

being of Chamba, Yardang, Mumuye, and Fulani ethnic groups.

Study Population

The population of this study comprises of both male and female participants from the study area. Just like the other parts of Adamawa State, one of the prime occupations of the inhabitants of Mayo-Belwa LGA is farming. They indulge in various agricultural activities such as cattle, sheep and goat rearing; cultivating crops such as maize, sorghum, groundnut, cassava, millet, yam, rice etc. The people also undertake livestock production such as poultry production and pigery on small scale.

Sampling Technique

HIV/AIDS patients (both males and females) of different age groups who presented with diarrhoea and/or abdominal pains participated in the study were randomly selected. The samples collected for investigation included diarrhoeic and non-diarrhoeic samples. Specimens were also randomly collected from patients with normal stools and/or without abdominal pain and symptoms of diarrhoea.

Participants and specimens

A total of 80 HIV/AIDS patients comprising males and females of different age groups presented with diarrhoea or no diarrhoea and/or abdominal pains attending Cottage Hospital Mayo Belwa between September 2022 and December 2022 participated in the study. The samples collected for investigation included diarrhoeic samples. Patients clinically diagnosed with HIV/ AIDS was also included in the study and noted as immunocompromised. Specimens were also collected from patients with normal stools and/or without abdominal pain and symptoms of diarrhoea.

Method of Sample Collection

Stool samples were collected in screw cap universal containers. Before sample collection, each respondent from whom consent was earlier received was instructed on how to do the collection. The fresh stool samples were collected in a screw cap container and immediately to the laboratory (Cottage hospital Mayo-belwa) for examination.

Examination of Faecal Samples

Each faecal sample was concentrated by sedimentation. Thereafter, faecal smears from the concentrates were made. The smears were stained using Modified Ziehl-Neelsen technique after which the slides were examined for *Cryptosporidium* oocysts under the microscope at x100 magnification. Stained oocysts appeared pinkish to reddish and were identified using morphological characteristics with reference to standard keys.

Statistical Analysis

The results obtained were analysed using the SPSS version 25.00 statistical software, 2017. Results were reduced to percentages and presented in tables. Chi-square test was used to test for significant association between infection and various variables at 95% confidence level.

Ethical Considerations

A letter of introduction was obtained from the Head, Department Biological Sciences, Federal University Wukari and submitted to the Chairman and Director of Health Mayo Belwa Local Government Area, for approval before the samples were collected.

Results/discussion

The results for cryptosporidium infection among HIV/AIDS patients segregated into age and gender is shown in the Table 1.0. The result shows no statistical significance ($P > 0.05$) even though females show higher prevalence percentages. The female Individuals within the age range 16-45 years had 40% prevalence percentage while the males had 33.33%. the females within the age range 45 years and above also had higher prevalence of 60% while the males had 66.67%. This shows that the older age group had higher prevalence over the lower age group. Some of the individuals within the age range 45 and above do not have a consistent touch with health personnel to able to obtain their Anti-retroviral drugs which might help reduce the action of this parasite, hence the high prevalence.

Table 1.0. Distribution of Cryptosporidium by age and Sex among HIV/AIDS patients attending Cottage Hospital in Mayo-Belwa

Age range	Immunocompromised		CH	P-value
	Male	Female		
05-15	0(0.00)	0(0.00)	0.61	0.7371
16-45	2(33.33)	4(40.00)		
46-Above	4(66.67)	6(60.00)		
Total	6	10		

CH = Chi square value, P-value = Probability value

Table 2.0 below shows the overall prevalence distribution of cryptosporidiosis among HIV/AIDS patients attending Cottage Hospital in Mayo-Belwa. The Females had higher prevalence (22.22%) over the males (17.14%) although not statistically significant $P < 0.05$.

Table 2.0 Distribution of the prevalence of cryptosporidium by gender among HIV/AIDS patients attending Cottage Hospital in Mayo-Belwa

Sex	NumberExamined	Number Positive
Male	35(44%)	6(17.14%)
Female	45(56%)	10(22.22%)
Total	80	16(20.00%)

Diarrhea caused by opportunistic intestinal protozoa is a common problem in HIV-infected patients. In the present study, the females (22.22%) showed higher prevalence over the males (17.14%). This was in agreement with the work of Abubakar Aliyu, 2014 who also observed high prevalence among females but in contrast to the study of Fatima and Shahnaz 2018 who in her study observed higher rate of infection in males (15.5%) than females (14.8%).

The result also shows that the older age group (45 and above) had higher prevalence over the lower age group. This was in agreement with the work of Abubakar Aliyu, 2014 who also observed high prevalence among females of age 45-55 and also in agreement to the result from North-Western Nigeria by Maikaiet *et al.*, (2012), who reported a prevalence of 1.9% among patients aged 2 months to 70 years-old. It is likely that variation in prevalence among age groups is associated with levels of exposure, practices or behaviors in the community that exhibit temporal variation or because some older individuals do not have a consistent touch with health personnel to able to obtain their Anti-retroviral drugs which might help reduce the action of this parasite, hence the high prevalence. In contrast, other studies in the tropics have indicated that prevalence of infection is highest in age group 15 – 26.

This study appears to be the first from Mayo-belwa in North eastern Nigeria. The prevalence of 20% recorded among the HIV infected patients in this study though in agreement was quite higher than the prevalence recorded in Sokoto North western Nigeria by Abubakar Aliyu, 2014. The study also disagrees with the study carried out in a tertiary institution in South Eastern Nigeria by Nwokediuko, *et al.*, 2005, using modified Ziehl Nelsen Staining Technique, where Cryptosporidium was not detected in stool samples in 189 HIV infected and non-infected patients with diarrhoea. The prevalence rate (20%) was also observed to be relatively high compared to the result of Boniface, *et al.*, (2017) who using the same detection method reported an overall Cryptosporidium prevalence of 4.0% and 6.0% prevalence rate among HIV infected patients. The reason for this difference can be related to the known fact that HIV opportunistic infections, Cryptosporidiosis inclusive, tend to vary from one locality to another and from one country to the other depending on the level of contamination of water, food stuff and contacts with animals which are important factors in dissemination of the parasite or due to the fact that some of the patients are receiving anti-retroviral therapy and therefore have

improved immune responses. Cryptosporidiosis in Nigeria has also been reported from tertiary institutions among children in the North-Central (4.8%) (Banwatet *et al.*, 2003 and Akujobi and Ogunsola, 2005).

This study has few limitations, this is because only a single stool specimen was examined per patient. As a result, the prevalence of infection may have been under estimated

Conclusion

The present study has demonstrated prevalence of Cryptosporidium in faeces of HIV/AIDS infected patients attending cottage hospital Mayo-Belwa. Both males and females were examined during the study. The females showed higher prevalence rate over the males. Higher prevalence rate was observed from the older age group compared to the lower age group. The male individuals generally showed least prevalence. It is therefore recommended that findings of this study be used in establishing base line information and for implementing control/prevention intervention measures against parasitic cryptosporidium infections this vulnerable group (HIV patients) in Mayo-Belwa LGA, Adamawa State.

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