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Pre-Disposing Factors Contributing to the Prevalence of Intestinal Parasitic Infections (IPI) among the HIV/AIDS Patients in Bungoma County, Kenya

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Abstract: ***The role of HIV infection on the pathognomomic of HIV infections is not clearly understood. The aim of the current study was to determine the epidemiology of IPI and predisposing factors among HIV/AIDS patients in Bungoma County Hospital. This study was a cross-sectional study on 240 HIV(+ve) and 60 HIV(-ve) individuals. Stool samples were observed for intestinal parasites. Differences in prevalence and intensity of parasites were analyzed using Pearson Chi-square test. Factors causing observed differences in the prevalence and intensity of the parasites were analyzed using Chi-square test to identify significant factors responsible for observed prevalence. Significantly (χ^2 = 23.764, df = 1, p = 0.002) higher prevalence of IPI occurred among HIV/AIDS patients (33.4%) compared to in HIV-ve patients (19.3%). Protozoan and helminthic parasites were the main parasites identified. Age, levels of education, income levels, smoking and drinking habits as well as dietary habits contributed significantly (p < 0.05 to increased prevalence of Intestinal parasitic infection among the HIV/AIDS patients. The study demonstrate that infection with HIV exacerbate intestinal parasitic infections (IPI). It is recommended that routine examination of stool samples for parasites would significantly benefit HIV infected and uninfected individuals by contributing to reduce morbidity.***

Keywords: HIV/AIDS, Intestinal Parasitic Infections, Epidemiology, Prevalence, Bungoma County

1. Introduction

As much as 60% of the World's population is at risk of intestinal parasite infections (IPI) [1]. About 3.5 billion people are affected, and 450 million are ill as a result of these infections [2]. The IPI is more severe health problem in many tropical regions [3]. The rate of parasitic infection is remarkably high in Sub-Saharan Africa [4-5]. Complicating the management of IPI is the proliferation of the co-occurrence of IPI and HIV/AIDS among the patients. Sub-Saharan Africa is currently the leading in HIV/AIDS prevalence and has one of the highest IPI infections worldwide [6]. During infections with HIV/AIDS, patients are superimposed infections by opportunistic infectious agents due to the defect of immunity. In developing countries, problems caused by intestinal parasites are complicated and are a major cause of illness and kills millions of AIDS patients annually [7]. The progressive decline of mucosal immunologic defense mechanisms predisposes patients to precocious, intermediate, or late gastrointestinal manifestations such as diarrhea and other infections [8]. In the late stages of AIDS, the protective effects of nonspecific defense mechanisms, production of IgA antibodies and local cellular immune responses are diminished [9], however, how these increase susceptibility to various intestinal opportunistic agents are not clear. In general, infection by intestinal parasites causes diseases that are significant causes of morbidity and mortality in all age groups, but immunocompromised patients due to HIV/AIDS are more likely to affected by the IPI, which rather remain largely underreported.

In Kenya, reliable figures for the prevalence of intestinal parasites among HIV/AIDS patients including Bungoma County are scarce largely due to the absence of any data or to the inadequacy of those available. In the current study, a cross sectional study to document the prevalence of intestinal parasitic infection in Kenyan HIV- infected patients was performed. The research also compared the prevalence of intestinal parasites among HIV/AIDS patients of different gender, age groups, sex, and habits such as food habits, alcohol and smoking habits.

2. Research Design and Methodology

Study area: The study was conducted at Bungoma District Hospital, in Bungoma County in Kenya. It has an area of 2,069 km² and a population of 1,630,934.

Research design: The study was conducted through a cross sectional survey design.

Study population and sample size: The study participants were people living with HIV/AIDS aged 18 to 65 years inclusive and not on antiretroviral therapy (ART) during the period of June 2010 to February 2011, who had been referred from: Outpatient department (OPD), Health Centres and Dispensaries within the County. The sample size (n) was determined from the target population using [10] resulting in a sample size of 240

Inclusion and exclusion criteria: The study subjects were 240 HIV/AIDS and 60 HIV(-ve. While those who were traveling, admitted in the ward, or those on ART, or those who had taken antibiotics or antihelmithic a week earlier; or declined to give consent were excluded.

Data collection tools: Qualitative data was collected from 300 respondents at Bungoma County Hospital from June 2010 to February 2011 using patients' questionnaires. The questionnaires were distributed to patients in presence of the medical practitioners working at the CCC. For quantitative data; a single fresh stool sample of (10-20 gms) was collected from each study participants. 1 g of the stool was preserved in 3 ml of 10% formalin and specimens examined by direct saline, iodine wet mount preparation and formol ether sedimentation methods following the standard procedure. Concentration technique and modified Ziehl Neelsen staining techniques were used for the detection of oocyst of several intestinal parasites [11] under light microscope (×40 magnification). Parasite species were identified by their different morphological forms: cysts, flagellates, ciliates, larvae and eggs; with their characteristic identifying features.

