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Sociodemographic Determinants and Gender Disparities in Hiv infected patients among rural population in Eastern Cape South Africa

Olufunmilayo Olukemi Akapo[1*], Teke Apalata[1,2]

[1]*Department of Laboratory Medicine and Pathology, Faculty of Medicine and Health Sciences, Walter Sisulu University, Mthatha, South Africa.*
[2]*National Health Laboratory Service, Nelson Mandela Academic Hospital, Mthatha, South Africa.*

Corresponding author: Olufunmilayo Olukemi Akapo (*Email:* oakapo@wsu.ac.za)

Abstract

South Africa continues to experience the highest global HIV burden, with rural provinces like the Eastern Cape facing stark disparities in access to care. This cross-sectional study examined sociodemographic determinants among 218 HIV-infected individuals across seven facilities in OR Tambo, Joe Gqabi, and Alfred Nzo districts between February 2019 and February 2021. HIV status was confirmed using Determine™ and UniGold™ Rapid HIV-1/2 tests. Among females, 57.6% were single, 27.3% married, and 10.1% widowed. For males, 47.4% were single or married, with no widowed or cohabiting individuals recorded. Smoking was similar across genders (females: 9.6%; males: 10.5%), while alcohol use was notably higher among males (36.8%) than females (14.1%). Odds ratio (OR) analysis revealed that males had 44% lower odds of being on ART above age 35 (OR: 0.56; 95% CI: 0.21–1.52). Males were more likely to be single (OR: 1.51), while females had higher odds of being unemployed (OR: 0.48). Notably, males had over three times the odds of alcohol use compared to females (OR: 3.54; 95% CI: 1.28–9.77). These findings highlight persistent gender and socioeconomic disparities, underscoring the need for tailored, community-level HIV interventions to meet the UNAIDS 95-95-95 goals and national HIV response strategies.

Keywords: Eastern Cape, Gender disparity, HIV, Public health, Rural South Africa, Sociodemographic factors.

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1. Introduction

Human Immunodeficiency Virus (HIV) continues to pose a major public health challenge in sub-Saharan Africa, which accounts for approximately 11% of the global population yet bears a disproportionate burden of the epidemic [1]. Despite more than three decades since the virus was first identified, the region remains the epicenter of the global HIV crisis. This disproportionate impact is driven by a complex interplay of structural, cultural, biological, behavioral, social, and economic factors. Women and adolescent girls are particularly vulnerable due to gender inequalities, limited access to healthcare and education, and socio-cultural norms that constrain their autonomy and increase their risk of exposure.

South Africa bears the largest burden of HIV globally. As of 2023, an estimated 7.8 million people were living with HIV in the country, with women and young adults disproportionately affected [2-4]. Despite sustained national efforts, including the scale-up of antiretroviral therapy (ART), the incidence remains alarmingly high, particularly in rural and underserved communities. Structural barriers such as healthcare access disparities, stigma, and socio-economic inequalities continue to undermine prevention and treatment efforts [5-7].

Sociodemographic characteristics, including age, gender, education, employment status, and marital status, play a significant role in influencing HIV acquisition and treatment outcomes. Notably women in SSA (sub-Saharan Africa) continue to exhibit higher HIV prevalence than men, a disparity driven by gendered economic inequalities, biological vulnerability, and societal norms surrounding sexual behavior [8-10]. Marital status is another critical determinant, particularly among women in monogamous or polygamous unions, where many infections occur despite the perception of being in low-risk partnerships [11-13]. These dynamics underscore the need for tailored interventions that address gender and marital vulnerabilities within broader HIV prevention and care strategies.

Understanding the sociodemographic profile of people living with HIV (PLHIV) is crucial for developing targeted prevention strategies and enhancing ART program effectiveness. While national surveys and HIV/AIDS surveillance systems provide valuable insights, they often fail to capture the true burden of the epidemic in areas with low population densities and limited data availability particularly among vulnerable and hard-to-reach populations [14-16]. Despite widespread documentation of national trends, there remains a significant gap. in localized data from rural communities in the Eastern Cape Province an area characterized by high HIV prevalence and persistent structural health inequities [17, 18].

