40)
Participation in And Opportunities for Recreation/Leisure	2.795 (1.07)
Home Environment	4.18 (3.05)
Health and Social Care: Accessibility and Quality	3.98 (0.41)
Transport	3.925 (0.47)
Overall Quality of Life and General Health	
Overall Quality of Life	2.535 (1.07)
General Health	2.55 (1.00)

Table 4 shows the results comparing the differences in mean scores between the four QoL domains and other factors such as sex, age, education, marital status, tuberculosis, CD4 count, and ART adherence

For the physical health domain, PLWH aged less than 45 had higher mean scores of the physical health compared to those above 45 years old (p-value > 0.05). Those with a higher level of education also had greater mean score of physical health compared to those with lower education level (p=> 0.05). **For the psychological domain**, those with a history of smear-positive tuberculosis had significantly higher mean score compared to those with negative TB (p = 0.036). **For the social relationship domain,** those with age group less than 45 years compared to those above 45 years old (p = 0.0035). Those with CD4 counts more than 350 cells/mm3 individuals had a significantly higher mean score compared to those with CD4 counts less than 350 cells/mm3 (p=0.002*). **For the environment domain**, smokers had significantly higher mean score compared to non-smokers (p = 0.006). Those with a history of smear-positive tuberculosis had significantly higher mean score compared to those with negative TB (p = 0.001).

Table 4: Comparison of different independent variables with QoL domains

Factors	Domain 1	Domain 2	Domain 3	Domain 4	Total
	Mean ± SD				
Total	19.24 ± 0.31	15.59 ± 0.30	10.21 ± 0.15	26.55 ± 0.21	17.87 ± 0.57
Sex					
Male	19.42 ± 0.55	16.02 ± 0.34	10.5 ± 0.25	26.58 ± 0.22	18.10 ± 0.26
Female	19.12 ± 0.93	15.32 ± 0.24	10.01 ± 0.4	26.63 ± 0.24	17.39 ± 0.58
P Value	0.342	0.238	0.082	0.557	0.29
Age (years)					
≤45	19.12 ± 0.56	15.86 ± 0.3	10.5 ± 0.4	26.75 ± 0.27	18.46 ± 0.323
≥45	18.85 ± 1.06	15.24 ± 0.27	9.89 ± 0.26	26.43 ± 0.11	17.09 ± 0.323
P value	0.38	0.243	0.035*	0.138	0.319
Education					
Primary	18.82 ± 1.12	14.63 ± 0.52	9.47 ± 0.48	26.18 ± 0.3	17.10 ± 0.49
College	19.19 ± 0.36	15.33 ± 0.34	9.76 ± 0.63	27.06 ± 1.12	18.41 ± 0.21

P value	0.241	0.238	0.28	<0.155	0.312
Marital Status					
Unmarried	19.37 ± 0.63	15.65 ± 0.59	12 ± 5.65	27.05 ± 1.39	11.75±0.99
Married	18.95 ± 0.8	15.67 ± 0.65	8.6 ± 2.8	26.55 ± 1.34	14.94 ± 1.40
P value	0.374	1.187	0.004*	0.725	0.08
CD4 cell count					
≤350	18.23 ± 1.22	15.10 ± 0.57	9.18 ± 2.81	26.27 ± 1.34	16.81 ± 1.44
≥350	18.78 ± 0.91	15.38 ± 0.28	9.31 ± 2.42	26.69 ± 1.36	17.85 ± 0.97
P value	0.144	<0.236	0.002*	0.615	<0.236
Tuberculosis					
Yes	18.37 ± 1.24	15.28 ± 0.36	9.41 ± 2.87	26.66 ± 1.78	17.45 ± 1.26
No	18.54 ± 1.35	14.50 ± 0.45	8.45 ± 2.09	25.89 ± 0.45	16.78 ± 0.98
P Value	0.059	0.036*	0.21	0.001*	0.122
Alcohol					
Yes	18.43 ± 1.41	14.86 ± 0.42	8.91 ± 2.64	26.54 ± 0.94	17.50 ± 1.35
No	18.71 ± 1.1	15.14 ± 0.71	9.04 ± 2.25	26.96 ± 0.96	14.96 ± 1.26
P value	0.9	0.205	0.901	0.497	0.978
Smoking					
Yes	19.42 ± 0.38	16.01 ± 0.64	9.93 ± 2.03	27.47 ± 1.0	18.19 ± 1.01
No	17.68 ± 1.47	14.23 ± 0.96	8.2 ± 2.7	26.18 ± 1.0	16.60 ± 1.53
P value	0.45	0.118	0.205	0.006*	0.194
Medication adherence					
Below 90%	18.98 ± 0.73	15.58 ± 1.0	9.5 ± 2.29	27.3 ± 1.02	17.84 ± 1.26
Above 90%	18.86 ± 1.46	15.4 ± 1.1	9.24 ± 2.53	26.66 ± 1.23	17.54 ± 1.58
P value	0.75	0.58	0.472	0.096	0.196

Table 5: Multivariate linear regression analysis of the physical health domain in PLWH

Dependent variable	Independent variable	Coefficient	(95% CI)	P value
Domain 1 Physical Health	Gender (Male vs Female)	0.92	(0.09, 1.76)	0.03
	Tuberculosis	1.16	(0.18, 2.14)	0.02
	Age	-0.03	(-0.06, 0.01)	0.12
	Education (Illiterates vs Primary)	0.08	(-0.28, 0.45)	0.66
	Marital status (Single vs Married)	0.54	(-0.19, 1.28)	0.15
	Alcohol	0.85	(-0.4, 2.09)	0.18
	Smoking	0.12	(-1.25, 1.5)	0.86
	CD4 counts	0.0003	(0, 0)	0.17
	Adherence	-0.01	(-0.09, 0.07)	0.76

As shown in Table 5, there is no significant association found between gender, TB positive and physical health domain of QoL ($p>0.005$).

Table 6: Multivariate linear regression analysis of the psychological domain in PLWH

Dependent variable	Independent variable	Coefficient	(95% CI)	P value
Domain 2 Psychological	Gender (Male vs Female)	1	(0.07, 1.94)	0.04
	Tuberculosis	0.4	(-0.7, 1.49)	0.48
	Age	-0.03	(-0.07, 0.01)	0.19
	Education (Illiterates vs Primary)	0.07	(-0.34, 0.47)	0.75
	Marital status (Single vs Married)	0.91	(0.09, 1.73)	0.03
	Alcohol	0.09	(-1.3, 1.49)	0.89
	Smoking	-0.04	(-1.58, 1.5)	0.96
	CD4 counts	0.0007	(0,0)	0.05*
	Adherence	0.01	(-0.08,0.11)	0.76

As shown in Table 6, those with high CD4 Cell count are significantly associated with the better psychological domain (β: 0.0007, CI: (0,0), *p*=0.05*).

