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Intestinal Parasitic Infection in Human Immuno-Diffeciency Virus and Acquired Immune Difficiency Syndrome (HIV/Aids) Patients Attending General Hospital Doma in Nasarawa State

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Abstract

Intestinal parasitic infections poses significant risks for individuals living with HIV/AIDS due to their compromised immune systems as it remains a significant global health concern, particularly in low and middle income region like Doma Local Government Area where sanitation and hygiene practices tends to be inadequate. The study investigated the intestinal parasites in a total of 400 stool samples collected from informed individuals living with HIV/AIDS that vary in age, gender, and socioeconomic status attending General Hospital Doma in Nasarawa State. Samples were preserved to prevent degradation, followed by microscopic examination and analyzed for the presence of eggs, cysts, or trophozoites, using direct smear, concentration methods, and formalin-ethyl acetate sedimentation technique to enhance detection rates. A structured questionnaire was used to gather information on risk factors and data were analyzed using SPSS version 23.0. The P-value <0.05 was considered statistically significant. Intestinal parasites were recovered in 103 out of 400 samples processed, yielding an overall prevalence rate of 25.7%. Among the recovered

parasites, Hookworm exhibited the highest prevalence at 24.3%, followed by *Giardia lamblia* at 20.4%. Other notable infections included *Ascaris lumbricoides* (18.4%), *Entamoeba histolytica* at 14.6%, *Enterobius vermicularis* (10.7%), *Strongyloides stercoralis* (6.8%), *Hymenolepis nana* (3.9%), and *Toxoplasma gondii* (1.0%). The highest prevalence of infections occurred among patients in the age group 21-30years (19.4%) while the lowest prevalence was observed in patients aged 61 years and above (4.9%) ($P<0.05$). The observed difference in infection prevalence among the sexes was not statistically significant ($P> 0.05$), however, infections were more common in females (52.9%) compared to males (47.1%). Based on their risk factors patients who live in rural settings are more infected (71.9%) than those who live in an urban setting (28.1%), patients who are poor financially were more infected (61.1%) than those who are middle class (28.1%) and rich (10.6%) and patients who drink table water were less infected (4.9%) compared to those who drink borehole water (18.4%), well water (30.1%) and stream water (46.6%). Overall, the findings underscore the high burden of intestinal parasitic infections among HIV/AIDS patients, with specific demographic patterns that warrant further investigation for effective treatment and prevention strategies.

Keywords: Doma, HIV/AIDs, Intestinal Parasites, Patients.

Introduction

It is estimated that as much as 60% of the world's population is infected with intestinal parasites, which play a role in morbidity due to intestinal infections (Kang *et al.* 2022). Intestinal parasites are widely prevalent in developing countries, probably due to poor sanitation and inadequate personal hygiene. Most of these parasites are encountered in tropical areas where they could be described as endemic, causing enormous and grave pathological effects. The commonest parasitic infections reported globally are *Ascaris lumbricoides* (20%), Hookworm (18%), *Trichuris trichiura* (10%) and *Entamoeba histolytica* (10%) (WHO, 2019). The prevalence of infections and degree of factors predisposing to infection vary from one region to another (Kabatende *et al.,* 2020).

Among the most common illnesses in humans in underdeveloped nations are parasitic infections brought on by intestinal helminths and protozoan parasites (Funso-Aina *et al.,* 2020). Over 2 billion people, or about one- third of the world's population, are infected, with children making up the vast majority

(Hotez *et al.,* 2019 & WHO, 2020). These illnesses are linked to bad hygiene practices, a lack of access to clean water, and poor sanitary habits, therefore they occur wherever there is poverty (Steketee *et al.,* 2023). Intestinal parasites impact the poorest and most destitute places in tropical and subtropical regions of the world, where they are found in variable degrees of prevalence (Bunza *et al.,*2021 & Faria *et al.,* 2022). Nigeria has a high prevalence of intestinal parasites, mostly as a result of poor personal and environmental hygiene, tainted food, and water contamination from improperly disposed of human waste (Uzairue *et al.,*2023).