This study aims to characterize the sociodemographic patterns among HIV-positive adults receiving ART at seven health facilities in three districts (OR Tambo; Joe Gqabi, and Alfred Nzo) of the Eastern Cape Province of South Africa thus providing evidence to inform more nuanced and community-responsive HIV interventions, in alignment with South Africa's National Strategic Plan on HIV, TB, and STIs (2023–2028) and the UNAIDS 95-95-95 targets.

2. Methodology

2.1. Study Design and Participants

This cross-sectional study was conducted to investigate the sociodemographic determinants and gender disparities among HIV-infected patients at seven health facilities in the three districts (OR Tambo; Joe Gqabi, and Alfred Nzo) of the Eastern Cape Province of South Africa over two years, from February 2020 to February 2021 using a community-based sample. Two hundred and eighteen participants were recruited using questionnaire administration including individuals who have been on ART for six months, aged 18 years upward and registered in the study sites. Informed consent was obtained prior to data collection.

2.2. Data Collection

Data collection and measurement of risk variables for non-communicable diseases (NCDs) was carried out using a World Health Organization (WHO) STEPwise instrument [19]. Participants were educated about the study's objective, risks, and confidentiality using written informed consent forms. Participants who were diagnosed with HIV infection at the start of ART and who were at least 18 years old were enrolled in the study consecutively. The WHO STEPwise tool was used to collect demographic information, alcohol usage, smoking status, alcohol use, and physical examination. HIV test was carried out at the clinic using a serial algorithm using the Determine Rapid HIV-1/2 antibody (Abbott Laboratories, Abbott Park, Illinois, USA) and the Unigold Rapid HIV Test (Trinity Biotech, PLC, IDA Business Park, Bray, County Wicklow, Ireland).

2.3. Variables and Outcomes

The primary outcome in this analysis is the sociodemographic distribution and characteristics among HIV-positive individuals**.** The secondary outcome includes behavioral risk characteristics associated with HIV-positive individuals**,** gender-based comparative analysis of sociodemographic and behavioral patterns, age group distribution of HIV-positive individuals and identification of vulnerable subgroups.

2.4. Statistical Analysis

The study employed both descriptive and inferential statistics using R software (version 4.3.1) to analyze sociodemographic and behavioral characteristics of HIV-positive adults. Descriptive statistics, including frequencies and percentages, were used to summarize categorical variables such as gender, marital status, education, employment, smoking, and alcohol use, while mean and standard deviation were used for age. Chi-square tests were conducted to assess associations between gender and other sociodemographic variables, with significance set at $p < 0.05$. Odds ratios (ORs)

with 95% confidence intervals (CIs) were computed to assess the strength of associations between key risk factors, including alcohol use and smoking. Differences in marital status, education, employment, and behavioral factors were illustrated using bar charts. Categorical variables were presented as proportions (%).

3. Results

Table 1 presents the age distribution and marital status of HIV-positive adults receiving ART at Mthatha Academic Hospital. Among females, the 35–50 age group constitutes the largest proportion (45.0%), while the highest proportion of males falls within the younger 0–35 age group (36.8%). Single women represent the largest marital status category at 57.6%. Among males, the proportions of those who are married, and single are equal at 47.4%. Notably, no widowed individuals are recorded among males, whereas 10.1% of female participants are widowed. The study population is predominantly single (71%), with a mean age of 28 years. The educational status of both genders shown females 57.0%, males 78.9%, respectively. Women with no formal education shown 4.5%. Unemployed women are 49.0% while 57.9% of the men are employed. The smoking rate in both female and male groups is ~10%. The rate of alcohol use in males report is 36.8% females is 14.1%.

Table 1.
Demographic distribution among the HIV positive clinic attendees.

