KNOWLEDGE AND PRACTICES RELATED TO HELMINTH INFECTIONS AMONG MOTHERS LIVING IN A SUBURBAN AREA OF SRI LANKA

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Abstract. Intestinal helminth infections are a global problem. We assessed maternal knowledge among Sri Lankans about helminth infections and patterns of anthelmintic use to treat their children. We conducted this cross sectional study at the University Pediatric Unit in Teaching Hospital Ragama, during September 2011 to November 2011. Two hundred children admitted to the Pediatric Unit and their mothers were randomly recruited into the study. An interviewer administered questionnaire asking about socio-demographic factors, availability of sanitary facilities and safe drinking water, knowledge about intestinal infections and anthelmintic use. Nearly all the mothers interviewed reported having a safe toilet and 62% reported having safe drinking water. Eighty-four percent of children were given anthelmintic medication periodically irrespective of symptoms. Of these, 39.3% were treated every 3 months, 55.3% every six months and 5.3% annually. Of the children who received routine anthelmintic treatment, 81% had risk factors for helminth infection and 62.5% had evidence of a helminth infection in the past. There was no statistically significant association between routine anthelmintic medicine use and the presence of risk factors (odds ratio 0.28; confidence interval 0.04-1.31) or having symptoms of helminth infection (odds ratio 1.67; CI 0.73- 3.8). Maternal knowledge regarding helminth infection was poor. Health education programs regarding helminth infections and their treatment are indicated.

Keywords: anthelmintics, helminth, knowledge, practices, mother, Sri Lanka

INTRODUCTION

Helminth infections are a common global health problem in children. Common helminth infections among Sri Lankan children include *Enterobius vermicularis, Ascaris lumbricoides*, *Necator americanus* and *Trichuris trichiuria* (Fernando *et al*, 2001). Trichuris infections are the most common helminth infection among children in Sri Lanka (Fernando *et al*, 2001). *Ancylostoma duodenale* and strongiloidiasis are not commonly found in Sri Lanka (Gunawardana *et al*, 2011). The life cycle of these helminthes, other than *Enterobius vermicularis*, includes a soil phase. The fertilized eggs of these helminthes are

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deposited in the soil where infective larval stages develop. In ascariasis and trichuriasis, the infective larval stages develop within the ova and the ova are swallowed by a human causing infection. The larval stages of *Necator americanus* are found free in the soil and enter humans by piercing the skin (Kliegman *et al*, 2007). In *Enterobius vermicularis*, the ova are deposited by the female around the anus and humans acquire infection by fecal-oral transmission. Enterobius ova can also be found in dust where it can be ingested (Neva and Brown, 1998).

The transmission of intestinal helminth infections, other than *Enterobius*, depends on sanitary facilities, availability of safe drinking water, footwear use and food hygiene. Enterobiasis may occur even with good hygienic practices (Neva and Brown, 1994). Over the years socio-economic conditions in Sri Lanka have improved significantly. Sri Lanka has moved from a low income country to a low-moderate income country (Ministry of Finance and Planning, 2010). Sri Lanka has impressive health statistics with a maternal mortality rate of 33.4 per 100,000 and an infant mortality rate of 10.1 per 1,000 live births (Ministry of Healthcare and Nutrition, 2008). According to UNICEF, the youth female literacy rate of Sri Lanka was 99% (UNICEF, 2012). With these positive socio-economic changes the prevalence of helminth infections has also decreased in Sri Lanka (de Silva and Jayawickrama, 2012). By 1992, the prevalence of helminth infections among rural school children was only 2% (Fernando, 2001).

Despite this reduction in helminth infection prevalence, the use of anthelmintic treatment has remained high in Sri Lanka. The people of Sri Lanka hold incorrect beliefs regarding transmission and treatment of helminth infections. The high use of anthelmintics in Sri Lanka may be due to these false beliefs. This study was undertaken to determine the knowledge and practices of Sri Lankan mothers regarding prevention and treatment of helminth infections.

MATERIALS AND METHODS

This study was carried out at the University Pediatric Unit of Ragama Teaching Hospital, during September 2011 - December 2011. In a pilot study done by us, we found 85% of children aged 2 - 5 years received regular anthelmintic treatment irrespective of symptoms. Accordingly, we determined 196 subjects were required to be included in this study, to assess routine anthelminthic use (prevalence of 85%, with a 95 confidence interval of 80 - 90%). Every third child admitted to the Pediatric Unit during the study period was asked to participate in the study. Inclusion criteria were children above 24 months, whose mother gave written consent to participate in the study. For children less than 24 months the next child admitted was invited to participate. None of the mothers refused to participate and a total of 200 children and their mothers were included in the study. A pretested, validated questionnaire was administered by an interviewer to obtain the data. The questionnaire asked about socio-demographic information, availability of sanitary facilities, food hygiene, availability of safe drinking water, knowledge about intestinal helminth infections and practices related to anthelminthic treatment.

