Knowledge, perceptions and behaviour of mothers toward intestinal helminths in Upper Egypt: implications for control

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Operational research was conducted in Qena Governorate, Upper Egypt, to gather the information needed to design an integrated control programme for intestinal helminths in the area. To this aim, qualitative and quantitative techniques were used on a sample representative of the entire governorate. Mothers were questioned about their knowledge and perception of intestinal helminths, their hygienic habits and health-seeking behaviour. At the same time, a coprological survey was conducted on all the children 2 to 12 years of age living in the selected households (n = 2657) to provide baseline data on the prevalence of infection with these parasites. The survey results showed that intestinal helminth infections were more prevalent in rural areas and in three of the 12 Governorate districts. Almost all the respondents considered worms harmful and were aware of the need for treatment. More than adequate knowledge was present on ways to prevent infection. Good hygienic practices were associated with a low prevalence of infection in the household. Practical recommendations were formulated to design a helminth control programme tailored to the local situation and to prioritize allocation of resources. Passive case detection appeared to be appropriate to the level of infection in Qena (<15%). The intervention should target areas and districts where prevalence of infection was higher, and all children below 12 years of age. Health education, besides encouraging mothers to refer their children to the health units for treatment, should focus on improving hygienic behaviour. While schools might be the best channel to contact children, the use of informal channels of communication, such as television, should be promoted to reach the mostly illiterate mothers. The research highlights the importance of gathering information on mothers’ perceptions and behaviour in the design and implementation of a community-based intestinal helminths control programme.

Introduction

Infections with intestinal parasitic helminths occur worldwide and are most prevalent in the poorest communities of the developing world, with more than one billion people estimated to be infected in the world.1 The public health impact of helminth infection has been consistently underestimated in the past, but there is now a general consensus that diseases caused by intestinal helminths represent an important public health problem, especially for children.2 Recent studies suggest that even moderate intensity of infection may have adverse effects on growth, development and cognitive function, particularly for children of school age.3,4 Parasitic diseases are considered the leading cause of DALYs lost among school-age children in the developing regions,5 and globally, the DALY loss due to intestinal helminths was estimated at 43.5 million for the year 1990, second only to tuberculosis (46.5 million).6

The most common intestinal helminths in the world are Ascaris lumbricoides (round worm), Trichuris trichiura (whip worm), and hookworms. They are usually referred to as soil-transmitted helminths since they are most commonly disseminated by contamination of soil and environment with infected faeces, especially by children. All three parasites are
found in Egypt, but national data on prevalence of infection among children is lacking.

Other helminths present in Egypt are Enterobius vermicularis (pinworm) and Hymenolepis nana (dwarf tapeworm). Their effects on child development appear less serious, though little data is available compared to that for soil-transmitted helminths. Several reports, however, have associated H. nana infection with growth retardation, especially in subjects with high worm load. Besides contact with soil, auto-infection and person-to-person transmission are possible means of transmission for these two parasites. However, lack of sanitation, poor water supply and unclean practices contribute to the spread of all intestinal helminth infections in the community. Schistosomes are also endemic in Egypt, both S. mansoni and S. hematobium, but they are transmitted only through water contact and require a different control approach to that for intestinal helminths.

To control helminth infection in the community, the guidelines developed by the World Health Organization (WHO) suggest considering three major fields of action in a coordinated effort: improved sanitation, chemotherapy, and health education. Theoretically, proper sanitation represents the most effective way of preventing intestinal parasitic infections; however, achieving this may take several years and absorb substantial financial resources. In the short term, it is questionable whether increased availability of latrines can be expected to decrease drastically the prevalence of helminth infection.

Until an overall improvement of sanitation can be achieved, the use of community treatment by chemotherapy and improvement of personal hygiene by health education are advocated as effective and affordable short-term measures for controlling helminth infections. Safe, inexpensive and effective antihelminthics are now widely available, but the success of a chemotherapy programme will depend upon the selection of the target group and type of antihelminthic.

Health education activities, to be effective, will also need the identification of the target audience and the formulation of clear messages, which take into account local perceptions and behaviour. Furthermore, the role played by the target population is of great importance; if the members of the community are aware of the negative effects of intestinal helminths on the health of their children, they will be more likely to support and sustain intervention measures. Although it is recognized that the control and prevention of parasitic diseases depend upon adequate knowledge of human behaviour, the literature on this subject is limited and few studies have considered people’s perceptions and attitudes toward worm infection and treatment.

