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Knowledge, Attitude and Practice (KAP) Assessment of Intestinal Parasitic Infection among School Children in Asmara, Eritrea

Khawaja Shakeel Ahmed*, Nuredin Mohamedkassm Siraj, Henok Fitsumberhan, Sara Isaac, Semhar Yohannes, Dawit Eman, Yacob Berhane, Matiwos Araya

Department of Biomedical Sciences, Asmara College of Health Sciences, Asmara, Eritrea
Email: *khajashakeel@gmail.com

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Abstract

Purpose: Poor hygiene practice, inadequate sanitary conditions and lack of awareness of correct mode of transmission are some factors that attribute to high intestinal parasitic infection among children. Therefore, having proper knowledge, good attitude and practice (KAP) against the aforementioned factors can significantly mitigate the spreading of intestinal infection. **Methods:** The present study was a cross-sectional study which comprised of 127 students who were selected by stratified random sampling. A self-administered questionnaire was used to record KAP of students against intestinal parasitic infection. Total 126 students gave stool samples which were analysed by formol-ether concentration technique. In addition, sewage samples were also collected and analysed for any parasitic load. Statistical data were generated by Chi-square test. **Results:** A total of 126 stool samples were examined in the study of which 46 (36.50%) were found infected with one or more intestinal parasites. Among the parasites identified, the most common was *Hymenolepsis nana* with a prevalence rate of 35 (76.0%). Here, most of the students 96 (76.1%) were having poor knowledge about the correct mode of transmission of intestinal parasites. Majority of the students 91 (72.2%) practicing defecation in open air when they are at home, and all 126 (100%) are doing that at school, and significant number of students were not washing hands after defecation. **Conclusion:** Lack of knowledge regarding mode of transmission and practice of defecation in open air and not washing hands after defecation are issues of great concern, because many parasitic infection have faecal-oral mode of transmission. So, health authorities have to take these issues seriously and action would be vital to resolve it.

Keywords

Eritrea, Asmara, School Children, Knowledge, Attitude, Practice

1. Introduction

It is a matter of grave concern that in developing countries intestinal parasitic infection poses a major health problem which is not addressed properly. In developing countries, there are number of factors that have profound significance for high level of intestinal parasitic transmission [1] [2] [3]. The factors like poor personal and environmental hygiene, poor nutrition, overcrowding and climatic conditions not only favour the survival and development of parasites but also contributes to the high prevalence of infection among people.

School children are always at the highest risk of acquiring parasitic infection due to their dirty habits of playing or handling infested soil, eating with soiled hands, unhygienic toilet practices, drinking and eating of contaminated water and food [4] [5]. There are number of published reports which implicate about intestinal parasitic infection with poor nutritional status among children of school age [6] [7] [8] [9] [10].

The parasitic infections like, *amoebiasis*, *giardiasis*, *ascariasis*, and *trichuriasis* are some of the common parasitic infection worldwide. The aforementioned infections are commonly associated with low plasma vitamin A, loss of weight, chronic blood loss, iron deficiency anaemia, and stunted growth among children [4] [11] [12]. Alteration of normal gastrointestinal flora by intestinal parasites has been associated with diarrhoea a major cause of childhood mortality and morbidity in developing countries [13]. In view of the negative socio-economic impact of the parasitic infections in children, there is always a need for the development of more adaptable preventive and control measures. For this to be achieved effectively there is a need to generate baseline data on the occurrence of parasitic infection.

The present study is aimed to determine prevalence of intestinal parasitic infection among school children of one elementary school of Asmara. A study on the prevalence of various intestinal parasitic infections among children is a prerequisite not only for formulation of appropriate control strategies but also to predict risk for communities under consideration.

The present study also stresses on assessing Knowledge, Attitude and Practice (KAP) of target people against intestinal parasitic infection, because no health related programme can be implemented or it will be effective as it should be until the assessment of knowledge of target population is not done. So to ensure a clear message to be delivered, the knowledge and perceptions of the people who are more prone to the intestinal infections must be taken into consideration.

Few studies were conducted earlier in Eritrea to assess knowledge, attitude and practice of students towards parasitic infection but very few of them were

published.