Safe drinking water was defined as water obtained from a protected well, spring or pipe, which was boiled and cooled before use. A safe toilet was defined as a toilet having either a commode or a squatting pan with a water seal. Un-

Table 1
Socio-demographic characteristics of study population.

Characteristic	Frequency (*N*=200)	Percentage
Maternal education		
None	6	3.0
Grade 1-5	10	5.0
Grade 6-11	67	33.5
Grade 12-14	52	26.0
University	7	3.5
Monthly income, SLR[a]		
<5000	8	4.0
5000-10,000	34	17.0
10,000-20,000	96	48.0
20,000-30,000	39	19.5
>30,0000	23	11.5
Religion		
Buddhist	125	62.5
Christian	60	30.0
Hindu	7	3.5
Muslim	8	4.0

[a]USD1= SLR130

hygienic food practices were considered eating food not prepared at home on a regular basis, flies having easy access to food and not washing hands after going to the toilet, before preparing food or before eating food. Risk factors for helminth infections were considered to be drinking unsafe water, not having safe toilet facilities, children defecating in the garden, the presence of unhygienic food practices and not using footwear outside. Evidence of past or present helminth infections were having a history of passing a helminth, the presence of itchy feet, a history of pruritus ani and having a stool exam show a helminth infection.

Data collection was carried out by medical students supervised by the first investigator. Data analysis was done using the statistical package for social sciences (SPSS) version 16 (SPSS, Chicago, IL). The statistical significance of data was determined using an odds ratio.

The study was approved by the research ethics committee of the Faculty of Medicine, University of Kelaniya.

RESULTS

The study subjects (200 children and their mothers) belonged to mixed socio-economic backgrounds. Some demographic characteristics of the study population are shown in the Table 1.

Sanitary facilities and hygienic practices

Nearly all families (99%) had access to a safe toilet; 24.5% had a commode and 75.5% had a squatting pan. Children defecated in the garden in 23% of families. Toilets were accessible to flies in 17.5%. Sixty-two present of families consumed safe drinking water. Forty-eight percent of families consumed food prepared outside the home on a routine basis. Food was

accessible to flies in 22% of households. Fifty-three point five percent of children wore footwear outside on a routine basis. Ninety-seven point five percent of mothers washed their hands with soap and water after going to toilet and before preparing food. Eighty-three percent of children had at least one risk factor for helminth infection.

History of helminth infections

Twenty-six percent of children had passed a helminth at least once in the stool. Fifty-six point five percent of children had a history of pruritus ani. Sixty point five percent of children had evidence of a helminth infection at least once in the past. None of the children had a stool or other examination for enterobiasis to confirm a diagnosis.

Maternal knowledge

Seventy-two percent of mothers reported decreased interest in food and pruritus ani as symptoms of helminth infections. Other symptoms mentioned as evidence of helminth infections were abdominal pain (31.5%), growth delay (6.5%), itchy feet (4%), chronic cough (1.5%), pica (7%), abdominal distention (11%), hypopigmented patches (19%), excessive sleepiness (13%) and vomiting (15%).

Fourteen percent of mothers believed helminthes occurred spontaneously in the human gut. Other modes of contacting helminth infections mentioned by mothers were swallowing parasite eggs (67%), piercing skin (6%), playing with sand (51%), eating sweets (38.5%), poor general hygiene (18%) and eating raw scraped coconut (5.5%).

Practices related to anthelmintic use

Of the 200 mothers interviewed, 168 (84%) reported giving routine anthelmintic treatment to their children. Of these, 39.3% gave anthelmintic treatment every 3 months, 55.3% gave in every 6 months and 5.3% gave it yearly. Of the 168 children who received routine anthelmintics, only 30% had a repeat course after 10 to 14 days and in 30.5% the other family members were treated. Seventy-point five percent of the mothers obtained the anthelmintic treatment from their general practitioner. Eighty point five percent of mothers received treatment without a prescription. None of the children had a stool examination to confirm the presence of a helminth infection.

Of the 168 children who received routine anthelmintic treatment, 63 never had evidence of a helminth infection in the past. Of the 121 children who had evidence of an infection, 105 were taking anthelmintic treatment routinely. There was no statistically significant association between routine anthelmintic use and having a history of a helminth infection (odds ratio 1.67; 95% confidence interval 0.73-3.80).

There was no significant correlation between routine use of anthelmintics and presence of risk factors for acquiring helminth infection. Of the 166 children who had poor hygienic practices, 136 had routine anthelmintic treatment. Routine anthelmintic treatment was taken by 32 children who did not have any risk factors for acquiring helminth infections. There was no statistically significant association between the presence of risk factors and routine anthelmintic treatment (odds ratio 0.28; 95% confidence interval 0.04-1.31).

DISCUSSION

Helminth infections are one of the oldest diseases to affect humans (Cox, 2004). Helminth infections are an important public health problem due to the

morbidity they cause and the false beliefs people have about them. These beliefs are so strongly held that even definitive scientific evidence has failed to change them. This has resulted in irrational and inappropriate use of anthelmintic treatment. The cost of unnecessary anthelmintic treatment is significant for a country like Sri Lanka, with a limited health budget. It exposes children to unnecessary side effects of drugs as well. In areas with unhygienic living conditions there is a place for routine anthelmintic treatment, but with hygienic living conditions the decision to give anthelmintic treatment should be made on an individual basis, preferably with confirmation of infection by stool examination.

