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Prevalence and associated factors of intestinal parasitic infection in basic school children in Sana'a Yemen

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ABSTRACT
Background: Intestinal parasitic infection is the most common endemic infection worldwide and represent major public health problems, mainly in developing countries like Yemen.
Aim: The study aim is to identify the prevalence and associated factors of intestinal parasitic infection among basic school children in Sana'a city Yemen.
Methods: A crosssectional descriptive study involved 500 basic school children was conducted from April to May 2013. 500. Stool specimens were collected from all participants and examined for intestinal parasitic infection using direct microscopy, wet concentration method then sedimentation method. Data entered and analyzed using SPSS software. Results: The overall prevalence of intestinal parasite infection among the participants was 31.2% and it was higher in Azal district 35.5%. The predominant parasites were Giardia Lambela 48%. The highest prevalence of intestinal parasitic infection 34.4% was among participants from public school and lesser 10.4% among participants from private school. The result was statistically significant (P>0.001). Prevalence of intestinal parasite infection was found among participants for illiterate mothers to be 35.1%, it was high 36% if there is only one bath room in house and the result was statistically significant (P>0.001). Prevalence of intestinal parasite infection 63% was among participants who did not follow hand washing practice after defecation and the result was statistically significant (P>0.001). Most of participants 70.6% don't have water supply during observation. Conclusions: Intestinal parasites were prevalent in varying magnitude among the schoolchildren. The prevalence of infections were higher for protozoa compared to helminthes. Measures including education on personal hygiene, environmental sanitation, water supply and treatment should be taken into account to reduce the prevalence of intestinal parasites

CONTENTS

Introduction:

Intestinal parasitic infection is the most common endemic infection worldwide and the single worldwide cause of illness1. Intestinal parasitic infection represents major public health problems, mainly in the tropical and subtropical regions2. WHO estimated that 3.5 billion people are affected, and 450 million are ill as a result of these infections, the majority being children3. Intestinal parasitic infections constitute a global health burden causing clinical morbidity in 450 million people4.

Poor environmental hygiene, poverty, and impoverished health services are closely associated with the high prevalence of intestinal helminthic infestations5. Intestinal parasitic infections are one of the major health problems in several developing countries6. In developing countries, intestinal parasitic infections are common, varying from one country to another, depending on the socioeconomic status, degree of personal and community hygiene, sanitation and climatic factors. Intestinal helminthic infestations are most common among school age children, and they tend to occur in high intensity in this age group7,8. Intestinal parasitic infection is relatively frequent among Yemeni people especially school age children9. In Yemen, intestinal parasitic infections are common varying from one area to another, depending on the degree of personal, community hygiene, sanitation and climatic factors10.

Several studies and surveys on intestinal parasitic infections in different localities such as Sana'a province and population such as children and restaurant workers had done and have shown a high prevalence rates11-21. School children in Yemen form about 25% of the total population. In Yemen, there are still some areas, where epidemiological information regarding intestinal parasitic infection is lacking. Therefore, the aim of the study was to identify the prevalence and associated factors of intestinal parasitic infection among basic school children in Sana'a city.

Subjects and Methods

A descriptive, cross-sectional study was carried out among basic school children in Sana'a, the capital city of the Republic of Yemen from first of April to the end of May 2013. Sana'a city is at an altitude of 2,200 m above the sea level. Sana'a has a population of approximately 1,937,500 (2012), making it Yemen's largest city.

The sample size was calculated using Epi Info version 7.2. Based on the following assumptions (Reference population = 250000, expected frequency = 50% based on the average of finding of previous study22, precision 5%, CI 97%) to be 471, 6% of the calculated sample size had been added to overcome the possible dropout , so the actual sample size is 500 pupils. The multistage randam sampling method was used to select the sample proportionately from 23 schools (15 public and 8 private schools). Sample was distributed according to the type of school proportionately. Four hindered thirty three school children from public schools and 67 school children from private schools were enrolled. Three classes were randomly selected from each school. Targets school children were selected following methods, 251 boys and 249 girls. Data were collected through pre-tested interviewer-administered structured questionnaire, observation of school environment and stool analysis. The children were interviewed in their mother tongue. Selected school children for the study were interviewed to obtain information about demographic characteristics, habits and behavior such as washing hands before eating and after defecation. Observation of the school environments (availability of safe water) was carried out during the field visits to each school. Fecal specimens were collected at home in the morning and transferred to private specialized labor-atory within 20 minutes and examined by direct microscopy, wet concentration meth-od then sedimentation method. Data entered and analyzed using SPSS software version 18. Necessary approvals were obtained from general director of Sana'a educational office and directors of involving schools. Participation in the stu-dy was voluntary. Written consent from the parent of child was obtained from all participants prior to the study. Confidentiality of gathered information was assured. Antiparasitic drugs were provided for infected school children with any intestinal parasitic infection. Leaflets

for increasing awareness of school children were distributed during field work in target schools.