2. Methods

2.1. Study Area & Study Design

The study was a cross sectional study conducted among students of one elementary school located near the sewage stream which is 3 to 4 km away from Asmara. The untreated raw sewage flows through a stream called Maibella, which extends from Paradizo to Tsada Kristian area where the inhabitants depend on farming and livestock raising practices using this untreated sewage.

2.2. Sampling & Study Population

A stratified random sampling technique was used to identity 127 students (10.85%) from a total of 1170. The proportion of students who were living near sewage area and away from it was calculated to find out the number of study subjects to be involved from each residence. In addition, breakdown proportion of students from each grade and section was calculated by using random interval and random start method to get the number of students to participate from each grade and section.

2.3. Data Collection

A self-administered questionnaire was developed in Tigrinia (local African dialect) and in English to record demographic data, and data associated with knowledge, attitude and practice of students against intestinal parasitic infection. A total of 20 questions was included in the questionnaire. Before the start of the study, a similar questionnaire was developed and pre-tested for ascertaining consistency and appropriateness of language using school children different from the ones who participated in the study.

The study included both clinical (stool) and non-clinical (sewage) samples for detection of intestinal parasites. Each enrolled child was asked to provide a faecal sample in cleaned and wide mouthed leak proof bottles. The pupils were adequately instructed by the supervisors of the study on how to get a little portion of their stool into the bottles which were supplemented with 10% formal saline as a preservative. The clinical and non-clinical samples collected were all examined in the parasitology lab of National Health Laboratory.

Furthermore, total nine samples were collected superficially from three sewage sites designated as A, B, and C in clean and dried bottles to examine the presence of parasites.

Site A: Where the sewage begins to flow in open air.

Site B: Where industrial wastes mix into the sewage.

Site C: Where faecal matter is discarded by sewage trucks.

The entire study took four months for completion.

2.4. Ethical Consideration

Ethical approval was obtained from the ethics committee of Asmara College of

Health Sciences (ACHS). A written informed consent was obtained from the director of the school being a guardian of all the selected students participating in the study. At the end of the study infected children were appropriately treated, and their information was kept confidential.

3. Sample Analysis

Human stool specimens were analysed by formol-ether concentration method and microscopic examination [14]. Sewage samples were also analysed by using standard method and microscopic examination [15].

4. Data Analysis

The laboratory test results were entered into pre-designed SPSS software for windows version 18. Frequency distribution tables of different parameters were drawn. Different parameters were compared using chi-square test. Statistical values were considered significant when $p < 0.05$.

5. Results

A total of 127 students 56 (44.4%) males and 70 (55.6%) females aged 5 - 13 years with male to female ratio 1.3:1 were selected. The response rate was 99.9% because one student who enrolled for our study was dropped out from the school.

The distribution of students based on their residence was 10 (8.0%) and 116 (92.0%) *i.e.* away and near to sewage (Table 1).

In all, 46 students (36.50%) were infected with one or more intestinal parasites. 35 (76.0%), three (6.5%) and two (4.3%) were infected with single parasite *i.e. Hymenolepis nana*, *Ascaris lumbricoides and Enterobius vermicularis* respectively, six (13.0%) with two or more parasites. Among the children infected with multiple infection the parasites found were *Giardia lamblia/Hymenolepis nana*, *Enterobius vermicularis/Hymenolepis nana* and by *Giardia lamblia/Hymenolepis nana/Ascaris lumbricoides*. The most prevalent parasite identified

Table 1. Socio-demographic characteristics of the participants.

Variables	Number (n = 126)	Percentage
Sex		
Male	70	55.6%
Female	56	44.4%
Age		
<10	88	69.8%
>10	38	30.2%
Residence		
Near to Sewage	116	92.%
Away from Sewage	10	8.0%

in both the single and multiple infections was *Hymenolepis nana.* When we correlated the presence of parasite with the residence of students, we recorded a ratio of 40 (87%) and six (13%) *i.e.* those living near to the sewage and away from it.

