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Prevalence of Pinworm Infection in Children of District Mardan, Khyber Pakhtunkhwa, Pakistan

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ABSTRACT

The aim of this study was to determine the Enterobius vermicularis prevalence in Khyber Pakhtunkhwa's (KP) Mardan district. Five months, from December 2018 to April 2019, were used to gather the data. For the research, 140 kids between the ages of 1 and 14 were chosen at random. Enterobiasis was detected in stool samples by the direct smear technique. The findings of this study revealed that 27% (38/140) ($p<0.05$) of children had positive E. vermicularis tests. As compared to boys, girls had a greater prevalence. Age-wise study showed that children aged 1–5 years had the highest prevalence (34.33%) ($p<0.05$), while those aged 11–14 years had the lowest frequency (14.8%). Out of all the areas tested, Rashakai had the greatest incidence (34%). Monthly, the prevalence was at its lowest in April 2013 (17.4%) and at its highest in March 2013 (35.14%) ($P < 0.05$). The results indicate that E. vermicularis is highly prevalent in Rashakai, underscoring the necessity of focused treatments in this region. Therefore, a clean water supply, proper living conditions, cleanliness, and health education can all help to control and limit the infection. The study concludes that E. vermicularis prevalence varies by age, sex, region, and season. High rates in Rashakai and among children highlight the need for targeted interventions, including health education, improved sanitation, and routine screening, to effectively reduce infection burdens in vulnerable populations.

INTRODUCTION

The human pinworm, *E. vermicularis*, is the cause of enterobiosis, which affects more than 400 million people worldwide. E. vermicularis infections are still present, however they are more common in underdeveloped nations, whereas parasitic diseases have mostly been eliminated in industrialised nations. According to Farooqi (1964) and Khan et al. (2017a), the prevalence rates in Pakistan rose from 0.2% in 1964 to 14.1% in 2017. Because eggs cannot survive in hot, dry environments, the infection is less prevalent in tropical regions (Afrakhteh et al., 2016).

Pinworm is the common name for the intestinal nematode helminth parasite *E. vermicularis* (Roberts and Janovy, 2009). The most common contact-borne infectious helminth is Enterobius infection. In most cases, enterobias is caused by ingesting eggs through contaminated hands or food. The lumen of the caecum or terminal ileum is home to mature threadworms. In crowded communities and unsanitary settings, it is especially more common in children. According to one estimate, there are one billion sick persons worldwide (Nagar, 1987; Cook, 1994). While most cases are asymptomatic, children may experience symptoms such as irritability, loss of appetite, catarrhal inflammation, insomnia, bedwetting, teeth grinding, diarrhoea, pruritus vulvae, nightmares, nausea, recurrent cellulitis, and endometritis. Additionally, anal itching is the primary sign of the illness. Pinworms can occasionally cause deadly submucosal infections (Lee et al., 2011).

Ingestion of eggs carrying third-stage larvae, usually through tainted hands, drink, or food, is how the disease is spread. The duodenum is where eggs hatch, while the caecum is where larvae develop. Males die after mating, but females carry up to 11,000 eggs, which can

contaminate bedding, clothes, or be swallowed or breathed (Bogitsh et al., 2013; Park et al., 2005).

Mostly a childhood infection, enterobiosis causes itching in the perianal area, discomfort in the abdomen, sleeplessness, irritability, and sometimes serious side effects like recurrent UTIs, appendicitis, and ectopic infections in the female reproductive tract, liver, and lungs (Kubiak et al., 2017; Choudhury et al., 2017; Ng et al., 2011).

According to studies conducted in Pakistan over the previous 20 years, prevalence rates vary by location and technique, ranging from 1.3% to 16.3% (Jamil, 1999; Khan et al., 2018b). Only a small amount of research, meanwhile, focusses on pinworm infections in humans. The occurrence of *E. vermicularis* in children in Pakistan's District Mardan is investigated in this study.

