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Prevalence of Intestinal Parasites in Sickle Cell Disease Patients Attending Jos University Teaching Hospital, Nigeria

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Abstract

Several studies have shown that sickle cell disease (SCD) is made worse by infections; it was necessary to carry out this study to ascertain the occurrence of intestinal parasitic infections to the number of SCD patients infected compared to Non-SCD patients, the impact of the infections on Pack cell volume (PCV) of the SCD patients in Nigeria populace. A total of 140 stool samples were collected from both SCD patients and Non-SCD patients. 3 ml of venous blood, seventy samples in total were collected from the SCD patients only. The blood and stool samples were collected from September 2005 to November 2005; structured questionnaire was administered to each of the patient that gave consent to be part of the study alongside with questionnaire interview. The stool samples were analysed macroscopically and microscopically using saline, iodine and formal-ether concentration technique. The blood samples were analysed by micro-heamatocrit method. The findings showed that a total of six parasites were identified among the SCD patients and a total of thirteen parasites were identified among Non-SCD patients. Although the prevalence of intestinal parasitic infections was low among the research participates, the identified parasites fell into the 4 major categories of intestinal parasites, an indication that SCD patients can be susceptible to any of the intestinal worms/protozoa. Despite a low prevalence of intestinal parasites among the studied individual at the time of this study, it is however, necessary for regular laboratory investigations for intestinal worm/protozoa since they are still a public health problem.

Keywords

Sickle Cell Disease, Intestinal Parasites, Prevalence, Pack Cell Volume, Infections

1. Introduction

Sickle cell disease (SCD) is a genetic disorder in which the structure of hemoglobin is abnormal because a nucleotide is substituted on the Beta globin gene, leading to the formation of sickle shaped red blood cells and a variety of clinical symptoms [1]. A high number of people with SCD live in Africa, where little is known about this disease; however, we do know that this disease is accompanied by a more intense clinical course in Africa than other parts of the world and infections have a part in enhancing the intensity of SCD [2]. In West Africa, Nigeria included the occurrence of the sickle cell trait (HbAS) is about 20% to 25% of which 2% of the Nigeria population is affected by SCD [3]. A study on the effect of intestinal parasites on haematological parameters of SCD patients in Kano, Northern Nigeria recorded 27% patients with intestinal parasites and a high significant mean heamatocrit for patients without intestinal parasites than those with intestinal parasitic infections, and no significant differences between patients with or without intestinal infections in relation to platelet and leukocyte counts; they further suggested a relationship between anaemia and intestinal parasites infection [4]. Similar study on intestinal parasites and *cryptosporidium* species in SCD patients in Iraq recorded a high percentage of SCD patients infected with intestinal parasites compared to non-SCD patients, no significant difference between SCD and non-SCD patients with respect to isolation of *cryptosporidium* species and they recorded isolation of *Isospora belli* for the first time in Iraqi patients with SCD [5]. Since a large number of SCD patients live in regions where infections are prevalent and they are susceptible to infections because of a defect in their immune system [6], bacterial infections and parasitic infections are a major presenting manifestation in sickle cell patients [7]. Data suggest that some intestinal protozoa like *Giardia intestinalis* infections have a negative effect on linear growth and hemoglobin of children, [8] and also some worms especially hookworm load even when low can cause anaemia in people whose intake of iron is low and whose iron stores are already depleted [9]. It was however necessary to carry out a study on the prevalence of intestinal parasitic infections among SCD patients compared with non-SCD patients and to see if the packed cell volume of SCD patients is relational to their intestinal worm infections.

2. Methods

2.1. Study Area/Population

A total of 140 patients of Jos University Teaching Hospital Jos, North-Central Nigeria were included in this study; of which 70 were sickle cell disease (SCD) patients, attendees of adult/Paediatric Haematology and Sickle cell disease clinic and 70 were non-SCD patients (controls). Blood and stool samples were collected between the months of September 2005 and November 2005. Seventy blood and stool samples were collected from the SCD patients and 70 stool samples were collected from Non-SCD patients.

2.2. Sample Collection and Laboratory Analysis

The stool and blood samples were collected in suitable containers. Questionnaire interview was also carried out for the studied patients to obtain data on educational status, source of drinking water, water treatment type and clinical symptoms.