From the sewage stream a total of nine samples were collected, three samples from each collection site. Sewage concentration technique was performed thrice for each site [15]. The laboratory findings, showed that site A and site C were contaminated with intestinal parasites, and site C showing more parasitic load than site A; however this couldn't be shown quantitatively. While, site B was negative for any ova or parasite even though the first obtained result was repeated thrice for confirmation (Table 2).

5.1. Assessment of Knowledge

The knowledge of the selected students were assessed based on their responses to questions on mode of transmission of intestinal parasites, degree of harmfulness of sewage exposure to health, method of prevention regarding intestinal parasitic infection, and generally if they've ever heard about intestinal parasites. To the question regarding having any prior knowledge of intestinal parasites, 92 (73%) and 34 (27%) study subjects responded that they heard, and they hadn't respectively. Then we assessed the knowledge regarding mode of transmission, this was done by suggesting five medium's out of which two were possible modes of transmission. Based on their responses, the respondents were separated into those who know, and those who didn't know. Based on the assessment, 20 (15.8%) and 106 (84.1%) know, and didn't know the correct mode of transmission.

For determining knowledge regarding the degree of adverse and harmful effects to sewage exposure, four choices were given *i.e.* very harmful, harmful, harmless and don't know. The results showed, 79 (62.7%) and 32 (25.4%) of the students responded that sewage is very harmful and sewage is only harmful, while 13 (10.3%) thought it is harmless and two, (1.5%) of the respondents don't not know about it effects. To assess the knowledge of study subjects on some of the preventive methods of intestinal parasites, four methods were suggested out which two were correct. Respondents were categorized into, those who know, those who partially know, and those who didn't know, for two, one and no correct

Table 2. Parasites found in sewage samples.

Sewage site	Intestinal parasites found
Site A	*Hymenolepis nana*, *Strongyloides stercoralis*,
Site B	Negative for any ova or parasite
Site C	*Hymenolepis nana*, *Strongyloides stercoralis*, *Ascaris lumbricoides. Schistosoma mansoni*, *Taenia species* and *Amoeba species*

Table 3. Assessment of knowledge of study subjects.

	Number	Percentage	P-value (x^2 value)
Previous knowledge on IP			
No	34	27%	0.000 (26.698)
Yes	92	73%	
Mode of transmission of IP			
Know	20	15.8%	0.001 (10.560)
Don't Know	106	84.1%	
Degree of harmfulness of sewage exposure			
Very harmful	79	62.7%	0.000 (112.216)
Harmful	32	25.4%	
Harmless	13	10.3%	
Don't Know	2	1.5%	
Prevention methods of IP			
Don't Know	13	10.3%	0.000 (97.000)
Partially Know	19	15.1%	
Know	94	74.6%	

responses respectively. The results showed that 94 (74.6%) know correct prevention methods, while, 19 (15.1%) have partial knowledge about it. The rest, 13 (10.3%) of the students didn't knew how intestinal parasite infection can be prevented (Table 3).

5.2. Assessment of Attitude and Practice of Study Subjects towards Risk Factors

To assess the attitude of study subjects towards sewage, they were asked about whether playing or working around sewage can cause parasitic infections or not. 109 (86.5%), 16 (12.7%) and one (0.79%) students said it will cause intestinal parasitic infections, it will not, and he/she have no idea respectively. In response to the question that assessed the study subjects' attitude towards defecating in open air, 76 (60.3%) students agreed it will contribute and 46 (36.5%) of them said it will not, while four (3.2%) of the students answered that they don't have any idea. In order to assess the hygienic practice of the study subjects, the question about their hand washing practice after defecation was asked. The results showed that 117 (92.9%) don't wash their hands after defecation, while, nine (7.1%) are doing that. Furthermore, in response to the question about the use of proper toilet for defecation at home, 91 (72.2%) said that they are defecating in open air, 34 (27%) of them are using toilet, while one (0.79%) using both. However, at school all 126 (100%) were defecating in open air (Table 4).

Table 4. Attitude and practice of the study subjects towards risk factors.

