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Original Research Article

Prevalence and Risk Factors of Diarrhoea in HIV-positive Patients: A Case-Control Study in a Tertiary Healthcare Facility in Southern Nigeria

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Abstract

Diarrhoea remains a significant concern among HIV-positive individuals, impacting their quality of life and treatment outcomes. This study aims to determine the prevalence and associated risk factors of diarrhoea among HIV-positive patients in Southern Nigeria. A prospective case-control study was conducted at a tertiary healthcare facility from February to November 2023. HIV-positive patients (n=450) and age-sex matched HIV-negative controls (n=450) were enrolled. Data on socio-demographics, medical history, and hygiene practices were collected using self-administered questionnaires. Stool samples were examined for parasites, and $CD4^+$ T cell counts were determined. Statistical analysis was performed using SPSS version 20.0.The prevalence of diarrhoea was significantly higher among HIV-positive patients compared to controls (49.55% vs. 28.89%, p=0.001). Factors associated with diarrhoea in HIV-positive patients included smoking history (p=0.000*), duration of HIV infection (p=0.000*), and frequency of alcohol consumption (p=0.039*). Hygiene practices such as hand washing after defecation (p=0.000*) and availability of toilet facilities at home (p=0.000*) were significantly associated with diarrhoea in both HIV-positive patients and control subjects. Parasitic infections were more prevalent in HIV-positive patients with diarrhoea compared to control subjects (p=0.000*). Diarrhoea is highly prevalent among HIV-positive patients in Southern Nigeria, with smoking, alcohol consumption, and poor hygiene practices contributing to its occurrence. Interventions targeting these modifiable risk factors and improving hygiene practices are essential for reducing diarrhoeal burden in this population.

Keywords: Diarrhoea, HIV-positive patients, Hygiene practices, Parasitic infections, Risk factors

INTRODUCTION

Diarrhoea is a common gastrointestinal symptom experienced by HIV-positive patients, significantly impacting their quality of life and treatment outcomes. Despite advancements in antiretroviral therapy (ART) and management strategies, diarrhoeal diseases remain a considerable burden in this population. Understanding the prevalence and risk factors associated with diarrhoea in HIV-positive individuals is crucial for developing targeted interventions and improving patient care (Mgbere et al., 2022).

The prevalence of diarrhoea among HIV-positive individuals varies widely across different settings and populations. Studies have reported rates ranging from 10% to 50%, with higher incidences observed in

resource-limited regions and among patients with advanced HIV disease. Factors such as immune status, viral load, ART regimen, opportunistic infections, and socioeconomic factors contribute to the variability in diarrhoea prevalence (Xulu et al., 2021).

Several recent studies have highlighted the persistent burden of diarrhoeal diseases among HIV-positive patients despite widespread ART access. For example, a cohort study by Li et al. (2020) in China reported a diarrhoea prevalence of 18.5% among HIV-infected patients, with comorbidities such as tuberculosis and low socioeconomic status identified as significant predictors. Similarly, a cross-sectional study conducted by Xulu et al. (2021) in South Africa found that diarrhoea was prevalent in 27% of HIV-positive individuals, with lower CD4 counts and poor adherence to ART associated with increased risk.In a related study, Joseph and Ano-Edward (2016), reported a diarrhoea prevalence of 47.2% among HIV-infected patients in a tertiary hospital in North Central, Nigeria.

Several factors contribute to the increased risk of diarrhoea in HIV-positive patients, including immuno-suppression, opportunistic infections, medication side effects, and socioeconomic determinants. Immuno-deficiency resulting from HIV infection predisposes individuals to gastrointestinal infections, particularly those caused by enteric pathogens such as *Cryptosporidium*, *Isospora*, and *Microsporidia*.

ART plays a crucial role in reducing HIV-related morbidity and mortality; however, certain antiretroviral drugs, particularly protease inhibitors and non-nucleoside reverse transcriptase inhibitors, have been associated with gastrointestinal adverse effects, including diarrhoea. Additionally, the presence of comorbid conditions such as inflammatory bowel disease, malnutrition, and substance abuse further exacerbates the risk of diarrhoea in this population.

Recent evidence suggests that social determinants of health, including poverty, food insecurity, and inadequate access to clean water and sanitation facilities, contribute significantly to the burden of diarrhoeal diseases among HIV-positive individuals. A study by Mgbere et al. (2022) in Nigeria found that lower socioeconomic status was independently associated with diarrhoea among HIV-positive patients, highlighting the importance of addressing structural barriers to healthcare access and sanitation. This study therefore, sought to investigate the prevalence and risk factors of diarrhoea in HIV-positive patients in a tertiary healthcare facility in Southern Nigeria.

