Impact of sanitation and health education on intestinal parasite infection among primary school aged children of Sherpur, Bangladesh

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SUMMARY This study was carried out in 1999–2000 in the northern part of Bangladesh to determine the impact of sanitary latrine use and of health education on intestinal parasites in school-aged children. The children were between 5 and 13 years of age and stool samples revealed that more than half (53%) of the study sample was still infected with one or more intestinal parasites even after 4 years of intervention. Ascariasis was found to have the highest prevalence rate (36.2%) and hookworm the lowest (10.7%). Intestinal parasite infection was significantly lower ($P < 0.05$) among those who used a sanitary latrine and received health education. This result is consistent with observations that the effect of sanitation and health education is slow to develop. Concerted primary healthcare activities with community development efforts should be undertaken to improve the overall living condition of the people of this area to control this problem.

Introduction

Intestinal parasitic infection stubbornly remains one of the constant public health problems in almost all developing countries. It is widely recognized as a mirror of socio-economic conditions and an indicator of poor sanitation. It has been estimated that more than a quarter of the world is suffering from one or other type of intestinal parasites[1]. Despite its frequency, it ranks high in 'The forgotten problems of forgotten people'[2]. Of course, this lack of action reflects the classic economic dilemma in third world health: the problem of making rational decisions on healthcare under the constraints of competing claims for the allocation of scarce resources. A high concentration of intestinal parasites inevitably leads to anaemia, malnutrition and different types of morbidity, particularly growth and cognitive development in the children[1].

Bangladesh is a tropical country and more than 85% of its people live in rural areas with a *per capita* income of US$350[3]. The main sources of water supply in rural Bangladesh are shallow tube-wells, man-made ponds and the rivers. In rural areas, most prefer open-air defaecation. Thus, the hot humid climate, poor literacy (65%) and sanitation rate (35%), and non-pursuance of proper hygienic habits favour the transmission of intestinal parasites in this community. A number of epidemiological studies found an alarmingly high prevalence of intestinal parasites, ranging from 26% to 76% in the general population[4–6] and from 31% to 99% among children[7–9]. The wide range of sample sizes, selectiveness of the populations surveyed and the differences in sensitivity of the methods made it difficult for us to assess the public health significance. But, the common suggestion in all the above studies was that periodic chemotherapy, improvements in sanitary conditions and health education programmes would control intestinal parasitic infection in this part of the world.

Although no such intervention programme has been taken up in Bangladesh, examples from other developing countries have shown that this type of intervention programme did reduce the overall infection rate. In Nigeria it was seen that the primary health care interventions in three rural communities have reduced the intestinal parasites by more than 78% after 30 months[10]. In Zimbabwe, a control programme in two valleys reduced the prevalence rate from 62% to 33% after 5 years[11]. Another study in Oman has shown that an intervention programme reduced the hookworm prevalence among rural school children from 40% to 1.3% after 4 years[12].

The absence of a national control programme for this disease in Bangladesh probably reflects a shortage of resources and a general apathy among healthcare authorities. Some of the non-government organizations (NGOs) came forward to supplement government activities particularly in the field of primary health care. Gono Shasthaya Kendra (GK), a NGO, has been offering integrated primary healthcare services to 600 000 people through its 10 centres countrywide since 1972. Its activities are aimed at the overall socioeconomic development of the society. With a view to improving the health status of the villagers, GK distributed sanitary latrines to a large number of people in its Bhatshala project in 1996. In Bangladesh no studies have so far been carried out to see the effects of sanitary latrine use and health education on intestinal parasite infection. Our study is probably the first of this kind in Bangladesh.

