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INTESTINAL PARASITES AND MICROSPORIDIA IN PATIENTS WITH CHRONIC KIDNEY DISEASE, SOHAG GOVERNOMETAL HOSPITALS

By
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Abstract

Parasitosis causes significant morbidity and mortality among immunosuppressed hosts. Acquisition of infection, clinical severity, and outcome of a parasitic disease depend on innate and acquired host immunity and parasites' own response to its host after infection.

This study evaluated parasitic infections among patients with chronic kidney disease (CKD) from Sohag Governorate Hospitals. A total of 100 morning stool samples were collected from the patients and another 100 stool samples from healthy control from January to May 2020. Each sample was divided into two parts; one part for microscopic examination, and the second was preservation and late need. The intestinal parasites were 66/100 CKD patients (66%), whom 25 with nephritic syndrome and 41 on dialysis patients compared to 31/100 controls. The results showed that the commonest one was *Cryptosporidium pyrvum* with or without *Microsporidia* spores.

Keyword: Patients, Chronic kidney disease, *C. pyrvum*, Others, *Microsporidia* spores.

Introduction

The commonest opportunistic parasites causing morbidity and/or mortality in the immuno-compromised subjects were especially the gastrointestinal ones (Baiomy *et al,* 2010). Persons with weakened immune systems are those with HIV/AIDS; cancer and transplant patients who are taking certain immunosuppressive drugs; and those with inherited diseases that affect the immune system and risk of developing severe disease may differ depending on each person's degree of immune suppression, which was 3% in USA population (McGrath *et al,* 2020). Besides, malnutrition and vitamin deficiency resulted from inadequate intake or from losses during dialysis procedures (Fredrico *et al,* 2013). Also, blood exposure to artificial membranes with the inflammatory activation and release of cytokines causes activation of monocytes and the complement cascade led to a change in the immune response against infectious disease-agents (Dyab *et al,* 2016). Moreover, the gastrointestinal parasites in infected food handlers may be a real risk to persons more prone to diseases like hospitalized patients, mainly those suffering from the immuno-deficient diseases (Elnakib *et al,* 2018).

This paper aimed to evaluate the intestinal parasites and fungus microsporidia spores in patients with chronic kidney disease (CKD) in Sohag Governmental Hospitals.

Materials and Methods

In the present study, after approval from the Scientific Ethics Committee, obtained an informed written consent, one hundred stool samples were collected from chronic kidney disease (CKD) patients from Sohag Governorate Hospitals and nearly cross-matched stool samples from healthy controls over the period from the beginning of January to the end of June 2020. Each sample was divided into two parts, one for microscopic examination and the second was preservation for any later needs.

Study design: Medical sheets were filled out on each patient, and control. Morning samples free from water and urine contamination were collected in clean labeled cartoon box container. The fecal samples were examined macroscopically for consistency, presence of blood or mucus and parasites as the pinworm round or tapeworm segments

and others (Garcia *et al,* 2001). Microscopic examinations were done as direct wet smear; formalin-ether sedimentation, Sheather's floatation, and Modified Ziehl-Nelseen (MZN) stain methods (El Shazly *et al*, 2007).

Results

The CKD patients aged from 20 to 70 years (44.6±20.3). The males were 39 and females were 61. They were (55) from urban areas and (45) from rural ones, of whom 36 suffered from nephritic syndrome and 64 on regular dialysis. Controls were 49 males and 51 females with age ranged from 20 to 55 years old. Intestinal infections were diagnosed in 66/100 CKD patients (25 with nephritic syndrome & 41 on dialysis) as compared to 31/100 controls.

The patients with nephritic syndrome infections were 2/5 males, and 23/31 females, but infections in patients on dialysis were 21/34 males and 20/30 females.

In the CKD patients, intestinal infections were detected in 23/66 (34.85%) males compared to 43/66 (65.15%) females, without sexual risk factor (P = 0.16). Patients were one (1.51%) in 20-29 years, eight (12.12%) in 30-39 years, 15 (22.73%) in 40-49 years, 37 (56.06%) in 50-59 years, and five (7.58%) in 60-69 years (P < 0.001).

Cryptosporidium parvum mixed with Microsporidia spores were in 35 patients; one in 20-29 years, three in 30 to 39 years, nine in 40 to 49 years, 19 in 50 to 59 years, three in 60 to 69 years.