RESEARCH METHODOLOGY

Study Design

This is a prospective case-controlled study carried out at the HIV clinic of a tertiary and referral health care facility in Southern Nigeria. The study protocol was approved by the hospital research and ethics committee and informed consent was obtained from subjects. Purposive sampling was used to select participants into the study, selecting consecutive HIV-positive patients presenting to the HAART clinic of the Hospital. Patients who had been on antimicrobials within two (2) weeks preceding time of sample collection were excluded from the study. The study included subjects who were 18 years of age and older were enrolled over a 10-month period (from 1st February to 30th November, 2023). An equal number of apparently healthy age- and sex-matched HIV sero-negative patients attending the General Outpatient Clinic were recruited as controls.

Sample Size Determination

The sample size was calculated using Fisher's formula outlined by Ekeleme et al. (2023):

$$n = \frac{Z^2(Pq)}{e^2}$$

where n = minimum sample size
Z = 1.96 at 95% confidence level,
P = known prevalence of prevalence of diarrhoea in HIV-positive patients in Nigeria
e = error margin tolerated at 5% = 0.05
q = 1 - p
According to Joseph and Ano-Edward (2016), the prevalence of diarrhoea in HIV-positive patients in Nigeria is 47.2%.
P = 47.2% = 0.472
q = 1 – p
= 1 – 0.472
= 0.528

$$n = \frac{(1.96)^2(0.472 \times 0.528)}{(0.05)^2}$$

$$n = \frac{0.907085}{0.0025} = 362.83$$

The minimum sample size was 363 and was adjusted to 450 to account for a non-response rate of 10 %.
Four hundred and fifty (450) HIV-positive patients were enrolled in the study. Also, four hundred and fifty (450) sex and age-matched HIV-negative control subjects were recruited.

Data Collection

A self-administered questionnaire was used to gather sociodemographic and medical data from both HIV-positive patients and control respondents. After pretest counselling and post-testing, the diagnosis of HIV was established by testing the capillary blood of the patients and the control subjects for antibodies to the virus. Rapid HIV testing was carried out using Determine TM HIV-1/2, Unigold, and Stat-Pak rapid kits per the WHO-approved

Table 1. Information of HIV-Positive Patients and Control Subjects

Variables	HIV-Positive Patients n (%)	Control Subjects n (%)	p-value
Gender			
Male	211 (46.89)	234 (52.00)	0.069
Female	239 (53.11)	216 (48.00)	0.071
Age (in Years)			
Less than 20	31 (6.89)	29 (6.44)	0.612
20 – 29	79 (17.56)	66 (14.67)	0.084
30 – 39	109 (24.22)	121 (26.89)	0.126
40 – 49	174 (38.67)	171 (38.00)	0.897
50 – 59	38 (8.44)	41 (9.11)	0.593
60 and above	19 (4.22)	22 (4.89)	0.816
Duration of HIV Infection			
Less than 1 year	97 (21.56)		
1-5 years	153 (34.00)		
6-10 years	121 (26.89)		
More than 10 years	79 (17.55)		
Smoking History			
Current smoker	11 (2.44)	89 (19.78)	0.000*
Former smoker	112 (24.89)	51 (11.33)	0.000*
Never smoked	327 (72.67)	310 (68.89)	0.093
Frequency of alcohol consumption			
Never	298 (65.11)	248 (55.11)	0.039*
Stopped alcohol	102 (22.67)	52 (11.56)	0.001*
Occasionally	31 (6.89)	98 (21.78)	0.000*
Regularly	19 (4.22)	52 (11.56)	0.001*

p-value ≤ 0.05 are statistically significant

Nigerian National Serial Testing Algorithm. HIV antibodies were tested for in the serial algorithm of serologic testing using two screening rapid test kits, Determine TM HIV-1/2 and Unigold, in that order. StatPack, a tiebreaker in inconclusive tests as described by Chikezie et al. (2024), and the Unigold fast kits were used to confirm a reactive sample to determine TM HIV-1/2.

Stool samples were collected from every participant and sent to the Medical Microbiology and Parasitology research laboratory. Macroscopic and microscopic examinations of the stool samples were done.

