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Prevalence of intestinal helminthic parasites among the children of the local population of Quetta District, Balochistan, Pakistan

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Abstract

The present study was conducted to determine the prevalence and associated risk factors for intestinal parasitic helminths in children from a local population of Quetta district. For this purpose, stool samples were taken from children of the urban and rural areas of the district. The current findings showed that the overall 43.80% prevalence was recorded in children of rural and urban areas of Quetta district. Five species of intestinal helminths parasites were found at a different prevalence rate of infection. *Hymenolepis nana* was detected at the highest 48 (15.24%) in children than other species. Gender wise infection was recorded higher in females (25.71%) than males (18.09%). The Age-wise high prevalence rate was recorded in the age group of 6-10 years of children (48.14%) than 11-15 years (42.15%) and up to 5 years of children (40.95%). The prevalence of helminthic in the Quetta district is high due to the rapid increase in population low socio-economic status, living with unhygienic conditions, sanitation issues, and high pollution.

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Introduction

The term "Helminths" refers to a variety of worms that live in or on human and animal bodies. Infection caused by these parasites is commonly called helminthiasis. The most common helminthic parasites are the nematodes that commonly known as intestinal worms. They contain whipworm *Trichuris trichiura*, roundworms (*Ascaris lumbricoides*) and Threadworm (*Strongyloides stercoralis*). Infection follows the ingestion of contaminated food and water.

Human lifestyle and behaviors have been involved to progress the transmission of helminthic parasites. Predominant among these are poor sanitation, lack of access to health care, and overcrowding. Besides, bare footing and eating unwashed fruits and vegetables are also vital risk factors (WHO, 2002). The high rate helminths prevalence is associated with few risk factors such as social and economic status of a particular area, lack of Government intervention, lack of quality education and improper hygiene conditions (Drake *et al.*, 2002).

The most important risk factor illumination high helminthic infections among children are the behavior in nature. Children are generally very active, playing with the soil and objects in the environment with little or no supervision (Ojurongbe *et al.*, 2011). It is also well-known that though individuals of all ages harbor worms, as a subsequent result it was noted that it is highly prevalent among those children living in tropical and subtropical areas (Bethony *et al.*, 2006).

Intestinal helminthic infections are a serious health concern issue through the word especially in developing countries (Chopra *et al.,* 2002). According to a report conducted in Yemen, the rate was noted at 50%, while in Bangladesh infection rate was noted at 80% (Farag HF, 1985; Khan *et al.*, 1986). In Pakistan, numerous research work has been done on the spread of this infection in different parts of the country (Bilqees *et al.*, 1982; Siddiqui, 1979; Shaikh *et al* 2000; Siddiqui *et al.*, 2002; Shaikh *et al.*, 2009). Similarly, in urban areas such as Islamabad (23%) (Qureshi, 1992) and Zhob (30.6%) (Ghauri and Alam, 1992) less prevalence was noted as compared to the rural areas where the prevalence was noted high such as Skardu (54.9%) (Ali *et al.*, 2006) and Abbottabad (85%) (Nishiura *et al.*, 2002).

Keeping in the view of the above factors, the research was completed in Quetta city. To know what the infection rate is among the children of Balochistan, we had collected stool samples of both sexes and all age groups. The risk factor was also included in the research, to examine the other factors that can cause the spread of the infection.

Materials and methods

Study area

Quetta city is the capital of the Balochistan province, Pakistan. It is the largest district with a population of nearly 2,275,699. Quetta is mountainous and located at a typical elevation of 1680 meters (5510 feet) above sea level, forming it Pakistan's only high-altitude major city.

Sampling method

We had collected the samples of stools from rural and urban areas from March to October 2018. The study populations of children were divided according to 3 age groups (up to 5 years, 6–10 years and 11–15 years). The study comprises of a cross-sectional investigation containing a designed questionnaire. The Following data was required for demographic factors such as age, sex, locality and learning level and also a few related gastrointestinal symptoms such as abdominal distress, sickness, vomiting and diarrhea. Approximately 2g of fresh stool was collected from each individual using a cleaned cup. Each of the specimens was labeled. Intestinal parasites; egg, larva and adult worm were examined under a compound microscope, using normal saline solution and iodine solution using a small portion of a fecal sample. While the remaining portion of the stool samples was stored in a mixture of sodium acetate, glacial acetic acid and 10% formalin solution then transport to the Research Laboratory for further examination. However, the collected stools were concentrated using the formol-ether sedimentation technique, screened using conventional normal saline and Lugol's Iodine wet mounts and examined under the compound microscope.