Ethical Consideration*:* This study was conducted with the approval of the Institutional Research and Ethics Committee (IREC) of Moi University. Informed written consent was obtained from each study participant. Participants were also informed that they were free to withdraw consent any time; and that their stool specimens were examined by qualified persons. Moreover, all personal information of the participants was treated with strict confidentiality. Study participants positive for intestinal parasites were treated free of charge using standard drugs at the Comprehensive Care Clinic (CCC).

Data analysis: All data were analyzed using SPSS V.17. Data were summarized using frequency, means and standard deviation. Differences in prevalence were analyzed using Pearson Chi-square test. Significant factors causing observed differences in the prevalence and intensity of the parasites were analyzed using chi-square test. In all analysis, results were considered significant at $p < 0.05$**.**

3. Results

Socio-demographic characteristics of the respondents are provided in Table 1. Most of the HIV/AIDS patients were female 138(57.5%). More than half of the HIV/AIDS patients (125, 56.2%) were aged between 36-50 years. Most of the HIV/AIDS patients had secondary level of education 142(59.2%). With regard to occupation, 109(45.4%) HIV/AIDS(+ve) and 26(43.3%) HIV(-ve) were self employed.

Table 1: Socio-demographic characteristics of the respondents

		HIV(+ve)		HIV(-ve) (control)	
Attribute	Characteristics	Frequency	%	Frequency	%
Gender	Male	102	42.5	27	45
	Female	138	57.5	33	55
Age	<18	15	6.3	7	11.7
	18-35 years	36	15.0	12	20
	36-50 years	135	56.2	26	43.3
	>50 years	54	22.5	15	25
Level of education	None	13	5.4	6	10
	Primary	65	27.1	17	28.3
	Secondary	142	59.2	23	38.4
	Tertiary	20	8.3	14	23.3
Occupation	Unemployed	78	32.5	21	35
	Self-employed	109	45.4	26	43.3
	Formal	53	22.1	13	21.7

The prevalence of intestinal parasitic infections among the HIV/AIDS patients was 33.4% while among the healthy individual it was 19.3%. Protozoans and helmithes were identified in the stool samples (Table 2). Among the protozoa highest prevalence was reported for *Entamoeba histolytica* (41.2%), followed by E. *coli*, *Giardia lamblia* and *Cryptosporidium* spp. In the helminth groups, *Ascaris lumbricoides*, *Trichura trichura*, *Ancylostoma duodenale* and *Stronglyoides stercoralis* were of importance. The prevalence of intestinal protozoa was significantly higher in the HIV/AIDS patients as compared to the non-infected patients ($p < 0.05$). However, there was no significant difference in the prevalence of intestinal helmithes between the two groups ($p > 0.05$).

Table 2: Prevalence of various intestinal parasitic infections among the study subjects

Parasite	*Group*			
	HIV(+ve)	*HIV(-ve)*	*Chi-square*	*P-value*
Entamoeba histolytica	99 (41.2)	7 (11.7)	18.385	<0.001
Entamoeba coli	86 (35.8)	4 (6.7)	19.44	<0.001
Giardia lamblia	80 (33.3)	6 (13.3)	9.262	0.002
Cryotosporidium spp	30 (12.5)	1 (1.7)	6.080	0.014
Ascaris lumbricoides	33 (13.8)	3 (5)	3.480	0.062
Stronglyoides stercoralis	16 (6.7)	1 (1.7)	2.245	0.134
Ancylostoma duodenale	24 (10)	3 (5)	1.465	0.226
Trichuris trichura	28 (10.7)	1 (1.7)	4.245	0.017

A total of eight factors (Age, gender, marital status, levels of education, income levels, smoking habits dietary habits and drinking habits) were analyzed and how they influence the prevalence of intestinal parasites in HIV/AIDS patients. Among the analyzed factors, it was established that all the factors except marital status affected the prevalence of intestinal parasitic infections among the HIV/AIDS patients (Table 3). Prevalence of IPI increased significantly ($P < 0.05$) with increasing age of the patients. Significantly ($p < 0.05$) higher proportion of the females than males had IPI. The general trend in decline of the IPI with levels of education and income levels was also significant ($p < 0.05$). It was also noted that smokers had significantly ($p < 0.05$) higher prevalence of intestinal parasitic infections than the non-smokers. Patients who attested to eating more fatty food (meat) recorded higher prevalence of intestinal parasitic infections than vegetarians ($p < 0.05$). People consuming alcohol had lower prevalence of IPI than those who did not engage in the drinking.