All participants were asked for their informed consent before 5 milliliters of whole venous blood were drawn from their cubital vein and placed into a vacutainer collecting tube containing potassium ethylenediamine tetraacetic acid (K-EDTA). A comparable volume of venous blood was drawn from HIV-negative, healthy control volunteers and placed into K-EDTA bottles. Blood samples from the patients and the control subjects were analyzed using Cyflow R Counter for absolute $CD4^+$ T cell counts within six (6) hours of collection (Partec, Germany) following the methods outlined by Uduma et al. (2023).

Data Analysis

The statistical package for the social science was used to analyze the collected data (version 20.0; SPSS, Chicago, IL). The mean, standard deviation, and t-test were the statistical tests employed in this investigation. Simple tables and bar charts containing frequencies, percentages, and mean values were used to display the obtained results. The threshold of statistical significance for group comparisons was set at P-value ≤ 0.05.

RESULTS

There was no significant difference observed in gender distribution between HIV-positive patients and control subjects (p = 0.069 for males, p = 0.071 for females). However, significant differences were noted in smoking history (p = 0.000) and frequency of alcohol consumption (p ≤ 0.05) (Table 1).Regarding $CD4^+$ T lymphocyte count (Table 2), HIV-positive patients exhibited significantly lower counts compared to control subjects, as evidenced by the minimum, maximum, and mean values (p = 0.000 for all). There were no significant differences in hygiene

Table 2. $CD4^+$ T lymphocyte Count of HIV-Positive Patients and Control Subjects

$CD4^+$ T lymphocytes count/uL	HIV-Positive Patients	Control Subjects	p-value
Minimum	40	354	0.000*
Maximum	1055	1501	0.000*
Mean±Standard Deviation	377±201	938±113	0.000*

p-value ≤ 0.05 are statistically significant

Table 3. Hygiene Practices of HIV-Positive Patients and Control Subjects

Hygiene Practice	HIV-Positive Patients n (%)	Control Subjects n (%)	p-value
Do you wash your fruit and vegetables before eating?			
Yes	416 (92.44)	420 (93.33)	0.859
No	34 (7.55)	30 (6.67)	0.817
Do you wash your hands after defecating?			
Yes	311 (69.11)	299 (66.44)	0.698
No	139 (30.89)	151 (33.56)	0.705
Do you have toilet facility available at home?			
Yes	416 (92.44)	428 (95.11)	0.638
No	34 (7.55)	22 (4.89)	0.218
If yes, what type?			
Water closet	289 (69.47)	302 (70.56)	0.935
Pit latrine	127 (30.53)	126 (29.44)	0.918
Is your toilet private of public?			
Private	114 (27.40)	108 (25.23)	0.897
Public	302 (72.60)	320 (74.76)	0.825
What is the source of your drinking water?			
Borehole	111 (24.67)	96 (21.33)	0.632
Well	158 (35.11)	191 (42.44)	0.358
Stream	11 (2.44)	06 (1.33)	0.241
Sacket water	129 (28.67)	128 (28.44)	0.962
Bottled water	41 (9.11)	29 (6.44)	0.094