Gender Categories				
Female = 198			**Male = 19**	
Characteristics	**Frequency (n)**	**Percentage (%)**	**Frequency (n)**	**Percentage (%)**
Age and Marital status characteristics of the participants				
Age	Female		Male	
0-35	49/198	24.7	19-Jul	36.8
35-50	89/198	45	19-Jun	31.6
51+	60/198	30.3	19-Jun	31.6
Marital Status	Female		Male	
Single	114/198	57.6	19-Sep	47.4
Living together	7/198	3.5	0/19	0
Married	54/198	27.3	19-Sep	47.4
Divorced	3/198	1.5	19-Jan	5.3
Widowed	20/198	10.1	0/19	0
Educational and Employment Status of the participants				
Educational Level	Female		Male	
None	9/198	4.5	0/19	0
Primary	48/198	24.2	19-Feb	10.5
Secondary/Matric	113/198	57	15/19	78.9
Postgraduate	28/198	14.1	19-Feb	10.5
Employment Level				
Unemployed	97/198	49	19-Jun	31.5
Self employed	18/198	9	19-Feb	10.5
Employed	85/198	43	19-Nov	57.9
Smoking and Alcohol status of the participants				
Smoking Status	Female		Male	
No	179/198	90.4	17/19	89.5
Yes	19/198	9.6	19-Feb	10.5
Alcoholic Status	Female		Male	
No	170/198	85.9	19-Dec	63.2
Yes	28/198	14.1	19-Jul	36.8

Table 2 presents the odd ratio and 95% (CI) for age and marital status among the participants. The Males had lower odds of being on ART among this participant at >35 years than females while Males had higher odds of being single than females. Females had higher odds of having no education though the CI is wide and uncertain, they also had over twice the odds of being unemployed than males. Table 4 also presents the odd ratio and 95% (CI) for employment status educational level, smoking and alcoholic status among the participants.

Table 2.
Odd Ratio (OR) and 95 % Confidence Interval (CI) among the participants by gender.

Comparison	Female (n)	Male (n)	Odds Ratio (OR)	95% CI
Age: 0–35 vs >35	49 vs 149	7 vs 12	0.56	(0.21 – 1.52)
Marital Status: Single vs Not Single	114 vs 84	9 vs 10	1.51	(0.53 - 4.27)
Employed vs Unemployed	85 vs 97	11 vs 6	0.48	(0.17 - 1.35)
Employed vs self employed	85 vs 16	11 vs 2	0.97	(0.20 - 4.78)
No Education vs Education	189 vs 9	19 vs 0	0.55	(0.03 -9.89)
Smoking vs No smoking	179 vs 19	17 vs 2	1.11	(0.24 – 5.73)
Alcoholic vs Non-Alcoholic	170 vs 28	12 vs 7	3.54	(1.28 – 9.77)