	Number	Percentage	P-value (x^2 value)
Do you think playing around sewage area can cause IP?			
Yes	109	86.5%	0.000 (163.000)
No	16	12.7%	
Don't Know	1	0.79%	
Do you thing defecating in open air has a role in transmission of IP?			
Yes	76	60.3%	0.000 (62.286)
No	46	36.5%	
Don't Know	4	3.2%	
Do you wash your hand after defecating?			
Yes	9	7.1%	0.000 (92.571)
No	117	92.9%	
Where do you defecate at home?			
Toilet	34	27%	0.000 (98.714)
Open air	91	72.2%	
Both	1	0.79%	
Where do you defecate at school?			
Toilet	0	0%	0.000 (122.032)
Open air	126	100%	
Both	0	0%	
Total	126	100%	

6. Discussion

Intestinal parasitic infection can be acquired at any age but young children are more prone to acquire it, this may be because of their weak immune system, disaster dislocation, high-density camp living and malnutrition. Intestinal Parasitic infection is a worldwide problem, but it is more devastating in developing countries where there is chronic shortage of basic hygiene facilities, lack of knowledge about their correct mode of transmission and their preventive measures.

In this study, the observed overall prevalence rate of intestinal parasite was (36.5%) which is relatively less compared to other studies conducted out of Eritrea, but it is almost similar to other studies done in other towns of Eritrea. Here, the most common parasite identified was *H. nana* with a prevalence of (76%). *H. nana* is an easily transmissible parasite; it usually transmits through fecal-oral route and also through rodents which serves as a mechanical carrier which is a common characteristic of places with poor sanitation.

Of the students surveyed, (73%) were classified as having proper knowledge of

intestinal parasites and the most important source of information was the school. This good knowledge about parasitic infection among students of our study encourage that the same health education must be given at school to other students from other towns of Eritrea, because a study done in Adi-Tekelezan subzone of Eritrea showed only (3.4%) of the students were having good knowledge about parasitic infection. Those subjects who are having good knowledge about parasitic infections were always considered at lower risk compared to their less knowledgeable peers.

The present study found that a majority of the children don't know the correct mode of transmission of parasitic infection. This lack of knowledge about the correct mode of transmission of infection is highly precarious to the children's health and requires immediate attention, because the transmission routes of more than 400 parasites have been identified, of these, many (45%) can be transmitted by close nonsexual contact, including the fecal-oral route. Intestinal parasites may be transmitted directly (hand-to-hand contact) or indirectly (contact with food or environmental surfaces). Therefore**,** not knowing the correct mode of transmission always have a profound significance in acquiring the infection especially among young children's where poor hygiene conditions are prevalent [16] [17].

Regarding the question about "severity of sewage," majority of the students replied it is "very harmful" some replied it is harmful" and few replied it is "harmless" which was (62.7%), (25.4%), (10.3%), respectively. Over all, this knowledge of students regarding sewage does not guarantee that they will not acquire any parasitic infection because their understanding about the mechanism of transmission of parasitic infection was insufficient. Earlier, study reported that farmers living in the same sewage area were using the sewage water for growing vegetables and selling them in local market. So, there is a great probability that students can acquire this infection after consuming those contaminated vegetables. The same study revealed that at least (45%) of the farmers were found to be harboring Giardia cysts of 75 occupationally exposed farmers [18].

To prove the presence of parasites in the sewage water used for growing vegetables, we collected nine samples from three different sites which were designated as A, B and C. The site A and C showed the presence of parasites while site B showed negative results this may be due to the fact that site B is the site where industrial waste is dumped. Heavy metals which are mined and processed by the mining and ore-smelting industries are having toxic effect to all biological life including the people. It is already proved Arsenic and antimonial compounds have been used since ancient times for treatment of parasitic infection as they are toxic to the parasite [19]. The site A and C are the sites where the sewage water begans and faecal matter is discarded respectively, and the load of parasite was higher at site C. This high load of parasite at site C indicates that if the faecal matter is not discarded hygienically it can have devastating impacts on human health.

When we asked about the prevention methods of intestinal parasitic infection,

(74.6%) of the students knew it. The results of our study when compared with other studies done in other towns of Eritrea, we found proximity. But, knowing only the prevention methods of parasitic infection is not a solution or keeping them safe from contracting the disease until good hygiene is not practiced, and the hygiene practice we found here was very disappointing.