Laboratory methods

To find out the eggs, as well as the larvae of the helminthic parasites in fecal samples, the thick smear method of Kato-Katz was used (Birrie and Medhin, 1996). To find the larvae of hookworm species, the revised Harada Mori stool cultivation procedure was used (Widjana and Sutisna, 2002). The agar plate culture was used for the retrieval of larvae of *Strongyloides stercoralis*. The taxonomic identity of the parasites was performed with the use of available literature (Manwell, 1961; Yamaguti and Systema, 1961).

Statistical analysis

Intestinal helminths infection and relation to possible risk factors were determined by using epi-info™ (version 7.3) statistically through Chi-square ($\chi 2$) test. Graph plotting was performed by GraphPad Prism (version 8.0, USA). The Sample area coordinates were adjusted by ArcGIS (version v10.5 Redlands, CA, United States).

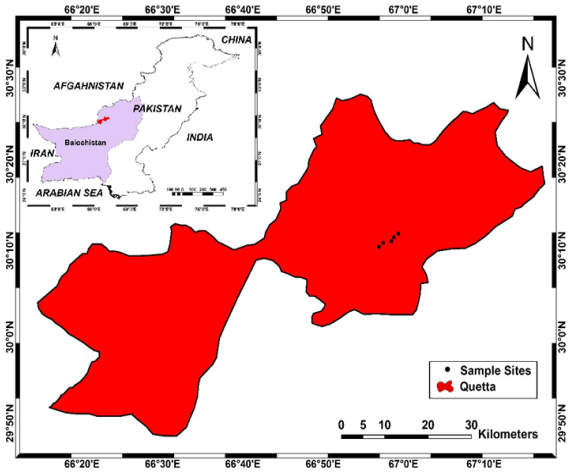

Fig. 1. Map showing the samples collection sites in the Quetta district, Balochistan Pakistan.

Results

A total of 315 stool samples were inspected during the study. Of which 138 (43.80%) fecal smear was found positive with helminthic parasites and 177 (56.19%) negative (Fig. 2). Five species of intestinal helminths viz., *Hymenolepis nana*, *Enterobius vermicularis*, *Ascaris lumbricoides*, *Strongyloides stercolaris* and *Ancylostoma duedenales* were determined during the investigation. The *H. nana* was found to be highest in 48 (15.24%) children followed by *Enterobius vermicularis* in 38 (12.06%), then *A. lumbricoides* in 32 (10.15%), *S. stercolaris* in 12 (3.80%) and least in *A. duedenale* 8 (2.54%) respectively (Table 1).

Among the examined fecal smear, 57 were found positive for males and 81 for females respectively. The highest prevalence rate of infection was observed in female 25.71% than male 18.09%. The fecal samples of three aged groups ranging between 1-5 (Group-A), 6-10 (Group-B) and 11-15 (Group-C) years were examined and found 21, 64 and 53 fecal samples positive with the prevalence rate of 6.66%, 20.31% and 16.82% respectively. The result revealed a high prevalence rate in the age group of 6-10 years of children than 11-15 years and up to 05 years of children. The locality wise prevalence of infection was found highest 86 (27.30%) in the rural areas than of urban areas 52 (16.50) (Table. 2).

Table 1. Prevalence of intestinal helminths parasites (positive case record).

Intestinal helminths	Number of positive samples (n=315)	Percentage (%)	p-value
Ascaris lumbricoides	32	10.15%	0.002
Ancylostoma duedenale	8	2.54%	0.003
Enterobius vermicularis	38	12.06%	0.52*
Hymenolepis nana	48	15.24%	0.03
Strongyloides stercolaris	12	3.80%	0.001
Total	138	43.80	-

* Non-significant values.

Table 2. Socio-demographic risk factors and intestinal helminthic infection among children of Quetta district.

Variables		IPI Positive*	p-value**
Gender	Male Female	57 (18.09) 81 (25.71)	0.02
Age category	1-5 6-10 11-15	21 (6.66) 64 (20.31) 53 (16.50)	0.01
Residence	Rural Urban	86 (27.30) 52 (16.50)	0.34
Latrine	Unavailable Available	87 (27.61) 51 (16.19)	0.05
Family size	2-5 More than 5	36 (11.42) 102 (32.38)	0.02

*The percentage is calculated from the total examined for the representative characteristic.