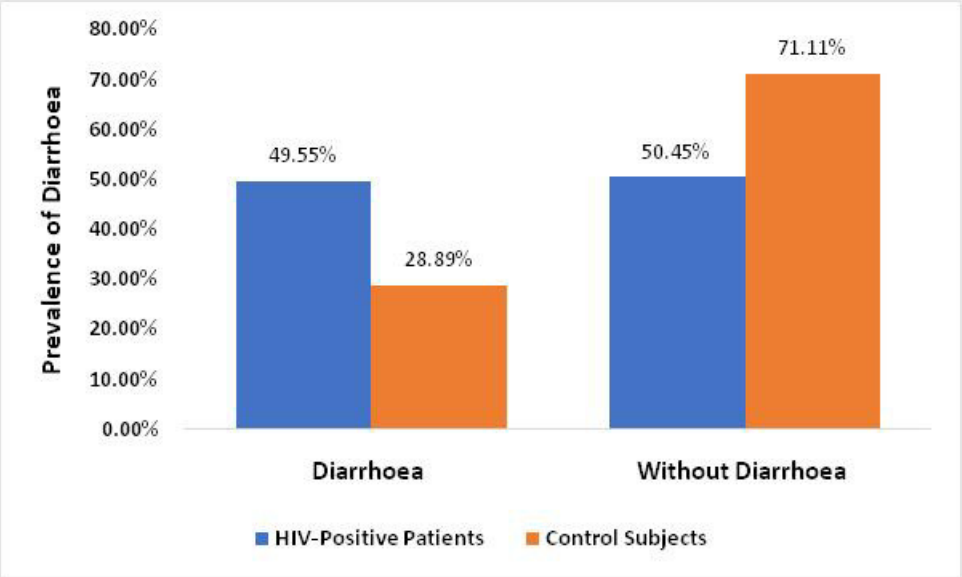

Figure 1. Prevalence of Diarrhoea in HIV-Positive Patients and Control Subjects

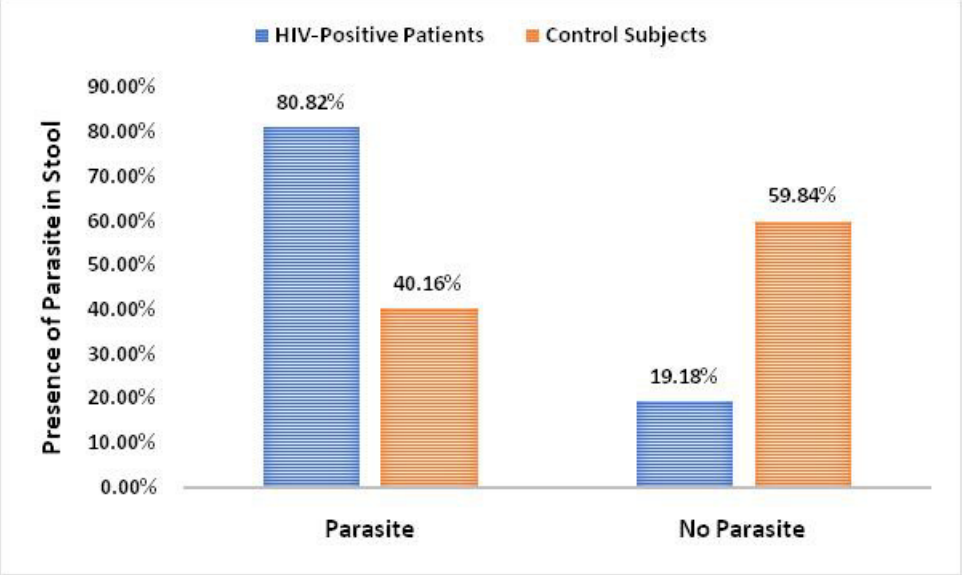

Figure 2. Presence of Parasite in Stool of Participants with Diarrhoea

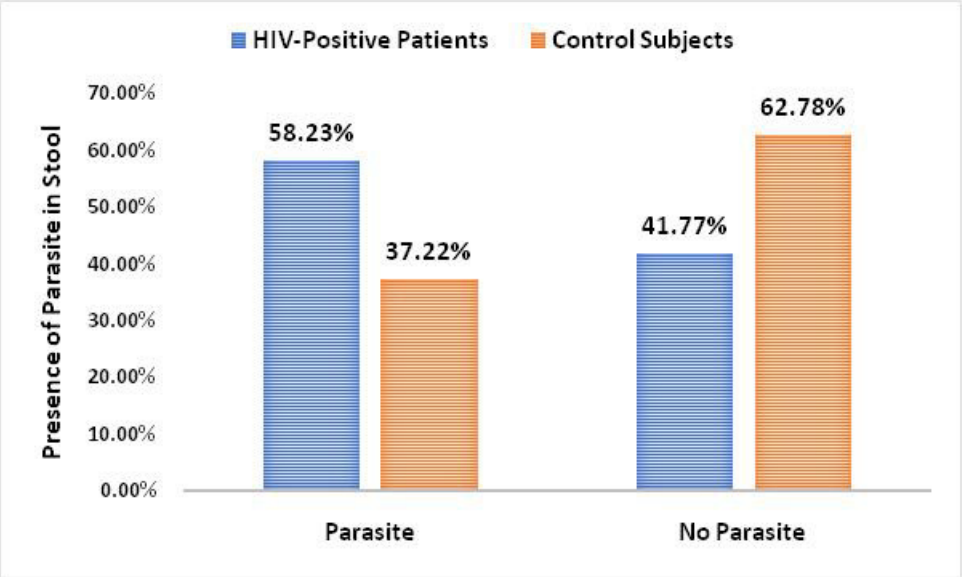

Figure 3. Presence of Parasite in Stool of Participants without Diarrhoea

Table 4. Prevalence of intestinal parasitosis in HIV-positive Patients and Control Subjects

