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Case-Control Study of Intestinal Parasitic Infection in Hemodialysis Patients in Sohag Governorate

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ABSTRACT

Background: Patients on hemodialysis have drastically lowered immune systems. Particularly in people with compromised immune systems, intestinal parasites can cause severe morbidity and death.

Objective: In Sohag Governorate, this case-control study examined the probabilities and prevalence rates of intestinal parasite infections in hemodialysis patients.

Material and methods: This case-control study was carried out on 100 hemodialysis cases and 100 healthy control, the median was 55 years IQ (45:55), and control the median age was 39 IQ(30-45). Formol ether sedimentation concentration method, Modified Kinyoun's Acid-Fast Stain (cold), and direct wet mount and iodine stained smear were used to analyze the three fecal samples taken from each patient.

Results: The present study observed a very highly significant statistical difference between cases and controls as regards single or mixed or no intestinal parasitic infection, the mixed intestinal parasitic infection was the main type in the cases group, while, most of the controls were non_infected or single type of infection, parasitic infection in hemodialysis patients was significantly higher about 4.7 more times than controls.

Conclusions: Patients on hemodialysis with weakened immune systems brought on by chronic renal disease are more vulnerable to parasite infections. The findings of the current study demonstrated that intestinal parasites were much more common in hemodialysis patients.

Keywords: Case-control, Dialysis, Intestinal parasites.

INTRODUCTION

Chronic kidney disease (CKD), a condition that is becoming more widespread, nearly always necessitates renal replacement therapy, such as (dialysis treatment). For both preventing and treating parasite infections, immunity is essential [(1)]. Additionally, CKD impairs immunity, increasing a person's susceptibility to infections [(2)]. The modification of the microbial flora of the gut and the breakdown of the intestinal barrier structure caused by CKD are significant contributors to the pathophysiology of inflammation and uremic toxicity [(3)].

CKD negatively impacts neutrophil chemotaxis, phagocytosis, bactericidal actions, and T-cell activity. Due to their weakened immune systems, patients with CKD might get parasite infections [(4)]. Due to their compromised immune systems, kids with chronic kidney disease (CKD) are more prone to parasite infections [(5)].

Intestinal parasite infections are among the most common chronic diseases affecting people. Infectious microorganisms that seldom cause illness in healthy persons instead appear in patients with weak host defenses and cause opportunistic infections.

In individuals with impaired immune systems, certain parasites, such as the *Cryptosporidium* species, *Isospora, Microsporidia, Giardia lamblia, Entamoeba histolytica*, and *Strongyloides stercoralis*, cause gastrointestinal illnesses [(6)].

Among the most prevalent intestinal parasite illnesses in the globe are helminthic disorders caused by *Ascaris lumbricoides*, *Enterobius vermicularis*, *Trichuris trichiura*, *Hymenolepis nana*, and *Strongyloides stercoralis*. Children who are immunocompromised, such as those who are HIV-positive or receiving hemodialysis, are particularly in danger from the serious health problems caused by these organisms [(7)].

In Sohag Governorate, this study examined the probabilities and prevalence rates of intestinal parasite infections in hemodialysis patients.

MATERIAL AND METHODS

In the current study, 100 stool samples were taken from hemodialysis patients at Sohag Governorate Hospitals and 100 stool samples were taken from a healthy control group at outpatient clinics who did not have chronic kidney disease.

Using the case-control study equation developed by **Kelsey *et al.* [(8)],** the OpenEpi software, version 3 open source calculator, calculates the sample size. Using a 2-tailed test with an error probability of 0.05 and 80% power, we estimated that the odds ratio was around 3 and that the proportion of controls to cases was equal (type 1 error). We estimated that each group would require roughly 100 samples.

The inclusion criteria of age distribution in that study were cases the median was 55 years IQ (45:55) and control the median age was 39 IQ(30-45) as in **Figure (1).**