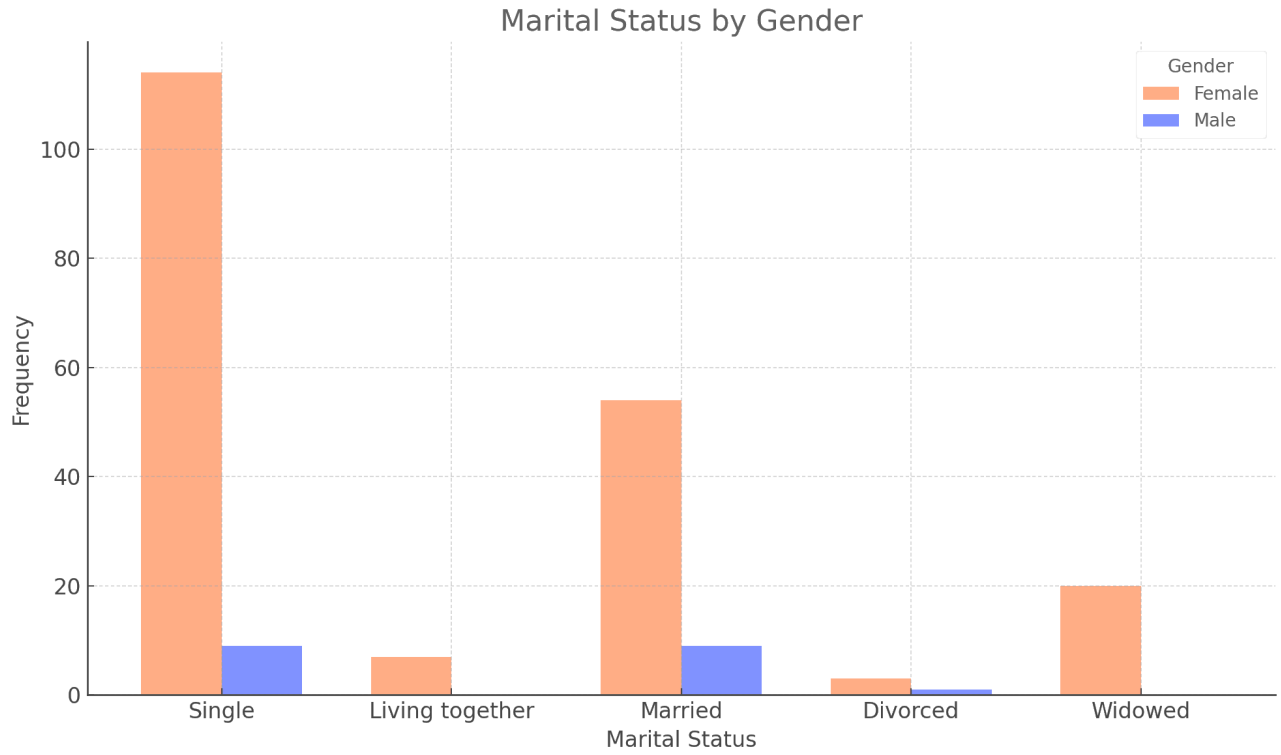


Figure 1.
Marital status of the participants stratified by gender.

Figure 1 compares HIV-positive participants by gender across different marital statuses. Among females, the highest proportion of HIV-positive individuals were single (57.6%), followed by married (27.3%) and widowed (10.1%). In contrast, among males, both single and married individuals represented equal proportions (47.4%), while no widowed or cohabiting male participants were HIV-positive.