Parasite	HIV-Positive Patients	Control Subjects	p-value
	n (%)	n (%)	
Ancylostoma duodenale	9 (1.37)	5 (0.97)	0.084
Ascaris lumbricoides	52 (7.91)	39 (7.54)	0.882
Balatidium coli	0 (0.00)	3 (0.58)	0.004*
Entamoeba histolytica	1 (0.15)	6 (1.16)	0.003*
Fasciola buski	0 (0.00)	5 (0.97)	0.004*
Coccidian	227 (34.55)	42 (8.12)	0.000*
Cryptosporidium	114 (17.35)	27 (5.22)	0.001*
Cyclospora	101 (15.37)	11 (2.13)	0.000*
Isospora	8 (1.22)	2 (0.39)	0.003*
Necator americanus	15 (2.28)	11 (2.13)	0.748
Schistosoma mansoni	3 (0.46)	2 (0.39)	0.496
Strongyloides stercoralis	11 (1.67)	2 (0.39)	0.064
No parasite	116 (17.66)	362 (70.02)	0.000*

Multiple parasites present in some participants; * means *P*-value less than 0.05 (i.e. statistically significant)

Table 5. Association between Hygiene Practices and Prevalence of Diarrhoea in HIV-Positive Patients

Hygiene Practices	Prevalence of Diarrhoea		p-value
	Diarrhoea	Without Diarrhoea	
Do you wash your fruit and vegetables before eating?			0.001*
Yes	198 (47.60%)	218 (52.40%)	
No	25 (70.53%)	9 (26.47%)	
Do you wash your hands after defecating?			0.000*
Yes	121 (38.91%)	190 (61.09%)	
No	102 (73.38%)	37 (26.62%)	
Do you have toilet facility available at home?			0.000*
Yes	194 (46.63%)	222 (53.37%)	
No	29 (85.29%)	5 (14.71%)	
If yes, what type?			0.001*
Water closet	115 (39.79%)	174 (60.21%)	
Pit latrine	88 (69.29%)	39 (30.71%)	
Is your toilet private of public?			0.000*
Private	17 (14.91%)	97 (85.09%)	
Public	186 (61.59%)	116 (38.41%)	
What is the source of your drinking water?			0.002*
Borehole	56 (50.45%)	55 (49.55%)	
Well	98 (62.03%)	60 (37.97%)	
Stream	9 (81.82%)	2 (18.18%)	
Sacket water	49 (37.98%)	80 (62.02%)	
Bottled water	11 (26.83%)	30 (73.17%)	

Table 6. Association between Hygiene Practices and Prevalence of Diarrhoea in Control Subjects

Hygiene Practices	Prevalence of Diarrhoea		p-value
	Diarrhoea	Without Diarrhoea	
Do you wash your fruit and vegetables before eating?			0.000*
Yes	103 (24.52%)	317 (75.48%)	
No	27 (90.00%)	3 (10.00%)	
Do you wash your hands after defecating?			0.000*
Yes	30 (10.03%)	269 (89.97%)	
No	100 (66.23%)	51 (33.77%)	
Do you have toilet facility available at home?			0.000*
Yes	110 (25.70%)	318 (74.30%)	
No	20 (90.91%)	2 (9.09%)	
If yes, what type?			
Water closet	44 (14.57%)	258 (85.43%)	
Pit latrine	84 (66.67%)	42 (33.33%)	
Is your toilet private of public?			
Private	18 (16.67%)	90 (83.33%)	
Public	110 (34.38%)	210 (65.63%)	
What is the source of your drinking water?			
Borehole	10 (10.42%)	86 (89.58%)	
Well	102 (53.40%)	89 (46.60%)	
Stream	6 (100.00%)	0 (0.00%)	
Sacket water	9 (7.03%)	119 (92.97%)	
Bottled water	3 (10.34%)	26 (89.66%)	

practices between HIV-positive patients and control subjects in terms of washing fruits and vegetables, washing hands after defecating, having a toilet facility at home, and type of toilet facility (Table 3).

The prevalence of diarrhoea was significantly higher among HIV-positive patients compared to control subjects ($p = 0.001$) (Figure 1). Similarly, Figures 2 and 3 showed a significantly higher presence of parasites in stool samples of both HIV-positive patients and control subjects who experienced diarrhoea compared to those without diarrhoea ($p = 0.000$ for both).Table 4 indicated significant differences in the prevalence of various intestinal parasites between HIV-positive patients and control subjects, with higher rates observed among HIV-positive patients ($p \leq 0.05$).Tables 5 and 6 revealed significant associations between hygiene practices and the prevalence of diarrhoea in both HIV-positive patients and control subjects ($p \leq 0.001$ for all), highlighting the importance of hygiene in reducing the incidence of diarrhoea.

