



Original article

Intestinal parasitic infections among hemodialysis Sudanese patients

Abdelhakam G. Tamomh^{*1}, Elham Elamin², Mohammed A. Suliman¹, Hafiz Y. Mohammed¹, Ahmed Mohammed Elnour Elkhalfifa^{2,3}, Fatima A. Omer¹, Khalid A. Bukhary¹

1- Department of Parasitology and Medical Entomology, Faculty of Medical Laboratory Sciences, University of El Imam El Mahdi, Kosti, Sudan.

2- Department of Hematology, Faculty of Medical Laboratory Sciences, University of El Imam El Mahdi, Kosti, Sudan.

3- Department of Public Health, College of Health Sciences, the Saudi Electronic University, Riyadh, Saudi Arabia

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ABSTRACT

Background: Intestinal parasitic infections (IPIs) can result in high morbidity and mortality, particularly in immunocompromised patients. Intestinal parasitic infections rate among hemodialysis Sudanese patients studied infrequently. Our paper aimed to examine and determine the prevalence of intestinal parasites among hemodialysis Sudanese patients. **Methods:** Stool samples were collected from Sudanese patients at hemodialysis center in Kosti city, White Nile state, Sudan. All stool samples were examined to detect the type of parasites and determine the prevalence using formol-ether concentration technique and modified Ziehl Neelsen (ZN) stain technique. **Results:** The overall prevalence of intestinal parasitic infections among hemodialysis using formol-ether concentration technique and modified ZN stain technique was (28.6%) and (44.6%) respectively. The total prevalence of parasites detected by formol-ether concentration technique; *Giardia lamblia* (46.9%), *Entamoeba histolytica* (12.5%), *Entamoeba coli* (40.6%), and by modified ZN staining technique; *Cryptosporidium species* (28%) and *Isoospora belli* (8%). The prevalence of IPIs was higher among males than females (74 vs. 26%, respectively; $P > 0.05$). **Conclusions:** Studying the prevalence of IPIs among hemodialysis Sudanese patients, may predict their health status leading to better diagnosis and treatment. Health education and personal hygiene were recommend to reduce the transmission of parasitic diseases. This is the first descriptive study of IPIs among hemodialysis in the area of study.

Introduction

Intestinal parasites are considered as major health problems, particularly in the tropical countries [1,2]. In developing countries continue a noteworthy cause of morbidity and mortality, it is estimated that 3.5 billion people are affected and 450 million are ill as a result of these infections and majority being children [3-6]. In other estimation, about one-quarter of world's population is infected and about 80% of all deaths annually are due to infectious and parasitic

diseases in developing countries [7,8]. The reason behind the high prevalence of these infections is closely correlated to lack, poor environmental cleanliness, and destitute health services [9,10].

Intestinal parasite infections are more recurrent among school-age children, and they tend to occur in high strength in this age group, numerous studies on intestinal parasite were conducted in school children [11-14]. Intestinal parasites prevalence rate is

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* Corresponding author: Abdelhakam G. Tamomh

E-mail address: abdelhakam738@mahdi.edu.sd

displaced by bad and poor sanitation. Intestinal parasites which are known to be a potential health problem and could be found in such areas are Roundworm (*Ascaris lumbricoides*); Tapeworm (*Taenia saginata*, *Taenia solium*); Threadworm (*Strongyloides stercoralis*); *Hymenolepis nana*, Whipworm (*Trichuris trichuria*) and Pinworm (*Enterobius vermicularis*) [15-17]. Some of these intestinal parasites are frequently seen in renal transplant recipients [18,19]. It is responsible for both acute and chronic diarrhea, which causes significant morbidity. Intestinal parasite infections lead to several complications, however, most of the cases are being asymptomatic carriers and usually tend to be chronic [20,21].

