Case report

Cryptosporidium and *Cyclospora* infection transmission by swimming

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Abstract

Cyclospora and *Cryptosporidium* are obligate, intracellular, coccidian protozoa that cause self-limited diarrhoea in immunocompetent and prolonged diarrhoea in immunocompromised patients. This is the first case of coccidia infection acquired after swimming in a swimming pool in Nepal. This study describes the chronological evidence of these coccidia infections in a Nepalese swimmer with the possible epidemiological link of the environmental contamination in swimming pools in Kathmandu. It represents an important public health issue among the urban areas of the world.

Keywords: Cryptosporidium, Cyclospora, epidemiology, hyperchlorination, swimming, transmission

Introduction

Swimming is an excellent exercise which keeps the physiology and psychology of the human body in a fit and fine status. However, it is a potential source of contamination of fungal, bacterial, viral and parasitic organisms. *Cyclospora* and *Cryptosporidium*, coccidian protozoan parasites, cause the symptomatic and asymptomatic illness in the humans. They are soilborne, foodborne and waterborne parasites and are mostly transmitted through the consumption of food or drinking of water contaminated with oocysts of parasites. In this case study, we have described the first case of *Cyclospora* and *Cryptosporidium* infection transmission by swimming in the swimming pool in Kathmandu valley, Nepal.

Case report

A 27 year-old man in Chabahil, Kathmandu, Nepal, suffered from gastrointestinal illness on May 11, 2008, 3 days after enjoying swimming in one of swimming pools in Kathmandu Valley. He was suffering from vomiting, non-bloody watery diarrhoea, stomachache, excessive gas, explosive bowel movement and mild fever.

He visited Tribhuvan University Teaching Hospital, Maharajgunj, Kathmandu in May 12 to check up his health. His blood counts for TC, DC, and Hb were normal and routine stool microscopy and blood culture for typhoid were negative. The physician recommended metronidazole 400 mg t.i.d. for 5 days along with vitamin B complex and rehydration solution (Jeevan Jaal).

He told us that he had not gone to any place outside his home for drinking water and for food for one month. He had been drinking boiled water for one month. He had no contact with nurseries, groups, soil and animals for that period. But during sunny day, when he had gone for swimming, he had accidentally drunk water in the pools. He told us about eight-day diarrhoea which had not been resolved till May 19, 2008. At the same day, we took three stool samples from him. We examined his stool by direct wet mount at 2.5% potassium dichromate solution and formol-ether concentration method and repeated the same tests thrice. The first test gave the positive detection of *Cyclospora* parasites in the range of 1-3 oocysts per X400 and *Cryptosporidium* parasites in the range of 4-10 oocysts per X400. The second test was positive for *Cryptosporidium* only in the same range but negative for *Cyclospora* and the

third tests gave the positive detection of the above parasites in the identical ranges (1-3 oocysts per 400 fields for each parasite). We conducted modified acid–fast and hot-safranin staining techniques to prove these coccidia. We performed bisporulation assay and oculo-stage micrometer methods to distinguish *Cyclospora* oocysts from those of *Cryptosporidium* as previously described.[3] Bacteriologic tests of stool were negative.

He continued Trimethoprim-Sulfamethoxazole (TMP-SMZ) 160/800 mg PO b.d. for 7 days along with ORS (Oral Rehydration Solution, *Jeevan Jaal*) and liquid soup of pea. The diarrhoea resolved in May 28, 2008. We collected his stool samples thrice and examined again. But there was no detection of any intestinal parasites in these samples. Again after 5 days, we collected the stools, but there was no oocyst in the stool.

From May 20 to 29, we started to collect samples of street human stool, dog stool, bird stool and cattle dung, vegetables and surface rain water. We used 2.5% potassium dichromate to observe by direct wet mount. We centrifuged (3000 rpm for 5 minutes) the samples and diagnosed for *Cyclospora* and *Cryptosporidium* by acid fast staining. Our laboratory results showed the presence of these species in street human samples and *Cryptosporidium* species solitary in most of the samples. At least, human stool is good source of both parasites, whereas, cattle dung, vegetables and water sources are primarily associated with *Cryptosporidium* oocysts contamination (Table 1). We couldn't diagnose *Cyclospora* in dog and bird stool, cattle dung, vegetables and water samples. The recovery of oocysts of *Cyclospora* was confirmed by using bisporulation assay.