Results

A total of 500 fecal samples were collected from participated school child-ren. The response rate was 100%. The overall prevalence of intestinal parasitic infection among the participants was 31.2% (156/500). The prevalence of intestinal parasitic infection in studied directorates was 35.5%, 30.9%, 27.6% and 26% in Azal, AL-Safiah, AL-Tahreer and Old Sana'a directorates respectively. Results as shown in table1.

Of all intestinal parasitic infections detected among participated school child-ren, the most common parasite was Giardia Lamblia 48.1% followed by Entamoeba histolytica 46,2%. Details demonstrated in table 2. Associated factors of intestinal parasitic infection in current study

Regarding the gender, there was no significant difference in prevalence of intestinal parasitic infection between males and females 32.7% and 29.7% respectively. Of the total 500 school children, the highest prevalence of intestinal parasitic infection was found among school children of age group 6-9 years 33.1%. However, this result was not statistically significant. Details are shown in table 3.

We found that the prevalence of intestinal parasitic infection was significantly higher among school children from public school 34.4% compared to children from a private school 10.5%. The result was statistically significant (P>0.001). The vast majority of target school children's parents were educated 89.6% (fathers) and 63% (mothers). Intestinal parasitic infection was found among school children for illiterate parents to be 35.1% and 28.8% (mothers and fathers respectively). There was no significant difference in prevalence of intestinal parasitic infection according to the parents' education level of the school children (P> 0.05). For more details present in table 3.

Results showed that intestinal parasitic infections found among participated school children with rented houses

35.2%, while among school children with own houses 27.8%. There was no significant difference in prevalence of intestinal parasitic infection by house possession (P> 0.07).

We found that intestinal parasitic infections were 34.3% among school children if the number of rooms in their houses ≤ 3 rooms, while it was 27.3% if the number of rooms in their houses< 3 rooms. There was no significant difference in prevalence of intestinal parasitic infection according to the No. of rooms (P>0.09). The results showed a high prevalence of intestinal parasitic infections 36% if there is only one bathroom in house whereas more than 1 bathroom it was 10.8%. The result was statistically significant (P>0.001). For more details see table 3. Intestinal parasitic infections were found more common among those school children who used unsafe water for drinking and other purposes 34% in comparison to others 29.5%. There was no significant difference in prevalence of intestinal parasitic infection according to the source of water supply (P> 0.05). Results as shown in table 3. The current study found that the number of school children who don't wash their hands before eating was 41 children 8.2% while those who wash their hands before eating were 459 children 91.8%.

The study showing that washing hands before eating is associated with decreased exposure of intestinal parasitic infection. The prevalence of intestinal parasites among school children who wash their hands before eating was 30.3%, while it was 41.5% among those who don’t wash their hands before eating. There was no significant difference in prevalence of intestinal parasitic infection according to the washing hands before eating of the school children (P> 0.05).

This study found that 94.8% of school children wash fruits and vegetable before eating in comparison to 5.2% of school children who do not wash. Prevalence of intestinal parasitic infection decrease among those who are washing fruits and vegetables before eating 29.9%, in comparison to those who have a habit of eating unwashed fruits and vegetables before eating 53.8%. There was no significant difference in prevalence of intestinal parasitic infection according to the washing fruits and vegetables before eating (P>0.05).Table 3.

Intestinal parasitic infections were found more commonly among those school children who did not follow hand washing practice after defecation 63%, in comparison to others who wash hands after defecation 20.2% and the result was statistically significant (P>0.001). Table 3.

Table 1: Prevalence of intestinal parasitic infection by districts.

Districts	**Studied**	**Infected**	**%**
Azal	180	64	35.6
AL-Safiah	149	46	30.8
AL-Tahreer	94	26	27.7
Old Sanna'a	77	20	25.9
Total	**500**	**156**	**31.2**

Table 2: Prevalence of intestinal parasitic infection by types of parasite.

The parasite	**No**	**%**
Ascaris Lumbricoides	2	1.3
EntrobiusVermicularis	1	0.6
Hymenolepis Nana	5	3.2
Taenia species	1	0.6
Entamoeba Histolytica	72	46.2
Giardia Lamblia	75	48.1
Total	**156**	**100**

Table 3: Factors associated of intestinal parasitic infection in the current study.