Table 7: Multivariate linear regression analysis of the social relationship domain in PLWH

Dependent variable	Independent variable	Coefficient	(95% CI)	P value
Domain 3 Social Relationship	Gender (Male vs Female)	0.41	(-0.54, 1.36)	0.4
	Tuberculosis	1.44	(0.33, 2.56)	0.01
	Age	-0.01	(-0.05, 0.03)	0.73
	Education (Illiterates vs Primary)	-0.11	(-0.53, 0.3)	0.59
	Marital status (Single vs Married)	-1.05	(-1.89, -0.21)	0.01*
	Alcohol	-0.45	(-1.87, 0.97)	0.54
	Smoking	0.87	(-0.7, 2.44)	0.28
	CD4 counts	0.0001	(0, 0)	0.44
	Adherence	0.02	(-0.08, 0.11)	0.71

As shown in Table 7, those who were currently not married are significantly associated with the better social relationship domain (β: -1.05, CI: (-1.89, -0.21), *p*=0.01*).

Table 8: Multivariate linear regression analysis of environment domain in PLWH

Dependent variable	Independent variable	Coefficient	(95% CI)	P value
Domain 4 Environment	Gender (Male vs Female)	0.41	(-3.1, 3.92)	0.82
	Tuberculosis	-0.5	(-4.62, 3.63)	0.81
	Age	-0.02	(-0.17, 0.12)	0.74
	Education (Illiterates vs Primary)	0.25	(-1.29, 1.78)	0.75
	Marital status (Single vs Married)	-0.36	(-3.45, 2.73)	0.82
	Alcohol	-0.47	(-5.71, 4.78)	0.86
	Smoking	-4	(-9.79, 1.8)	0.18
	CD4 counts	0.0001	(0, 0)	0.85
	Adherence	0.16	(-0.19, 0.5)	0.37

As shown in Table 8 men, those with high CD4 counts, and adherence to ART are positively associated with the environment domain. However, there was no significant association between the environment domain and sociodemographic factors.

Table 9: Multivariate linear regression analysis of overall QoL in PLWH

Dependent variable	Independent variable	Coefficient	(95% CI)	P value
Overall QoL	Gender (Male vs Female)	0.67	(-1.21, 2.54)	0.49
	Tuberculosis	0.33	(-1.87, 2.54)	0.77
	Age	-0.03	(-0.11, 0.05)	0.51
	Education (Illiterates vs Primary)	0.16	(-0.66, 0.99)	0.69
	Marital status (Single vs Married)	0.09	(-1.56, 1.75)	0.91
	Alcohol	0.19	(-2.61, 2.99)	0.89
	Smoking	-1.94	(-5.03, 1.16)	0.22
	CD4 counts	0.0001	(0, 0)	0.9
	Adherence	0.07	(-0.11, 0.26)	0.45

As shown in Table 9 there is a positive association between those who were males, TB positive, alcohol use, higher education, being unmarried, high CD4 counts, and high ART adherence are positively associated with overall QoL (p>0.05). However, there was no significant association between overall QoL and the above-mentioned sociodemographic factors.

4.0 Discussion

4.1 Sociodemographic

This study demonstrates that most PLWH are young adults aged 25–44 years, married, female, and illiterate. The results are similar to the studies conducted by Shriharsha et al. in 2019 and Nyamathi et al., in 2018.[7, 8, 10, 25, 52] These results suggest that low education level may continue contribute to the risk of HIV. To address these issues, it is essential to ensure that all people have access to comprehensive HIV prevention, care, and treatment services. This includes providing education about HIV and addressing HIV-related stigma and discrimination. In addition, targeted testing, treatment, and support services should be available to women and other vulnerable populations. In developing countries, females may have to do more household work compared to males. Besides improving gender equality is important. The interventions should target married individuals, and women to improve their QoL. Finally, it is essential to improve health literacy among PLWH, such as providing educational materials in multiple languages and conducting health education programs.

4.2 Quality of Life

Findings from this study, reported the lowest mean scores in the physical and psychological domains, indicating poor QoL consistent with the studies conducted by Agarwal et al. in 2012 and Dasgupta et al. 2018 in Malda, West Bengal.[21, 31, 40, 41, 42] This study suggests that interventions

should prioritize improving physical health to improve the overall QoL. The results indicate that older adults have a lower QoL in the physical and psychological domains. The results suggest improving HIV/AIDS services and access to ART. This includes improving the availability of ART and affordability of HIV drugs in more rural and remote areas and strengthening the health infrastructure to provide better access to HIV care and support services. To effectively combat HIV/AIDS, there is a need to raise public awareness and reduce stigma and discrimination against PLWH. Additionally, psychosocial support should be provided to PLWH to help them manage the psychological impact of PLWH. Therefore, health promotion activities should focus on increasing physical activity, improving nutrition, and providing access to services that can address mental health issues to improve their overall QoL.

4.2.1 QoL and CD4 Count

The study findings show that high CD4 counts is significantly associated with the better psychological domain. The study results were in accordance with a study conducted in Zhejiang province, China, in 2014, which examined the QoL of 2479 PLWH and found that a higher CD4 counts tend to have better QoL than other PLWH.[5, 36, 39] Another study conducted in 2018 by Biraguma J. et al. involving 794 PLWH in sub-Saharan Africa (SSA) revealed that individuals with low CD4 counts had poorer physical health related QoL.[17] This study's results suggest the need to provide energy-boosting activities, developing strategies to improve self-esteem, providing social support, and improving physical safety. This could aim to target mental health services, health promotion activities, and supportive care for PLWH. Additionally, further research is needed to understand the underlying mechanisms of why these factors are associated with better psychological well-being in PLWH. This could involve providing education and interventions on

communication skills, building support networks, and connecting individuals to resources and services.

This study results also suggest that those who were currently not married, were associated with a better social relationship domain of QoL**.** In 2021 a study among 109 people living with HIV in India was conducted; Subramanian et al. found that those with higher CD4 counts had reported higher QoL which is consistent with our study.[15]

4.2.2 QoL and Tuberculosis

This study revealed that although there was no significant correlation, a positive association was found between a history of TB and improved QoL among PLWH. However, those infected by the disease have often faced a lower QoL and, those who survived TB often have better physical and mental health and improved economic security than those without TB. Active TB has poorer QoL than latent TB.[28] A study in 2019, at the ART center Mangalore over six months among 104 PLWH resulted in HIV-TB coinfected patients had a lower mean score in all domains than only PLWH.[28] This study results were inconsistent with majority of studies among PLWH. One possible reason could be smaller sample size which could have affected the results. It is important to collect further information.