Methodology

A cross-sectional survey was carried out at a GK Bhatshala health project to ascertain the prevalence of intestinal parasites and its association with various independent variables. Bhatshala is situated in the Sherpur district of Bangladesh serving a population of 70 000. People in this area live on subsistence agriculture and more than a third were landless. This project area has three health centres namely Lasmanpur, Elsha and Shapmari centre. Primary school children residing in four villages around the Lasmanpur health centre were selected for this study. In these four study villages, GK distributed 150 pit latrines at a subsidized cost (US$4). There were 289 families living there in 1996. Two primary schools, one managed by GK and one a government primary school, are situated in this study area. As the GK managed primary school is situated almost in the middle of the four villages all the students of the GK primary school belonged to these four villages. The government primary school is situated at one corner of the study area, so they have students both from the study area and outside the study area.

The Government primary school was open to all but GK used to pick children only from the poor class through house-to-house visits in their catchment area. All the teachers of the GK primary schools were female whereas in the government school 60% teachers were female. The teacher student ratio in both the schools was similar, i.e. 1:35. Salaries in the government school were about twice those in the GK school. GK school-teachers conducted regular health education classes 1 hour a week. There was a health education corner at GK primary school where different types of posters and health education messages were displayed. Health education relevant to intestinal parasites included how the disease was acquired, how to avoid becoming infected, and how to use sanitation facilities properly. It also stressed the importance of personal cleanliness, change in defaecation behaviour, washing hands with soap after defaecation, washing hands before eating and keeping the nails short. GK health workers also conveyed various health education messages to the villagers during their monthly group meetings.

At the beginning of the study, formal meetings were held with the school teachers. Investigators also visited each class and briefed the students about the objectives. They also visited the four villages and held six group meetings with the villagers. GK health workers who made house-to-house visits in these villages for domiciliary healthcare services also informed the mothers about this study. GK health workers who maintain family cards for each family found that a total of 317 children aged between 5–13 years lived in the study area. Of these, 167 students were attending the GK primary school and 38 children were attending the government primary school.

The study was conducted between 15 June 1999 and 15 October 1999. Every day 12–15 plastic capped containers were handed over to the mothers and a register was maintained. Mothers were asked to accompany their children while handing over the stool-containing pot at the GK health centre. They were also informed that some blood would be drawn for measuring haemoglobin. The mothers' presence was necessary to ensure the children's comfort and cooperation during the taking of blood and to ensure that the left thumb impression on the consent form was obtained. A direct thin smear examination technique was used to identify the protozoa's cysts and trophozites as well as the helminth's eggs and larvae. GK's skilled laboratory technicians carried out this examination with cover-slip preparation of faecal emulsion in normal saline, 1–2% eosin and Lugol's iodine for diagnosis. During preparation, care was taken to use the right proportions of faeces (2 mg) and diluting fluid, so that the cover slip did not float. In this study we did not attempt to measure the intensity of infection at this rural level. It took about 30 minutes for all other measurements and examination. It was possible to examine 10–12 stool samples every day. Stool samples were collected over a period of 1 month.

Results

Sample description

A total of 149 stool samples were provided voluntarily by children from four villages, a participation rate of 47%. Socioeconomic differential to participation did not run the risk of selection bias as more than 90% of this population was poor. The participation rate was higher in the GK school (53%) than in the government school (45%). Among the children not attending school the participation rate was 39%. Participation was also similar in the groups with latrines (47%) and without latrines (43%). A brief description of the sample has been provided in Table 1.

One hundred and five sample children (70.5%) were attending different primary schools. Of these, 88 GK school children received health education, 80 children were using sanitary latrines at the time of study and 62 children had both, i.e. received health education and used sanitary latrines.

Overall 53% ($n = 72$) of the sample had different types of intestinal parasites in their stool. Poly-parasitism was present in 42 cases of the positive samples. The association between different variables has been shown in Table 2 which shows that relatively younger children were slightly less likely to be infected with intestinal parasites than the older children but that the difference was not statistically significant [$P > 0.05$, odds ratio (OR) = 0.9]. Boys were slightly more likely to have intestinal parasites in their stool than girls but it was not statistically significant ($P > 0.05$, OR = 1.1).

