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Prevalence of *Cryptosporidium* spp. Infection in Renal Transplant and Hemodialysis Patients

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Abstract

Transplanted and hemodialysis patients are frequently affected by parasitic diseases such as cryptosporidiosis. *Cryptosporidium* is a parasite causing self-limited diarrhea and enteritis in healthy individuals. The presence of *Cryptosporidium* infection was studied in three groups including 87 renal transplant patients, 103 hemodialysis patients, and 60 healthy individuals as the control group. Two stool specimens were obtained from each case. The specimens were concentrated by the formalin-ether method and two smears were prepared from each. The smears were stained by modified acid-fast method and were observed under a light microscope. Ten (11.5%) renal transplant and 4 (3.88%) hemodialysis patients were positive for *Cryptosporidium* infection. No positive results were obtained in the control group. The results showed a statistically significant difference between renal transplant and control groups (P= 0.02), but the difference between hemodialysis and control groups was not significant (P= 0.2). The results also showed that the rate of *Cryptosporidium* infection in renal transplant patients was much higher than hemodialysis patients. The susceptibility of renal transplant patients to *Cryptosporidium* infection is much more than other studied groups and this could be due to immunosuppressive therapy in these patients.

Keywords: Cryptosporidium spp., *Renal transplantation, Hemodialysis, Protozoa, Iran*

Introduction

Cryptosporidium is one of the intestinal protozoa belonging to the subclass of Coccidia. This important pathogenic parasite was described for the first time by Clarke in 1895. He observed oocysts of this parasite in the gastric epithelial cells of the mouse (1). Almost 12 years later, in 1907, Tyzzer isolated this parasite from the gastric mucosa of mice with no clinical signs. In 1976, the first human case was reported (2-4). The epidemiology of cryptosporidiosis is very similar to giardiasis. Clinically, *Cryptosporidium* infection can lead to a variety of signs and symptoms. It can cause severe and prolonged diarrhea in patients with immunodeficiency and AIDS, and in infants (4, 5). In the past, *Cryptosporidium* was considered as a gastrointestinal parasite in young animals (e.g. cattle). But, today, as its pathogenic role in human has been recognized, it is considered as one of the most common pathogens in both humans and animals (6).

Cryptosporidium infection can persist for a long time and can lead to serious complications in patients with AIDS, renal transplant or cancer patients (7-9). But, in patients with an intact immune system, this organism leads to a self-limited infection. There is an indirect relation between the duration of infection and the CD_4^+ cell count (1, 2, 10).

Urmia is located in north-west of Iran and is the center of West Azerbaijan Province. As Urmia is a cattle-raising area and there are active kidney transplantation departments in this city, this

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study has been performed to determine the prevalence of cryptosporidiosis in this city.

Materials and Methods

All patients who underwent renal transplantation were entered into this study from 1997 through 1999. Of 170 patients, 15 patients died, 14 were under dialysis because of rejection of the transplanted kidney, and 16 did not refer to the renal transplantation center. Thirty eight patients refused to participate in the study. The remaining 87 were allocated to the experimental group. Thirty non-immunosuppressed cases were selected from different wards as the control group. Totally, 178 samples were collected; of which 150 samples belonged to 75 patients (two samples each) and the rest belonged to 28 patients who were taken only one sample each. In the year 2000, 128 patients were hospitalized for hemodialysis in Taleghani teaching hospital. Of which, 103 cases participated in this study. Stool samples of all patients were sent for examination. In addition, 30 cases (20 from urban and 10 from rural areas) were selected as controls. A questionnaire was designed for collection of information such as age, sex, date of transplantation, duration of hemodialysis, contact with animals and diarrhea. Each case received two stool specimen containers and was asked to return the samples in one week.

The samples were concentrated by formalin-ether method. A drop was taken from each deposit by Pasture pipette and was smeared on a glass slide. The slides were stained by modified acid-fast method. In this method, oocysts of *Cryptosporidium* were visualized as red spots on blue background. All the smears were examined by light microscope with ×100 objective. χ^2 test was used for statistical comparison of two proportions.

Results

Of 87 renal transplant patients, 57 (32 females and 25 males) were from urban areas. Examination of the samples revealed that 10 (11.5%) patients in the renal transplant group were positive for *Cryptosporidium* infection. None of the samples in the control group were positive for this infection and the difference was statistically significant (P= 0.02).

Of 103 hemodialysis patients with an average age of 50 yr and an average duration of hemodialysis of 3 yr, 55 were male. Among these patients, 4(3.88%) cases (3 males and 1 female) of contamination were detected. No contaminated case could be detected in the control group. The relationship between control and experimental groups was not significant. But, there was a positive relationship between duration of hemodialysis and contamination with parasite (P= 0.001).

Discussion

Cryptosporidium has been known as an important cause of watery or mucoid diarrhea in immuno-competent persons that heals spontaneously in several days or weeks. Because of low sanitary levels, in developing countries, infection with this parasite occurs mostly in the first years of the life, but in developed countries the infection can be linked to day care or schooling (6). While self-limiting in immunocompetents, a chronic, long lasting diarrhea (sometimes deadly) and even extra-intestinal illnesses can be seen in immuno-compromised patients especially those with lower counts of $CD4^+$ cells.

As renal transplantation recipients receive immunosuppressive drugs for all their life, they not only need lower dose of organisms to be infected, but also may produce more sever symptoms. This study showed higher prevalence of cryptosporidiosis among these patients compared to the control group and was in concordance with previous studies (11, 12). Ok et al. could find such a significant relation between *Cryptosporidium* infection and renal transplantation. In their study 18.8% of transplanted patients and 7.1% of control group were infected (11). Although Chieffi et al. were unable to find statistically significant relation, but

the infection rate was yet higher in renal transplant recipients (34.8%) than controls (17.4%) (12).

Patients undergoing hemodialysis were also assayed for *Cryptosporidium* infection and their infection rate was higher than controls but no significant relation was achieved. This was in agreement with Chieffi et al. (25% and 17.4%, resp.) (12), and in contrast with Seirafian et al. (11.5% and 3.9%, in that order) (13) and Turkcapar et al. (20.7% and 0%, respectively) (14).

The infectious dose of *Cryptosporidium* is relatively low and in some isolates, infection may be acquired by ingesting only one oocyst. The oocysts are fully infective when shed and this way of infection takes place easily. They are also very resistant to environmental conditions and in moist places can remain infective for six months. Their small size and resistance to chlorine facilitate water transmission. Finally some of genotypes have important animal reservoirs like cattle (6). So *Cryptosporidium* has a potentially high infectivity, and transmission occurs with no trouble.

Above mentioned studies show the higher prevalence of *Cryptosporidium* infection among renal transplantation recipients than normal population. As treatment is not always feasible in these patients and also they receive immunosuppressive drugs, preventing measures like drinking boiled water, avoiding contact with infected people or young pets and avoiding swallowing water while swimming need to be employed (15).

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