4.2.3 QoL and ART Adherence

The study findings demonstrate that there was no significant relationship between ART adherence and QoL. However, ART adherence is positively associated with the environment domain and are positively associated with overall QoL in PLWH. Additionally, it was found that

ART adherence could improve QoL.[44] Another study conducted by Ekstrand et al. in 2018 among rural women living with HIV in South India revealed a correlation between decreased ART adherence and a decreased QoL.[14] This could target mental health services, health promotion activities, and supportive care for PLWH. Additionally, further research is needed to understand the underlying mechanisms of why these factors are associated with better psychological well-being in PLWH. This could involve providing education and interventions on communication skills, building support networks, and connecting individuals to resources and services.

PLWH can receive psychological support and counseling services tailored to their needs to help them cope with the challenges of HIV infection. While the study findings found that PLWH reported high scores in the social and environmental domains, the scores in the physical and psychological domains were low, suggesting that interventions focus on improving these aspects to improve QoL among this population. Physical health policies focusing on early diagnosis and treatment of HIV can help reduce their risk of developing severe health conditions, such as AIDS. Finally, more research is needed to understand the effects of sociodemographic factors on QoL in PLWH.

4.3 Implications for Public Health Programs

Access to care and treatment, encouraging HIV testing, and raising knowledge of HIV should be the main objectives of public health initiatives for PLWH in India. The programs should emphasize encouraging safe sexual practices, offering HIV prevention, and testing services, expanding access to low-cost antiretroviral medications, offering psychosocial support, and creating a secure environment for PLWH to access and receive services. Additionally, programs

should address gender inequity, gender-based violence, and the stigma and discrimination that PLWH endure. Taking measures to ensure PrEP reaches people who need and desire it, including but not limited to the daily medication that prevents HIV. Establishing a network of organizations that are all community-driven that work to support and advocate for those living with HIV. Initiatives should also work to create an environment that allows PLWH to access complete healthcare services and participate in deciding how to implement HIV and AIDS programs.

4.4 Implication for Training of Health Care Professionals

Educating healthcare professionals to provide quality care for PLWH is essential. Comprehensive care includes medical and psychological care and referrals to support services and resources. Healthcare professionals must stay updated with information on the most current treatments available, understand the psychological and social issues that come with the diagnosis, be aware of the legal implications, and practice ethical considerations while treating those affected. They should also be able to counsel and educate those affected by HIV/AIDS. Finally, healthcare professionals in India must be able to provide culturally competent care by understanding the unique cultural, social, and religious needs of those affected by the disease and providing treatment accordingly.

4.5 Implications for Public Health Policy

In response to the HIV epidemic, the Indian government has adopted a comprehensive national response program that aims to reduce the transmission of HIV and improve care and support for PLHIV. This program, called the National AIDS Control Programme (NACP), focuses on prevention, care and support, and systems strengthening.[5] This implicates the need to reduce the spread of HIV in India further by addressing the need of following public health policies.

Increase access to HIV testing services: HIV testing services should be increased, particularly in rural and low-income areas. This can be achieved through health facility-based testing services, community-based testing services, and mobile testing units. Strengthen the capacity of healthcare providers: healthcare providers, including doctors, nurses, and community health workers, should be provided with adequate training and resources to provide care and support to PLWH effectively.

Awareness and knowledge about HIV and AIDS: Awareness and knowledge about HIV and AIDS should be increased, particularly among at-risk populations. This can be achieved through increased access to HIV prevention education in schools and other public settings.

Address the stigma and discrimination associated with HIV: Stigma and discrimination towards PLWH should be addressed through laws and policies that protect the rights of PLWH and promote their inclusion in society.

Improve access to antiretroviral therapy: Access to antiretroviral therapy should be improved, particularly among at-risk populations and rural and low-income areas.

Strengthen the monitoring and evaluation of HIV prevention efforts: It is essential to monitor and evaluate the effectiveness of HIV prevention efforts in India. This can be done by assessing the coverage of HIV prevention services, the uptake of HIV tests, the impact of targeted

interventions, and the effectiveness of HIV prevention campaigns. The Government of India should also establish a system to track the progress toward achieving the targets set by the National AIDS Control Programme.

Increase political commitment and resources for HIV prevention: To effectively address the HIV epidemic in India, there is a need to increase political commitment and resources for HIV prevention programs. This can be done by increasing funding for HIV prevention programs and ensuring that the programs are well-resourced and adequately staffed. The Government of India should also ensure that HIV prevention efforts are well-coordinated and integrated with other public health programs.

Expand access to HIV prevention services: Access to HIV prevention services must be expanded to ensure that all individuals at risk of HIV infection are reached. This can be done by increasing the availability of voluntary counseling and testing services, expanding access to antiretroviral therapy, providing HIV prevention education, and scaling up access to harm reduction services.

Expand access to HIV testing: Access to and uptake of HIV testing is low in many parts of India. Integrating HIV testing into health care services and increasing awareness about the importance of HIV testing can help to ensure that more people know their HIV status and can access appropriate care and treatment.

Improve access to HIV prevention services for adolescents: Adolescents are particularly vulnerable to HIV, yet access to HIV prevention services is often inadequate in many parts of India. Efforts to improve access to HIV prevention services for adolescents, including providing accurate information about HIV and promoting condom use, can help to reduce HIV transmission among this population.

5.0 Limitations

This study had several limitations. First, recall bias may affect the information obtained because the WHOQOL-BREF instrument measures QoL over four weeks. Second, because this is a cross-sectional survey, we cannot draw any causal relationship between sociodemographic and disease-related variables and QoL. Therefore, a prospective study is required to confirm this study's outcomes. We may have overlooked some information while collecting the data, which could have influenced the results. Thirdly, the study sample size is small, which is not representative of the whole population, and the results cannot be generalized to the whole PLWH population in India. Finally, the study needed to collect information on important variables such as stigma, discrimination, co-morbidities, and economic and social support, which could have significantly impacted QoL.

6.0 Conclusion

The positive and significant relationship is associated with those who were currently not married and having a higher CD4 counts and QoL among this population of PLWH in Bhimavaram suggests interventions addressing these factors may help PLWH improve their QoL. The interventions include improving access to HIV prevention and care services, as well as improving access to ART treatment among this population to women. Furthermore, efforts are needed to reduce gender disparities in healthcare access in India and promote positive mental health and physical well-being for PLWH. These interventions can improve the overall QoL for PLWH in Bhimavaram.