Cyclospora and *Cryptosporidium are* obligate, intracellular, coccidian protozoa that cause self-limited diarrhoea in immunocompetent and prolonged diarrhoea in immunocompromised patients.[1,2] The same direct wet mount at 2.5% potassium dichromate solution, modified acid–fast and hot-safranin staining techniques can be used to detect both parasites.[3] Vomiting, diarrhoea, stomachache, excessive gas, explosive bowel movement and mild fever are the common symptoms of both microorganisms leading a significant health risk to humans.[4] Both show a high rate of infection with a distinct seasonality in developing countries.[5]

Both parasites are faecalborne, waterborne, foodborne, soilborne pathogens and can survive for months in a latent form outside hosts, as the oocysts retain their infectivity for several months in both salt and fresh water.[6] The oocysts are very hardy and survive for prolonged periods in the environment. It can retain viability and therefore infectivity under moist and cool conditions for several months.[7] *Cryptosporidium* has also been associated with chlorine treated water in swimming and wading pools.[8] Chlorination of water supplies does not appreciably kill the oocysts of *Cryptosporidium*and *Cyclospora*.[9-11]

Cryptosporidium is easily spread from person-to-person in crowded home or day-care nurseries because oocysts are infectious at the time of excretion.[4] However, direct person-to-person spread of *Cyclospora* is unlikely.[2,11] *Cyclospora* infected swimmers have contaminated sporulated oocysts around their anus and internal cloths and may contaminate the water in pools. The oocysts-contaminated internal clothes of *Cyclospora* infected asymptomatic or symptomatic persons with poor health are

Table 1: Detection of *Cyclospora (Cycl)* and *Cryptosporidium (Crypt)* in different samples collected near the diarrhoeal patient and the swimming pool, from May 20, 2008 to May 29, 2008 in Kathmandu, Nepal.

Samples	Near living of patients			Near swimming pool		
	Numbers	*Cycl*	*Crypt*	Numbers	*Cycl*	*Crypt*
Human stool*	7	3	1	3	1	1
Dog stool*	4	0	0	8	0	0
Bird stool*	2	0	0	3	0	0
Cattle dung*	4	0	1	1	0	1
Vegetables*	13	0	1	9	0	0
Water**	14	0	2	17	0	1

* All samples collected within periphery of 100 metres away from the habitat of the patient. Vegetables include spinach, basil, bitterguard, garlic in the nearest markets.

**Water includes surface rain water in the nearest road (within 10 metres).

likely to be a risk factor of cyclosporiasis. The similar case had been already detected in Chicago where an 8-year-old child became ill and passed *Cyclospora* oocysts in the faeces one week after swimming in Lake Michigan.[7] Transmission of *Cyclospora* and *Cryptosporidium* was possible because the infected persons had accidentally drunk the contaminated water during swimming.

The oocysts of *Cyclospora* are excreted in low numbers from an infected patient.[3] So, we had detected only 1-3 oocysts per X400 fields in the previous tests but we were unable to detect the parasites just in the second test. The absence of coccidia in the patient after the resolve of diarrhoea suggests the permanent cure of *Cyclospora* and temporary or permanent cure of *Cryptosporidium* by TMP-SMZ.

The laboratory findings suggest that there are some risk factors epidemiologically linked in the transmission of these coccidia among people in Kathmandu. There are street human faeces as the point sources of the coccidia transmission. Surface rain water acts as the medium of coccidia transmission in different places. Besides, the oocysts carried by sandals, may be carried by surface rain water and might contaminate the pool. Insects, mice, birds may act as the mechanical vectors to carry oocysts from point sources to swimming pools. Another possibility is the transmission of coccidia by carrier swimmers through their anal parts and active resistant of the chlorine by these coccidia. However, in this study, it is difficult to say *Cyclospora* and *Cryptosporidium* outbreaks occurred from swimming pool because of the lack of the study of positive cases in the water samples from the pool. Due to ethical reason, we couldn't test the water samples from this area. So, as a part of our descriptive research, we just were able to sketch the epidemiological link of coccidian diarrhea caused in swimmers after swimming in the pool.

This study is not complete enough for the transmission of coccidia in the absence of risk factors from the point sources. So, further study should be made by a large number of samples from point source to prove the existence of the epidemiological link of coccidiosis in swimmers.

Conclusions

The current study raises an important public health issue among the urban areas of the world. It concludes that either the standard of the swimming pool in Kathmandu valley is suboptimal or the person going to swim in the pool is with poor health. The swimmers should consult the parasitologists and public health workers to test their stools for these coccidia. They should also consume anticoccidian drugs as preventive options. It needs further confirmation how TMP-SMZ coupled with ORS (Jeevan Jaal) works against *Cryptosporidium* oocysts.

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