Repeated mass drug administration with diethylcarbamazine citrate and albendazole was carried out in Sri Lanka to eradicate lymphatic filariasis. Although albendazole is highly effective against soil-transmitted helminthes, this exercise had virtually no effect on the prevalence of helminth infections (Gunawardana *et al*, 2008). A systematic review of randomized controlled trials on the effect of anthelmintic drugs on hemoglobin level revealed routine administration of anthelmintic agents results in only a 5 -10% reduction in the prevalence of anemia (Gulani, 2007). The findings reveal the ineffectiveness of repeated, routine anthelmintic treatment.

Other than *Enterobius*, all the other helminthes found in Sri Lanka have a soil phase in their life cycle. The ova passed in the stools are not infective if ingested directly. Satisfactory toilet facilities and proper disposal of human excreta should cause these infections to be rare. Nearly all the families in this study (99%) had access to a safe toilet. Safe drinking water was available to 62% of families and more than 50% of children used footwear outdoors. Most families had hygienic food practices and good toilet habits. Many studies carried out in Sri Lanka recently, have shown a low prevalence of helminth infections (de Silva and Jayawickrama, 2012). In this context, the 84% of children in this study cohort who received routine anthelmintic treatment is surprising. This study found no statistically significant association between routine use of anthelmintics and having risk factors for helminth infections. We also found no association between routine anthelmintic use and evidence of helminth infections. The practices of anthelmintic use in Sri Lanka at present are inappropriate and irrational.

A major reason for the high use of anthelmintics is the incorrect beliefs among the Sri Lankan public regarding transmission of helminth infections. Fourteen percent of mothers believed helminth infections occurred spontaneously. Parents often bring their children in requesting anthelmintics, stating their child is eating a lot of sweets. These mothers have the belief worms have an affinity for sweets. Playing with sand may lead to helminth infections where sanitary facilities are poor. These beliefs have been held firmly over many generations so that even after a detailed explanation, some parents insist on having anthelmintics for their children. Sixty-seven percent of mothers knew helminth transmission can occur after ingestion of helminth ova. Only 6% of mothers knew about transmission of hook worms by larva piercing the skin. In an area with very high literacy rate these figures are surprising.

Other reasons for the high use of anthelmintics is wrongly attributing some childhood symptoms to helminth infection. Lack of interest in food, abdominal

pain, hypopigmented patches on the skin and abdominal distention were some of the symptoms mentioned by mothers in this study. Other than pruritus ani, the majority of children with helminth infections remain asymptomatic. Loss of appetite, chronic abdominal pain and vomiting can be features of helminth infections but occur only when there is a heavy helminth load. Poor feeding habits, such as force feeding and prolonged breast feeding are the main reasons for poor feeding among Sri Lankan children, not helminth infections (Perera *et al*, 2011). Intestinal motility disorders are the main cause for chronic abdominal pain in children (American Academy of Pediatrics, 2005). The hypopigmented patches attributed to helminth infections are mainly pitariasis alba or pitariasis versicolor, which have no association with helminth infections. Symptoms associated with helminth infection such as chronic cough, pica and itchy feet, were not commonly known to these mothers. The results of this study highlight the importance of strengthening health education programs regarding helminth infections.

When present, risk factors of acquiring a helminth infection may be shared by other family members. When one family member is infected with a helminth, it is likely other family members are also infected. It is generally recommended when anthelmintics are given the entire family be treated to prevent reinfection (Kliegman *et al*, 2007). Of the children routinely treated for helminth infections, in only 30% were the rest of the family treated. A repeat course of anthelmintic after 2 weeks is also recommended for enterobius infection (British National Formulary, 2009) because of reinfection from eggs in the environment (Neva and Brown, 1998). Of the children who received routine anthelmintic treatment, only 30.5% had a repeat course of anthelmintics. This explains why some children present with pruritus ani repeatedly and need treatment repeatedly. This situation is unacceptable considering more than 90% of children had anthelmintic treatment prescribed by a doctor, hence the need for a national policy on prescribing anthelmintics.

The main limitation of this study was recall bias. If information about hygienic practices were obtained by direct inspection of households it would have been more accurate. We reassured mothers the information obtained was only for research purpose and they would not face any repercussions by disclosing true information.

In conclusion, sanitary facilities available for this cohort of children were satisfactory. Maternal knowledge regarding transmission, clinical features and treatment of helminth infections was poor. A significant number of children received routine anthelmintics without indications, while some children who needed treatment did not receive it. Although anthelmintics were prescribed mainly by doctors, principles for treating helminth infections were not followed. We recommend educational programs be carried out regarding helminth infections and a national policy for prescribing anthelmintics to children be developed.

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