Appendix A Informed Consent Form

Appendix A.1 : 1 of 2 Informed Consent Form

INFORMED CONSENT FORM

I have read the foregoing information or it has been read to me. I have had the opportunity to ask questions about it and any questions i have asked have been answered to my satisfaction. I consent voluntarily to participate as a participant in this research.

Name of the participant:

Signature of the participant:

Date:

If illiterate (witness)

I have witnessed the accurate reading of the consent form to the potential participant and the individual has had the opportunity to ask questions. I confirm that the individual has given consent freely.

Name of the witness: Thumb print of participant

Signature of the witness:

Date:

I have accurately read witnessed the accurate reading of the consent form to the potential participant and the individual has had the opportunity to ask questions. I confirm that the individual has given consent freely.

Name of the researcher:

Signature of the researcher:

Date:

Appendix A.2 : 2 of 2 Informed Consent Form

అంగీకార పత్రము

నేను ఈ అధ్యయనమునకు సంబంధించిన వివరాలను చదివాను (లేదా) నాకు ఈ అధ్యయమునకు సంబంధించిన వివరాలు చదివి వినిపించబడినవి. నా సందేహములు వ్యక్తము చేయుటకు నాకు సమయమివ్వబడినది మరియు వాటికి తగిన సమాధానము పొందియున్నాను. నేను ఈ అధ్యయనంలో పాల్గొనుటకు స్వచ్ఛంధంగా అంగీకారము తెలుపుచున్నాను.

పాల్గొనువారి పేరు :

పాల్గొను వారి సంతకం :

తేదీ :

నిరక్షరాస్యులకు

అధ్యయనంనకు సంబంధించిన వివరాలను పాల్గొను వారికి సవివరముగా చదివి వినిపించారని మరియు పాల్గొను వారికి తమ సందేహములు వ్యక్తం చేయుటకు సమయమివ్వబడిందని సాక్ష్యమిస్తున్నాను. కావున ఈ వ్యక్తి అధ్యయనంలో పాల్గొనుటకు తన అంగీకారం తెలిపియున్నారని రూఢీపరచుచున్నాను.

సాక్షి పేరు :

సాక్షి సంతకం : పాల్గొను వారి వేలిముద్ర

తేదీ :

నేను ఈ వ్యక్తికి అంగీకార పత్రమును చదివి వినిపించాను/చదవబడిందని సాక్ష్యమిచ్చుచున్నాను. వారికి తమ సందేహములు వ్యక్తం చేయుటకు అవకాశమివ్వబడింది. కావున ఈ వ్యక్తి ఈ అధ్యయనంలో పాల్గొనుటకు అంగీకారం తెలిపియున్నారని రూఢీపరచుచున్నాను.

పరిశోధకుని పేరు :

పరిశోధకుని సంతకం :

Appendix B

Appendix B.1 : 1 of 2 Data Collection Form

Shri Vishnu College of Pharmacy, Bhimavaram- 534 202.

"Drug Utilization Patterns and Quality of Life in HIV Patients"

VISHNU UNIVERSAL LEARNING

DATA COLLECTION FORM

PATIENT ID: HIV0114 AGE (yrs.): GENDER: IP/OP: BREF: YES/NO

ADMITTED ON: TYPES OF HIV: HIV I HIV II both

SOCIAL HISTORY:

Residence:_____Education: IL PS SS CLG Marital Status: M S

Alcohol: YES, NO Smoking: YES NO

Pregnant Now: YES ☐ NO ☐

Trimester: 1ST ☐ 2ND ☐ 3rd ☐

Family History of HIV: Father ☐ Mother ☐ Spouse ☐ Children ☐

MODE OF TRANSMISSION / RISK FACTORS FOR HIV

Heterosexual	☐	Blood transfusion	☐	Unknown	☐
MSM	☐	Mother To Child	☐	Commercial sex work	☐
Injecting Drug Use	☐	Probable safe injection	☐	Migrant ☐Trucker	☐

TUBERCULOSIS TREATMENT (RNTCP) DURING HIV CARE

EPISODE 1			EPISODE 2
DISEASE CLASS ☐ Pulmonary TB ☐ Smear positive ☐ Smear Negative ☐ Extra pulmonary ☐ Site: …. ☐ Past history of TB	**TB REGIMEN** ☐ Category I ☐ Category II ☐ Other specify: ☐ Non-DOTS: ☐ Rx for MDR:	**Rx OUTCOME** ☐ Cured ☐ Rx completed ☐ Rx failure ☐ Died ☐ Transferred out	**TYPE:** Rx CATEGORY: Rx outcome:

Appendix B.2 : 2 of 2 Data Collection Form

Anti-Retroviral Treatment and Follow Up Visits:

Height(cms): Initial Weight(kgs): BMI: Viral load:

Date of visit	WHO clinical stage	CD4+	Type of OI'S	Antiretroviral drugs(regimen)	Adherence to ART (%)	Remarks	TB treatment Y/N	ART ADR's if any
First visit								
At start of ART								

Reasons to stop

Side Effects ☐ Pregnancy ☐ Newly Diagnosed TB ☐ ATT Completed ☐ others ☐

Reason for changing of regimen:

Clinical failure ☐ Immune failure ☐ Virological failure ☐

Reasons for substitute:

Side effects ☐ Pregnancy ☐ Newly diagnosed TB ☐ ATT completed ☐ others ☐

Others:

Appendix C WHOQOL BREF

Appendix C.1 : 1 of 4 WHOQOL BREF

WHO/MSA/MNH/PSF/97.4
English only
Distr.: Limited

WHOQOL-BREF

PROGRAMME ON MENTAL HEALTH
WORLD HEALTH ORGANIZATION
GENEVA

For office use only

	Equations for computing domain scores	Raw score	Transformed scores*	
Domain 1	(6-Q3) + (6-Q4) + Q10 + Q15 + Q16 + Q17 + Q18 ☐ + ☐ + ☐ + ☐ + ☐ + ☐ + ☐	=	**4-20**	**0-100**
Domain 2	Q5 + Q6 + Q7 + Q11 + Q19 + (6-Q26) ☐ + ☐ + ☐ + ☐ + ☐ + ☐	=		
Domain 3	Q20 + Q21 + Q22 ☐ + ☐ + ☐	=		
Domain 4	Q8 + Q9 + Q12 + Q13 + Q14 + Q23 + Q24 + Q25 ☐ + ☐ + ☐ + ☐ + ☐ + ☐ + ☐ + ☐	=		

* Please see Table 4 on page 10 of the manual, for converting raw scores to transformed scores.

Appendix C.2 : 2 of 4 WHOQOL BREF

I.D. number

ABOUT YOU

Before you begin we would like to ask you to answer a few general questions about yourself: by circling the correct answer or by filling in the space provided.