Cyclospora cayetanensis was only in ten patients; three in 40 to 49 years, five in 50 to 59 years, and two in 60 to 69 years. *Entamoeba histolytica* was only found in 11 patients; two in 30 to 39 years, another two in 40 to 49 years, six in 50 to 59 years, and one in 60 to 69 years.

Giardia lamblia were detected in 12 patients; three in 30 to 39 years, another three in 40 to 49 years, five in 50 to 59 years. Also, the *Hymenolepis nana* eggs were found in 12 patients; two in 40 to 49 years, eight in 50 to 59 years, and two in 60 to 69 years. The intestinal infections were detected in 34/45 (51.52%) urban CKD patients and 32/55 (48.49%) rural areas without significance.

The intestinal infection rates among controls were 31; these were *G. lamblia* cysts 20 cases, *H. nana* ten cases and one case with mixed *G. lamblia* cysts and *H. nana*. Intestinal infections were detected in nine healthy control from urban areas and 22 cases from rural ones. Residence was a risk factor for acquiring intestinal parasites in healthy control (P <0. 05).

Statistical analysis: Data were collected, tabulated and analyzed using an IBM personal computer with Statistical Package of Social Science (SPSS) version 20 (IBM Corporations, 2011), Armonk, NY.

Details were given in tables (1, 2, 3, 4, & 5) and figures (1, 2, 3, & 4)**.**

Table 1: Intestinal infections in one hundred CKD patients.

Variants	Total	Infected	Males infected No. & %		Females infected No. & %		Total
Nephritic syndrome	36	25	2/5	5.13%	23/31	37.7%	25%
Dialysis	64	41	21/34	53.8%	20/30	32.7%	41%
Total (n=100)	100	66	23/39	58.9%	43/61	70.4%	66%

Table 2: Age groups of intestinal parasitic infected CKD patients.

Age group	No.	*C. parvum*	*Cy. cayetanensis*	*E. histolytica*	*G. lamblia*	*Hy. nana*	Total	Percentage
20-29	4	1	0	0	1	0	1	1.52
30-39	24	3	0	2	3	0	8	12.12
40-49	21	9	3	2	3	2	15	22.72
50-59	46	19	5	6	5	8	37	56.06
60-69	5	3	2	1	0	2	5	7.58
Total	100	35	10	11	12	12	66	66

P value 0.000

Table 3: Residence of CKD patients and intestinal infections versus control.

Residence	Patients	Infected	Percent	P value	Control	Infected	Percent	P value
Rural	45	32	71.11%	0.08	47	22	46.8%	0.02
Urban	55	34	61.81%		53	9	16.9%	
Total	100	66	66%		100	31	31%	

P > 0.05 non-significant

Table 4: Intestinal infections in control.

Parasite	Patients	Percentages
G. lamblia cysts	20	20%
H. nana eggs	10	10%
H. nana eggs+ *G. lamblia* cysts	1	1%
Total	31	31%

Table 5: Infected healthy control and sexes.

Control	Infected		P value
Male	15/49	30.6%	0.5
Female	16/51	31.3%	
Total	31	31%	

P value = 0.5 (not a significant).

Discussion

Chronic Kidney Disease is a major public health problem, which needs a worldwide coordinated to prevent of risky outcomes by disease control for human welfare (Levey *et al,* 2007). The end-stage of the renal disease (ESRD) has significantly increased in developing countries including Egypt. Diabetes mellitus is still the leading cause of ESRD, but numbers of hypertensive patients among that population have significant rise (Soliman *et al,* 2012). The commonest cause of morbidity and mortality in immunocompromised patients were mainly the gastrointestinal ones, especially parasites and micro-organisms **(**Noskin, 1999).

In the present study, the intestinal infections in CKD patients were 66% (25 with nephritis & 41on dialysis) was highly significant ($p< 0.005$) as compared to 31% (31) in controls. El Nadi and Taha (2004) in Sohag University Hospitals reported among randomly picked patients in renal dialysis unit, 84% suffered from mixed intestinal infections. Baiomy *et al.* (2010) in Cairo found the intestinal parasites were 6% in diabetic and renal failure patients, which was less than malignant patients (18%) compared to 10% (20) controls. Sanad and Al-Malki (2007) in Saudi Arabia reported high cryptosporidiosis rate among immunocompromised that indicated the presence of infection source(s) nosocomial source. Warady and Chadha (2007) in USA reported that end-stage renal disease (ESRD) treatment modality in children was renal transplantation. They added that efforts to define the epidemiology of pediatric CKD worldwide are necessary if a better knowing of the problem full extent, areas for study, and the potential impact of intervention was desired. Mortazavi *et al.* (2011) in Iran reported the prevalence of intestinal parasites was 51.5% of hemodialysis patients as compared to 54.1% in normal subjects. Harambat *et al.* (2012) in the Holland reported in the last three decades, there were major improvements in the care of CKD children. They concluded that the children now mainly die from cardiovascular causes and infection rather than from the renal failure. Karadag *et al,* 2013) in Turkey found the prevalence of intestinal parasites in hemodialysis patients was 62/142 (43.7%) compared to 19/150 (12.7%) of controls.