DISCUSSION

Diarrhoea remains a significant concern among HIV-positive individuals, impacting their quality of life and potentially complicating their management. This study aims to investigate the prevalence and risk factors associated with diarrhoea in HIV-positive patients within a tertiary healthcare facility in Southern Nigeria. The study population consisted of 450 HIV-positive patients and an equal number of control subjects. Analysis of gender distribution revealed a slightly higher proportion of females among HIV-positive patients compared to controls (53.11% vs. 48.00%, p=0.071), albeit not statistically significant. Age distribution showed no significant difference between the two groups across various age brackets ($p>0.05$), indicating similar age compositions.

Regarding the duration of HIV infection, the majority of patients had been living with HIV for 1-5 years (34.00%) and 6-10 years (26.89%), with smaller proportions for less than 1 year (21.56%) and more than 10 years (17.55%). This distribution underscores the chronic nature of HIV infection in the study population, with a considerable proportion having lived with the condition for several years. Smoking history analysis revealed a significantly lower prevalence of current and former smokers among HIV-positive patients compared to controls ($p<0.05$), suggesting a potential protective effect of smoking cessation or reduced smoking prevalence among individuals living with HIV. Similarly, a significant difference was observed in the frequency of alcohol consumption between the two groups ($p<0.05$), with HIV-positive patients showing lower rates of alcohol consumption, particularly regular and occasional drinkers.

These findings align with previous research highlighting the multifactorial nature of diarrhoea in HIV-positive individuals. Consistent with our results, studies have reported higher rates of diarrhoea among HIV-positive individuals compared to the general population, with prevalence ranging from 20% to 60% (Mocroft et al., 2000; Kelly et al., 2013). Furthermore, our observation of a lower prevalence of smoking and alcohol consumption among HIV-positive patients corroborates findings from studies emphasizing the detrimental effects of these behaviours on HIV progression and gastrointestinal health (Uduma et al., (2023), Chikezie et al. (2024), Crum-Cianflone et al., 2009; Palella et al., 2006).

The results of the $CD4^+$ T lymphocyte count in both HIV-positive patients and control subjects are presented in Table 2. The results indicate a notable disparity between the two groups, with HIV-positive patients exhibiting significantly lower $CD4^+$ T lymphocyte counts compared to the control subjects. The minimum $CD4^+$ T lymphocyte count observed in HIV-positive patients was 40 cells/µL, while the maximum was 1055 cells/µL. In contrast, control subjects demonstrated a minimum $CD4^+$ T lymphocyte count of 354 cells/µL and a maximum of 1501 cells/µL. The mean $CD4^+$ T lymphocyte count among HIV-positive patients was 377±201 cells/µL, substantially lower than the mean count of 938±113 cells/µL among control subjects. Statistical analysis revealed significant differences in $CD4^+$ T lymphocyte counts between the two groups ($p < 0.05$).

These findings align with previous research demonstrating the inverse relationship between $CD4^+$ T lymphocyte count and HIV progression (Uduma et al., 2023, Chikezie et al. 2024). Lower CD4+ T lymphocyte counts are indicative of advanced HIV disease and immunosuppression, rendering individuals more susceptible to opportunistic infections such as diarrhoea (*Crytosporidiosis, Cyclosporiasis, Isosporiasis* etc.). Studies conducted in similar settings have reported comparable results, reaffirming the association between $CD4^+$ T lymphocyte count and diarrhoea prevalence in HIV-positive patients.

For instance, a study by Shiferaw et al. (2019) in Ethiopia found a significant correlation between low $CD4^+$ T lymphocyte counts and increased incidence of diarrhoea in HIV-positive individuals. Similarly, a study conducted by Omoregie et al. (2018) in Nigeria observed lower $CD4^+$ T lymphocyte counts among HIV-positive patients with diarrhoea compared to those without diarrhoea. These consistent findings underscore the importance of $CD4^+$ T lymphocyte count as a prognostic indicator for diarrhoea risk in HIV-positive populations across different geographic regions.

Furthermore, interventions aimed at improving immune function and increasing $CD4^+$ T lymphocyte counts, such as antiretroviral therapy (ART), have been shown to reduce the incidence and severity of diarrhoea in HIV-positive patients. A study by Sodiende et al. (2020) demonstrated a significant decrease in diarrhoea

prevalence following ART initiation, attributed to $CD4^+$ T lymphocyte count restoration and immune reconstitution.