Intestinal parasitic infections had long been recognized as an important health problem especially among Nigerian children (Graitcher and Gentry, 2021), thus the need for this study. Other studies had also indicated a correlation between intensity of infection with hookworm and with *Ascaris lumbricoides* and iron-deficiency anaemia and intestinal obstruction (Centers for Diseases Control [CDC], 2019). However, only few reports have been made on the prevalence of intestinal parasites of humans in Maiduguri (Biu and Adam, 2004). This study was attempted to provide and improved data on the various intestinal parasitic infection in patient attending General Hospital, Doma.

Statement of the Problem

Intestinal parasitic infections (IPIs) are a critical public health issue, particularly in immunocompromised populations such as individuals living with HIV/AIDS. The World Health Organization (WHO) estimates that approximately 36 million people are living with HIV globally, with a significant proportion facing increased vulnerability to opportunistic infections, including IPIs (WHO, 2021). The prevalence of these infections among HIV/AIDS patients can lead to severe health complications, worsening their clinical status and increasing mortality rates (Boulware *et al.,* 2019).

At General Hospital Doma, there is a concerning trend of rising intestinal parasitic infections among HIV/AIDS patients. These infections, which include organisms such as *Giardia lamblia*, *Entamoeba histolytica*, and various helminths, can significantly impact the health outcomes of individuals with compromised immune systems (Nielsen *et al.,* 2019). The immunosuppressive nature of HIV facilitates the establishment and persistence of these parasites, resulting in gastrointestinal symptoms such as diarrhea, abdominal pain, and malnutrition (Kumar *et al.,* 2019).

The interplay between HIV and IPIs is particularly detrimental, as these infections can exacerbate the progression of HIV disease. Studies have shown that patients with concurrent intestinal parasitic infections often experience higher viral loads and lower CD4+ T-cell counts, indicating a more severe immune-compromised state (Ahmed,

2023). This vicious cycle not only complicates the management of HIV/AIDS but also leads to increased healthcare costs and resource utilization (Mugisha *et al.,* 2020).

Materials and Methods

Study Area

Nasarawa State is located in North Central Nigeria, it is situated in the interval of longitude 7° and 9° 37' East of the Greenwhich Meridian and latitude 7° 45' and 9° 25' North of the equator. Plateau State shares boundary with the State in the East, in the North, Kaduna State, in the South, Benue and Taraba States, while Kogi State and Federal Capital Territory flanks it in the West.

Doma is a Local Government Area in Nasarawa State, its headquarters are in Doma. It has an area of 2,714km^2 and a population of 137607 in the 2006 census. The postal code of the area is 950. Farming is the occupation of most of the Alago people who are the predominant tribe in Doma. The kingdom of Doma was founded in 1232 by Andoma and lasted until 1901 when it became part of the British Protectorate of northern Nigeria (Yaro, 2018).

This research work was conducted at General Hospital, Doma Local Government Area of Nasarawa State.

The materials essential for managing intestinal parasitic infections in HIV/AIDS patients include diagnostic tools such as stool collection kits and rapid test kits for detecting parasites like *Giardia* and *Cryptosporidium*, treatment medications including anti-parasitic drugs like nitazoxanide and albendazole, as well as nutritional supplements to address deficiencies; preventive supplies comprising educational materials on hygiene, water purification systems, and sanitation equipment to minimize infection risk; monitoring tools like health assessment questionnaires and data collection software for tracking patient outcomes; and community outreach resources such as awareness campaign materials and training modules for healthcare providers to promote integrated care approaches, all of which are crucial for effective diagnosis, treatment, and prevention of these infections.

Study Participants

A total of 400 informed individuals living with HIV/AIDS who are consented and are at risk of or currently experiencing intestinal parasitic infections. These participants may vary in age, gender, and socioeconomic status, recruited from the healthcare facilities. Inclusion criteria generally involve confirmed HIV status and the presence of specific IPIs, while exclusion criteria may rule out those with other severe co-morbidities.