What is your **gender**? Male Female

What is you **date of birth**? _____ / _____ / _____
Day / Month / Year

What is the highest **education** you received?
None at all
Primary school
Secondary school
Tertiary

What is your **marital status**?
Single Separated
Married Divorced
Living as married Widowed

Are you currently **ill**? Yes No

If something is wrong with your health what do you think it is?_____illness/ problem

Instructions

This assessment asks how you feel about your quality of life, health, or other areas of your life. **Please answer all the questions.** If you are unsure about which response to give to a question, **please choose the one** that appears most appropriate. This can often be your first response.

Please keep in mind your standards, hopes, pleasures and concerns. We ask that you think about your life **in the last two weeks.** For example, thinking about the last two weeks, a question might ask:

		Not at all	Not much	Moderately	A great deal	Completely
	Do you get the kind of support from others that you need?	1	2	3	4	5

You should circle the number that best fits how much support you got from others over the last two weeks. So you would circle the number 4 if you got a great deal of support from others as follows.

		Not at all	Not much	Moderately	A great deal	Completely
	Do you get the kind of support from others that you need?	1	2	3	4	5

You would circle number 1 if you did not get any of the support that you needed from others in the last two weeks.

Appendix C.3 : 3 of 4 WHOQOL BREF

Please read each question, assess your feelings, and circle the number on the scale for each question that gives the best answer for you.

		Very poor	Poor	Neither poor nor good	Good	Very good
1(G1)	How would you rate your quality of life?	1	2	3	4	5

		Very dissatisfied	Dissatisfied	Neither satisfied nor dissatisfied	Satisfied	Very satisfied
2 (G4)	How satisfied are you with your health?	1	2	3	4	5

The following questions ask about **how much** you have experienced certain things in the last two weeks.

		Not at all	A little	A moderate amount	Very much	An extreme amount
3 (F1.4)	To what extent do you feel that physical pain prevents you from doing what you need to do?	1	2	3	4	5
4(F11.3)	How much do you need any medical treatment to function in your daily life?	1	2	3	4	5
5(F4.1)	How much do you enjoy life?	1	2	3	4	5
6(F24.2)	To what extent do you feel your life to be meaningful?	1	2	3	4	5

		Not at all	A little	A moderate amount	Very much	Extremely
7(F5.3)	How well are you able to concentrate?	1	2	3	4	5
8 (F16.1)	How safe do you feel in your daily life?	1	2	3	4	5
9 (F22.1)	How healthy is your physical environment?	1	2	3	4	5

The following questions ask about **how completely** you experience or were able to do certain things in the last two weeks.

		Not at all	A little	Moderately	Mostly	Completely
10 (F2.1)	Do you have enough energy for everyday life?	1	2	3	4	5
11 (F7.1)	Are you able to accept your bodily appearance?	1	2	3	4	5
12 (F18.1)	Have you enough money to meet your needs?	1	2	3	4	5
13 (F20.1)	How available to you is the information that you need in your day-to-day life?	1	2	3	4	5
14 (F21.1)	To what extent do you have the opportunity for leisure activities?	1	2	3	4	5

		Very poor	Poor	Neither	Good	Very good

Appendix C.4 : 4 of 4 WHOQOL BREF

				poor nor good		
15 (F9.1)	How well are you able to get around?	1	2	3	4	5

The following questions ask you to say how **good or satisfied** you have felt about various aspects of your life over the last two weeks.

		Very dissatisfied	Dissatisfied	Neither satisfied nor dissatisfied	Satisfied	Very satisfied
16 (F3.3)	How satisfied are you with your sleep?	1	2	3	4	5
17 (F10.3)	How satisfied are you with your ability to perform your daily living activities?	1	2	3	4	5
18(F12.4)	How satisfied are you with your capacity for work?	1	2	3	4	5
19 (F6.3)	How satisfied are you with yourself?	1	2	3	4	5
20(F13.3)	How satisfied are you with your personal relationships?	1	2	3	4	5
21(F15.3)	How satisfied are you with your sex life?	1	2	3	4	5
22(F14.4)	How satisfied are you with the support you get from your friends?	1	2	3	4	5
23(F17.3)	How satisfied are you with the conditions of your living place?	1	2	3	4	5
24(F19.3)	How satisfied are you with your access to health services?	1	2	3	4	5
25(F23.3)	How satisfied are you with your transport?	1	2	3	4	5

The following question refers to **how often** you have felt or experienced certain things in the last two weeks.

		Never	Seldom	Quite often	Very often	Always
26 (F8.1)	How often do you have negative feelings such as blue mood, despair, anxiety, depression?	1	2	3	4	5

Did someone help you to fill out this form?.....

How long did it take to fill this form out?.....

Do you have any comments about the assessment?

.....

.....

THANK YOU FOR YOUR HELP

Bibliography

1. Srikanth, B. A., Babu, S. C., Yadav, H. N., & Jain, S. K. (2012). Incidence of adverse drug reactions in human immune deficiency virus-positive patients using highly active antiretroviral therapy. Journal of Advanced Pharmaceutical Technology & Research, 3(1), 62. doi: 10.4103/2231-4040.93557

2. UNAIDS,(2021).CONFRONTINGINEQUALITIES, at: https://www.unaids.org/sites/default/files/media_asset/2021-global-aids-update_en.pdf, retrieved on: 21/09/2022

3. UNAIDS.GlobalHIV&AIDSstatistics-Factsheet. https://www.unaids.org/en/resources/fact-sheet

4. UNAIDS.Coreepidemiologyslides. retrieved from: https://www.unaids.org/en/resources/documents/2021/core-epidemiology-slides.

5. NACO, (2022). Surveillance, retrieved from: http://naco.gov.in/surveillance-epidemiology- 0

6. World Health Organization. (1998). Program on mental health: WHOQOL user manual, 2012revision. WorldHealthOrganization. https://apps.who.int/iris/handle/10665/77932

7. Sarkar, T., Karmakar, N., Dasgupta, A., & Saha, B. (2019). Quality of life of people living with HIV/AIDS attending an antiretroviral clinic in the center of excellence in HIV care in India. Journal of education and health promotion, 8, 226. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6905283/

8. Andersson, G. Z., Reinius, M., Eriksson, L. E., Svedhem, V., Esfahani, F. M., Deuba, K., & Ekström, A. M. (2020). Stigma reduction interventions in people living with HIV to improve health-related quality of life. The Lancet HIV, 7(2), e129-e140. https://doi.org/10.1016%2FS2352-3018(19)30343-1