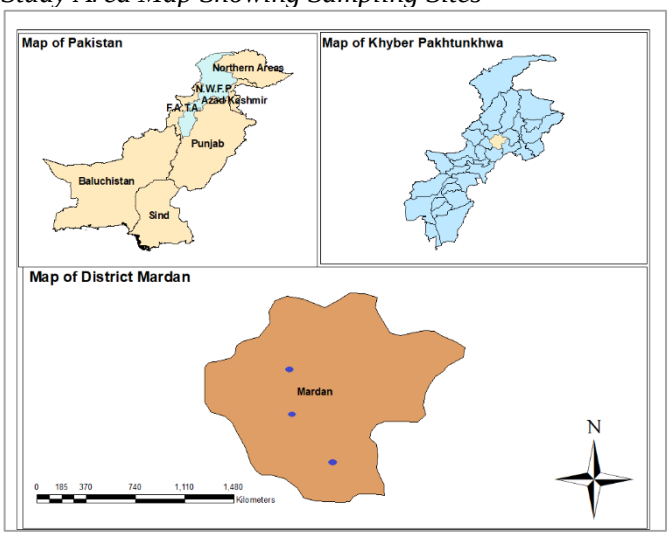
MATERIALS AND METHODS

Study Area

In District Mardan, the second-largest district in Pakistan's Khyber Pakhtunkhwa province, a cross-sectional study was carried out to investigate the prevalence of *E. vermicularis*. It is 1632 km2 in size and is situated in Pakistan at 34°N and 72°E. Malakand to the north, Nowshera to the south, Charsadda to the west, and district Swabi to the east form the district's borders (Figure 1). There are different seasons in the region, which has an average temperature of 22.2°C and an annual rainfall of 559 mm.

Figure 1

Study Area Map Showing Sampling Sites



Data Collection

The study was carried out between December 2018 and April 2019. 140 stool samples were taken from children ages 1 to 14 who were admitted to government hospitals (64 boys and 76 girls). A standardized questionnaire to gather demographic information (age, sex, date of collection, locale, digestive problems, and prior anti-parasitic medication) was created before to the study's start. To outline the goal of the study and obtain approval to conduct it, a meeting was arranged with the hospital's medical superintendents.

All of the children (participants) received verbal instructions the day before specimen collection on how to handle and collect fecal samples using screw-capped, wide-mouth plastic bottles that were clean, dry, and included 10% M.I.F. (merthiolate, iodine, formaldehyde) preservatives, along with a wooden spatula. The kids were told to gather around 10 grams of excrement. Following that, all of the samples were taken to Abdul Wali Khan University's Laboratory of Parasitology, Zoology Department, Mardan, for additional processing. Children who received anti-helminth treatment or whose parents forbade them from taking part in the research were not included.

Microscopic Examination

Wet Mount Techniques using Lugol iodine solution and regular saline were used to conduct the laboratory study for the diagnosis of the the disease. Procedures and techniques for sedimentation, floatation, and centrifugation were also employed to validate the findings.

Statistical Analysis

The children's data was initially entered into Microsoft Excel (2016 Version), organised, and then subjected to a descriptive analysis using Graph Pad Prism version 9. A significance level of $P \leq 0.05$ was applied to probability values that were less than or equal to 0.05.

RESULT

The aim of the current study was to ascertain the prevalence of *E. vermicularis* infection in children during a five-month period, from December 2018 to April 2019, in three different locations: Rashakai, Sheikh Maltoon Town, and Mardan. 140 stool samples from randomly chosen children of both sexes, ages 1 to 14, were gathered. The direct smear technique was used to analyse these samples in order to detect *E. vermicularis* infections.

According to the study, 38 (27%) ($P<0.05$) of the 140 children that were examined tested positive for *E. vermicularis.* A total of 64 males and 76 females made up the study population (Table 3.1). A larger prevalence rate among females than males is suggested by the fact that out of them, 16 males (25%) and 22 females (28.9%) ($P<0.05$) were determined to be infected. This sex-based variation in prevalence might be a result of behavioral variations, exposure hazards, or hygiene behaviours. Significant variations across the sample locations were shown by a geographic analysis of prevalence rates. The greatest prevalence rate of *E. vermicularis* was found in Rashakai (34%), followed by Sheikh Maltoon Town (24%), and Mardan (22.5%) ($P<0.05$) (Table 3.2). Variations in environmental circumstances, sanitary

standards, or socioeconomic variables that impact the parasite's spread in various areas might be the cause of these discrepancies.

The distribution of prevalence rates by age showed notable variance. The highest frequency of *E. vermicularis* infection was seen in children aged 1–5 years (34.33%), followed by those aged 6–10 years (23.9%). Children between the ages of 11 and 14 had the lowest prevalence rate, at 14.8% (P<0.05) (Table 3.3). According to these results, younger children could be more vulnerable because of their developing immune systems, intimate contact habits, or poor personal cleanliness.

Temporal changes in infection rates were further highlighted by the month-by-month prevalence study. March 2013 (35.14%) had the highest occurrence, followed by December 2012 (32%), February 2013 (25.7%), and January 2013 (20%). In April 2013, the prevalence rate was at its lowest, 17.4% (P<0.05) (Table 3.4). The survival and spread of *E. vermicularis* eggs in the environment may be impacted by climatic conditions, which may be connected to these seasonal fluctuations.