Sample Size Determination

A sample size of approximately 400 participants is targeted.

$$n = \frac{Z^2 p(1-p)}{E^2}$$

Where:

n = required sample size

Z = Z-value 95% (Z = 1.96)

p = estimated prevalence of in the population (0.20)

E = margin of error 5% (0.05)

$$n = \frac{(1.96)^2 + 0.5 + (1-0.5)}{(0.05)^2} \quad n = \frac{3.8416 + 0.25}{0.0025}$$

$$n = \frac{0.9604}{0.0025}$$

$$= 384.16$$

$$\approx \mathbf{400}$$

Sample Collection

Sample collection for the study involves obtaining stool specimens from participants living with HIV/AIDS, ensuring proper procedures are followed to maintain sample integrity, participants are provided with questionnaire, sterile collection kits that include containers and instructions for safe handling, and they are educated about the importance of collecting samples at specific times to enhance diagnostic accuracy, while trained healthcare staff helped in the process to ensure compliance and address any questions; once collected, samples were labeled accurately and transported under controlled conditions to the laboratory for analysis, where they undergo microscopic examination to identify the presence of intestinal parasitic infections.

Laboratory Analysis

Laboratory analysis of the collected stool samples involves a series of systematic procedures to accurately identify and quantify intestinal parasitic infections in participants living with HIV/AIDS, beginning with the preparation of samples, which includes mixing and preserving them to prevent degradation, followed by microscopic examination where trained technicians analyze the samples for the presence of eggs, cysts, or trophozoites, employing techniques such as direct smear, concentration methods, and formalin-ethyl acetate sedimentation to enhance detection rates; in addition to traditional microscopy, after completing the analysis, results are compiled and interpreted, leading to a comprehensive report that not only informs clinical management of the participants but also contributes to the overall understanding of the epidemiology of intestinal parasitic infections in the context of HIV/AIDS.

Ethical Consideration

The work received ethical clearance from the Ethical Review Committee on Human Research, Nasarawa State Ministry of Health, Nigeria with the protocol number; NHREC 18/06/2017.

Administrative clearance for this study was obtained from the Head of Laboratory Department General Hospital of Doma.

Data Analysis

The data generated from this study were presented using descriptive statistics. With SPSS version 23.0 was used to evaluate whether or not there were associations between the malaria *Plasmodium* prevalence and the subjects' variables. The p-values < 0.05 were considered statistically significant.

Results

Intestinal parasites were recovered in 103 out of 400 samples processed, yielding an overall prevalence rate of 25.7% (Table 1). Among the recovered parasites, Hookworm exhibited the highest prevalence at 24.3%, followed by *Giardia lamblia* at 20.4%. Other notable infections included *Ascaris lumbricoides* (18.4%), *Entamoeba histolytica* at 14.6%, *Enterobius vermicularis* (10.7%), *Strongyloides stercoralis* (6.8%), *Hymenolepis nana* (3.9%), and *Toxoplasma gondii* (1.0%).

The analysis of age distribution revealed that the highest prevalence of infections occurred among patients in their third decade of life (37%), while the lowest prevalence was observed in patients aged 61 years and above (2.9%) (Table 2). This indicates a trend where younger adults are more affected by these infections.

The observed difference in infection prevalence between sexes was not statistically significant ($P > 0.05$); however, infections were more common in females (52.9%) compared to males (47.1%) (Table 3). This suggests a potential need for gender-specific interventions, despite the lack of statistical significance.

Based on their risk factors patients who live in rural settings are more infected (71.9%) than those who live in an urban setting (28.1%), patients who are poor financially were more infected (61.1%) than those who are middle class (28.1%) and rich (10.6%) and patients who drink table water were less infected (4.9%) compared to those who drink borehole water (18.4%), well water (30.1%) and stream water (46.6%).