Table 3: Factors affecting the prevalence of intestinal parasitic infections among HIV/AIDS patients at Bungoma County Hospital

Attributes/ Characteristic		*Frequency*	*Prevalence of IPI*	χ^2	*P-value*
Age	<18	26	17.8	19.443	<0.001
	18-35	23	36.9		
	36-55	19	39.7		
	> 55	12	51.6		
Gender	Male	63	22.8	21.311	<0.001
	Female	17	44.4		
Marital status	Married	19	34.5	0.811	0.623
	Single	21	35.1		
	Divorced	21	32.3		
	Widowed	19	32.7		
Levels of education	None	31	49.3	25.442	<0.001
	Primary	18	45.4		
	Secondary	13	33.9		
	College	14	24.2		
	University	4	13.2		
Income levels	< 1500	27	51.1	31.222	<0.001
	1501-5000	18	35.4		
	5001-10000	15	32.5		
	10001-	13	24.9		
	> 20001	7	22.4		
Smoking habits	Smoker	34	45.2	22.133	0.001
	Non-	46	21.3		
Dietary habits	Eat fatty	25	44.2	9.442	0.022
	Vegetarian	8	23.2		
	Eat at home	49	34.3		
	Eat in	11	35.4		
Drinking habits	Drinker	33	27.5	19.233	0.001
	Non-	47	39.3		

4. Discussion

Despite increasing interest in the pathologic interactions between infections, few epidemiologic studies have assessed the occurrence of IPI and associated predictive factors in HIV-infected persons. Moreover, general prevalence surveys are more commonly done in children and none, to our knowledge, have examined risk factors for intestinal helminthic infection among HIV-infected adults in an urban SSA setting. In the present study, the overall prevalence of intestinal parasitic infections (IPI) among HIV/AIDS populations was (33.4%). It was higher than in other areas of Africa such as those reported in Senegal (15.3%) [12], Ivory Coast (17.9%) [13] and Congo (19%) [14], and relatively much higher than in developed countries such as: Netherlands (0.9%), Germany (1.1%), and USA (1.4%) [1]. However prevalence of (33.4%) were lower, compared to those reported in Nigeria (49%) [15]. This was probably due to all the species of parasites caused stress to the immune system and stimulated HIV to be more active, coupled with low level of sanitation [16].

Protozoan infections were more prevalent among the HIV/AIDS patients. Hayashi [17] reported *E. histolytica*'s positive rates of 35.1% in Machakos, 34.1% in Naivasha, almost similar to that reported in this study, but higher than 28.8% in Kitui, 31.4% in Nandi Hills and 27.9% in Taveta. Also reported *E. coli* positive rates of 44.2% in Naivasha, 46.4% in Kitui, 63.3% in Taveta; which were higher than those reported in our study. It is possible that human body already weakened by HIV/AIDS infection becomes an important site for parasitic infections. The resulting defects in cellular and humoral defense mechanism predispose the body to spectrum parasitic pathogens [18]. The study also determined lower helminth infections compared to protozoans. Low prevalence of helminthic infections has been reported in other tropical areas such as Thailand and especially among the HIV/AIDS individuals at different immune status [19]. Odhiambo reported high prevalence of amoebiasis in Kisumu County and observed that out of 1432 stool specimens 338 (about 26.3%) were positive for intestinal parasites [20]. The author attributes the widespread distribution of intestinal protozoa among HIV(+ve), especially *E. histolytica* and *E. coli*, in the County due to poor sanitation.

In this study, eight pre-disposing factors were used to determine the factors likely to influence the prevalence of the intestinal parasitic infections among the HIV/AIDS patients. First, it was established that prevalence of IPI increased with age. According to the results, HIV/AIDS patients aged 18 to 35 years had significantly lower prevalence of intestinal parasitic infections than those aged over 55 years. This observation is similar with that of [21]. The overall high infection rate with intestinal parasites recorded in the elderly could be due to reduced immunity during senescence [22]. Meanwhile significantly higher proportion of females had intestinal parasitic infections than their male counterparts. The higher prevalence of IPI among the females compared to males in these studies can be attributed to the fact that females in the study area engage in water and food preparation for the family, thus leaving them more exposed to infective agents of IPI than men. Alternatively it is also possible that more females visited the hospital not only for medical treatment but also for other services such as antenatal services and family planning in the study area. This is contrary to [23] observation that reported opposing trend and attributed it to the fact that males have fewer restrictions than females. The findings that parasite infections declined with increased level education of the study participants indicated the overall improvement of hygienic conditions and sanitation with knowledge of self deworming. It has been shown that such a relation between increase in educational level and lower prevalence of intestinal parasite infection [24]. Higher income levels was also found to result in reduced prevalence of IPI mainly because, people with high income have ability to afford drugs that will reduce the prevalence of IPI than those without any disposable income. Smoking and poor dietary habits were all found to increase the prevalence of IPI among the HIV/AIDS patients. Smoking, poor dietary habits and excess drinking have been associated with reduced immune response and increased pathogens in the body [25] and can presumably explain the high prevalence of these pathogens among the patients who smoked, non-vegetarians or consumed less alcohol.

5. Future Prospects

Numerous studies have shown that multiple factors can each influence the proportion of parasites infections in the current study, HIV status of the individual has been highlighted yet as another factor that may affect the prevalence of the IPI. In management of the IPI, this study support determination of HIV/AIDS status of the patients before commencement of treatment for IPI.

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