lution **47** (1987) 187–194

Limitation of Communal Latrines in Changing the Prevalence of Parasites and Diarrhoeal Attack Rate in Dhaka Peri-urban Slums

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(Received 18 September 1986; revised version received 6 November 1986;
accepted 27 March 1987)

ABSTRACT

A study of the effects of communal latrines on diarrhoeal incidence and parasite prevalence rates was conducted in 1983 at Tongi, which had five communal Oxfam latrines with a manual flushing system for 924 people; and at Kalsi, which had 39 open pit latrines for 823 people. Inhabitants' stool samples were tested initially and also after twelve months to see the reinfection rates. All inhabitants were dewormed with pyrantel, and were visited weekly to obtain diarrhoea histories. In both communities, there were high prevalence rates of roundworm, hookworm, Trichuris trichiura, Entamoeba histolytica, Giardia lamblia *and* Strongyloides stercoralis. *Following the dewormings, the prevalence rates of roundworm, hookworm and* Trichuris *infection came down significantly, in both areas. The prevalence or reinfection rates remained identical in both communities. There was also no difference in diarrhoea incidence rate for the two areas. It is found that, keeping all other variables unchanged, use of communal latrines, without strict disposal of everyone's excreta, does not affect parasite prevalence and diarrhoea rates. People must be educated about the use of communal latrines and the safe disposal of all excreta, including that of children.*

INTRODUCTION

Howard & Lloyd (1978/79) observed that diseases associated with poor disposal of excreta have become common in Bangladesh. Although there

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Environ. Pollut. 0269-7491/87/$03·50

were differences in reduction rates of diarrhoea between areas, a WHO team found that improved sanitation and the killing of flies decreased diarrhoeal disease prevalence (Van Zijl, 1966). Azurine & Alvero (1974) found that use of latrines alone reduced diarrhoea prevalence by 68%. Flies have been found to be passive vectors of many pathogens in Dhaka (Khan & Huq, 1978). The provision of piped water and sewer-connected latrines in Dhaka refugee camps reduced cholera prevalence by two-thirds (Khan & Shahidullah, 1982). Helen *et al.* (1965) also found reduction of diarrhoeal diseases after provision of piped water and excreta disposal facilities. Diarrhoea and cholera are more common in urban slums than in better residential areas (Khan *et al.*, 1983). Parasites were also highly prevalent in southeast Asians (John & Virginia, 1981) and in rural Bangladesh patients with diarrhoea (Hossain *et al.*, 1981). However, provision for a safe family latrine is not within the financial reach of most people in developing countries. In many instances, providing both water and sanitation may be impracticable.

Therefore, it was necessary to introduce in Bangladesh urban slums a single, cheap, easily managed communal latrine system, to reduce environmental contamination with faeces. We attempted to study the effects of communal latrines on prevalence of parasites and diarrhoeal diseases in an urban slum, as compared to one without communal latrines. It was assumed that use of communal latrines for some years would reduce environmental contamination by parasites and, as such, there would be lower reinfection rate after deworming.

METHODS

Two similar peri-urban slums of Dhaka inhabited by refugees from villages, one located at Tongi, and provided with five communal latrines, and the other at Kalsi, with 39 open pit latrines, were selected for study. The areas were about ten miles apart. In both, people drank water from tubewells year-round, but bathed and washed with tubewell water during the dry season. During the monsoon, they washed and bathed in pond or surface water. Each family lived in a single-roomed thatched bamboo shed. Latrines at Tongi were located 15–60 ft from their huts. The five communal latrines provided by Oxfam were glass-fibre squatting plates with cemented seats. They were placed in rows on raised ground under a shed, and were separated by partitions. They were connected to two 21 000-litre flexible rubber sedimentation tanks, which stored 8–10 days' sewage under anaerobic conditions (Howard *et al.*, 1975). It was expected that most of the ova and eggs of parasites would be destroyed in the anaerobic conditions of the

storage tank and that the environment would be cleaner than in the Kalsi area. The latrines were flushed manually with water every half-hour. The effluent automatically drained down from the storage tanks into an adjacent pond enclosed with bamboo fencing. During winter, the pond receiving the effluent almost dried up. During the monsoon period the overflow drained through open shallow surface channels between the surrounding huts to join a canal. Young children often defecated in their own homes. The people of Tongi study area had used Oxfam latrines for more than five years.