The Governorate of Qena, in Upper Egypt, ranks 16 out of the 21 governorates in Egypt for which Health Development Indicators are available. It has a mostly rural population dedicated to farming and cultivation of sugar cane. In the last census (1986) the lowest female literacy rate in the country was reported: 21% compared to a national average of 38%. Basic infrastructures are present, with all households served by electricity, more than 60% with piped water inside the house, and 90% with a household latrine. However, garbage and sewage disposal are almost non-existent and rural health services are far from satisfactory. Although intestinal helminths are considered to be prevalent in the governorate, there is a complete lack of data on types of parasites present and their prevalence.

The aim of this operational research was to collect accurate and reliable baseline data on the prevalence of infection with intestinal helminths and to assess the perceptions and behaviour of mothers towards these parasites, as well as use of health facilities and health-seeking behaviour of the population. It is expected that this information will be useful in the design of an appropriate control programme for intestinal helminths, facilitating allocation of resources in the area.

**Study site and survey methods**

The study covered the entire Qena Governorate, administratively divided into 12 districts, with an estimated total population of 2,574,000 inhabitants in 1992. The operational research utilized both qualitative and quantitative techniques of data collection. Qualitative techniques were implemented first in order to orient the following data collection. They included a number of interviews of key informants, mainly staff from the Egyptian Ministry of Health (MoH), and three focus group sessions, one session for men (ten school teachers) and two for women (nine mothers each per session). Quantitative techniques consisted of a household survey, utilizing a structured questionnaire with closed answers, and a coprological survey of children from 2 to 12 years of age.
The sample size was calculated from 768 households divided into 64 clusters of 12 households each, according to the protocol advocated by WHO. The method adopted for the sample selection was a two-stage random cluster sampling technique with probability of inclusion proportionate to size (PPS) in the first stage. Clusters were selected after stratifying the sample frame by 12 substrata (districts). The study design effect, to adjust for the cluster selection compared to a full random selection, was calculated to equal two.

One mother, or child caretaker, with one or more children aged 2 to 12 years, was interviewed in each selected household. A parallel coprological survey was conducted on the same sample of households, collecting faecal specimens from all children from 2 to 12 years of age present in each household. The faecal samples were analyzed using the Kato-Katz technique to detect intestinal helminths. A multiplication factor of 24 was applied to convert number of eggs per slide to eggs per gram of faeces (e.p.g.).

The survey questionnaire was designed on the basis of knowledge, acquired during focus group meetings and key informant interviews. It was administered in Arabic by local health staff, who ensured that the villages they covered were outside their regular service area. Age, religion, and level of education of the respondents were recorded, together with information on school attendance of their children and presence of television and other appliances in the household. A practical test on writing and reading one sentence was conducted on all the respondent women to assess functional literacy rates. A different section of the questionnaire included 13 questions on knowledge and perceptions of mothers toward worms and hygienic practices. In questioning mothers, the generic Arabic term for worms (didan, plural) was used since it is more widely understandable than the specific term for intestinal parasite (duda mahaweija) and clearly indicates intestinal parasites if related to health.

Respondents were asked whether they consider worms harmful, how children become infected with worms, how infection can be prevented, who is most affected by worms (including specific age classes and occupational groups), whether treatment for worms is necessary and which type of treatment they would prefer. They were also asked where their children defecate, and whether they and their children wash their hands before eating and after defecation. Finally, they were asked whether they use public or private health facilities when in need of treatment, what were the reasons for not using public facilities, their ability to pay for health services, and whether they had attended any health education sessions during the previous six months. The mother of each child who provided a faecal specimen was asked whether she had ever seen worms in the stool of that child and if that child had been treated for worms in the past. Answers to these two questions were reported on a separate stool collection form.

Data was entered in the computer using the EPINFO (version 5.1) software package. Analysis was performed in two subsequent steps with the SAS software program. First, a simple descriptive analysis was done to produce baseline data on prevalence of infection and a general overview of the study population. This was followed by a bi-variate analysis to assess if better knowledge and specific hygienic habits were associated with a lower prevalence of infection, evaluated calculating estimated relative risks or Odds Ratios. The results shown refer to an analysis where each child was classified as infected or non-infected. A different analysis was also performed at the household level where the classification ‘infected/non-infected’ was established on the basis of the presence of at least one infected child in the household. Given the consistency of the results, such an analysis was not reported. Finally, an attempt was made to assess to what extent the detection of worms in the faeces was a good indicator of infection and to explore treatment-seeking behaviour of mothers who detected worms in the faeces of their children.