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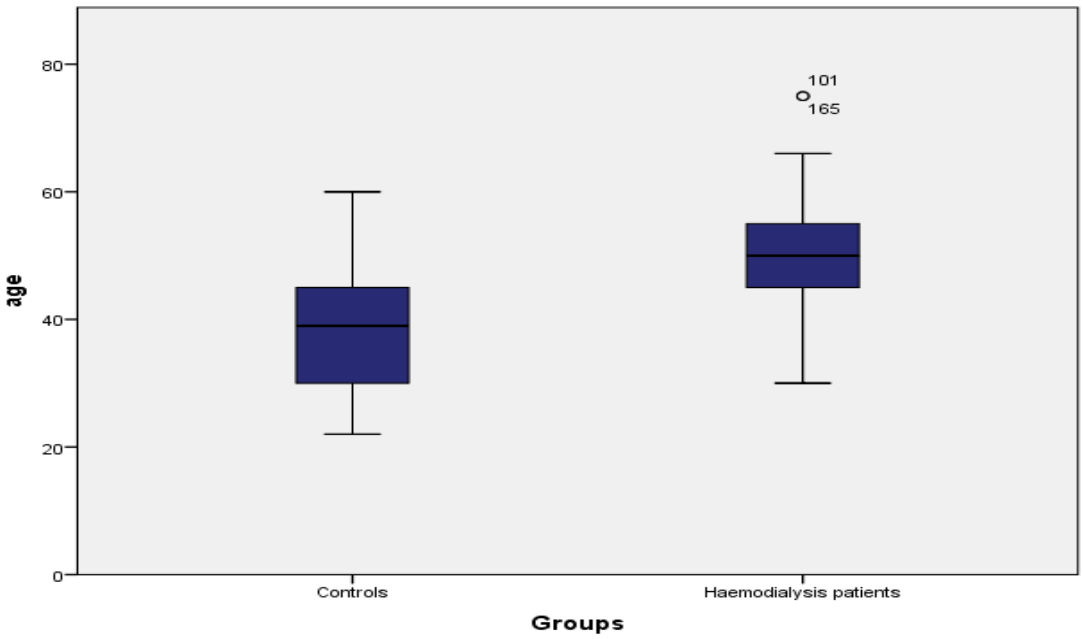

Figure (1): Box plot of age distribution in the study.

Individuals with chronic, life-limiting illnesses such as bronchial asthma, diabetes mellitus, cancer, and a recent history of using anti-parasitic medication were excluded from the study.

Three fecal samples were gathered from each instance on 3 days straight, separated by 1 day, in clean, disposable cups with a wide aperture and labels stating the date the samples were taken, the patient's name, and their age. Before being transported to the lab for examination, they were carefully collected to prevent urine contamination. Visual examination was used to evaluate the consistency, color, odor, and presence of mucus, blood, or fat in the fecal samples [(9)].

Stool samples were analyzed under a microscope to detect parasite infections using direct wet mount smear and iodine-stained smear procedures [(10)]. Formol ether sedimentation concentration method [(11)], staining with modified Kinyoun's Acid-Fast Stain (cold) and modified Ziehl Neelsen stain [(9)].

Ethical consent:

The study was authorized by Sohag University's Ethical Institutional Review Board. All study participants submitted informed permission after being informed of our research's aims. The Declaration of Helsinki for Human Beings, the international medical association's code of ethics, was respected throughout this inquiry.

Statistical analysis

The acquired data were coded and validated before being entered electronically. The Statistical Package for the Social Sciences (SPSS) version 23 was used to do statistical analysis on the data and then shown as tables and graphs.

Before being reported as mean and standard deviation, the quantitative data were tested for normality using the Kolmogorov-Smirnov test. Binary logistic regression was used to determine the odds ratio for risk exposure. P-value less than 0.05 was regarded as significant.

RESULTS

Table (1) shows that there was a very highly significant statistical difference between cases and controls as regards intestinal parasitic infection.

Table (1): Distribution of intestinal parasitic infections

Infection	Cases N=100	Controls N=100	P-value by Pearson's Chi-square
Yes	68(68.0%)	31(31.0%)	<0.001***
No	32(32.0%)	69 (69.0%)	
Total	100(50.0%)	100(50.0%)	200(100.0%)

Table (2) shows that there was a very highly significant statistical difference between cases and controls as regards single or mixed or no intestinal parasitic infection P<0.001. The mixed intestinal parasitic infection was the main type in the cases group, while, most of the controls were non_infected or single type of infection.c

Table (2): Types of intestinal parasitic infections

Infection	Cases N=100	Controls N=100	P-value by Pearson's Chi-square
Single	27 (27.0%)	30 (30.0%)	<0.001***
Mixed	41(41.0)	1 (1.0%)	
No	32(32.0%)	69 (69.0%)	
Total	100 (50.0%)	100 (50.0%)	200 (100.0%

Table (3) shows that there was a highly significant statistical increase of infection by *Cryptosporidium*, *Microsporidia*, *Cyclospora*, and *Entamoeba histolytica* in cases than controls (p<0.05). There was an nsignificant statistical difference between infection by *Giardia*, and *Hymenolepis nana* in cases than controls (p>0.05).