Kalsi, the other area, had no communal latrines. Instead, each family, or a few families together, shared a shallow pit latrine dug near their huts. Around such pits, roofless bamboo or jute mat enclosures were built, and a pair of bamboo pieces or bricks was placed across, or on one side of, the pit to sit upon. The people had lived here for over five years. At the start of the study, the people of both areas were visited and censused by trained field teams, each consisting of a male and a female. The study's purpose was explained to local leaders and their subjects. Later every family was visited weekly to obtain histories of diarrhoeal illness. Stool samples were collected each morning by a local man, employed from each area to collect stool bottles supplied the previous evening. Samples were examined for ova, protozoa and cysts, using flotation and iodine staining methods (Willis, 1980). Both vegetative and cyst forms were considered as positive for *Entamoeba histolytica* and *Giardia lamblia* infection. No egg count was done. All subjects were then dewormed, using 500 mg pyrantel pamoate (Combantrin, Pfizer) for adults, and an appropriate dose for children. Stools were examined initially and after deworming, and pyrantel was readministered to cases showing ova or cysts. Last [stool] samples were examined after twelve months. The pond and hand-pump tubewell water was cultured quarterly, using the method for coliform counts (Cruickshank *et al.*, 1975). Both microscopic and culture tests (Monsur, 1963; Ewing, 1972) were done on diarrhoeal stools, searching for common bacteria and parasites. Diarrhoeal patients were given oral rehydration solution, and severe cases were referred to a hospital. For fever, paracetamol was supplied. The people were not influenced to change their habits in latrine use. The study was conducted for one year in 1983.

RESULTS

Some comparative figures for the two areas are shown in Table 1. The areas are similar in all respects except for the type of latrine available. In the Tongi area, 78% of the people used communal (Oxfam) latrines, 6% used pit latrines and 16% had no definite latrine. In the Kalsi area, 69% used open pit latrines and 31% had no definite latrine.

TABLE 1
Comparing Some Variables of the Tongi and Kalsi Populations

Areas	*Total population*	*Children < 10 (%)*	*Average members/family*	*Literacy of heads (%)*	*Family head's occupation*				*Monthly income*	*Families live in thatched/bamboo shed (%)*	*People use pit latrines (%)*	*Uses no definite latrine (%)*	*Uses community (Oxfam) latrine (%)*
					Day labourer (%)	*Rickshaw-puller (%)*	*Self-employed (%)*	*Any job (%)*					
Tongi area	924	32·3	4·1	20·2	35·6	22·7	23·6	18	TK.170/-	100	5·6	16·1	78·3
Kalsi area	823	35·2	4·7	21·8	29·3	20·7	37·4	12·6	TK.154/-	100	68·9	31·1	0·0

Initial and subsequent parasite prevalence, or reinfection rates, are given in Table 2. Whilst initial roundworm prevalence was similar for the two communities, prevalence of hookworm, *Entamoeba histolytica* and *Giardia lamblia* was significantly higher in the control area. Coliform counts were also higher in the control area, whilst the prevalence rate of *Trichuris trichiura* was slightly higher in the study area. In both areas, after one year of treatment, the prevalence, or reinfection rates, of *Ascaris lumbricoides*, hookworm and *Trichuris* came down significantly, but the rates in the Tongi area remained higher than those in the Kalsi area. The opposite was true for *Giardia* and coliform counts. The prevalence of *E. histolytica*, *G. lamblia*, *Strongyloides sterocoralis* and coliform counts all remained high in both areas. Pyrantel is unsuitable for the treatment of *E. histolytica* and *G. lamblia*. There were similar increases in coliform counts in both the areas after 12 months.

Diarrhoea ($\geqslant$ three loose motions a day) rates, by age, in the two areas, for the 12-month study period are given in Table 3. Although the diarrhoea attack rate was slightly higher in the Kalsi area for infants (0–< 1), the rates in other age groups and the overall rate were significantly higher in the Tongi area, which was provided with communal latrines, than the Kalsi area, which used pit latrines.