Table 1 Sample description

	No. (%)
Age	
<7	39 (26.2)
7	50 (33.6)
8	22 (14.8)
>8	38 (25.5)
Sex	
Male	68 (45.6)
Female	81 (54.4)
Latrine	
Yes	80 (53.7)
No	69 (46.3)
Schooling	
No schooling	44 (29.5)
KG-2 grade	50 (33.6)
3–5 grade	55 (36.9)
Health education	
Yes	88 (59.1)
No	61 (40.9)
Parasites	
Round worm (AL)	54 (36.2)
Hookworm (AD)	16 (10.7)
Giardia	23 (15.4)
E. histolytica	33 (22.1)
No parasite	70 (47.0)

Table 2 Presence of parasites

Variables	Parasite: Positive N (%)	Parasite: Negative N (%)	χ^2	Odds ratio (95% CI)
Age				
8 or less	58 (52.3)	53 (47.7)	0.10	0.89 (0.40–1.98)
More than 8	21 (54.4)	17 (44.7)		
Sex				
Male	37 (54.4)	31 (45.6)	0.10	1.11 (0.55–2.23)
Female	42 (51.9)	39 (48.1)		
Education				
No schooling	32 (72.7)	12 (27.3)	9.74*	3.29 (1.44–7.63)
Schooling	47 (44.8)	58 (55.2)		
Schooling				
Government school	9 (52.9)	8 (47.1)	0.55	1.48 (0.47–4.72)
GK school	38 (43.2)	50 (56.8)		
Latrine				
No	44 (63.8)	25 (36.2)	5.96*	2.26 (1.11–4.63)
Yes	35 (43.8)	45 (56.2)		
Health education				
No	42 (68.9)	19 (31.1)	9.55*	2.91 (1.39–6.14)
Yes	38 (43.2)	50 (56.8)		
Latrine and health education				
No	35 (71.4)	14 (28.6)	11.77*	3.96 (1.65–9.61)
Yes	24 (38.7)	14 (61.3)		

*Statistically significant at 0.05 level

It was seen that children who were not attending any school were three times more likely to have intestinal parasites in their stools than those who were attending school and this was statistically significant ($P<0.01$, OR = 3.3). But no significant difference was seen between the children attending the GK school and those at the government school ($P>0.05$, OR = 1.5).

Those who did not use the sanitary latrine were twice as likely to have intestinal parasites in their stool as the children who did use the latrine and this difference was statistically significant ($P<0.05$, OR = 2.3). Children who did not receive health education were about three times more likely to have intestinal parasites in their stool than the children who did receive health education and this difference was statistically significant ($P<0.01$, OR = 2.9). Those who were not exposed to both, i.e. sanitary latrine and health education, were about four times more likely to have intestinal parasites in their stool than the children who were exposed to both and this difference was more significant statistically ($P<0.001$, OR = 3.96).

Discussion

This paper attempts to describe the impact of intervention activities on prevalence rates amongst 149 primary school-aged children of GK areas. The effects of parasites on nutrition within this study population has been described elsewhere[13]. Participation from the younger age group was good, but a large number of the higher age group children did not turn up. It should be noted that some of them were not actually staying in the village at the time of the study, being involved with some unskilled jobs in a nearby town. Some of the mothers, even after repeated requests, refused to allow their children to participate in the study due to fear of the taking of blood. Despite all these limitations, it is hoped that this paper will give a clear picture of an intervention activity (sanitary latrine and health education, but no mass chemotherapy) and its effect in this study area.

At the end of 4 years, we found that more than half of our sample (53%) had parasites in their stool. Although the pre-intervention prevalence rate for this group of people is not available to assess efficacy, some other similar studies in Bangladesh where no intervention activities had taken place indicate a very high (76–99%) prevalence rate[7,9]. Undoubtedly, this lower prevalence rate was due to the intervention programme carried out by GK. Ideally, a prevalence survey ought to be carried out on a genuine random sample, but this can be extremely difficult to obtain, as most investigators are dependent on volunteers who attend the survey in response to an invitation. The result of this survey, therefore, may be biased in favour of an artificially low prevalence rate since the volunteers may belong to more health conscious group or GK beneficiaries.

