Original Article

Intestinal worm infestation among schoolchildren in a rural community of Islamabad, Pakistan

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Objective: To determine the prevalence of worm infestation among schoolchildren of a rural community of Islamabad.

Methodology: This cross-sectional study was conducted at two primary schools of rural Islamabad and Shifa College of Medicine, Islamabad, from August to November 2015. Schoolchildren and their mothers were interviewed about their knowledge of hygiene, personal hygiene habits and sanitary conditions in their households. Stool specimens of the children were examined for ova and cysts using the formal-ether concentration technique. Descriptive statistics were calculated for both qualitative and quantitative variables.

Results: A total of 441 children were enrolled; males and females were equal. Mean age was 8.95 2.4 years. They belonged to lower socioeconomic group. Half the households (47%) had flush toilets, while the rest used pit-hole latrines. There was no sewerage system in the village and human waste emptied into nearby streams. 400 (90.7%) households used tap water, which was not boiled before consumption. Meat was procured from village butcher shops, which was locally slaughtered without inspection by public health authorities. Majority of children (94%) had adequate knowledge about personal hygiene such as hand washing, which was practised by 97% of them. 191 children provided stool specimens; 140 (73%) contained ova/cysts of intestinal parasites. Taenia saginata was the commonest parasite identified in 125 (89.3%) cases.

Conclusion: The high prevalence of taeniasis in schoolchildren in our study highlights the poor public health practices in our community. (Rawal Med J 201;43:196-199).

Key words: Intestinal parasites, Taenia saginata, hand washing.

INTRODUCTION

Intestinal parasites are the commonest cause of infection among humans with more than a billion infections globally.[1] Most affected are the poorer segments of society with inadequate sanitation. Children are particularly vulnerable. These parasites can have a profound adverse effect on the mental and physical development of infected children. Among the rural communities, where basic sanitation conditions and awareness are often inadequate, soil-transmitted roundworms such as Ascaris lumbricoides, Trichuris trichiura and hookworm are a major problem.[1-4] Tapeworms like Taenia saginata and Hymenolepis nana are another source public healthcare concern.[5,6] The purpose of this study is to determine the prevalence of intestinal worm infestation among schoolchildren of rural Islamabad and identify any associated risk factors so that appropriate control measures such as school de-worming and community awareness programmes can be initiated in collaboration with schools, parents and local health authorities.

METHODOLOGY

This cross-sectional study was conducted at two primary schools at Nurpur Shahan, Islamabad, and Shifa College of Medicine, Islamabad, from August to November 2015. Stratified Random Sampling was done followed by Simple Random Sampling using computer generated random numbers. There

were 5 grades in each primary school; with 3 sections in each grade with 50 students each; making a total of 1500 students. Sample size calculated was 383, using WHO sample size calculator keeping prevalence of helminth infestation at 52.8% according to a study from Karachi, Pakistan,[2] with 95% confidence level and 5% margin of error. All children studying in the two schools were included, while those taking treatment for worm infestations were excluded from the study. Approval of institutional review board & Ethics committee and the local education authority were obtained and all participants gave Informed consent.

Schoolchildren and their mothers were interviewed using a structured questionnaire regarding their socioeconomic conditions, their knowledge of hygiene, personal hygiene habits, sanitary conditions in their households, and source of food and water they consumed. Children were provided with clean plastic containers for collection of stool specimens and briefed about collection of the samples. Stool specimens were examined for ova and cysts in the Department of Pathology, Shifa College of Medicine, using formal-ether concentration technique.[7,8] Data were analysed using SPSS version 19.0.

RESULTS

A total of 441 schoolchildren were enrolled for the study. 222 were males and 219 were females. Mean age was 8.95 2.4 years (range 4-15). They belonged to lower socioeconomic group, with the fathers mostly employed in unskilled jobs, while more than 90% of the mothers were housewives. 46.5% fathers and 66% mothers were illiterate. Average size of the family ranged from 6-7. About half the households (47%) had flush toilets, while the rest used pit-hole latrines. 90% of households consumed municipal-supplied tap water, while the rest used wells. Water was not boiled before consumption. Groceries were procured locally. All mothers and 94% of the children had adequate knowledge of hygiene such as hand washing before eating and after using the toilet. Hand washing was practised by 97% of the children.

Table. Intestinal parasites identified (*n*=191).

Parasite	Frequency	Percent
Taenia saginata	120	85.7%
Hymenolepis nana	6	4.3%
Ascaris lumbricoides	4	2.9%
Giardia lamblia	1	0.7%
Taenia saginata & Hymenolepis nana	2	1.4%
Taenia saginata & Ascaris lumbricoides	1	0.7%
Taenia saginata & Giardia lamblia	1	0.7%
Ascaris lumbricoides & Giardia lamblia	3	2.1%
Total	140	73.3%

Out of 441 chilgren, 191 provided stool specimens. On examination, 140 (73.3%) samples contained ova/cysts of intestinal parasites. Taenia saginata was the commonest parasite identified in 125 (89.3%) cases, followed by Hymenolepis nana in 8 (5.7%). Mixed infections were seen in 7 (5%) cases (Table). All infected children were given appropriate treatment for their infestation.