** Non-significant.

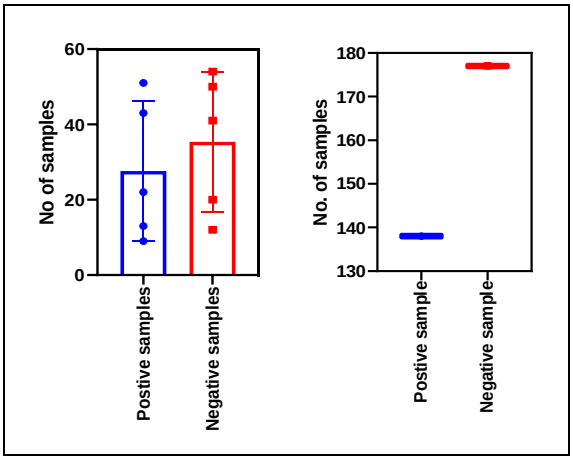

Fig. 2. The Overall prevalence of intestinal helminths among children of the local population of Quetta district.

Discussion

The prevalence of intestinal helminth infection is quite common in countries. This infection in Pakistan is also widespread in different parts of the country. The occurrences of intestinal helminths infections are slightly common among the countries. In Pakistan, it is also widely dominant with variable distribution in different parts of the country. A total of 315 fecal samples were examined, in which 138 samples were observed positive with an overall prevalence rate of 43.80%. This result was confirmed in the twin city of Pakistan, Rawalpindi and Islamabad where the prevalence of positive cases was found 14.6% and 34% respectively (Qureshi, 1992). Similar results (28.27%) were stated from Nawabshah (Akhund, 1994), Larkana 31%, and Shikarpur 33% (Shaikh *et al.*, 2003). It was shown in another research that due to lack of low sanitation conditions, more parasitic infections were found in school going children of public school (66.7%) than private (33.3%) (Pal and Subhani, 1989). The highest rate of infection (87.5%) was found in children who did not wash their hands before eating.

During the survey the five species of intestinal helminths viz *H. nana*, *Enterobius vermicularis*, *A. lumbricoides*, *Strongyloides stercolaris* and *A. duedenale* were identified. Among these, the most common was found the *H. nana* with the highest prevalence rate of (15.24%) followed by *E. vermicularis* (12.06%), *Ascaris lumbricoides* (10.15%), *Strongyloides stercoralis* (3.80%) and least common was observed the *A. duedenale* (2.54%). This result was also confirmed, where *H. nana* (16.19%) was identified as the most common helminths, also described as the common helminths in further studies (Ross, 2017). Another research revealed that the highest intestinal prevalence was obtained in *Ascaris lumbricoides* (29.20%) and least in *Hymenolepis nana* (2.35%). *Strongyloides stercoralis* (3.80%) and the least common was observed in the *A.*

The result also revealed that a high prevalence rate was observed in females 81 (25.71%) than male 57 (18.09%) in the rural and urban areas. A Similar observation indicates that intestinal parasites are higher in females (51.29%) than males (48.08%) (Akhund, 1994). The children of three age groups were examined and found a high infection rate 64 (20.31%) in the children of the middle age group 6-10 years , followed 53 (16.50%) of the age group11-15 and lower 21 (6.66%) in the age group of up to 5 years. These findings confirmed by Okafor, (2018) that the highest infection was at the age of 10-13 years (52.54%) and least was 14-17 years (49.02%). It was also verified by Ghauri, (1992). They recorded The high prevalence in the children of the middle age group (up to 12 years) than the children of above 12 years of age group.

The Current study shows that among five species of intestinal helminthic parasites, the most common helminths in children is *H. nana* 24 (15.24%) followed by *E. vermicularis* 38 (12.06%), *A. lumbricoides* 32 (10.15%), *S. stercolaris* 12 (3.80%) and least in *A. duedenale* 8 (2.54%) respectively. It is also noted that the highest prevalence rate occurs in the children of the middle age group from 06 to 11 years than of other age groups. Further, the percentage of female patients was higher in all age groups.

Conclusion

Our research shows that poor cleaning systems, water shortage, lack of sewage water system, rapid population spread, washing hands before eating and less education done in the society are the key factors responsible due to which the problem is spreading rapidly.

At the core of all problems, people need to be aware of what the problem is and it is more important to know how the problem can be remedied. Government, society and individual processes in this regard are the three stakeholders who can help to solve the problem.

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