9. Gebremichael, D.Y., Hadush, K.T., Kebede, E.M. *et al.* Gender difference in health-related quality of life and associated factors among people living with HIV/AIDS attending antiretroviral therapy at public health facilities, western Ethiopia: a comparative cross-sectional study. *BMC Public Health* **18**, 537 (2018). https://doi.org/10.1186/s12889-018-5474-x

10. Shriharsha, C., & Rentala, S. (2019). Quality of life among people living with HIV/AIDS and its predictors: A cross-sectional study at ART center, Bagalkot, Karnataka. *Journal of familymedicineandprimarycare*, *8*(3),1011–1016. https://doi.org/10.4103/jfmpc.jfmpc_411_18

11. Manjunath, S. R., Hiremath, R. N., Kumar, R., Khera, A., & Viswanath, K. (2022). Revisiting "Do People Living with HIV/AIDS Have Better Quality of Life"–Findings from a cross-sectional study. https://www.marinemedicalsociety.in/preprintarticle.asp?id=357924

12. Sun W, Wu M, Qu P, Lu C, Wang L (2013) Quality of Life of People Living with HIV/AIDS under the New Epidemic Characteristics in China and the Associated Factors. PLoS ONE 8(5): e64562. https://doi.org/10.1371/journal.pone.0064562

13. Madhumithra, D., Saya, G. K., Olickal, J. J., Kanungo, S., & Chinnakali, P. (2021). Quality of life and its determinants among sewage workers: A cross-sectional study in Puducherry, South India. *Nigerian Postgraduate Medical Journal*, *28*(1), 57. https://www.npmj.org/article.asp?issn=1117-1936;year=2021;volume=28;issue=1;spage=57;epage=61;aulast=Madhumithra

14. Ekstrand, M. L., Heylen, E., Mazur, A., Steward, W. T., Carpenter, C., Yadav, K., ... & Nyamathi, A. (2018). The role of HIV stigma in ART adherence and quality of life among rural women living with HIV in India. AIDS and Behavior, 22(12), 3859-3868. https://doi.org/10.1007%2Fs10461-018-2157-7

15. Subramanian, A., Mohan, A., Nandi, P. K., & Rajeshwari, K. (2021). Perceived social support, depression and their impact on quality of life of people living with HIV in India. AIDS care, 33(10), 1329–1334. doi: 10.1080/09540121.2020.1810620
16. Hailu T, Yitayal M, Yazachew L. Health-Related Quality of Life and Associated Factors Among Adult HIV Mono-Infected and TB/HIV Co-infected Patients in Public Health Facilities in Northeast Ethiopia: A Comparative Cross-Sectional Study. Patient Prefer Adherence. 2020; 14:1873-1887. https://doi.org/10.2147/PPA.S269577

17. Biraguma, J., Mutimura, E., & Frantz, J. M. (2018). Health-related quality of life and associated factors in adults living with HIV in Rwanda. SAHARA J: journal of Social AspectsofHIV/AIDSResearchAlliance, 15(1),110–120. https://doi.org/10.1080/17290376.2018.1520144

18. Jiang, T., Zhou, X., Wang, H., Luo, M., Pan, X., Ma, Q., & Chen, L. (2019). Psychosocial factors associated with quality of life in young men who have sex with men living with HIV/AIDS in Zhejiang, China. International Journal of Environmental Research andPublic Health, 16(15), 2667. http://dx.doi.org/10.3390/ijerph16152667

19. Birore, C. M., Wu, L., Abrefa-Gyan, T., & Lewis, M. W. (2022). Social Support and Quality of Life Among People Living With HIV/AIDS (PLWHA) in Ghana. Journal of Family Issues, 43(8), 2159-2180. https://doi.org/10.1177/0192513X211030046

20. Zeleke Negera, G., & Ayele Mega, T. (2019). Health-related quality of life among admitted HIV/AIDS patients in selected Ethiopian tertiary care settings: a cross-sectional study. The Open Public Health Journal, 12(1). doi: 10.2174/1874944501912010532

21. Dasgupta, P., Mukhopadhyay, S., & Saha, D. (2018). Assessment of quality of life among human immunodeficiency virus/acquired immunodeficiency syndrome patients: A studyat

antiretroviral therapy center at Malda, West Bengal, India. *Archives of Medicine and Health Sciences*, *6*(2), 208. doi: 10.4103/amhs.amhs_101_18

22. Torres, T. S., Harrison, L. J., La Rosa, A. M., Lavenberg, J. A., Zheng, L., Safren, S. A., & Hughes, M. D. (2018). Quality of life among HIV-infected individuals failing first-line antiretroviral therapy in resource-limited settings. AIDS care, 30(8), 954-962, https://doi.org/10.1080/09540121.2018.1427207

23. Li Y, Guo Y, Hong YA, Zeng C, Zeng Y, Zhang H, Zhu M, Qiao J, Cai W, Li L, Liu C. Mediating Effects of Stigma and Depressive Symptoms in a social media-Based Intervention to Improve Long-term Quality of Life Among People Living With HIV: Secondary Analysis of a Randomized Controlled Trial. J Med Internet Res. 2021 Nov 9;23(11): e27897. doi: 10.2196/27897. PMID: 34751654; PMCID: PMC8663519.

24. Lalhruaimawii, I., Danturulu, M. V., Rai, S., Chandrashekar, U. K., & Radhakrishnan, R. (2022). Determinants of stigma faced by people living with Human Immunodeficiency Virus: A narrative review from past and present scenario in India. *Clinical Epidemiology and Global Health*, 101117. doi: https://doi.org/10.1016/j.cegh.2022.101117

25. Wani, M. A. (2020). Social support, self-esteem, and quality of life among people living with HIV/AIDS in Jammu & Kashmir India. *Anales de Psicología/Annals of Psychology*, *36*(2), 232-241. https://doi.org/10.6018/analesps.351111

26. Desai, K. T., Patel, P. B., Verma, A., & Bansal, R. K. (2020). Environment and psychosocial factors are more important than clinical factors in determining the quality of lifeof HIV-positive patients on antiretroviral therapy. *Tropical Doctor*, *50*(3), 180-186. doi: 10.1177/0049475520908180

27. HIREMATH, R. N., PATIL, S. S., YADAV, A. K., & KADAM, D. (2019). Quality of Life and Nutritional Status of People Living with HIV/AIDS (PLHA's) in Western Maharashtra-A Prospective Cohort Study. *Journal of Clinical & Diagnostic Research*, *13*(6). doi:10.7860/JCDR/2019/37487.12903

28. Jha, D. K., Jha, J., Jha, A. K., Achappa, B., & Holla, R. (2019). Quality of life among HIV-tuberculosis coinfected patients. *Perspectives in Clinical Research*, *10*(3), 125. doi: 10.4103/picr.PICR_99_18