Helminthic infection leads to nutritional deficiency and impaired physical developments which will have negative consequences on cognitive function and learning ability [22]. Due to a condition of such severe immunity impairment, studies have shown that patients suffering from chronic renal failure demonstrate an increased susceptibility to infections in general, but mainly to bacterial infections in the respiratory, digestive and urinary systems and in the skin. Such infections are responsible for somewhere between 14-40% of the deaths of these patients [23,24]. Emerging intestinal parasites have gained increasing attention as important opportunistic pathogens responsible for clinically important infections in immuno-compromised patient [25]. An intestinal parasitic infection in renal transplant recipients requires careful consideration in the developing countries in the world [26-28]. Intestinal parasitic infections can result in high morbidity and mortality, particularly in immunocompromised patients. Infectious diseases are among the main causes of death in hemodialysis patients due to their impaired immune systems [29,30]. The aim of this study was to determine the prevalence of intestinal parasites among hemodialysis patients attending Kosti teaching hospital, White Nile state, Sudan.

Material and Methods

Study design

This cross-sectional-hospital based study was conducted in Kosti city, Sudan, during the period from November 2016 to January 2017. Kosti locality composed of five administrative units. It is bordered by El Dewiem locality in the north, Rabak locality in the east, Al Salam locality in the south and Tendalty locality in the west. The total of population is 404,763 people. The most important potable water sources are

rainwater and the White Nile. Health services: one teaching hospital, and three rural hospitals. The location and border for locality of Kosti lie between longitude 13.12- 13.40° E and latitude 13.39- 32.45° N, and at altitude 382 m above sea level. The estimated area of the locality is about 16.287 km². However, climate has a long rainy season which lasts for six months (April- Sept.) with an average humidity of 55%. The annual rainfall is 600 mm, the annual mean temperature 22.5 (Celsius) in winter and 34.5 (Celsius) in summer and there are twenty annual relative center, thirty-four Health units, and four Medical clinics. Education services: one hundred and forty kindergarten, eighty-two basic schools, twenty-six boys, twenty-six girls and thirty co-education, fifteen secondary schools, and two university. The most activities are grazing, agriculture, trade and fishing (www.whitenilestate.gov.sd, 2020) [31,32].

Sample collection and ethics

Stool samples were collected from hemodialysis center in Kosti Teaching Hospital from patients attending hemodialysis center in the hospital. The University of El Imam El Mahdi Ethics Committee approved the study without informed consent, as the samples were remnants following clinical use; therefore, the samples not specifically collected for this study and this study had no risk to the patients.

Exclusion criteria: All patients without renal failure.

Inclusion criteria: All patients with chronic renal failure and hemodialysis. One hundred and twelve stool samples were taken from hemodialysis patients attending Kosti Teaching hospital from November 2016 to January 2017. All data were collected according to age, sex, duration of dialysis, presence or absence of any intestinal parasitic infection. A questionnaire covering this information was contracted.

Direct wet preparation technique

The detection of intestinal parasites in stool sample was conducted according to described in which a drop of physiological saline was placed on slide and by using a piece of stick, a small amount of specimen (~2 mg), was mixed to make thin preparation, then covered with cover glass and examined microscopically using 10x and 40x objectives.

Formol-ether concentration technique

Formol-ether concentration technique was used as described by WHO [30], in which about one gram of feces placed in a container; 4 to 7 ml of 10% formol saline added, then emulsified and sieved using a fine sieve. The sieved sample was transferred to 15 ml

centrifuge tube, about two ml of diethyl ether added, shaken gently for few seconds, centrifuged, the fecal debris released from the surface of the tube then the supernatant discarded. After that, the sediment mixed by means of Pasteur pipette and transferred to a microscopic slide, covered with cover glass and examined microscopically using 10x and 40x objectives.

Modified Ziehl Neelsen stain technique

A Modified Ziehl Neelsen stain technique used as described by Tamomh et al and Mohaghegh et al [32,33], in which the air-dried smear was fixed in methanol for 3 minutes; the slide immersed in a cold strong carbol fuchsin and stained for 15 minutes; the slide rinsed thoroughly in tap water. Then decolorized in 1% acid methanol for 10 –15 seconds; the slide rinsed in tap water. Followed by Counter stain with 0.4% malachite green for 30 seconds; and the slide rinsed in tap water. Finally, the slide was examined for the presence or absence of parasites microscopically using the ×40 objective lens and confirmed the presence of parasites under the oil immersion objective lens.

Statistical analysis

All statistical analysis was carried out using SPSS software version 21. The Chi-square test were employed for analysis of differences between groups. $p < 0.05$ considered significance.