In the present study, sexes was not a risk factor for intestinal parasites in CKD patients ($P = 0.16$), in 23 males (58.9%) compared to 43 females (70.4%), but in controls intestinal parasites were in 15 males (30.6%) compared to 16 females (31.3%) with $P = 0.5$. Besides, old ages of the CKD patients was significantly associated with intestinal parasites ($P < 0.001$) within group of 60 to 69 years due to the possibility of combined with immune suppression in these ages. Codo *et al.* (2016) in Sweden reported that the men and women with the CKD differed with regard to underlying pathophysiology of the disease and its complications, presented with different signs and symptoms, with different responds to therapy and tolerate/cope with the disease differences. Luo *et al.* (2017) in China investigated the role of soil and rice pollution on human renal dysfunction. They found that the effects of S-Cd on renal health even as significant as R-Cd to protect people from the

cadmium pollution damage, which was vital to monitor the situation of soil and rice cadmium pollution. Liao *et al.* (2022) in Taiwan reported that information regarding the association between multiple-metal exposures as markers for early renal impairment in different sexes among youth showed that the effect metals (mainly Cd) on early renal impairment among them was sex-specific. They concluded that CKD was more or less an occupational acquired disease

In the present study, the residence was not a risk factor for intestinal infections in CKD patients (P = 0.08), but intestinal parasites were detected in 9/35 (16.9%) among control from urban areas and 22/47 (46.8%) from rural ones. The residence was a significant risk factor for intestinal parasites in control (P= 0. 02). This may be due the fact that the control ones in rural areas consumed contaminated food and water, low socioeconomic state, poor sanitation, inadequate hygiene habits and availability of gastrointestinal parasites. Meanwhile, CKD patients either in rural or urban areas both had low immunity, which favors intestinal parasites added by low immunity. Reducing medical errors and improving patient safety have become a national priority. CKD patients may be at higher risk for adverse consequences of the medical care, but few evaluated this question (WHO, 2009). Karadag *et al.* (2013) didn't find relation between prevalence of parasitic infections in hemodialysis patients and residence.

In the present study, the cestode, *Hymenolepis nana* was 12 in the CKD patients compared to 11in control, even in adults with high rate. Fallahi *et al.* (2015) in Iran found the prevalence of *H. nana* was (2.3%) among 78 dialysis patients. Also, *E. histolytica* prevalence was 11% in CKD patients compared to none in control. This disagreed with Abaza *et al.* (1995) in Ismailia Governorate who reported 7% among 427 immuncompromised patients. Also, El-Nadi and Taha (2004) reported 56% among 50 of hemodialysis patients. Moreover, *G. lamblia* infection was 12% in the CKD patients compared to 20% in controls. This agreed with Baiomy *et al.* (2010) who reported 10% in 100 immuncompromised patients compared to 50% in 20 controls. But, El-Nadi and Taha (2004) reported 58% *G. lamblia* among 50 haemodialysis patients.

In the present work, in CKD patients Microsporidia spores were mixed with 21 cryptosporidiosis, ten *Cyclospora cayetanensis*, two *G. lamblia* and another two cases *E. histolytica* compared to zero in control. El-Nadi and Taha (2004) in Sohag found that *C. parvum* was 48% among 50 hemodialysis patients. Dyab *et al.* (2018) detected 22% (11/50) and Mohamed *et al.* (2020) in Sohag detected 45% cryptosporidiosis in immunocompromised patients. Baqai *et al.* (2005) in Pakistan reported *C. parvum* in 50 cancer patients (10), diabetics (20) and dialysis (20). Mortazavi *et al*. (2011) in Iran found that *C. parvum* was 17% among 155 dialysis patients. Egyptian zoonotic cryptosporidiosis was reported (El Bahnasawy *et al,* 2018).