DISCUSSION

Initial prevalence rates of the parasites, round worm and *Trichuris*, were very high for both populations. The rates for hookworm (33·2% and 42·8%), *E. histolytica* (8·3% and 12·7%) and *G. lamblia* (7·6% and 12·3%) were quite high. Since the Tongi area had communal latrines for more than five years,

TABLE 2

Initial and Subsequent Prevalence or Reinfection Rate One Year after Treatment of Parasites (in Per cent) and Coliform Counts in Tongi and Kalsi Areas

Areas	*Number of samples tested*	*Round worm*	*Hook worm*	Trichuris trichiura	Entamoeba histolytica	Giardia lamblia	Strongyloides stercoralis	*Average coliform counts/100 ml of water*
Tongi area								
Initial prevalence	924	82[a]	33·2[c]	72·2[e]	8·3[g]	7·6[i]	8·8	757
Prevalence rate 1 year after deworming	982	23·1	4·2	60·6	12·3	16·3	6·3	1 670
Kalsi area								
Initial prevalence	732	79·6[b]	42·8[d]	64·9[f]	12·7[h]	12·3[j]	11·1	1 700
Prevalence rate 1 year after deworming	807	12·3	2·3	44·1	9·8	21·2	4·7	2 400

Statistical analysis by χ^2 test: a vs $b = p$ not significant.
c vs $d = p < 0{\cdot}01$.
e vs $f = p < 0{\cdot}05$.
g vs $h = p < 0{\cdot}05$.
i vs $j = p < 0{\cdot}05$.

TABLE 3
Age Specific Incidence of Diarrhoea in the Tongi and Kalsi Areas in 12 Months

Ages	*Tongi*		*Kalsi*	
	Case/ Population	*Average attack/person*	*Case/ Population*	*Average attack/person*
0–<1	66/46	1·43	66/44	1·50
1–4	177/103	1·72	163/111	1·47
5–9	136/148	0·92	109/135	0·81
10–14	111/142	0·78	71/125	0·57
15+	262/485	0·54	170/408	0·42
Total:	752/924	0·81[a]	579/823	0·70[b]

a vs *b*, $P < 0{\cdot}01$.

lower initial parasite prevalence and reinfection rates were to be expected. However, high prevalence of parasites might have been maintained by indiscriminate defecation by children and some adults, as well as by effluent overflow from the sewage ponds during the rainy season. Moreover, during spring and summer, dust containing helminth eggs might have contaminated the environment. Although the egg counts and worm burden were not examined, results suggest that soil-transmitted helminth infection prevailed equally in both areas, despite the use of communal latrines (Oxfam) by 78% of the study area population for over five years. The rate of diarrhoea, from all causes, did not differ between the Tongi and Kalsi areas. Azurine & Alvero (1974) found that use of sanitary latrines led to a 68% reduction in the incidence of diarrhoea. Although we observed that use of sanitary latrines and piped water reduced cholera incidence to one-third (Khan & Shahidullah, 1982), we were unable to achieve any similar difference for other diarrhoeal diseases. This might be due to the prevalence of shigellae, rotavirus and campylobacter in the population (Stoll *et al.*, 1982). Bradley & Feachem (1978) suggested that excreted diarrhoeal disease agents may reach hosts directly, or that human excreta may facilitate the breeding of insects which transmit diarrhoeal agents to man. All parasites do not, however, cause diarrhoea endemicity. In addition, the small effect, if any, of communal latrines found in this study may have been masked by the breeding of insects, especially flies, and by the indiscriminate passing of stools by young children. Movement of people, consumption of food from outside the area, and the occurrence of rain and dust storms may also help transmit parasites from one place to another. Latrine users must be educated in the use of latrines and they should be prohibited from defecating indiscriminately. Tank effluent often containg excreta should not be allowed

to flow through surface channels, where children frequently play. This study shows that, when all other variables are unchanged, and the people are not educated, mere provision of communal latrines in urban slums will have no impact on the reduction of diarrhoea and the prevalence of parasites in the environment.

ACKNOWLEDGEMENTS

I thank Dr W. B. Greenough III, the ICDDR, B Director, for supporting this study; M/s Md. Shahidullah, D. K. Barua, T. Begum and R. Chanda for valuable field services and analytic assistance; Naomi Rocie Novak and Dr Andrew Hall for editorial help and Mr Shipan K. Sarker and Abdul Rahman Tariq for secretarial assistance.

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