The findings of this present study reveal several noteworthy points regarding hygiene practices and their potential correlation with the occurrence of diarrhoea in HIV-positive patients. Firstly, the majority of both HIV-positive patients and control subjects reported washing fruits and vegetables before consumption, with no significant difference between the two groups. This finding is consistent with previous studies emphasizing the importance of food hygiene in preventing diarrhoeal diseases (Smith et al., 2020).

Secondly, there is a relatively high proportion of individuals in both groups who do not consistently wash their hands after defecating. While the difference between HIV-positive patients and control subjects is not statistically significant, the overall low adherence to this basic hygiene practice highlights a potential area for intervention to reduce diarrhoeal incidence in both populations (Stanton et al., 2019).

Thirdly, the presence of toilet facilities at home is significantly higher among control subjects compared to HIV-positive patients. However, the type of toilet facility (water closet vs. pit latrine) does not differ significantly between the two groups. This finding underscores the importance of access to basic sanitation infrastructure in preventing diarrhoeal diseases, particularly in resource-limited settings where HIV prevalence is high (Gunda et al., 2018).

Fourthly, the majority of participants in both groups reported using private toilets rather than public ones, although the difference was not statistically significant. This preference for private sanitation facilities may indicate a perception of increased hygiene and safety, which could potentially contribute to lower diarrhoeal risk (Maru et al., 2021).

Finally, regarding the source of drinking water, there were no significant differences between HIV-positive patients and control subjects. However, the high proportion of individuals relying on wells for drinking water highlights a potential risk factor for waterborne diseases, including diarrhoea, particularly in settings where water quality may be compromised (Njuguna et al., 2017).

The findings of this current study further revealed a notably higher prevalence of diarrhoea among HIV-positive patients compared to control subjects. Specifically, 49.55% of HIV-positive patients experienced diarrhoea, whereas only 28.89% of control subjects reported similar symptoms. This significant disparity underscores the heightened vulnerability of HIV-positive individuals to diarrhoeal episodes, warranting further investigation into potential contributing factors.These results align with previous studies demonstrating a higher prevalence of diarrhoea among HIV-positive individuals. For instance, a study by Amadi et al. (2018) found that diarrhoea was more prevalent in HIV-infected patients compared to the general population in Nigeria. Similarly, a meta-analysis by Kelly et al. (2019) revealed a substantially elevated risk of diarrhoea in HIV-positive individuals across various settings.

The presence of parasites in stool samples further elucidates the underlying etiology of diarrhoea in both HIV-positive patients and control subjects. Among individuals experiencing diarrhoea, a significantly higher proportion of HIV-positive patients harboured parasites in their stool compared to control subjects (80.82% vs. 40.16%). This finding underscores the potential role of parasitic infections in exacerbating diarrhoeal symptoms among HIV-positive individuals.

Moreover, even in the absence of diarrhoea, HIV-positive patients exhibited a higher prevalence of parasites in stool samples compared to control subjects (58.23% vs. 37.22%). This suggests that parasitic infections may persist in HIV-positive individuals, potentially predisposing them to diarrhoeal episodes even during asymptomatic periods. These observations corroborate findings from previous research highlighting the association between parasitic infections and diarrhoea in HIV-positive populations. A study by Kelly et al. (2020) demonstrated a higher prevalence of parasitic infections, particularly protozoan parasites, among HIV-positive individuals with diarrhoea compared to those without diarrhoea.

The findings revealed varying prevalence rates of intestinal parasites among HIV-positive patients compared to control subjects. Notably, the coccidian parasites of the genera *Cryptosporidium, Cyclospora*, and *Isospora*, demonstrated significantly higher prevalence rates among HIV-positive patients. This aligns with previous research indicating that HIV infection predisposes individuals to a higher risk of opportunistic infections, including parasitic infections, due to compromised immune function (Mengist et al., 2021).

The significantly higher prevalence of *Cryptosporidium*, and *Cyclospora* among HIV-positive patients underscores the importance of screening and managing these infections in this population. These findings resonate with studies conducted in similar settings, emphasizing the importance of targeted interventions to address parasitic co-infections in HIV-positive individuals (Adamu et al., 2020).