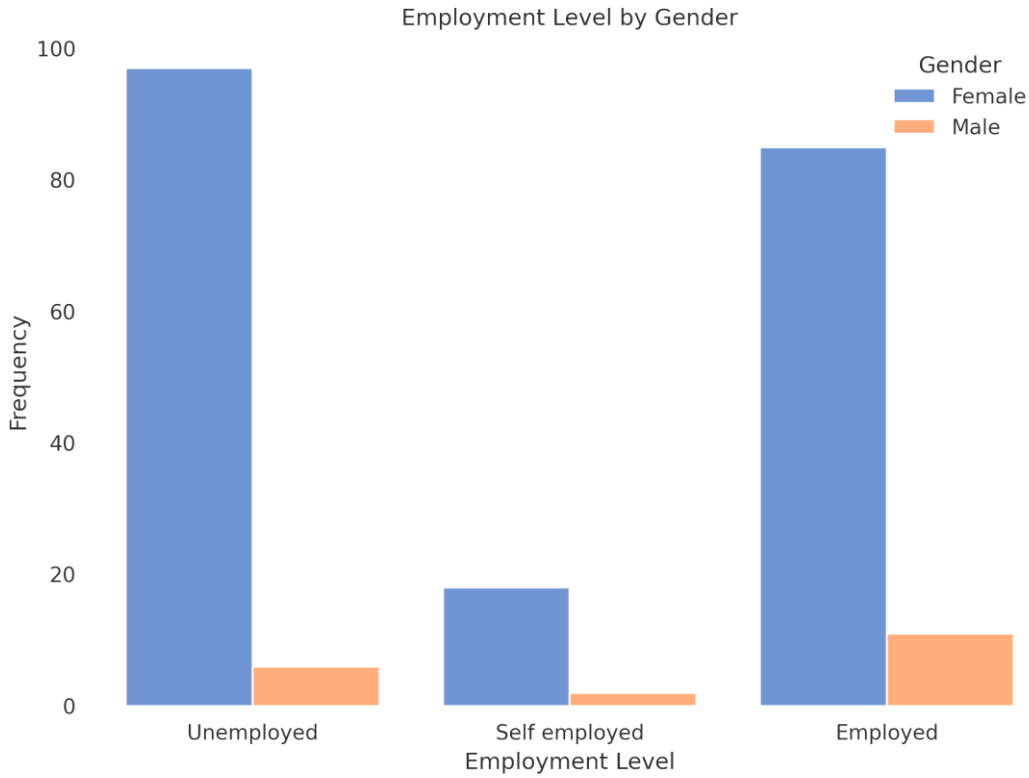
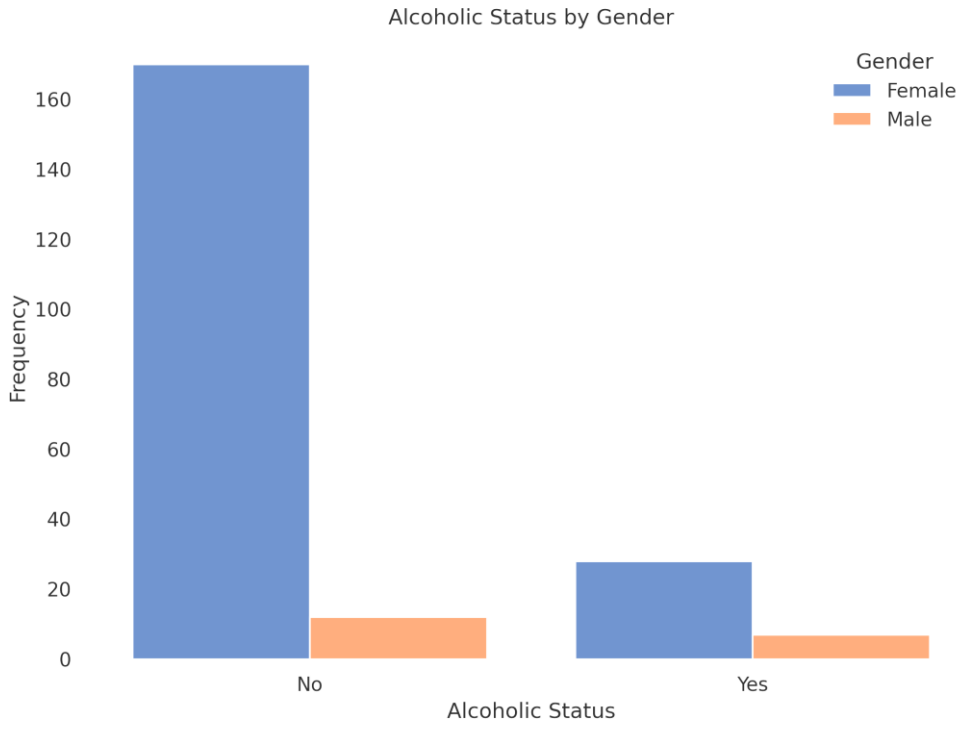


Figure 2.
Employment by Gender of the participants.

In Figure 2 Females have higher unemployment rates (49%) compared to males (31.5%). Males show a higher rate of employment (57.9%) than females (43%).



Figures 3.
Alcohol Status of the participant by gender.

This chart in Figure 3 visualizes the smoking status of HIV-positive participants by gender. Among females, 9.6% were smokers, whereas among males, the proportion was slightly higher at 10.5%. Non-smokers accounted for the majority in both genders, with 90.4% of HIV-positive females and 89.5% of HIV-positive males.