Results

The overall prevalence of IPis in stool samples of hemodialysis patients were 32 (28.6%) using formal ether concentration technique and 50 (44.6%) using modified ZN staining techniques as presented in table (1). Intestinal parasitic infections among the gender and age groups of hemodialysis Sudanese patients as shown in table (2). Out of 112 stool samples examined, 71 were male (63%) and 41 were female (37%). Intestinal parasitic infections according to the present or absent of diarrhea and the duration of dialysis as depicted in table (3). Out of 112 stool samples investigated, 49 (43.8%) of hemodialysis patients have diarrhea, while 63(56.2%) hemodialysis patients without diarrhea; while 49 (43.8%) of hemodialysis patients the duration of dialysis more than five years, and 63(56.2%) hemodialysis patients the duration of dialysis less than five years.

Table 1. Intestinal parasitic infections among hemodialysis Sudanese patients attending to Kosti Teaching Hospital, 2017.

Parasites	No. of positive (%)
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<i>Giardia lamblia</i>	15 (30%)
<i>Entamoeba histolytica</i>	4 (8%)
<i>Entamoeba coli</i>	13 (26%)
<i>Cryptosporidium species</i>	14 (28%)
<i>Isospora belli</i>	4 (8%)

Table 2. Intestinal parasitic infections among the gender and age groups of hemodialysis Sudanese patients attending to Kosti Teaching Hospital, 2017.

		No. of positive (%)	P
	15-25yrs	5 (10%)	
Age groups	26-36	9 (18%)	0.024
	Over 36yrs	36 (72%)	
Sex	Male	37 (74%)	
	Female	13 (26%)	0.089

Table 3. Intestinal parasitic infections according to the present or absent of diarrhea and the duration of dialysis among hemodialysis Sudanese patients attending to Kosti Teaching Hospital, 2017.

		No. of positive (%)	P
Diarrhea	With Diarrhea	24 (48.9%)	0.157
	Without Diarrhea	26(41.3%)	
Duration of dialysis	More than 5 years	41 (83.7%)	<0.001
	Less than 5 years	9(14.3%)	

Discussion

This current study was conducted in hemodialysis center at Kosi Teaching hospital in White Nile State, Sudan aimed to determine the intestinal parasites among hemodialysis patients. In this study 112 stool samples were screened for intestinal parasites among hemodialysis patients using formol-ether concentration technique and modified ZN staining techniques.

In our present paper, a high prevalence of parasites was detected by modified ZN staining technique and was found to be 50 (44.6%) and by formol-ether concentration technique was found to be 32 (39%) (Table 1). Previous studies showed high prevalence of intestinal parasites among hemodialysis patients of different populations [7,8,34]. This may be due to low socio-economic status associated with poor sanitation, inadequate hygiene habits, drinking of untreated water, malnutrition and

immunocompromised, leading to the onset of enteroparasitosis. Also, the high prevalence of infection according to age group found in patients over 36 years 36(72%). An impairment of immunity resulting from old age patients and long duration of dialysis. Therefore, age play a big role in immunity against parasitic infections.

Our current findings expressed the high prevalence of infection had been found among males 25 (78.2%) than females 7 (13%) (**Table 2**). Some previous studies in agreement with our results obtained and support our findings [13,14,22]. Clearly, the immunosuppressant effects of testosterone vertebrate provide a mechanism that can cause male biases in parasite infection.

In the present research our results explained the prevalence of parasitic infection in diarrheic and non-diarrheic hemodialysis Sudanese patients. The diarrhea was detected in disorder but not related to the presence of intestinal parasites. Our results indicate that the presence of diarrhea is not necessary to detect the intestinal parasites in hemodialysis Sudanese patients.

In conclusion, our study was the first study among hemodialysis Sudanese patients in hemodialysis center at Kosti teaching hospital in White Nile State, Sudan. Studying the prevalence of IPIs among hemodialysis Sudanese patients, may predict their health status and leading to better diagnosis and treatment, therefore prognosis of the disease. Health education and personal hygiene were recommended to reduce the transmission of parasitic diseases. Further studies should be applied to understand the mechanism of intestinal parasites among hemodialysis patients.

Ethics approval and consent to participate

The University of El Imam El Mahdi Ethics Committee approved the study without informed consent, as the samples were remnants following clinical use; therefore, the samples not specifically collected for this study and this study had no risk to the patients

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