In response to question about defecation in open air and playing around sewage area has any role in the transmission of parasitic infection, (60.3%) and (86.5%) of the students replied "Yes" respectively. This positive attitude towards risk factors of parasitic infection is because of the awareness generated by the parents, media or learning in the schools as school teachers pointed out. The results of our study are similar to other studies done in Eritrea where (95%) of students carries a similar positive opinion about defecation in open air.

We noticed that majority of the students have heard about parasitic infection but not about the correct mode of transmission, and they possess a positive attitude towards prevention methods of parasitic infection. With the above information we moved to the most important part of this study where we recorded the practicing habits of students. We believe if the knowledge and attitude are not brought in to practice it is worthless and cannot be as fatal as it should be to stop any infection. Although, health education by itself cannot guarantee the control of any infection but it is a fundamental starting point around which other measures can be formulated to create a favorable environment for the promotion of higher levels of health consciousness and more critical thinking towards improving the quality of life of endemic communities.

So, we tried to relate that knowledge and attitude with practice and the results were completely contrasting that was clearly reflected in their defecation practice. We found (72.2%) of students were defecating in open air when they are at home, and all (100%) were doing that when they are at school. When we relate this parameter with other studies done in the country we did not found any significant difference. The studies reported that out of three schools only one was having a toilet without enough water supplies, while the remaining two were lacking both of them.

There are studies which authenticate that the subjects who used open fields for defecation had markedly higher parasite infestation rates than those who used some type of lavatory. This open defecation can lead to serious infestation, because human faeces may contain a range of disease-causing organisms, including viruses, bacteria and eggs or larvae of parasites. The microorganisms contained in human faeces may enter the body through contaminated food, water, eating and cooking utensils and by contact with contaminated objects, thus making a large section of society vulnerable to many infections [20].

On the other hand, the present study showed that the majority of students were not washing hands after defecation. This is probably due to low knowledge of children about the faecal-oral transmission of intestinal parasite through their unwashed hands, or due lack of hand washing facilities close to lavatory. These findings are in concurrence with studies conducted in other schools of Eritrea

which reported about the lack of hand washing facilities close to toilets.

Hand washing is one of the important parameter which intervenes with fecal-oral transmission of diseases, and this habit can act as primary and secondary barrier to interrupt transmission. So, hand washing must be practiced well before and after taking meals and handling fluids. Washing hands is most important to remove the fecal matter after contact with stools, and this must be done with clean water and if possible with soap or any other cleaning agent [21] [22].

7. Conclusions

To conclude, this study targets two key issues that must be addressed when creating health and hygiene promotion programs. First, only few students were classified as having proper knowledge of transmission of intestinal parasitic infection. To increase this rate, health programs must be arranged to teach students about disease causation and their exact mode of transmission, because children are more receptive to learning and there is high probability to adopt healthy behaviors at a younger age. They can also be ambassadors of change by spreading what they have learned in school to their family and community members. Second, hygiene practices are contingent upon availability of sufficient resources. All of them are defecating in open air in their school and majority of them are doing that when they are at home, so well-designed and well-located latrines with adequate amounts of clean water, are essential in promoting hygiene. If the health care organizations implement these two important factors—education and resources, it will help in decreasing the risk of intestinal disease. Additionally, the local authorities need to address the issue of open sewage running in the residential area, and health education program should also be initiated among the farming community and the population regarding the risks of the use of untreated wastewater for raising agricultural crops.

Still, we believe a more comprehensive study must be conducted in future in the same and other schools of Asmara and this report can be used as a baseline for all those studies.

8. Limitation of the Study

In the beginning the study was aimed to be conducted among farmers who are residing near the sewage stream and using the same sewage water for their farming activities. However, due to their unwillingness the research shifted to the school students who are studying in the school located near the sewage stream. The quantitative numbers of the parasites couldn't be analyzed because the Mc master slide that was necessary to count the parasites wasn't available, similarly quantitative analysis of the parasites in the stool sample wasn't possible due to lack of kato katz material. Shortage of time was also a bit challenging it affected our study to take small sample size.

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