Overall, the findings presented in this chapter underscore the high burden of intestinal parasitic infections among HIV/AIDS patients, with specific demographic patterns that warrant further investigation for effective treatment and prevention strategies.

Table 1: Prevalence of intestinal parasitic infections among HIV/AIDS patients at General Hospital Doma

Parasites species	Frequency	Percent	Valid Percent	Cumulative Percent
E. histolytica	15	14.6	14.6	14.6
Hook worm Ova	25	24.3	24.3	38.8
G. lamblia	21	20.4	20.4	59.2
A. lumbricoides	19	18.4	18.4	77.7
H. nana	4	3.9	3.9	81.6
E. vermicularis	11	10.7	10.7	92.2
S. stercoralis	7	6.8	6.8	99.0
T. gondii	1	1.0	1.0	100.0
Total	**103**	**100.0**	**100.0**	

Statistics

Parasites Species

N	Valid	103
	Missing	0
Mean		3.3689
Median		3.0000
Mode		2.00
Skewness		.639
Std. Error of Skewness		.238
Kurtosis		-.504
Std. Error of Kurtosis		.472
Sum		347.00

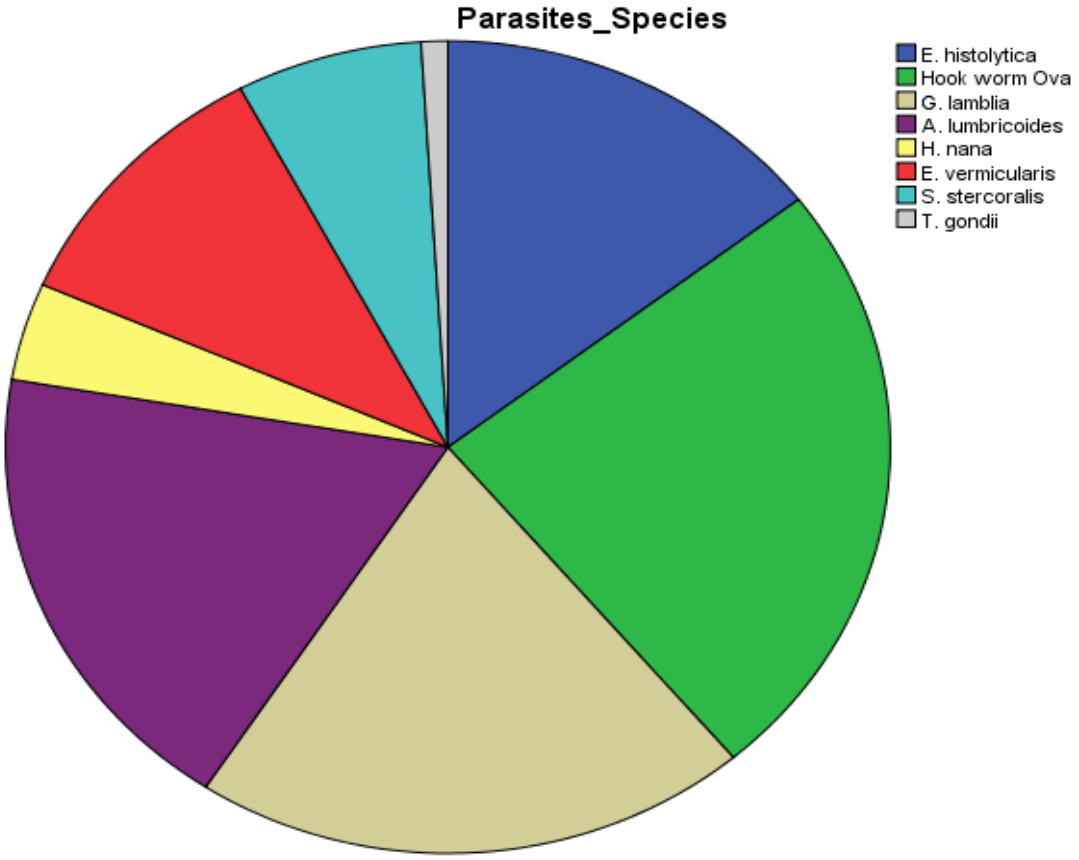


Fig. 1: Prevalence of intestinal parasitic infections among HIV/AIDS patients at General Hospital Doma