Due to the unexpected results, follow-up interviews were conducted with the mothers of infected children. 96 (68.6%) gave history of beef consumption at least once a month. Beef was procured from local butcher shops and was always well-cooked.

A brief survey of the locality was conducted to assess sanitary conditions in the community and trace the source of taeniasis. Nurpur Shahan is located on the outskirts of Islamabad near the shrine of Bari Imam. The village is underdeveloped with unreliable electric and water supplies. There is no sewerage system and human waste is either deposited in pit-holes or empties into nearby streams through open drains. Four butcher shops were identified. Their sources of beef were both local cattle as well as animals procured from the cattle market of Rawalpindi. Animals were slaughtered by the butchers themselves and sold without inspection by public health authorities. Cattle could be seen grazing in the open area around the village. Findings of the study were communicated to the District Health Officer.

DISCUSSION

Our study showed both expected as well as unexpected results. The prevalence of intestinal parasites in our study population was very high (73.3%). This is consistent with data from around the developing world, where a high prevalence ranging from 33% to 88% has been reported.[9-13] The situation in Pakistan is no different.[2,14-19] This high prevalence is attributed to poverty, inadequate sanitation, lack of awareness and poorly developed public health services.[2] Although a high burden of intestinal parasites is common in these communities, the types of parasites can vary in different geographical localities due to diverse social and environmental conditions unique to that area.[3]

Soil-transmitted helminths such as roundworms and protozoa are the commonest intestinal parasites reported from around the world including Pakistan.[1-3] However, the spectrum of parasites in our study was quite different, with a low prevalence of soil-transmitted parasites (11%) and a very high prevalence of Taenia saginata (89%). Both findings are unusual. Although our study population belonged to a disadvantaged background, they had a high level of awareness about personal hygiene such as hand washing, which was practised by 97% of the children. This might account for the low prevalence of soil-transmitted parasites and shows the importance of public awareness about hygiene.

Taenia saginata on the other hand is transmitted by ingestion of beef infected by larval form of the parasite. Humans are the definitive hosts and harbour the adult parasite, which can live up to several years and sheds terminal segments in stool. Each segment can contain up to 100,000 eggs, which have been reported to survive in the soil for as long as 200 days.[3,20] Cattle grazing on grass contaminated with human excreta ingest Taenia eggs, which develop into larvae and encyst in muscles. The life cycle is completed when humans ingest inadequately cooked beef containing the larvae.[20] Consumption of water contaminated by Taenia saginata eggs can also lead to infection in the cattle.[21]

Taeniasis has a global distribution. Although exact epidemiologic data is not available, the prevalence of taeniasis is not very high.[5,20] A study from Dera Ismail Khan in Western Pakistan reported a prevalence of 16% in 2012.[19] However, we have not come across any report with a burden of disease as high as the one seen in our study. Transmission of taeniasis can be prevented by proper disposal of human waste, inspection of meat by health inspectors and its proper cooking.[5,20] Unfortunately, in our community, there was no sewerage system and human waste emptied into local streams. Free-ranging cattle were observed grazing around the village and drinking water from these streams. Cattle are slaughtered in local butcher shops and their meat is sold without inspection by health authorities. All these factors appear to be the cause of high prevalence of taeniasis in our study population.

A high burden of intestinal parasites can have an adverse effect on the physical and mental development of children.[4,22,23] Control of taeniasis requires a multi-pronged approach targeting both the human and animal hosts.[5] Besides preventing measures such as public awareness, proper disposal of human waste, meat inspection and monitoring of cattle grazing; treatment of both humans and cattle should be undertaken.[4,5,23] Mass deworming of schoolchildren at risk was advocated by the World Health Assembly in 2001.[23] Implementation of this programme in several African countries has shown encouraging results.[5,23,24] Preventive chemotherapy can target the whole population or high-risk groups at regular intervals.[5] An alternative approach can be treatment after carrying out screening, as was done in our study. Treatment of cattle with anti-helminthic drugs can also be undertaken. Unfortunately, the prospects of development of a vaccine against the parasite are not promising.[5,20] It is important to remember that no control strategy is likely to work in isolation. A holistic approach incorporating health education, hygiene and chemotherapy implemented in close cooperation between the government, health professionals and members of the community is required to overcome the problem.

CONCLUSION

The high prevalence of taeniasis in schoolchildren

in our study highlights the poor public health practices in our community.

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