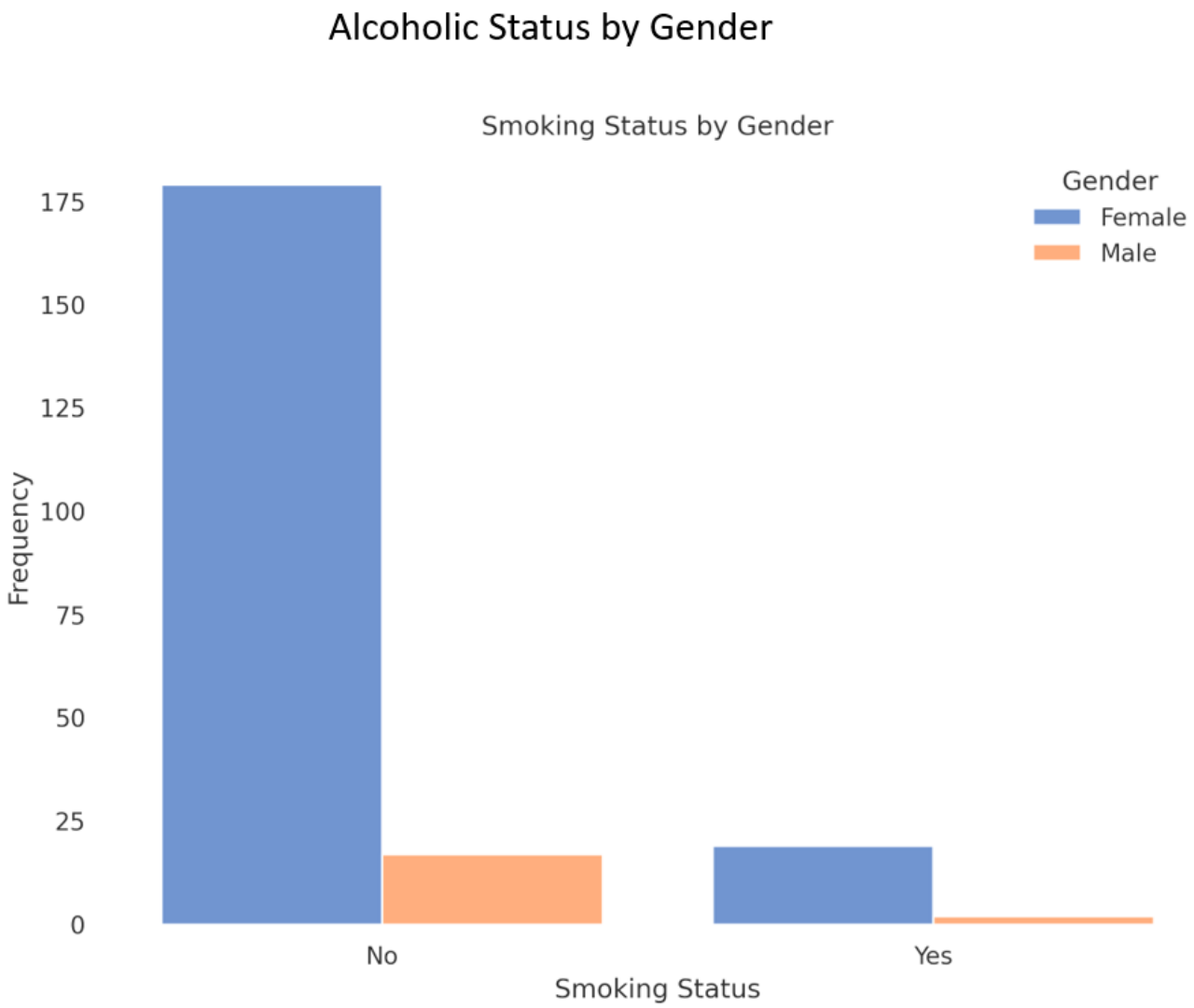


Figure 4.
HIV-Positive Participants stratified by gender and alcohol consumption.

This Figure 4 above compares alcohol consumption among HIV-positive participants across genders. A higher proportion of males (36.8%) reported alcohol consumption compared to females (14.1%). Conversely, 85.9% of HIV-positive females and 63.2% of males were non-drinkers. This discrepancy indicates a potential association between alcohol use and HIV status that may be more pronounced in males, warranting targeted behavioral interventions.

