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Intestinal Parasitic (Including *Cryptosporidium*) Infections in Day-Care Centres

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Objectives: To investigate the importance of the intestinal parasites including *Cryptosporidium* in children of day–care centres as a cause of enteric infections and risk of spread to close contacts of infected children.

Methods: Stool samples were collected from 43 children attending the day-care centres, 10 personnel of the centres and 55 household contacts of the children. Direct smear method and then formalin-ether sedimentation method were carried out for all stool samples to detect intestinal parasites. Fecal smears were prepared from the sediment and stained by the modified Ziehl-Neelsen method for the recovery of red-pink oocysts of *Cryptosporidium*.

Results: Thirty-one (72%) children were found to be infected for intestinal parasites compared to 1 (10%) positive personnel and 19 (34.5%) positive household contacts of the children. *Cryprosporidium* oocysts were found to be excreted in 4 (9%) children compared to 4 (7.2%) household contacts. No single positive case was recovered among the examined personnel of the day-care centres.

Conclusion: The present report provided useful information on the seasonal occurrence, patterns of transmission and risk of spread to close contacts of infected children. The roles of children and staff in the transmission of parasitic diseases would contribute to the development of effective prevention and control measures in child care centres.

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Because more children are attending day-care centres, more attention has been focused on the frequent transmission of pathogens there. These pathogens often spread to day-care staff, household contacts and other persons in the community. Prevalence rates of cryptosporidiosis ranged from 1.8% to 3.8%[1]; in Georgia, USA (1.8%)[2]; in Salamanca, Spain (7.3%)[3]; and in France (2.8%)[4]. Among six different outbreaks in day-care centres in USA between 1984 and 1989, children under two years old had a higher infection rate (60%) than old children or care givers[5]. Cryptosporidiosis is a common cause of diarrhoea in children and has been associated with both sporadic and epidemic diarrhoea in child care centres.

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High levels of secondary household transmission were associated with outbreaks among children attending day-care centre (12.4%)[5].

Since no work has been done on the importance of the intestinal parasites including *Cryptosporidium* in children of day –care centres, this study is designed to investigate the importance of such organisms as a cause of diarrhoeal disease and risk of spread to close contacts of infected children.

METHODS

Forty-three children (24 boys and 19 girls) below six years age (mean 3.29± 1.67), were included in this study. They were attending four day-care centres and two of nursery houses located in centre of Basrah City. They were located on one floor and provided with a common play corridor with common toilet facility including hand-washing area for both the staff and children. There were both bowel –trained and non-bowel –trained children. Each child brought his own food, and there was no common source of food. The staff of the involved day-care centres included 10 people. Those children belonged to 55 households.

During the period from January to May 1998, stool samples were collected from children attending the day-care centres, personnel of the centres and household contacts of the children. Direct smear method and then formalin–ether sedimentation concentration method[6] were carried out for stool samples to detect ova, cyst and trophozoite stages of intestinal parasites. Fecal smears were prepared from the sediment and stained by the modified Ziehl-Neelsen method[6] for the recovery of red-pink oocysts of Cryptosporidium.

RESULTS

The results of stool testing for the presence of *Cryptosporidium* (acid-fast protozoa) and other intestinal parasites are described in Table 1. Out of the examined 43 children of the day-care centres, 31(72%) were found to be positive for intestinal parasitic infections compared to 1(10%) positive personnel of the day-care centres and 19(34.5%) positive household contacts of the children.

Table 1. **Intestinal parasitic and Cryptosporidium infections among children in day-care centres, personnel of the centres and household contacts of the children**.

	No. examined	*Intestinal parasitic infection No. (%)*	*Cryptosporidium No. (%)*
Children of day-care centres.	43	31 (72.0)	4 (9.0)
Personnel of day-care centres.	10	1 (10.0)	0 (0.0)
Household contacts	55	19 (34.5)	4 (7.2)

Out of the 43 examined children *Cryptosporidium* oocysts were found to be excreted in 4 (9%) compared to 4 (7.2%) positive household contacts (Table 1). No single positive case was recovered among the examined personnel of the day-care centres.