The stool samples were examined macroscopically and microscopically. Direct wet mount preparations using saline and lugos iodine was done to examine for cyst, ova or larva of intestinal parasites. Formal-ether concentration method was also performed on all the stool samples. Micro-heamatocrite method was used to determine the pack cell volume of the venous blood from the SCD patients [10] [11].

3. Results

Subjects (SCD patients) and controls (Non-SCD patients) were age and sex matched. A total of 140 stool samples were collected. Seventy blood samples were also collected from subjects only. Intestinal parasites recorded among the subjects and controls were Hookworm, *Ascaris lumbricoides*, *Schistosoma mansoni*, *Vampirolepis nana*, *Dicrocoelium dendriticum* and *Entamoeba histolytica*. Of the seventy subjects studied, six were found to have intestinal parasites with a prevalence of 2 (2.9%) for *Ascaris lumbricoides*. Hookworm, *Schistosoma mansoni*, *Vampirolepis nana* and *Entamoeba histolytica* had a prevalence of 1 (1.4%) each. Thirteen intestinal parasites were recorded for the control group with the highest prevalence of 5 (7.1%) for *Schistosoma mansoni*. *Entamoeba histolytica*, Hookworm, *Vampirolepis nana*, *Dicrocoelium dendriticum* had a prevalence of 3 (4.3%), 2 (2.9%), 1 (1.4%) and 2 (2.9%) respectively (Table 1).

The results of the pack cell volume (PCV) were recorded in three ranges which are 11% - 20%, 21% - 30% and 31% - 40%. Hookworm, with a prevalence of 3.7%, was identified within the PCV range of 11% - 20%. For the range of 21% - 30%, *A. lumbricoides*, *S. mansoni*, *V. nana* and *E. histolytica* were identified with a prevalence of 5%, 2.5%, 2.5%, and 2.5%, respectively. No parasite was identified within the range of 31% - 40% (Table 2). The data collected from questionnaire interview were analyzed accordingly. The findings showed that Patients between 11 - 20 years old had the highest prevalence of 16.0%, for the subjects, while those within 1 - 10 years old had the highest prevalence of 18.2% for the control group. The studied males and females were sex matched for both the SCD and non-SCD patients. Males were 34 and females 36. The prevalence of intestinal parasites was 8.8% for both males and females SCD patients, while the males had the highest prevalence of 23.5% for non-SCD patients. The highest prevalence was recorded among those who use pit toilet; 13.9% for the subject and 26.9% for control group. The results showed that the highest prevalence was recorded for those who did not attend any of the institutions of learning as 14.1% and 37.5% for the subjects and controls respectively. No parasite was identified for those who attended tertiary institution. All the subjects who were

Table 1. The prevalence of intestinal parasite among the studied patients and controls.

	SCD Patients		NON-SCD Patients	
Parasites	**No. Examined**	**No. (%) Positive**	**No. Examined**	**No. (%) Positive**
Hookworm	70	1(1.5)	70	2 (2.9)
Ascaris lumbricoides	70	2(2.9)	70	0(0.0)
Schistosoma mansoni	70	1(1.4)	70	5(7.1)
Vampirolepis nana	70	1(1.4)	70	1(1.4)
Dicrocoelium dendriticum	70	0(0.0)	70	2(2.9)
Entamoeba histolytica	70	1(1.4)	70	3(4.4)

Table 2. Prevalence of intestinal parasites in relation to PCV (heamatocrit) level (%) for SCD patients.

PVC Range (%)	No. Examined	No. Positive	Prevalence %
11 - 20	27	1	3.7
21 - 30	40	5	12.5
31 - 40	3	0	0.0

identified with parasitic infections drink tap water with 10.5% prevalence. Although, those who source water from well had the highest prevalence of 30.8% for the control group but the rest of the controls who drink tap water were infected with prevalence of 12.2%.

Limitation of the Study

The limitation in this study was that some patients were not willing to give consent for the study; time constraints and funding.