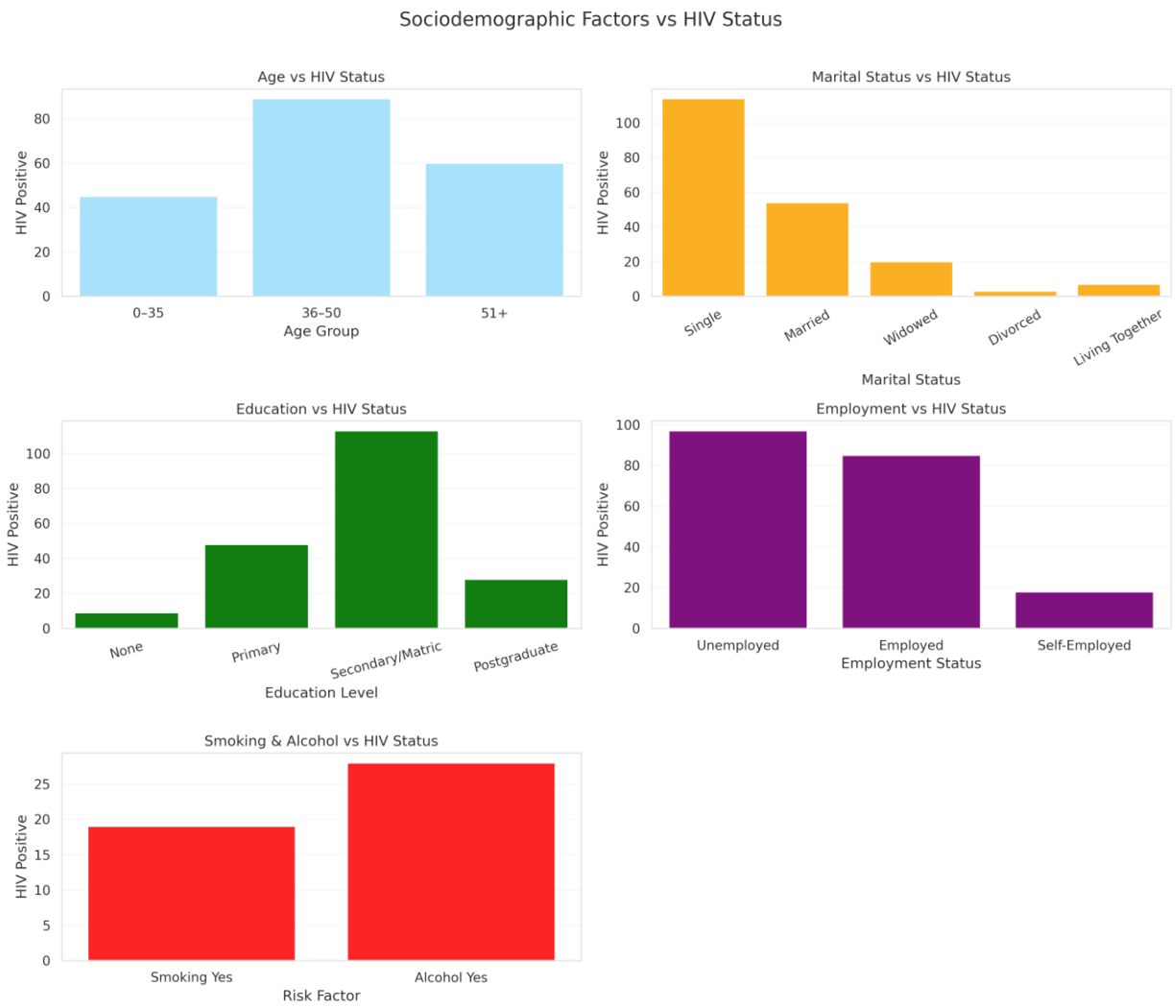


Figure 5.
Distribution of participants across key behavioral variables.

The Figure 5 above shows highest number of HIV-positive individuals among age group 36–50 age Single individuals accounted for over half (52.5%) of HIV-positive cases. Married participants (24.9%) widowed (9.2%), and those cohabiting (3.2%) had progressively lower rates, with divorced individuals showing the lowest prevalence (1.4%). Participants with secondary/matric education comprised the largest proportion (52.1%) of HIV-positive individuals, followed by those with primary (22.1%) and postgraduate (12.9%) education. Participants with no formal education accounted for only 4.1%. Unemployed individuals had the highest HIV prevalence (44.7%), followed by employed (39.2%) and self-employed individuals (8.3%). The Behavioral Factors like alcohol consumption show the smoking status of the participants at 8.8% compared to 91.2% of those that are not smoking while the alcohol consumption status shows 12.9%.