Interestingly, certain parasites such as *Ancylostoma duodenale, Entamoeba histolytica*, and *Fasciola buski* did not demonstrate significantly higher prevalence rates among HIV-positive patients compared to control subjects. This may suggest that factors other than HIV status play a more prominent role in the transmission and prevalence of these parasites within the studied population.

Moreover, the notably higher prevalence of no parasites among control subjects compared to HIV-positive patients underscores the potential impact of immune status on susceptibility to parasitic infections.

HIV-induced immunosuppression may predispose individuals to a broader range of infections, including those caused by opportunistic pathogens (Efunshile et al., 2020).

The results indicate a significant association between several hygiene practices and the prevalence of diarrhoea among HIV-positive patients. Firstly, the practice of washing fruits and vegetables before consumption showed a statistically significant difference in diarrhoea prevalence. HIV-positive patients who reported not washing their fruits and vegetables exhibited a higher prevalence of diarrhoea compared to those who did wash them. This finding underscores the importance of food hygiene in reducing the risk of diarrhoeal diseases among this population.

Secondly, handwashing after defecation emerged as another crucial factor associated with diarrhoea prevalence among HIV-positive individuals. Those who reported not washing their hands after defecation had a significantly higher prevalence of diarrhoea compared to those who practiced proper hand hygiene. This aligns with existing literature emphasizing the role of handwashing in preventing the transmission of enteric pathogens, which can be particularly harmful to immunocompromised individuals like those with HIV.

Moreover, the presence and type of toilet facilities at home were found to be significant predictors of diarrhoea prevalence among HIV-positive patients. Participants who did not have access to toilet facilities or relied on pit latrines were more likely to experience diarrhoea compared to those with water closets. This finding highlights the importance of sanitation infrastructure in reducing the burden of diarrhoeal diseases, especially in resource-limited settings where access to improved sanitation facilities remains a challenge.

Furthermore, the privacy of toilet facilities was also associated with diarrhoea prevalence among HIV-positive patients. Those who used public toilets had a significantly higher prevalence of diarrhoea compared to those with private toilets. This suggests that factors such as cleanliness and accessibility of toilets may influence the risk of diarrhoeal infections in this population.

Additionally, the source of drinking water was identified as a significant factor in diarrhoea prevalence among HIV-positive patients. Participants who relied on streams or sachet water had a higher prevalence of diarrhoea compared to those using borehole or bottled water. This highlights the importance of access to safe and clean drinking water in preventing waterborne diseases, which can exacerbate health complications in HIV-positive individuals.

The findings of this study are consistent with previous research highlighting the importance of hygiene practices and sanitation in reducing the risk of diarrhoea among HIV-positive patients. For instance, a study by Mengistie et al. (2019) conducted in Ethiopia found that inadequate handwashing practices were associated with a higher risk of diarrhoea among people living with HIV/AIDS. Similarly, a study by Siziya et al. (2018) in Zambia reported a significant association between lack of access to improved sanitation facilities and increased diarrhoea prevalence among HIV-positive individuals.

Furthermore, a systematic review by Cumming et al. (2019) examining the relationship between water, sanitation, and hygiene (WASH) interventions and diarrhoeal diseases among people living with HIV/AIDS concluded that improved WASH practices can significantly reduce the burden of diarrhoea in this population. The findings of our study align with the conclusions drawn from these previous investigations, emphasizing the importance of promoting proper hygiene practices and ensuring access to adequate sanitation and clean drinking water to mitigate diarrhoeal morbidity among HIV-positive patients.

CONCLUSION

This present study found that HIV-positive patients had a significantly higher prevalence of diarrhoea compared to control subjects. Furthermore, the presence of parasites in the stool was notably higher in HIV-positive patients with diarrhoea compared to control subjects, highlighting the importance of parasitic infections as contributors to diarrhoeal illness in this population. The study also identified several risk factors associated with diarrhoea in HIV-positive patients. Notably, smoking history and frequency of alcohol consumption showed significant associations with diarrhoeal prevalence, with current and former smokers exhibiting higher rates of diarrhoea compared to non-smokers. Additionally, poor hygiene practices, such as inadequate handwashing after defecation and lack of access to proper toilet facilities, were significantly associated with higher rates of diarrhoea among both HIV-positive patients and control subjects. These findings underscore the importance of targeted interventions to improve hygiene practices and reduce modifiable risk factors among HIV-positive individuals, which could help mitigate the burden of diarrhoeal illness in this vulnerable population. Furthermore, the study highlights the need for integrated approaches to managing both HIV infection and associated comorbidities such as parasitic infections to improve overall health outcomes in affected individuals.

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