**Results**

**Characteristics of the sample**

At the end of the survey, 768 interviews were conducted. Almost all the women interviewed (99.5%) were mothers ‘in charge’ of the household; with three of the women acting as a child caretaker because of the mother’s death. The median age of respondents was 33 years. Most were Muslim (93.6%); 6.4% were Christian (Coptic Orthodox, Catholic, and Protestant). Less than one-third of the mothers (28%) were able to read and write; 35% of them had not completed primary school. Among children, attendance at primary school was high at 92.1% of children from 6 to 12 years of age. However, 84.4%
of not enrolled or drop-out children were girls. Households served by latrines represented 88.2% of the total sample, the majority of latrines (97%) were located inside the house. At least one television was present in 87.2% of the households interviewed.

Prevalence of infection
The total sample included 2657 children, 13.5% of whom were infected with one or more of the five parasites present, and 35.5% of the households had at least one child harbouring worms. Multiple infections were not common and were detected in only 0.53% of the sample. The mean prevalence of helminth infection for different parasites was 6.9% for H. nana, 3.8% for E. vermicularis, 2.4% for A. lumbricoides, 0.6% for T. trichiura, and 0.4% for hookworm.

A difference in prevalence emerged when analyzing data by districts, as shown in Figure 1. Farshout district reported a prevalence more than double (30.6%) the average in the Governorate, followed by Kift and Luxor districts. Furthermore, rural villages presented a higher prevalence of infection (14.1%) than urban communities (8.4%). Intestinal helminths infection was more common among boys (14.4%) than girls (12.5%). Soil-transmitted helminths were more prevalent among school-age children, while infection with H. nana was more common in pre-school children. The highest intensity of infection, indirectly measured as mean e.p.g. of all infected individuals, was detected for A. lumbricoides (183 e.p.g.; n = 62), followed by H. nana (111, n = 182), T. trichiura (77, n = 15), Enterobius (65, n = 97) and hookworms (46, n = 10). Age-prevalence and age-intensity distribution for the most common parasites are presented in Figure 2 and Figure 3, respectively.

Key informant interviews
The government officials and the MoH staff interviewed considered intestinal parasites, mainly soil-transmitted helminths, a serious health problem in Qena. At the same time, they admitted that representative, community-based data on prevalence and intensity of infection with soil-transmitted helminths was lacking in the region, especially for school-age children (considered by the interviewed as the most affected people). Most of the key informants estimated coverage with household latrines to be close to 90%, but expressed concern about a type of latrine, called Baiarra, usually built next to the house, which sometimes floods out its content to the surface and may contribute to the spread of infectious and parasitic diseases.

Focus group meetings
Most of the participants of the focus group sessions perceived worms as a health problem, particularly for children, although the infection was considered very common and no social stigma was attached to this condition. Weight loss, pallor and anal itching were listed as major signs of worm infection. A local name was identified for round worms, Safaief, and pinworms, Zai Dud El-Mish, while the term Arabid was used to describe worms that have large pieces appearing in the stool, probably Taenia. A number of traditional drugs were identified. The juice of lupine, after leaving it in water for 24 hours, was the traditional remedy most used by mothers against worms.

Most of the mothers were aware of the persistence of worms in infected children, even after treatment, and this was explained by deeply rooted beliefs. First, they believed a ‘big mother of the worms’ was present inside the intestine of the child, which usually is not killed by the treatment. Second, they believed that commercial drugs were not powerful enough to eradicate the worms from the host. The possibility of continuous re-infection was not considered by the mothers, while this concept was clear to most of the teachers, who also stressed the importance of a hygienic lifestyle and that children avoid playing with soil in order to prevent infection.

Knowledge, perception and behaviour of mothers
Most of the respondents considered worms to be very harmful to health (89.3%). Among the potential sources of infection listed on the questionnaire, food and soil were chosen most often, with 41.8% and 41.7% respectively. A good level of knowledge was observed also for ways of preventing infection, with “washing hands” and “washing vegetables” indicated by 73.3% and 62.2% of the respondents, respectively. More than half of the study population perceived worms to be ubiquitous, with 58.5% considering that all people were likely to become infected. When asked about the most affected age group, children were cited more often (47.8%), compared to all ages (31.8%). Farmers were considered the most affected occupational group (53.6%).