Factors	**Studied**	**Infected**	**%**	**P-value**
Gender				
• Male	251	82	32.7	0.476
• Female	249	74	29.7	
Age group				
• 6-9	133	44	33.1	
• 10-13	298	94	31.5	= 0.909
• 14-16	69	18	26.1	= 0.306
Type of school. Public	433	149	34.4	> 0.001*
• Private	67	7	10.5	
Mothers' educational . Literat	315	91	28.9	= 0.145
• Illiterate	185	65	35.1	
House e				
possession. Own	270	75	27.8	= 0.07
• Rented	230	81	35.2	
No. of rooms				
• ≤ 3	277	95	34.3	= 0.09
• <room 3	223	61	27.3	
No of room				
bathrooms. 1	325	117	36	< 0.001
• <bathr 1	175	19	10.8	
Source of bathr				
water supply. Pipe	318	94	29.	= 0.29
• Other	182	62	34.5	
Hand			1	
washing . Yes	459	139	30.3	= 0.138
• No	41	17	41.5	
Washing				
fruits and . Yes	474	142	29.	= 0.0104
• No	26	14	53.9	
Washing of			8	
hands after . Yes	489	99	20.2	< 0.001
• No	11	7	63	

* Statistically significant results

By observation schools water supply and checking school children for nails cutting during filed work following results were observed: Lack of water supply was found in 69.6% of target basic schools while 30.4% of target basic schools have water supply.

The prevalence of intestinal parasitic infection was high 40.6% among school children with bad finger nails condition, while it was 14.4% among another group. The result was statistically significant (P>0.001). Results illustrated in table 4.

Table 4: Prevalence of intestinal parasitic infections according to nails condition

Finger nails condition	**Studied**	**Infected**	**%**	**P. value**
Good	180	26	14.4	< 0.001*
Bad	320	130	40.6	

**Statistically significant results*

Discussion

Intestinal parasitic infections have been recognized as one of the most significant causes of illnesses worldwide. This study attempted to show the prevalence and the associated factors for the prevalence of intestinal parasitic infection among basic school children in Sana'a city. In the present study, the overall preva-lence of intestinal parasitic infection among basic school children was found to be 31.2%. It was different from previous studies conducted in different parts of Yemen. For example in Sana'a studies conducted in 1985 and 2013 showed a high prevalence of intestinal parasitic infection 53% 11 and 54.8%12 than that current study was found and the result was slightly higher than the results reported in 2003 27.5%16. The present study was in agreement with the study conducted by Alyousfi et all. in 2011 30.9%21. Studies conducted in Hadhramout observed that the prevalence of intestinal parasitic infection was 37% 14, 28.7% 18 and 58.7% 20.

The studies conducted in other countries of the region reported different results, some of them were in agreement with current study and others were lower or higher than current study, for instance, in Oman 38.7% 23, in Egypt 22.43% 24, in Saudi Arabia 33.8 % 25, in Iraq 57.9% 26, and it extended 70% in Sudan27, 31.8% in Turkey28, 63.9% in India29, 79.8% in Ethiopia30 and in 84% Colombia31.

These variations in prevalence might be due to differences in climatic conditions, geographical factors in the studied areas, poor hygiene, environmental sanitation, socioeconomic and behavioral factors in the residents, educational status of parents and study subjects and previous control efforts. Giardia lamblia and Entameba histolytica were the first a 48.1% and the second 46.2%, most common protozoa in the present study, both can be transmitted orally through drinking water.

However, the prevalence of Giardia lambelia detected in this study was higher than that previous studies in Yemen: it was 10.2%11, 16.1%12, 20%14, 17.716, 19.17%20, 16.7%21.

The studies conducted in other countries revealed the lower prevalence of Giardia lambelia for example: in Oman10.5% 23, in Egypt 4.46% 24, in Saudi

Arabia12.5% 25, in Iraq 31%26, in Sudan 12.3%27.

Also, the prevalence of Entameba histolytica detected in this study was higher than that previous studies reported for this parasite in Yemen: it was 10.2%11, 21.5%12, 15.9%14, &16.7%16, 16.83%20, and 17.1%21. The studies conducted in other countries of the region revealed the lower prevalence of Entameba histolytica for example: in Oman 24%23, in Egypt %2324, in Saudi Arabia 8.3%25, in Iraq 24.3%26, and in Sudan 0.4%27. This high prevalence of both protozoa in the current study because all the school children share more or less the same environmental conditions which allowed the transmission and persistence of the parasites. These environmental factors which were observed during this study include lack of water supply in 69.6% of target schools, inadequate sanitation, poor hygiene, improper use of toilets similarity in socio-cultural behavior of the school children. Others intestinal parasites were of low prevalence.

