

Giardiasis in an Infant and Toddler Swim Class

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Abstract: A *Giardia* infected Washington State child was found to participate in an infant and toddler swim class. A stool survey of 70 child participants revealed a 61 per cent prevalence of *Giardia* infection. Also, 39 per cent of 53 mothers and 28 per cent of 21 fathers were *Giardia* positive. None of the non-swimming playmates were positive. Thirty-five per cent of 23 children exposed only at a better maintained pool to which the classes had been moved four weeks prior to the survey were positive. No evidence of transmission to non-swim class pool users was found. (*Am J Public Health* 1984; 74:155-156.)

Giardia is a commonly identified intestinal parasite, often associated with severe, prolonged diarrhea. Outbreaks of giardiasis have been traced to contamination of municipal water supplies with animal¹ or human² waste. *Giardia* infected aquatic mammals, a possible source of water contamination, are commonly found in the watersheds which supply much of Washington State's municipal drinking water.³ Giardiasis outbreaks have also been traced to fecal contamination of food⁴ and to person-to-person transmission within day care centers.^{5,6} Although the prevalence of *Giardia* infections among asymptomatic people in the United States is unknown, a recent survey of 1-to-3 year old asymptomatic children in two Washington counties found a 7.1 per cent prevalence of infection.⁷

During the course of routine follow-up of diagnosed *Giardia* infections, an infected Thurston County child was found to participate in an infant and toddler swim class. Complaints of diarrheal illness among some class members and the potential for person-to-person transmission within the swim class motivated an investigation. When, in late May 1982, it became apparent that an outbreak was occurring, the Thurston County Health Department excluded members from the classes until they submitted three negative stool specimens. The resulting stool survey is reported below.

Methods

A total of 75 children from 65 households were identified as participants in the swim classes. Ages of participants ranged from infants to 3-year-olds. The same instructor gave nine separate classes, meeting one half hour, twice a week. Class sizes varied from six to 14 children, and participants were not segregated by age. During the class, each child was accompanied by a parent, usually the mother, who was in the pool with the child and participated in the program. The classes had been held at a motel swimming pool until four

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weeks prior to the survey, when they were moved to an apartment complex swimming pool. The swim program began about three years prior to the survey.

In late May 1982, the parents of each swim class participant were requested to submit three stool samples, taken one day apart, from themselves and from each swim class child in their household. Stool samples were transported for analysis, in a 10 per cent buffered formalin solution, to the Washington State Public Health Laboratory in Seattle. A concentrated wet mount of each stool sample was examined microscopically for *Giardia* cysts.

Stool samples were received from 70 of 75 swim class children (93 per cent), 53 of 61 mothers (87 per cent), and 21 of 58 fathers (36 per cent).^{*} Sixty two of 65 households with children in the class submitted stool specimens.

Stool samples were also received from three asymptomatic non-swimming siblings of class participants and from 15 playmates of *Giardia* positive swim group children. The 15 playmates participated in an organized weekly play group with two of the *Giardia* positive swim-class members. Siblings and playmates were asked to submit at least two stool specimens for analysis and 11 (61 per cent) of the 18 children submitted two samples. The operators of 14 day care homes or centers where swim class members attended were requested to report outbreaks of diarrheal illness to the health department.

Eight non-swim class users of the motel pool (six adults, two children) and three users of the apartment pool (two adults, one child) submitted one stool specimen each for analysis. Two of these swimmers used the pool at the same time as the swim class but did not participate in the classes.

Monthly water quality and pool maintenance data were reviewed for both the motel and apartment complex pools for the period February to June 1982 to identify possible operational problems. In addition, the pool equipment was inspected to identify possible design or operational problems.

Results

Forty-three (61 per cent) of the swim class children, 21 (39 per cent) of the mothers, and 6 (28 per cent) of the fathers tested were *Giardia* positive. None of the non-swimming siblings or play-group members were *Giardia* positive. In all but three instances, a *Giardia* positive child was found when an infected parent was identified. There was no association between *Giardia* positivity and age of the child (Table 1). *Giardia* positive children were found in each of the nine swim classes.

Total coliforms and standard plate counts were negative for both swimming pools. The pH and alkalinity were also within acceptable ranges for both pools (pH 6.8 to 7.6, alkalinity 100 to 130). Turbidity was often a problem for the motel swimming pool and was a factor motivating the move to the apartment complex pool. Turbidity was minimal at the apartment complex pool. Free chlorine residuals were often

^{*}The requested three stool samples, taken on separate days, were received from 61 of the 70 children (87 per cent), 35 of the 61 mothers (57 per cent), and seven of the 58 fathers (12 per cent).

TABLE 1—*Giardia* Prevalence in Swim Group by Age of Child

Age (months)	<i>Giardia</i> +	<i>Giardia</i> -	% Positive
0-12	7	9	43
13-24	9	4	69
24-36	13	11	54
36+	12	5	70

p = .35.

low for the motel swimming pool (.2 ppm to 3.0 ppm free Cl₂) but were moderate for the apartment complex pool (1.5 ppm to 3.0 ppm free Cl₂).

Since the classes had been moved four weeks prior to the survey to a better maintained swimming pool, we examined *Giardia* positivity for 23 children who swam only at the better maintained swimming pool. Eight *Giardia* positive children were identified (35 per cent prevalence) among this group. In general, there was a higher prevalence among children attending for more than seven swim sessions (71 per cent) than for those attending less than seven sessions (35 per cent).

None of the 11 non-swim-class motel or apartment pool users were *Giardia* positive.

None of the day care operators reported outbreaks of diarrheal illness (diarrhea lasting five days or longer) occurring prior to or after the swim class outbreak. Six of the 43 *Giardia* positive children (13 per cent), three of the *Giardia* positive fathers (50 per cent), and 10 of the 21 positive mothers (47 per cent) were symptomatic.

Discussion

Each of the nine infant-parent swim classes were composed of six to 14 infants plus their parent helpers. The class exercises involved games where the participants passed through the water in a circle behind the other swimmers. This could explain how *Giardia* was initially spread within a class. Mothers and infants did not generally shower before entering the pool. Even with adequate chlorine levels, there may not have been enough contact time for the cysts, washed off a carrier, to be destroyed before ingestion by the next swimmer.

A fecal accident occurred in the apartment pool on May 5. The motel swimming pool operator and the mothers reported that there also had been accidents at the first pool, although they could not provide dates.

There were also several factors that may have contributed to the spread of the parasite between classes conducted

by the instructor. Frequently children were allowed to make-up missed sessions on another day, thus exposing other classes or being exposed to *Giardia*. Parents and infants commonly arrived early for a class or stayed after their class to play in the pool while other classes were in session. There were often as many swimmers playing in the water as participating in class. The child used by the instructor to demonstrate the swim techniques to all classes was *Giardia* positive. Also, new-comers to the swim class were incorporated into existing classes, exposing these infants and parents to *Giardia*-infected veteran swimmers. Except for the two children who participated in the organized play-group, there was little contact between the children outside the pools.

As most of the children were at diaper-age, it is difficult to determine whether the *Giardia* positive mothers contracted their infections in the pool or at home. Five of the six positive fathers did not participate in the swim classes. However, one swimming father and two mothers were positive while their children were *Giardia* negative after three stool samples, and seven mothers were positive whose children were not in diapers. These 10 parents may have contracted their infections in the pools.

The infections among swim class participants may not have affected non-swim class pool users. None of the routinely interviewed *Giardia* positive people from Thurston County (not part of swim classes) reported exposure to these pools. Also, nine swimmers who reported frequent use of the motel or apartment pools when swim classes were not in session were *Giardia* negative.

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