The majority of respondents agreed that worms should be treated (93.4%) and that they would
**Figure 1.** Prevalence by district: overall prevalence of intestinal helminth infections in the 12 districts of Qena Governorate, Egypt 1994 (error bars indicate 95% Confidence Limits; children 2–12 years of age; total n = 2657)

**Figure 2.** Prevalence of infection by age; overall prevalence of intestinal helminth infections and prevalence of each parasite by one-year age group in Qena, Egypt 1994 (children 2–12 years of age, total n = 2657)
prefer chemical drugs (98.0%) as opposed to traditional medicines. The proportion of mothers answering 'don’t know' to a specific question ranged from 18% to 36%, except for two questions, ‘How do you consider the effect of worms on health?’ and ‘Should worms be treated?’, for which less than 10% of the respondents were unable to give an answer. Most respondents declared that they and their children always wash their hands before eating (62.3%), while 44.5% of them do the same after defecation. Although it was reported that 76.7% of the children use latrines, 22.5% of them defecate anywhere.

Use of health services
More than half of the respondents (57.3%) relied on public health services, either health units or hospitals; the rest using private clinics or doctors. This percentage was consistent, analyzing data by district. The main reason reported for not using public services was unavailability of drugs (61.4%), followed by lack of equipment and competence (24.1%). Only 33.2% of the interviewed mothers declared that they were always able to pay for the health services that they need. A negligible number of respondents (8.5%) had attended health education sessions in the previous six months.

Detection of worms and treatment
Approximately 15% of mothers reported having seen worms in the stool of their child. This figure was slightly higher than the actual prevalence detected (13.5%) in the same sample of children. Of the total sample, 12% of the children had received some sort of treatment against worms.

Bi-variate analysis
Most children of mothers reporting good knowledge presented a lower prevalence of infection, although the reduction in risk for children of mothers who knew effective ways to prevent infection (washing hands/washing vegetables) was not significant (O.R. = 0.94; 95% C.I.: 0.74–1.20). Among good hygienic practices, only washing hands after defecation was associated with a significant reduction in risk of infection (O.R. = 0.81; 95% C.I.: 0.66–0.99). Furthermore, literate mothers were almost four times (O.R. = 3.75; 95% C.I.: 2.69–5.24) more likely to report that their children always wash their hands after passing stools than illiterate mothers. Finally, worms were more prevalent among children living in the households using public health care facilities (O.R. = 1.22; 95% C.I.: 1.00–1.49) and among

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**Figure 3.** Intensity of infection by age: intensity of intestinal helminth infections by age group in Qena, Egypt, 1994, indirectly measured as geometric mean of egg counts for infected individuals after the \( n + 1 \) transformation (children 2–12 years of age, total \( n = 366 \))
children of mothers who did not attend health education sessions (O.R. = 1.19; 95% C.I.: 0.82–1.71).

While a significant number of mothers who detected worms in the stools of their children provided them with treatment (p < 0.00001), one-third of them did not have their children treated (Figure 4). At the same time, prevalence of helminth infections was similar when comparing children whose mothers detected worms in their stool (14%) and those who did not (13%).

Discussion

The present study was designed to utilize data on intensity of infection with intestinal helminths. The unexpected low prevalence and intensity of infection detected in the area made this procedure unreliable. For this reason the statistical analysis only takes into account the presence or absence of one or more of the different intestinal helminths. Furthermore, the sample was stratified by district, to facilitate interventions through the District Medical Offices of the rural health structure, and not by ecological setting (urban and rural areas, desert and river villages). The data therefore generated information for the whole area and by district but did not really allow stratification at the analysis level by type of settlement, which appeared to be a good predictor of level of infection.

However, given the large sample size and the particularly accurate technique used for diagnosis of infection, this operational research maintains its value in assessing the extent of the problem and in defining associations between prevalence of infection among children and knowledge, perceptions and behaviour of mothers toward intestinal helminths.

This study did not consider schistosomes, since only *S. hematobium* is endemic in Qena, and presents different clinical signs to that of intestinal helminths. Furthermore, like *S. mansoni*, it does not appear in the stools of infected individuals and is transmitted through water contacts. For the same reasons, the long lasting Health Education campaign for control of schistosomiasis in Egypt has focused mainly on preventing water contact and pollution. Thus, it is unlikely to have affected the results of the present study.

In defining the appropriate control strategy, three major fields of action, identified by WHO were considered.