4. Discussions

The results of this study showed a rather limited prevalence of intestinal parasites infection among the SCD patients attending Jos University Teaching Hospital. This result agrees with [4] who showed a low prevalence of intestinal parasites infection among SCD patients in Kano, Nigeria. The prevalence of intestinal parasites among the studied SCD patients when compared with the Non-SCD patients was low. This is contrary to the findings of a study by [5], who recorded a very high prevalence of intestinal parasites including *Cryptosporidium species* among SCD patients admitted to three hospitals in Iraq compared to the controls (Non-SCD) patients.

The low prevalence of intestinal parasites among the studied group is possibly due to regular check-up, these patients are out-patients who kept regular appointments with the clinicians as the situation demands. Also records showed that the majority of them drank treated water. Besides, close interaction with some of the patients' guardians suggested that they maintained a standard of

personal hygiene due to the state of health of their wards. More also, by observations patients were seen eating foods high in protein like eggs; a good reason for a raised immune acquisition and high resistance to re-infection by intestinal parasites [12]. The findings of this study suggest that the low PCV results obtained may not be associated with the presence of intestinal parasites but rather malaria parasites because the majority of the patients who participated in this study indicated having had malaria infection some few days before the study was carried out.

The high prevalence among the controls ages 1 - 10 is not different from other studies done in Nigeria [13], the low prevalence among the subject in same age group may be due to the severity of the clinical manifestations of the disease at this age [7] such that they have limited exposure to sources of infections. In terms of gender, both males and females subjects had same prevalence, which may be attributed to same threshold of chronic pains experienced by both sex [14], hence hampering their involvement in activities that may expose them to intestinal parasitic infections. The males for the controls had a higher prevalence contrary to the findings of [15], who recorded higher prevalence among females. All studied patients who use pit toilet had the highest prevalence, on a contrary [16] recorded the highest prevalence among those who use "bush" in Sagbama, Nigeria. Educational background is associated with intestinal parasite infection [17]; which is reflected in the findings of this study, as those who did not go to any institution of learning had the highest prevalence.

Although the controls who Source water from the well had the highest prevalence and the Subject who source water from tap had the highest prevalence, the rest of the controls who drink tap water were infected. This result agrees with those of [16]. Thus, the source and treatment of drinking water is relational to rate of intestinal parasite infections.

Intestinal parasites infection is still an important public health concern globally because of its high incidence in many countries as well as its nutritional effects such that patients with symptoms of *Giardia lamblia* and *Enterobius vermicularis* infections have lower vitamin B_{12} levels than patients without the infections, a possible reflection of a more affected intestinal mucous [18]. Stress of infections is involved in the pathogenesis of the common complications of painful crisis seen in sickle cell disease patients [19] leading to high rate of morbidity and mortality in sickle cell disease patients.

5. Conclusion

The prevalence of intestinal parasites is low among the studied population (subject and controls), However, the findings of this study revealed that the intestinal parasites recorded among sickle cell patients belong to the four major classes of parasites such as *Ascaris lumbricoides*, Hookworm (*Nematode*), *Schistosoma mansoni* (*Trematode*), *Vampirolepis nana* (*Cestode*) and *Entamoeba histolytica* (*protozoa*). This implies that SCD patients could possibly be susceptible to any

of the intestinal parasites. Intestinal parasitic infections are a public health problem and since these parasites have the ability to obstruct proper absorption of food nutrient in the GIT and in some cases iron intake, it is necessary that SCD patients who already have impaired immune system carry out routine laboratory investigation for intestinal parasites, advocate for periodic deworming of the subjects with the objective of alleviating their burden of infections and hence improve their general health state.

Ethical Approval

Ethical approval was obtained for this study from the ethical committee of the Jos University Teaching Hospital Jos.

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Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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Appendix

Questionnaire

1) What is your age range?

1 - 10 ☐ 11 - 20 ☐ 21 - 30 ☐ 31 - 40 ☐

2) Indicate your gender?

male ☐ female ☐

3) What is your educational status?

primary school ☐ secondary school ☐ tertiary school ☐ none ☐

4) How would your describe your toilet facility?

bush ☐ pit ☐ water closet ☐

5) Indicate your source of drinking water

well ☐ sachet water or pure water ☐ tap water ☐

6) Do you treat your drinking water?

yes ☐ no ☐

If yes then tell us how ……

7) Have you had malaria recently?

yes ☐ no ☐

If yes tell us the clinical symptoms……