Table 2: Specific types of intestinal parasites affecting HIV/AIDS patients at General Hospital Doma

	Intestinal parasites affecting HIV/AIDs (%)								
Age Group (yrs)	***E. histolytica***	***Hookworm ova***	***G. lamblia***	***E. vermicularis***	***S. stercoralis***	***A. lumbricoides***	***T. gondii***	***H. nana***	**p-value**
1–10	2 (2.49)	5 (5.20)	5 (10.0)	1 (2.00)	1 (6.67)	3 (4.00)	0 (0.0)	0 (0.00)	**0.00**
11–20	4 (4.99)	5 (5.20)	3 (6.00)	2 (4.00)	1 (6.67)	3 (4.00)	0 (0.0)	1(0.33)	
21–30	2 (2.49)	5 (5.20)	5 (10.0)	3 (6.00)	0 (0.00)	4 (5.33)	1(25.0)	0(0.00)	
31–40	2 (2.49)	3 (3.12)	3 (6.00)	1 (4.00)	2 (13.33)	3 (4.00)	0 (0.0)	1(0.33)	
41–50	2 (2.49)	4 (4.16)	3 (6.00)	2 (4.00)	2 (13.33)	3 (4.00)	0 (0.0)	2(0.67)	
51–60	2 (2.49)	2 (2.08)	1 (2.00)	1 (2.00)	1 (6.67)	2 (2.67)	0 (0.0)	0(0.00)	
61–70	1 (1.26)	1 (1.04)	1 (2.00)	1 (2.00)	0 (0.00)	1 (1.33)	0 (0.0)	0(0.00)	
Total	15(18.7)	25(26.0)	21(42.0)	11(22.0)	07(46.6)	19(25.3)	1(25.0)	04(1.3)	

Table 3: Sex related prevalence of Intestinal Parasitic Infections among HIV/AIDS patients

Intestinal Parasites	SEX		Total (%)	p-value
	Male (%)	Female (%)		
Hookworm ova	20 (13.43)	30 (14.27)	50 (7.09)	0.89
Hymenolepis nana	10 (6.73)	15 (7.14)	25 (3.56)	
Giardia lamblia	15 (10.09)	20 (9.53)	35 (4.97)	
Entamoeba histolytica	5 (3.36)	10 (4.76)	15 (2.13)	
Strongyloides stercoralis	7 (4.71)	8 (3.81)	15 (2.13)	
Ascaris lumbricoides	5 (3.36)	15 (7.14)	20 (2.84)	
Toxoplasma gondii	3 (2.02)	7 (3.34)	10 (1.42)	
Enterobius vermicularis	5 (3.364)	6 (2.86)	11 (1.56)	
Total	47 (47.1%)	56 (52.9%)	103 (25.7)	
Mean	0.5137	0.5253		

Table 4: Risk factors associated with intestinal parasitic infections attending General Hospital Doma

Options	Frequency	χ^2value	P-value
Settlement			
Rural	29 (9.3)	39,40	0.00
Urban	74 (16.4)		
Financial Status			
Poor	63 (13.3)	11.020	0.00
Middle class	29 (8.2)		
Rich	11 (4.2)		
Source of Drinking Water			
Stream	48 (12.5)	94,090	0.00
Well water	31 (7.4)		
Borehole water	19 (4.4)		
Table water	5 (1.4)		
Total	**103 (25.7)**		

Discussion

The findings revealed a concerning prevalence of intestinal parasitic infections (IPIs) among HIV/AIDS patients at General Hospital Doma. With an overall prevalence rate of 25.7% is similar to that of Mekonnen and Sadik (2024), Gautam *et al.,* (2024) and Belete *et al.,* (2024) 28.8%, 27% and 25.6% prevalence rate respectively, and lower

than the 32.5% by Girma and Genet (2024), 33.6% by Aleleign *et al.,* (2024) and 31% prevalence rate by Wondmagn *et al.,* (2025). The finding however is higher than the 12% prevalence rate by Wondimagegn and Halilu (2024), the 2.8% prevalence rate by Abdalal *et al.,* (2024) and the 16.66% prevalence rate by Adugna *et al.,* (2024). The data underscores the significant health burden posed by these infections within this vulnerable population.