29. Aggarwal, A. N. (2019). Quality of life with tuberculosis. *Journal of clinical tuberculosis and other mycobacterial diseases*, *p. 17*, 100121. doi: 10.1016/j.jctube.2019.100121

30. Carvalho, M. V. D. F., Silva, A. R. D. S., Taminato, M., Bertolozzi, M. R., Fernandes, H., Sakabe, S., & Hino, P. (2022). Tuberculosis/HIV coinfection focused on care and quality of life. *Acta Paulista de Enfermagem*, *35*. doi: http://dx.doi.org/10.37689/acta-ape/2022AO02811

31. Agrawal, H., Mourya, R., Shrestha, R., & Agrawal, S. (2014). Quality of Life Among HIV Positive Individuals in Kathmandu Valley and Eastern Regions of Nepal. *Kathmandu University Medical Journal*, *10*(4), 3–7. https://doi.org/10.3126/kumj.v10i4.10985

32. Anand, D., Puri, S., & Mathew, M. (2012). Assessment of Quality of Life of HIV-Positive People Receiving ART: An Indian Perspective. Indian journal of community medicine: official publication of Indian Association of Preventive & Social Medicine, 37(3), 165–169. https://doi.org/10.4103/0970-0218.99918

33. Tran, B. X. (2012). Quality of life outcomes of antiretroviral treatment for HIV/AIDS patients in Vietnam. PloS one, 7(7), e41062. https://doi.org/10.1371/journal.pone.0041062

34. Tran, B. X., Phan, H. T., Latkin, C. A., Nguyen, H. L. T., Hoang, C. L., Ho, C. S., & Ho, R. C. (2019). Understanding global HIV stigma and discrimination: are contextual factors sufficiently studied? (GAPRESEARCH). International journal of environmental research and public health, 16(11), 1899. http://dx.doi.org/10.3390/ijerph16111899

35. Pasipanodya, E.C., Kohli, M., Fisher, C.B. et al. Perceived risks and amelioration of harm in research using mobile technology to support antiretroviral therapy adherence in the context of methamphetamine use: a focus group study among minorities living with HIV. Harm Reduct J 17, 41 (2020). https://doi.org/10.1186/s12954-020-00384-1

36. *HIV and AIDS in India*. Avert. (2020, January 28). Retrieved December 13, 2022, from https://www.beintheknow.org/living-with-hiv

37. Liping, M., Peng, X., Haijiang, L., Lahong, J., & Fan, L. (2015). Quality of Life of People Living with HIV/AIDS: A Cross-Sectional Study in Zhejiang Province, China. PloSone, 10(8), e0135705. https://doi.org/10.1371/journal.pone.0135705

38. Nyamathi, A. M., Carpenter, C. L., Ekstrand, M. L., Yadav, K., Garfin, D. R., Muniz, L. C., ... & Sinha, S. (2018). Randomized controlled trial of a community-based intervention on HIV and nutritional outcomes at six months among women living with HIV/AIDS in ruralIndia. AIDS(London,England), 32(18),2727. https://doi.org/10.1097%2FQAD.0000000000002016

39. Nyamathi, A., Ekstrand, M., Heylen, E., Ramakrishna, P., Yadav, K., Sinha, S., ... & Arab, L. (2018). Relationships among adherence and physical and mental health among women living with HIV in rural India. *AIDS and Behavior*, *22*(3), 867-876. doi: 10.1007/s10461-016-1631-3

40. Handajani, Y. S., Djoerban, Z., & Irawan, H. (2012). Quality of life people living with HIV/AIDS: outpatient in Kramat 128 Hospital Jakarta. *Acta Med Indones*, *44*(4), 310-6. https://pubmed.ncbi.nlm.nih.gov/23314972/

41. Purakayastha, R., & Anjenaya, S. (2020). Assessing the quality of life of HIV/AIDS patients attending antiretroviral clinic: a cross-sectional study. Int J Sc Res Publ, 10(6), 555-77. https://www.ijsrp.org/research-paper-0620.php?rp=P10210153

42. Laxmeshwar, C., Stewart, A. G., Dalal, A., Kumar, A. M. V., Kalaiselvi, S., Das, M., ... & Isaakidis, P. (2019). Beyond 'cure and 'treatment success': quality of life of patients with multidrug-resistant tuberculosis. The International Journal of Tuberculosis and Lung Disease, 23(1), 73–81. doi: 10.5588/ijtld.18.0149

43. Gowda, S., Channabasappa, A. N., Dhar, M., & Krishna, D. (2012). Quality of life in HIV/AIDS patients in relation to CD4 count: A cross-sectional study in Mysore district. *International Journal of Health & Allied Sciences*, *1*(4), 263. doi: 10.4103/2278-344X.107892

44. Opollo, V., Sun, X., Lando, R., Miyahara, S., Torres, T. S., Hosseinipour, M. C., ... & A5274 study team. (2020). The effect of TB treatment on health-related quality of life for people with advanced HIV. *The International Journal of Tuberculosis and Lung Disease*, *24*(9), 910–915. doi: 10.5588/ijtld.19.0716

45. Dar, S. A., Shah, N. N., Wani, Z. A., & Nazir, D. (2019). A prospective study on quality of life in patients with pulmonary tuberculosis at a tertiary care hospital in Kashmir, Northern India. *Indian journal of tuberculosis*, *66*(1), 118-122. doi: 10.1016/j.ijtb.2018.07.002

46. Igumbor, J., Stewart, A., & Holzemer, W. (2013). Comparison of the health-related quality of life, CD4 count, and viral load of AIDS patients and people with HIV who have been on treatment for 12 months in rural South Africa. SAHARA-J: Journal of Social Aspects of HIV/AIDS, 10(1), 25-31, https://doi.org/10.1080%2F17290376.2013.807070

47. Keskin, S., Kaya, A., & Günay, E. (2018). Impact of HIV/AIDS-related stigma on family members of HIV/AIDS patients: The case of Turkey. BMC Public Health,18(1). https://doi.org/10.1186/s12889-018-5462-8

48. Walter, A. W., & Morocho, C. (2021). HIV Related Knowledge, HIV Testing Decision-Making, and Perceptions of Alcohol Use as a Risk Factor for HIV among Black and African American Women. International journal of environmental research and public health, 18(9), 4535. https://doi.org/10.3390/ijerph18094535

49. Swendeman, D., Fehrenbacher, A. E., Roy, S., Das, R., Ray, P., Sumstine, S., & Jana, S. (2018). Gender disparities in depression severity and coping among people living with HIV/AIDSinKolkata,India. PLoSOne, 13(11),e0207055, https://doi.org/10.1371/journal.pone.0213093

50. Porges EC, Bryant VE, Woods AJ, et al. The effect of current alcohol consumption on cognitive impairment varies as a function of HIV status and age. Alcohol Clin Exp Res. 2015; 39:268a.