The most common parasites detected in both children attending the day-care centres and their household contact were *B.hominis*, *G.lamblia*, *E.vermicularis* and *Cryptosporidium* (Table 2). Sex distribution was almost equal. However, the difference between parasitic infections including Cryptosporidiosis in children of the day-care centres and their household contacts is statistically significant ($P < 0.05$). Only single case of giardiasis was detected among the examined 10 personnel of the day-care centres (Table 2).

Table 2.

DISCUSSION

Intestinal parasitic and *Cryptosporidium* infections result from ingestion of the infective stage in contaminated water, food or through feco-oral route from person to person. These infections often spread to day-care staff and household contacts. These infective stages are often resistant to most common disinfectants and adverse environmental conditions. Infectious diarrhoea is an important public health problem among young children attending day-care centres who experienced approximately 1.0 to 2.8 episodes per child a year[7]. Infants and toddlers in day-care centres are 1.6 to 3.5 times more likely to have diarrhoea than those cared for at home[8]. Among children younger than 3 years of age who attend day-care centres, an estimated 50% of infectious diarrhoea are acquired while at a day-care facility[9].

Cryptosporidium is a common cause of diarrhoea in children and has been associated with both sporadic and epidemic diarrhoea in child care settings[5]. Outbreaks of cryptosporidiosis have been reported from day-care centres in the USA[5], Britain[10], Australia[11], France[12], Portugal[13] and South Africa[14]. Sporadic infections have also been reported in day-care centres and day-care home[2-4].

Once organisms introduced into a child care facility by a source child, they spread to other children and staff members through deposits on environmental surfaces, which serve as possible sources for further transmission. Child to child transmission is suggested by clustering of cases within classrooms. Attack rates are highest among children who are non-bowel-trained children. Attack rates are often higher among toddlers than among infants in day-care centres[11] and that may be attributed to the increased mobility of toddlers and their greater degree of personal interaction.

Transmission of cryptosporidiosis from children to staff has been documented in several outbreak investigations[5]. The risk of infection appears to be greatest for staff persons who care for children in diapers[5,14,15]. The existence of a common play area and restroom introduces the possibility of transfer through fomites; also contamination of

toys may play a role in transmission of the infection. The short period spent in our local centres (4 hours) may reduce this transmission to the minimum.

Evidence for secondary transmission of infection from children to household and other close contacts has been found in many outbreak investigations. Adult household contacts, especially those that changed diapers of infected children, have been shown to be at greater risk of infection than sibling's or adults who did not change diapers[15].

The present report has provided useful information on the seasonal occurrence, patterns of transmission and risk of spread to close contacts of infected children. Improved knowledge of the role of children and staff in the transmission of enteric diseases would contribute to the development of effective prevention and control measures in child care centres. These measures include hand washing, use of clothes or diapers capable of retaining liquid faeces, separation of diapering and food handling areas and responsibilities, disinfection of diapers area and toys, excluding diarrhoeic children and use of disposable gloves when changing diapers.

CONCLUSION

Cryptosporidiosis may spread to all family members and to neighbours and close relatives who have regular contact with an infected child.

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Table 2. Distribution of intestinal parasitic infections among children in day-care centres, personnel of the centres and house-hold contacts in relation to sex

Parasite	Children in day-care centres. N=43			Personnel in day-care centres. n=10			Household contacts. n=55		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
Cryptosporidium	2	1	3	-	-	-	2	-	2
Blastocystis hominis	4	3	7	-	-	-	4	3	7
Giardia lamblia	3	4	7	-	1	1	2	1	3
Entamoeba histolytica	1	-	1	-	-	-	-	1	1
Enterobius vermicularis	6	4	10	-	-	-	1	2	3
Trichuris trichiura	-	1	1	-	-	-	-	-	-
Ascaris lumbricoides	-	-	-	-	-	-	1	-	1
Cryptosporidium, G. lamlia & B. hominis	-	1	1	-	-	-	-	-	-
G. lamblia & E. vermicularis	-	1	1	-	-	-	-	-	-
Cryptosporidium & B. hominis	-	-	-	-	-	-	1	-	1
No. Total	16	15	31	-	1	1	11	8	19
%	37.2	34.8	72.0	-	10.0	10.0	20.0	14.5	34.5