As regard to the gender, the prevalence of intestinal parasitic infection among boys and girls in this study was 32.7% and 29.7% respectively showing that both genders are equally susceptible to infection. The difference was not significant (P> 0.05). This result was less than reported in Iraq 59.9% and 56.2%26 and the study conducted in Ethiopia 51.6% and 48.4%30 among boys and girls respectively. This high prevalence associated with males may be due to the fact that they are more often engaged in predisposing activities such as playing in unhygienic playing fields and eating with unwashed hands.

Although the youngest age group (6-9 years) of schoolchildren was more affected 33.1%, the difference between this age group and other age groups (10-13 years) and (14-16 years) was not statistically significant P value = 0.909 and 0.306 respectively. In contrast, another study in Iraq reported that the prevalence was found to be more 71.4%26 in age group (6-11years). This is maybe because children in these age groups often spend more of their leisure time outdoors, playing and or seeking in garbage dumps.

They are also more often in contact with soil and eat indiscriminately with unwashed hands and this could be due to the fact that as the child grows older the exposure to different risk factors for intestinal parasite infection increases.

Regarding the type of school, the school children in public basic schools were more infected 34.4% than the school children in private basic schools 10.5% with statistically significant difference P-value <0.001. This might be because Public basic schools are not providing social services such as water system facilities to the public schools to ensure total eradication of intestinal parasitic diseases. Also, private schools take care of the children more than in public schools.

Current study observed that the prevalence of intestinal parasites was higher among school children of illiterate mothers 35.1% than school children of literate mothers 28.9%. There was no significant difference in prevalence of intestinal parasitic infection according to the mother's education level of the school children (P> 0.05). This result is in agreement with a study conducted in Turkey (42.6% and 29.4)28 , it was notably high in a study conducted in Ethiopia (57.8% and 42.2%)29 and in India (68.4% and 41.2%)29. The relation between a child's health and mother's education is well known. Health indicators of children whose mother's education level is lower are always worse.

This study showed a high prevalence of intestinal parasitic infections 36% if there is only one bathroom in house whereas more than 1 bathroom it was 10.8%. The result was statistically significant (P>0.001).

School children who don't practices washing hands before meal more exposed to get intestinal parasites. This study found that the prevalence of intestinal parasites was 41.5% in school children who are not washing hands before eating. This result was in agreement with a study conducted in rural Sana'a rural area by Al-Mekhlafi et al 12 and was in disagreement with the study conducted in Ethiopia 53.6% 30.

In this study, the prevalence of intestinal parasites was high in school children who eat raw fruits and vegetables without washing them 53.8%, while it was 29.9% among another group of school children who wash fruits and vegetables before eating with significant difference (P= 0.0104). This result was in agreement with a study conducted in rural Sana'a rural area by Al-Mekhlafi et al 12 and in Ethiopia 77.9%30. This confirms that contaminated hands or foods can play a vital role in transmission wide range of parasites through fecal-oral route. This is probably due to low knowledge of children about the fecal-oral transmission.

Washing of hands after defecation was found to be significant risk factor for intestinal parasitic infection (P>0.001), the prevalence of intestinal parasites was found more common in those school children who did not follow hand-washing practice after defecation 63%, while it was 20.2% among school children who wash hands after defecation. A similar high result was found in India 74.36% 29.

Intestinal parasitic infections were found more common among those school children who used unsafe water for drinking and other purposes 34% in comparison to others 29.5%.

There was no significant difference in prevalence of intestinal parasitic infection according to the source of water supply (P>0.05). This is because Intestinal parasitic infections can be transmitted orally through drinking and use unsafe water.

Prevalence of intestinal parasitic infection was high 40.6% among school children with bad finger nails trims. Similar trend has been reported by Al-Mekhlafi et al12 and Shrestha et al. 33.3%33. The effect of socioeconomic status on risk of intestinal parasitic infections could be attributed to several other factors such as lack of access to safe water, poor hygienic environment, lack of access to education due to financial constraints and overcrowded conditions34.

Conclusion

In conclusion, this study indicates that intestinal parasites are remarkable among school children in Sana'a city especially among public schools, those who do not wash fruits and vegetables before eating, those who do not wash hands after defecation, and those with bad nails condition.

Recommendations

Much work remains to be done to improve the health of the school children. Measures including education on personal hygiene and environmental sanitation, water supply and treatment should be taken into account to reduce the prevalence.

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