In the present study, ten *Cy. cayetanensis* cases were mixed with cryptosporidiosis and *Microsporidia* in CKD patients compared to zero in controls. El-Nadi and Taha (2004) found 12% *Cy. cayetanensis* among 50 hemodialysis patients. Baiomy *et al.* (2010) reported 3% *Cy. cayetanensis* among 100 immunocompromised patients (40 malignancy, 30 diabetes mellitus and 30 with chronic renal failure. Ali *et al.* (2000) in Sharkia Governorate found that *C. cayetanensis* was 7.5% (9/120) patients on dialysis.

In the present study, *Microsporidia* was 35% (35) in patients with the CKD, of whom 21 cases were mixed with *C. parvum*, ten were mixed with *C. parvum* and *Cy. cayetanensis*, two mixed with *C. parvum* and *G. lamblia* infection and another two were mixed with *C. parvum* and *E. histolytica* compared to zero in controls. Abaza *et al.* (1995) in Ismailia detected that the fungus spores was 2.3% (427) immunocompromised patients. El-Nadi and Taha (2004) in Sohag found that *Microsporidia* was 2% (50) haemodialysis patients. Karadag *et al.* (2013) in Saudi Arabia found *Microsporidia* spores in 2.1% of

the patients on dialysis. Besides, Al-Herrawy and Gad (2016) in Egypt reported that domestic animals (dogs, cats, rabbits, cattle, buffaloes, sheep, goats, donkeys and pigs) played a role in the dissemination of intestinal microsporidiosis in the environment.

Conclusion

The outcome data showed chronic kidney disease patients on dialysis or with nephritic syndrome mainly older patients were more liable to *Cryptosporidium parvum* with or without fspores of Microsporidia. Other intestinal protozoa and *H. nana* was detected.

Nevertheless, the prevention of contaminated food and water remains the most effective way of reducing food borne parasitic infections. The health authorities must take into consideration the control of gastrointestinal infections.

References

Abaza SM, Makhlouf LM, El-Shewy KA, El-Moamly AA, 1995: Intestinal opportunistic parasites among different groups of immunocompromised hosts. J. Egypt. Soc. Parasitol. 25, 3: 713-27.

Al-Herrawy, AZ, Gad, MA, 2016: Microsporidial spores in fecal samples of some domesticated animals living in Giza, Egypt. Iran. J. Parasitol. 11, 2:195-203

Ali, MS, Mahmoud, LA, Abaza, BE, Ramadan, MA, 2000: Intestinal spore-forming protozoa among patients suffering from chronic renal failure. J. Egypt. Soc. Parasitol. 30, 1:93-100.

Baiomy, AM, Mohamed, KA, Ghannam, MA, Shahat, SA, Saadawa, AL, 2010: Opportunistic parasitic infections among immunocompromised Egyptian patient. J. Egypt. Soc. Parasitol. 40, 3: 797-808.

Baqai, R, Anwar, S, Kazmi, SU, 2005: Detection of *Cryptosporidium* in immunosuppressed patients. Med. Coll. Abbottabad 17, 3:38-40

Barazesh, A, Fouladvand, M, Tahmasebi, R, Heydari, A, Fallahi, J, 2015: The prevalence of intestinal parasites in hemodialysis patients in Bushehr, Iran. Hemodial. Inter. 19, 3:447-51.

Cobo, G, Hecking, M, Port, FK, Exner, I, Lindholm, B, *et al,* 2016: Sex and gender differences in chronic kidney disease: progression to end-stage renal disease and haemodialysis. Clin. Sci. (Lond.) 130, 14:1147-63.

Dyab, AK, Yones, DA, Ibraheim, ZZ, Hassan, TM, 2016: Anti-giardial therapeutic potential of dichloromethane extracts of *Zingiber officinale* and *Curcuma longain* vitro and in vivo. Parasitol. Res. 115:2637-45

Dyab, AK, El-Salahy, MM, Abdelmoneiem, H M, Amin, MM, Mohammed, MF, 2016: Parasitological studies on some intestinal parasites in primary school children in Aswan Governorate, Egypt. J. Egypt. Soc. Parasitol. 46, 3:663-72.

Dyab AK, El-Salahy, MM, Amin, MM, Hawary, B, Desoky, RM, 2018: Egyptian cryptosporidiosis in immunocompromised children. J. Med. Microbiol. 27, 2:143-9.

El-Bahnasawy, MMM, Morsy, ATA, Morsy, TA, 2018: A mini-overview on zoonotic cryptosporidiosis. J. Egypt. Soc. Parasitol. (JESP) 48, 1:35-44.