Sanitation

In the present sample, 22.5% of the children were reported to defecate anywhere, regardless of the presence of a latrine in the house. Actually, just 11.2% of the households did not have a latrine available. Due to the enormous number of eggs produced by one adult female worm, a single contaminated stool passed in the soil is sufficient to infect an entire village for years. In Qena, efforts could be made towards universal availability of a family latrine and also to improve the type of latrine commonly used in the area. However, this may not bring any reduction in the level of infection until a change in the behaviour of children and their hygienic practices is achieved. This will only be possible through health education targeting mothers and children.

Health education (HE)

According to the survey results, most respondents were well aware that worms are harmful to health. A reasonable proportion possessed accurate knowledge of sources of infection and ways to prevent transmission, though this was not associated with a lower prevalence of infection. Furthermore, most mothers, especially those who were literate, reported correct hygienic practices in the household, and their children had a lower prevalence of infection. In the present context, HE should focus on improving positive behaviour rather than knowledge.
Given the low attendance at HE sessions and the mostly illiterate target population, informal channels of communication such as television and radio should be considered. In particular, with 87.2% of households having a television, any message delivered through this media should reach virtually the entire population. Encouraging results were achieved in Egypt utilizing television to deliver health education messages by the National Schistosomiasis Control Program. At the same time, the good enrolment rate for school-aged children suggests that schools may be an effective channel for reaching this sector of the population.

The HE messages should be developed to take into account practices and behaviour associated with the lower prevalence of infection in this community. According to the survey results, a very positive behaviour was that of washing hands after defecation. Promoting hand-washing will also have benefits beyond helminth control. HE should also stress the efficacy of presently available chemotherapy, and make clear that the persistence of infection after treatment is due to continuous re-infection occurring when hygienic practices, well known to the majority of the mothers, are not put into practice.

Chemotherapy

The results of the coprological survey showed a relatively low level of infection in the region, which does not justify the great concern expressed by the MoH local staff. However, high-prevalence districts and areas (rural villages) were identified. On the basis of the experience gained in past years, two options emerged as the most cost-effective means of delivering antihelminthics: mass treatment or selective treatment after mass screening. Both options can be applied either to the entire population or to a selected target group (school-children, farmers, etc.).

However, these options are justified only when the prevalence of infection exceeds a certain level. At the present level of infection, passive case detection may be a sufficient control measure if drugs are made available at the health units and priority is given to children living in areas with high prevalence of infection. An additional reason for support of this activity is the identification of *H. nana* as the most common parasite in Qena, which requires treatment (niclosamide) different to that for other soil-transmitted helminths (mebendazole, albendazole). For the same reason, case detection should not be limited to school-age children but should cover pre-school children who were more affected by *H. nana* in Qena, as has been reported in other regions of the country. This activity will present low costs and still may be the most appropriate strategy to fulfill the objective of morbidity control.

In a control strategy that relies on passive case detection, the community’s perception of the disease is particularly important in ensuring its effectiveness, since perception will affect compliance. It was also observed that motivation to seek treatment arises from the high level of awareness of infection and the belief that worms are harmful to health, rather than a biochemical understanding of the cause of infection. In Qena, the situation appears to be particularly favourable for the promotion of treatment by passive case detection. In fact, 89.3% of the interviewed mothers considered worms harmful and more than 90% of them seemed to be fully aware of the need for treatment of worms. Almost all of them (98%) also trusted pharmaceutical drugs.

In spite of this, one-third of the mothers who detected worms in the stools of their children did not provide them with treatment, thus suggesting that a problem of drug supply is present in the area. The main reason reported for not using public health services was the non-availability of drugs. In the same context, users of public health care facilities reported higher prevalence of infection, and only 32.2% of the households reported that they were always able to pay for the health services they needed. Thus, positive results can be expected from supplying rural health units with sufficient drugs to provide antihelminthic treatment, preferably free of charge.

Analysis of the stool collection forms shows that the proportion of children whose mothers said they had passed worms in the stools is close to the overall prevalence of infection. This method seems to be reliable for determining the prevalence of infection in the community, as has been suggested. Conversely, the same method does not seem to be a feasible way of detecting infection in individuals; rural health units in Qena need to be provided with the equipment and personnel necessary for diagnosing cases. Lack of equipment and competence was the second most frequent complaint about public health service delivery from people who do not use it, thus improving the diagnostic capacity of these facilities is also expected to increase their utilization. Finally, passive case detection should be actively promoted by HE, encouraging mothers to refer their children...
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