51. Jia H, Uphold CR, Wu S, Chen GJ, Duncan PW. Predictors of changes in health-related quality of life among men with HIV infection in the HAART era. AIDS Patient Care STDs. 2005;19(6):395–405. doi: 10.1089/apc.2005.19.395

52. Mohammed SA, Yitafr MG, Workneh BD, Hailu AD. Health-related quality of life and associated factors among people living with human immunodeficiency virus on highly active antiretroviral therapy in Northeast Ethiopia: Cross-sectional study. PLoS One. 2021 Mar 5;16(3): e0247777. doi: 10.1371/journal.pone.0247777. PMID: 33667245; PMCID: PMC7935299.

53. Remor, E. (2002). Social support and quality of life in patients with HIV infection. Aten Primaria, 30(03), 143-8. doi: 10.1016/s0212-6567(02)78993-2

54. Desta, A., Biru, T. T., & Kefale, A. T. (2020). Health-related quality of life of people receiving highly active antiretroviral therapy in Southwest Ethiopia. PloS one, 15(8), e0237013. https://doi.org/10.1371/journal.pone.0237013

55. Zuñiga JA, Jang DE, Walker G, Ohueri CW, A García A. Differences in Health-Related Quality of Life Predictors in People Living with HIV With and Without Diabetes. J Assoc Nurses AIDS Care. 2020 Sep-Oct;31(5):544-552. doi: 10.1097/JNC.0000000000000138. PMID: 31789685; PMCID: PMC7890568.

56. Yen, Y. F., Lai, H. H., Kuo, Y. C., Chan, S. Y., Chen, L. Y., Chen, C. C., ... & Chuang, P. H. (2022). Association of depression and antidepressant therapy with antiretroviral therapy adherence and health-related quality of life in men who have sex with men. PloS one, 17(2), e0264503. https://doi.org/10.1371/journal.pone.0264503

57. Sun, W., Lu, H., Huang, F., Shiu, C. S., Zhang, L., & Chen, W. T. (2021). The longitudinal trajectory of the association between quality of life and depression among people living with HIV in China: a mixed-effects model. AIDS care, 1-8. doi: 10.1080/09540121.2021.1991879

58. Tran, B. X., Dang, A. K., Truong, N. T., Ha, G. H., Nguyen, H. L. T., Do, H. N., ... & Ho, R. C. (2018). Depression and quality of life among patients living with HIV/AIDS in the era of universal treatment access in Vietnam. International journal of environmental research and public health, 15(12), 2888.

59. Anuradha S, Makkar AM, Nandi PK, Rajeshwari K. Quality of life and its determinants among people living with HIV attending an antiretroviral treatment center in Delhi, India. Indian J Public Health. 2020 Apr-Jun;64(2):148-153. doi: 10.4103/ijph.IJPH_400_19. PMID: 32584297.

60. Timilsina, S., & Regmi, K. (2014). Assessing quality of life and depression among people living with HIV/AIDS and TB-HIV coinfection in Kathmandu, Nepal. SAARC Journal of Tuberculosis, Lung Diseases, and HIV/AIDS, 11(2), 7-14. doi: 10.3390/ijerph15122888

61. Rajeev, K. H., Yuvaraj, B. Y., Gowda, M. N., & Ravikumar, S. M. (2012). Impact of HIV/AIDS on quality of life of people living with HIV/AIDS in Chitradurga district, Karnataka. Indian journal of public health, 56(2), 116. doi: 10.4103/0019-557X.99901

62. Vahdat, K., Hadavand, F., Rabieian, P., & Farhangpour, L. (2012). Study daily quality of life in patients living with HIV in Bushehr province. http://ismj.bpums.ac.ir/article-1-322-en.html

63. Acharya, D. (2014). Assessment of quality of life of people living with HIV and AIDS receiving antiretroviral therapy in Kathmandu Valley. Journal of Institute of Medicine, 37(1), 9–13. https://www.researchgate.net/profile/Dipti-Shrestha-

2/publication/346210002_OPEN_ACCESS_wwwjiomcomnp/links/5fbcd7b6a6fdcc6cc65ed03a/OPEN-ACCESS-wwwjiomcomnp.pdf#page=13

64. Srivastava S, Bhatia MS. Quality of life as an outcome measure in the treatment of alcohol dependence. Ind Psychiatry J. 2013 Jan;22(1):41-6. doi: 10.4103/0972-6748.123617. PMID: 24459373; PMCID: PMC3895312.

65. Olickal, J. J., Saya, G. K., Selvaraj, R., & Chinnakali, P. (2021). Association of alcohol use with quality of life (QoL): a community-based study from Puducherry, India. Clinical Epidemiology and Global Health, 10, 100697. doi:https://doi.org/10.1016/j.cegh.2021.100697

66. Ghiasvand, H., Waye, K. M., Noroozi, M., Harouni, G. G., Armoon, B., & Bayani, A. (2019). Clinical determinants associated with quality of life for people with HIV/AIDS: a meta-analysis. BMC health services research, 19(1), 1–11. https://doi.org/10.1186/s12913-019-4659-z

67. Pachuau LN, Tannous C, Dhami MV, Agho KE. HIV among people who inject drugs in India: a systematic review. BMC Public Health. 2022 Aug 10;22(1):1529. doi: 10.1186/s12889-022-13922-2. PMID: 35948967; PMCID: PMC9367073.

68. Thomas B, Mimiaga MJ, Kumar S, Swaminathan S, Safren SA, Mayer KH. HIV in Indian MSM: reasons for a concentrated epidemic & strategies for prevention. Indian J Med Res. 2011 Dec;134(6):920-9. doi: 10.4103/0971-5916.92637. PMID: 22310824; PMCID: PMC3284100.

69. Stahlman S, Hargreaves JR, Sprague L, Stangl AL, Baral SD, Measuring Sexual Behavior Stigma to Inform Effective HIV Prevention and Treatment Programs for Key Populations JMIR Public Health Surveill 2017;3(2):e23. doi: 10.2196/publichealth.7334

70. Ekstrand ML, Bharat S, Ramakrishna J, Heylen E. Blame, symbolic stigma and HIV misconceptions are associated with support for coercive measures in urban India. AIDS Behav. 2012 Apr;16(3):700-10. doi: 10.1007/s10461-011-9888-z. PMID: 21290175; PMCID: PMC3313036.

71. National AIDS Control Organization. (2017). India HIV estimates 2017. http://naco.gov.in/images/pdf/India-HIV-Estimates-2017.pdf