El Nadi, N, Taha, A, 2004: Intestinal parasites detected among hemodialysis patients in Sohag University Hospitals. Minia Med. Bull. 15, 2: 233-40.

El Shazly, AM, Soltan, DM, El-Sheikha, HM, Sadek, GS, Morsy, ATA, 2007: Correlation of ELISA copro-antigen and oocysts count to the severity of cryptosporidiosis *parvum* in children. J. Egypt. Soc. Parasitol. 37, 1:107-20

Fallahi, OS, Rostami, A, Ebrahimi, M, Mehravar, S, Fallah, V, *et al,* 2015: Contamination of commonly consumed raw vegetables with soil transmitted helminthes eggs in Mazandaran Province, northern Iran. Inter. J. Food Microb. 25: 54-8.

Elnakib, MM, Mohamed, NM, Morsy, TA, 2018: General principles of infection control and safety initiatives. JESP 48, 3:543-56

Frederico, F, Maxlene, GIL, Barro, J, Nazaré, A, Carmelino GE, *et al,* 2013: Prevalence of intestinal parasitism and associated symptomatology among hemodialysis patients. Rev. Inst. Med. Trop. Sao Paulo 55, 2:69-74.

Garcia, LS, 2001: Diagnostic Medical Parasitology, 4th ed., ASM Press, Washington, DC.

Harambat, J, van Stralen, KJ, Kim, JJ, Tizard, J, 2012: Epidemiology of chronic kidney disease in children. Pediatr. Nephrol. 27, 3:363-73

Karadag G, Gulden S, Dervisoglu, E, *et al,* 2013: Investigation of intestinal parasites in dialysis patients. Saudi Med. J. 34, 7:714-8.

Levey, AS, Atkins, R, Coresh, J, *et al,* 2007: Chronic kidney disease as a global public health problem: Approaches and initiatives: A position statement from kidney disease improving global

outcomes. Kidn. Inter. 72:247-59.

Liao, KW, Chien, LC, Chen, YC, Kao, HC, 2022: Sex-specific differences in early renal impairment associated with arsenic, lead, and cadmium exposure among young adults in Taiwan. Environ. Sci. Pollut. Res. Int. 2022 Mar10:1-10. doi: 10.1007/s11356-022-19521-3.

Luo, HF, Zhang, JY, Jia, WJ, Ji, FM, Yan, Q, *et al,* 2017: Analyzing the role of soil and rice cadm-ium pollution on human renal dysfunction by correlation and path analysis. Environ. Sci. Pollut. Res. Int. 24, 2:2047-54.

McGrath, B, Broadhurst, M, Roman, C, 2020: Infectious disease considerations in immunocompr-omised patients. JAAPA 33, 9:16-25.

Mohamed, SR, El-Hady, HA, Ahmed, AM, 2020: Evaluation of immunochromatographic assay for diagnosis of cryptosporidiosis. JESP 50, 3:477-82.

Mortazavi, M, Seyrafian, S, Shahidi, S, Abadpour, Z, Shahbazi, F, 2011: Pyuria as a screening test for detection of urinary tract infection in patients on long-term hemodialysis. Iran J. Kidney Dis. 5, 1:50-2.

Noskin, GA, 1999: Vancomycin-resistant enterococci: Clinical, microbiologic, and epidemiologic fea- tures. J. Lab. Clin. Med. 130, 1:14-20

Soliman, AR, Fathy, A, Roshed, D, 2012: The growing burden of end-stage renal disease in Egypt. Renal fail. 34, 4:425-8.

Sanad, MM, Al-Malki, JS, 2007: Cryptosporidiosis among immunocompromised patients in Saudi Arabia J. Egypt. Soc. Parasitol. 37, 2: S765-74

Warady, BA, Chadha, V, 2007: Chronic kidney disease in children: the global perspective. Pediatr. Nephrol. 12:1999-2009

WHO, 2009: Guidelines on Hand Hygiene in Health Care. In: First Global patient Safety Challenge Clean Care is Safer Care, Geneva, Switzerland.

Explanation of figures

Fig. 1: *Cryp.* (*Cryptosporium* oocyct), *Cycl.* (*Cyclospora* oocyct), *Micro.* (*Microsporidia* spores) by MZN stain, x1000.
Fig. 2: *Cryptosporidium* oocysts stained by MZN stain, x1000.
Fig. 3: *Giardia lamblia* cyst wet mount x 1000.
Fig. 4: *Hymenolepis nana* egg wet mount x400.