4. Discussion

This study investigated the sociodemographic characteristics of HIV-positive adults receiving ART at seven health facilities in three districts (OR Tambo; Joe Gqabi, and Alfred Nzo) of the Eastern Cape Province of South Africa. Eastern Cape is a region persistently burdened by high HIV prevalence and structural health inequities. The analysis highlights key disparities in age, gender, marital status, education, employment, smoking, and alcohol use that are relevant for tailoring HIV prevention and treatment interventions in rural settings**.**

The findings from this study are Consistent with trends across SSA, this study found higher HIV prevalence among women, particularly in single (57.6%) or widowed (10.1%), while men were more likely to be infected within marriage (47.4%) [20, 21]. This mirrors findings from South Africa, where marital relationships especially polygamous and long-term monogamous unions remain a significant site of HIV transmission due to limited sexual negotiation power and high rates of extra-marital concurrency [12, 22, 23]. Similar dynamics have been documented in Uganda and Kenya, where HIV incidence among women in unions exceeds that among never-married peers [24-26].

In contrast, studies from India and Indonesia have identified different marriage-related risks, where women often contract HIV from a single long-term male partner with a history of injection drug use or transactional sex [27-29]. On the other hand, a different scenario exists in the United States with HIV incidence heavily concentrated among men who have sex with men (MSM), while marriage or cohabitation is not as closely tied to HIV risk for women [30, 31].

The age distribution of most participants between 35–50 years aligns with global data indicating that adults in their prime working years bear the greatest burden of HIV [31, 32]. However, the relatively high prevalence among young women under 35 is particularly concerning and mirrors patterns reported in other province of South Africa and other Sub-Saharan settings, where adolescent girls and young women (AGYW) are 2–3 times more likely to contract HIV than their male peers due to earlier sexual debut, age-disparate relationships, and biological vulnerability [33, 34].

In Asia, HIV is increasingly observed in older male populations with histories of labor migration or commercial sex engagement [35, 36]. Although smoking prevalence was similar across genders (~10%), alcohol use was significantly higher among males (36.8%) than females (14.1%). This echoes findings from Southern Africa, where alcohol consumption among men correlates with risky sexual behavior and nonadherence to ART [37-39]. In Asia, similar patterns exist among male injecting drug users, where substance use compounds both HIV risk and care disengagement [40, 41]. In the USA, while alcohol misuse is also linked to poor ART adherence, interventions addressing mental health and substance abuse are more widely integrated into HIV care [42, 43]. This discrepancy indicates a potential association between alcohol use and HIV status that may be more pronounced in males, warranting targeted behavioral interventions.

5. Strengths and Limitations

This study provides crucial localized data on the sociodemographic and behavioral profile of HIV-positive individuals in a rural setting of the Eastern Cape, an area that is often underrepresented in national surveillance efforts. These findings fill an important gap in evidence needed for community-tailored HIV interventions. Data were collected from six health facilities, which may limit the generalizability of the findings to other rural or urban settings in South Africa.

6. Conclusion

The Eastern Cape province remains one of the most underserved in South Africa. Findings from this study support other research showing limited access to early diagnosis, poor ART adherence, and higher structural vulnerability in rural areas. Small-area models in South Africa demonstrate that rural districts in the Eastern Cape. This study contributes to the growing body of literature emphasizing the importance of contextual, locally grounded HIV responses. While some determinants such as gender inequality and alcohol use are global, others are specific to the sociopolitical and economic realities of rural South Africa. Effective programming must therefore integrate sociodemographic targeting with structural interventions, such as economic empowerment, gender equity, and geographic service decentralization. As South Africa advances toward UNAIDS' 95-95-95 goals and its 2023–2028 National Strategic Plan, these findings can inform more equitable and responsive interventions tailored to rural, underserved communities.

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