No significant difference was found in the prevalence rate between boys and girls which agrees with some other studies of Bangladesh[5,8]. There was also little difference in the effect of occupational activities, habits and pastimes on the distribution of intestinal parasites in this age group – similar to findings in Malaysia[14]. But many studies have indicated that the prevalence of intestinal parasites in a given community is higher in females than males, independent of age. Their work in fields, educational level, nomadic character and ethnicity have explained this difference in prevalence[15-16].

Intestinal parasite infection was also found to increase after the age of 8. This trend conforms with the findings of other studies[17,18] and may be due to the fact that older children had to help their parents in the agricultural and vegetable plots near their homes. Infection occurred in children at a critical age for mental and physical development. This observation has a major implication for control activities. This variation in prevalence rates according to the host age warrants further study.

The study has also shown that children who did not receive health education were three times more likely ($P<0.05$) to be infected than those who did. One important responsibility assigned to the children was to educate their peers and members of their communities at large. A positive result has been obtained through peer education. It should be noted that the sample size from the government school was very small ($n = 17$). When the two groups of school children were combined, it was seen that merely attending school had a significant effect on intestinal parasite infection. This could be due to the raised level of health-related knowledge attained through attending school, which might have changed their life style. The school health programme should therefore be extended over several years and be carried out on a continuing basis. This could pave the way for devising a sustained control strategy in this society.

Non-users of the sanitary latrine were twice as likely ($P < 0.05$) to be infected than the users. As in our study there was no significant difference between those who had and those who did not have a latrine the issue of selection bias does not arise. The relationship of latrines to good health requires patient and pertinent explanation to communities that survived without them for generations. The building of latrines is not considered a high economic priority among rural populations, who often prefer to use their meagre resources for other purposes. The correct disposal of human faeces is particularly important for the control of intestinal worms because the eggs can survive in the environment for several years making it a durable source of human infection. Considering their simplicity of installation, use and maintenance, their low cost, and potential contribution to public health, pit latrines appeared to be invaluable in worm control.

It was evident that children who used sanitary latrines and received health education were about four times less likely ($P < 0.05$) to be infected with intestinal parasites than those who did not have access to both. Sanitation and health education is usually a slow process, taking decades to show visible results. In this study 38.7% still had intestinal parasites indicating that the overall level of faecal contamination of the environment in this area was high. A common practice in this area was open air defaecation. In many situations it was also noted that even after latrines were introduced, they were either not used by all the family members or were used improperly. These comments are not intended to denigrate the major achievements in improved sanitation. Every new latrine built and used, and every health education session conducted, is a small positive contribution in the effort to control intestinal parasites[19].

Since the inception of the primary healthcare concept in 1984, the focus has moved from dealing with specific medical problems to more comprehensive care through community involvement. GK has pioneered the role of primary healthcare provider in Bangladesh and its prevention and control measures at the community level are implemented through other major programmes such as community development, women's organizations, maternal and child health programmes, school health services, sanitation and water supply. The implementation of other community development programmes represents the best chance of continuity, success and cost effectiveness[20]. A sanitation programme which meets a perceived need, is most likely to succeed. It could be an effective entry point for promoting community participation in solving other health problems. With these concerted efforts, progress in the control of intestinal parasites has undoubtedly been made. So it could be said that without periodic mass chemotherapy, intestinal parasites could be controlled. But it takes time and progress is slow. Further research is required in this field using a case control approach to draw clear conclusions. Cases of heavily infected children compared with controls who are parasite free children would be required.