The high recovery rate of intestinal parasites, particularly Hookworm (24.3%), *Giardia lamblia* (20.4%) and *Ascaris lumbricoides* (18.4%), highlights the need for ongoing surveillance and targeted interventions. The predominance of Hookworm is particularly noteworthy, as it is associated with severe gastrointestinal complications, which can exacerbate the already compromised immune systems of HIV/AIDS patients. The presence of various other parasites, including *Entamoeba histolytica, Enterobius vermicularis*, *Strongyloides stercoralis*, *Hymenolepis nana* and *Toxoplasma gondii* suggests a diverse parasitic landscape that requires comprehensive management strategies and is similar to the findings of Sitotaw and Shiferaw (2020), Belete *et al.,* (2024), Wondimagegn and Halilu (2024), Achi *et al.,* (2024) and Mekonnen and Sadik (2024).

The analysis of age distribution, as illustrated in Table 2, indicates a peak prevalence of infections among patients in age group 20 to 30 years old (19.4%) and age 31-40 years old (18.4%). The finding is in contrast to the work of Deku *et al.,* (2024), who revealed that infection is highest in the older age groups. This trend may be attributed to several factors, including lifestyle choices, exposure risks, and possibly lower access to healthcare in younger adults. Conversely, the significantly lower prevalence in patients aged 61 years and above (4.8%) could reflect a combination of factors such as improved health awareness, preventive measures, and possibly a selection bias where healthier older individuals are more likely to seek medical care.

While the observed difference in infection prevalence between sexes was not statistically significant ($P > 0.05$), the data indicates a higher infection rate among females (52.9%) compared to males (47.1%) which corroborates the findings of Uthman *et al.,* (2024) and in contrast to the findings of Achi *et al.,* (2024) and that of Mekonnen and Sadik (2024) who revealed that males were more infected than females. This finding suggests potential underlying behavioral or biological factors that may predispose the females to higher infection rates. Although the lack of statistical significance implies that gender may not be a critical factor in this specific context, it does highlight the necessity for gender-sensitive health interventions and education programs tailored to address the unique risks faced by different demographics.

Statistical analysis revealed that risk factors such as settlement, source of drinking water and financial status were found to contribute to the transmission of these infections and this corroborates the findings of Hossein *et al.,* 2020 and Belete *et al.,* (2024).

Conclusion

Out of 400 HIV/AIDS patients, 103 (25.75%) were positive for intestinal parasitic infections, indicating a significant prevalence. Several risk factors, including financial status, source of drinking water, and settlement, were found to contribute to the transmission of these infections. These findings highlight the vulnerability of HIV/AIDS patients to opportunistic infections, particularly in resource-limited settings.

Recommendations

1. Improved Access to Clean Water: Implement programs ensuring access to safe drinking water, including water purification initiatives and distribution of filtration systems.
3. Health Education and Awareness: Educate HIV/AIDS patients on proper hygiene practices, safe water consumption, and parasite prevention methods.
4. Regular Screening and Treatment: Strengthen routine screening for parasitic infections in HIV/AIDS patients to enable early detection and treatment.
5. Financial and Social Support Programs: Advocate for support programs to improve the financial stability of affected individuals, as poverty is linked to higher infection rates.
6. Sanitation and Housing Improvements: Promote better sanitation practices and improve living conditions, especially in high-risk settlements.

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Conflict of Interest

The authors declare no competing interest.

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