Table (3): Cross-tabulation of different types of intestinal parasites among hemodialysis patients and controls

Name of the parasite	Cases N=100 (100.0%)	Controls N=100 (100.0%)	P-value by Pearson's Chi-square
Cryptosporidium Yes	41 (41.0%)	1 (1.0%)	<0.001***
No	59 (59.0%)	99 (99.0%)	
Microsporidia Yes	61 (61.0%)	0(0.0%)	<0.001***
No	39 (39.0%)	100 (100.0%)	
Cyclospora cayetanensis Yes	13 (13.0%)	0 (0.0%)	<0.001***
No	87 (87.0%)	100 (100.0%)	
Giardia lamblia Yes	61 (61.0%)	21 (21.0%)	0.083 (NS)
No	39 (39.0%)	79 (79.0%)	
Entamoeba histolytica Yes	14 (14.0%)	2(2.0%)	0.004**
No	86 (86.0%)	98 (98.0%)	
Hymenolepis nana Yes	9 (9.0%)	13 (13.0%)	0.498 (NS)
No	91 (91.0%)	87 (87.0%)	

Table (4) shows that the Odds ratio of occurrence of intestinal parasitic infection in hemodialysis patients was 4.7 more times than controls with a confidence interval of 95% from 2.6 to 8.59 with a very highly statistically significant probability P<0.001.

Table (4) Odds ratio by binary logistic regression for the occurrence of intestinal parasitic infection in cases and controls

Parameter of	Intestinal parasitic infection		Total	Odds ratio with a Confidence interval of 95% and p-value
	Yes	No		
Hemodialysis patients	68	32	100	4.73 (CI 95% 2.6-8.59) P value: <0.001***
Controls	31	69	100	

DISCUSSION

Hemodialysis patients' immune systems are severely compromised, rendering them more vulnerable to infections that might cause serious morbidity [12].

In the current investigation, stools from 100 hemodialysis patients and 100 healthy control groups were analyzed.

This study showed a statistically significant difference between cases and controls in terms of intestinal parasite infection. These results are in agreement with those in Qena Governorate by **El-Kady *et al.*** [13] who discovered that hemodialysis patients had an intestinal parasite prevalence of 66% as opposed to 26% in the control group. Parasitic infections were common in 42.9% of non-dialysis patients and 66.7% of HD patients, according to **Rady *et al.*** [14].

Our study also showed that there was a very highly significant statistical difference between cases and controls as regards single or mixed or no intestinal parasitic infection P<0.001. The mixed intestinal parasitic infection was the main type in the cases group, while, most of the controls were noninfected or single type of infection, this concurred with **El Nadi and Taha's** [15] study**,** as 50 fecal samples were taken from patients receiving hemodialysis at the Renal Dialysis Unit of Sohag University Hospital. The patients were chosen at random. 94% of the samples had parasites, and 84% had acquired mixed infections.

The study showed that the Odds ratio of occurrence of intestinal parasitic infection in hemodialysis patients was significantly 4.7 times higher than controls with a confidence interval of 95% from 2.6 to 8.59. This was supported by **Taghipour *et al.*** [16]**,** who conducted a meta-analysis of 11 case-control studies on intestinal parasites in hemodialysis patients and found that the pooled odds ratio for intestinal parasites was approximately 3.4 higher in hemodialysis patients than in healthy controls, with a 95% confidence interval between 2.37 and 4.87.

The study reported that there was a highly significant statistical increase of infection by *Cryptosporidium, Microsporidia, Cyclospora cayetanensis*, and *Entamoeba histolytica* in cases than controls (p<0.05). There was an insignificant statistical difference between infection by *Giardia*, and *Hymenolepis nana* in cases than controls (p>0.05), the prevalence rate among hemodialysis patients of *Microsporidia* infection was 61%, and *Cryptosporidium* infection was 41%.

Similarly, **El-Nadi and Taha** [15] discovered that the prevalence of *C.parvum* was 48% among 50 hemodialysis patients in Sohag University Hospitals, and **El-Kady *et al.*** [13] discovered a 40% prevalence of cryptosporidial infection among hemodialysis patients. **Rady *et al.*** [14] reported *Cryptosporidium* oocyst infection in 29.2% of hemodialysis patients.

CONCLUSION

Because of the acquired immunodeficiency caused by uremia, patients with chronic renal failure are more vulnerable to infections. Parasitic infections are a primary cause of sickness and mortality in this population. They have a higher risk of contracting *Cryptosporidium* mixed with Microsporidia, as well as a parasitic sickness with many parasites.

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