A general rise in the standard of living has played a crucial role in the spontaneous decline of this infection in many developing countries like Costa Rica, Cuba and Sri Lanka[21]. Political will and judicious use of their limited resources have helped them to achieve this target. To improve the quality of life, the Bangladesh government invests an important part of its national budget in drinking water, sewage services, housing, medical care and education. Usually these funds are insufficient to close the gap between prevailing and ideal conditions. However, it is possible to control intestinal parasites in Bangladesh. The present integrated approach adopted by the government and NGOs is encouraging in this regard. We think that the political commitment of the Bangladesh government and the supplementary development activities by various NGOs guarantees the future sustainability of the control activities.

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Patterns of use of oral rehydration therapy in Srinagar (Garhwal), Uttaranchal, India

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SUMMARY A study was conducted to assess the knowledge of preparing packet oral rehydration solution (ORS) and home-made salt–sugar solution (SSS) among mothers in Srinagar (Garhwal), Uttaranchal. Two hundred and twenty-five mothers were interviewed. Only a small proportion recognized the ORS packets (18.66%) and only 17.77% mentioned the correct method of preparing a solution from a packet (even after reading the instructions on the packet). Home-made SSS was adequately discussed by only 6.22% mothers and they were taught to correctly prepare and administer ORS and home-made SSS. After the educational programme, significant ($P < 0.001$) improvement in their knowledge was found. Eighty-six per cent knew the correct method of preparing packet ORS and 80.88% the correct method of preparing home-made SSS ($P < 0.001$). Interventions of this kind should be carried out to improve the knowledge and skills of mothers in treating childhood diarrhoea.

Introduction

Diarrhoeal diseases are a major public health concern especially in the developing countries[1–3]. It is a leading cause of childhood death in developing countries[4]. Mortality in diarrhoea is mostly due to dehydration, which can be treated by replacing fluid loss with oral rehydration solution (ORS) in over 90% of the cases[5]. The scientific basis of oral rehydration therapy (ORT) has revolutionized the concept and treatment of diarrhoea during the last decade[6]. Various studies have shown that it cures dehydration, including hypernatraemic and hyponatraemic dehydration and also prevent deaths[7–10]. It is simple, highly effective, inexpensive and scientifically appropriate[11]. The programme for the control of diarrhoeal diseases was introduced in India in 1987, a few years after the launching of the global diarrhoeal disease control programme[12].

ORT as recommended by the World Health Organization (WHO) and the United Nations Children's Fund (UNICEF) is the preferred method for treating children with dehydration due to diarrhoea, provided they are able to drink and do not show signs of shock[13]. It is vital that ORT should be administered correctly to be effective[14]. The mother is the first care provider for her child, particularly for when it is suffering from diarrhoea. Therefore, we examined the skills of mothers in the preparation and administration of the packet ORS and of home-made salt–sugar solution (SSS), to pinpoint areas where education was required.

Methods

The study was conducted among mothers in Srinagar (Garhwal), Uttaranchal, in August 2000 using the cluster sampling method. A pretested questionnaire was developed for collecting the baseline data which included demographic details, knowledge of preparing ORS and the prevention of diarrhoea, etc. A total of 225 mothers were interviewed whether at the time of interview their children were suffering from diarrhoea or not. An ORS packet was shown to the mothers and they were asked if they knew how to prepare the solution. They were allowed to read and understand the instructions written on the ORS packet before answering the question. Questions were also asked regarding measurement of water, storage of ORS, frequency of administration, etc.

To classify mothers as having adequate or inadequate knowledge, various open-ended and closed questions were used. For closed questions, a score of 1 was given for a correct answer and zero for an incorrect answer. For open-ended questions, a score of 2 was given for an adequate knowledge, 1 for an inadequate knowledge, and zero for 'don't know'. For example, if the respondent discussed correctly the method of preparing SSS she was given a score of 2. If she was aware of the concept of adding salt and sugar in water but not in exact proportions, she was given a score of 1 (i.e. having inadequate knowledge). Incorrect responses and ignorance of the concept were scored as zero. The scores were then converted into percentage of knowledge.