Table 3.1

Gender Wise Percentage Prevalence

Factors (Gender)	Sample Observations	Infected Samples	% Prevalence	*P* Value
Male	64	16	25.00%	
Female	76	22	28.95%	**<0.05**
Total	140	38	27%	

Figure 3.1a

Gender wise prevalence percentage of Enterobius vermicualaris

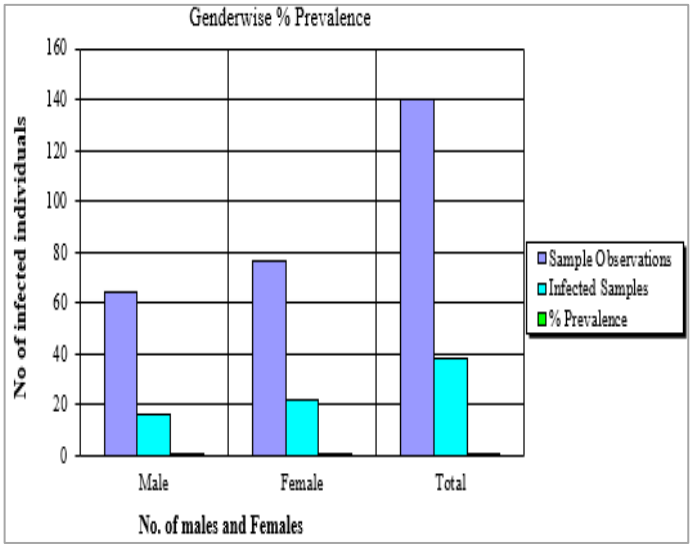


Table 3.2

Area wise Percentage Prevalence

Area	Samples	Infected	% Prevalence	*P* Value
Mardan City	40	9	22.50%	**<0.05**
Shaikh Maltoon Town	50	12	24.00%	
Rashakai	50	17	34.00%	
Total	140	38	27%	

Figure 3.2a

Area wise prevalence percentage of Enteroibius vermicularis

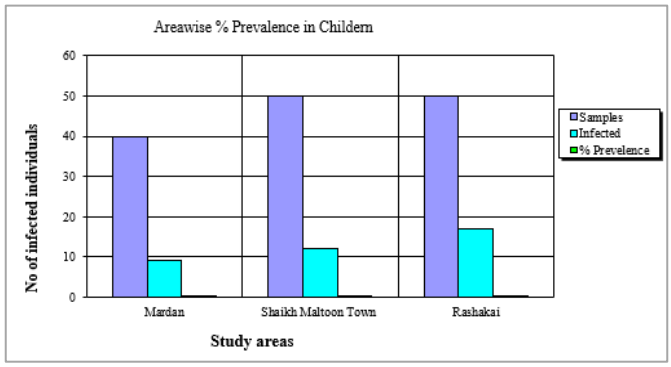


Table 3.3

Age Wise Percentage Prevalence

Age	Sample Observations	Infected Samples	% Prevalence	*P* Value
1-5	67	23	34.33%	
6-10	46	11	23.9%	**<0.05**
11-14	27	4	14.8%	

Figure 3.3a

Age wise prevalence percentage of Enterobiasis

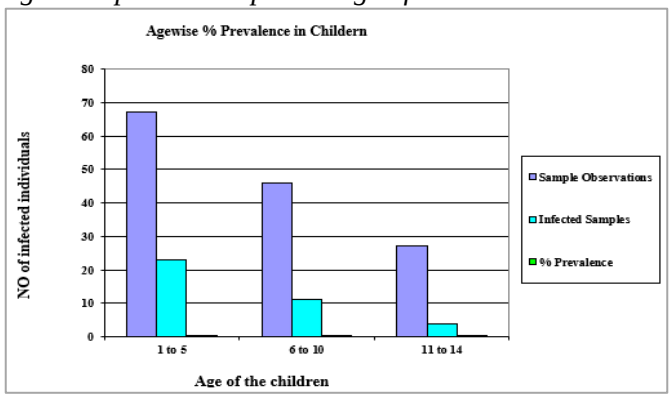


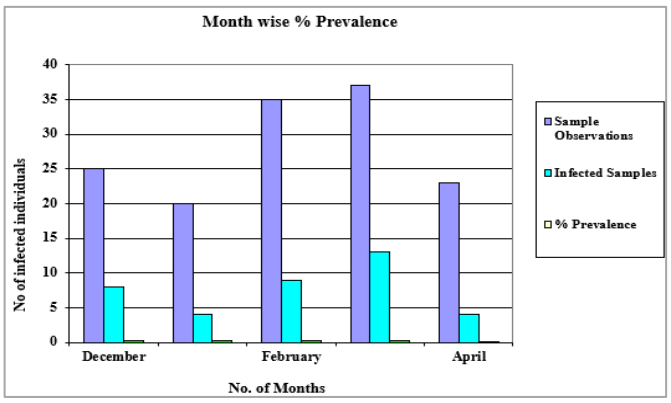
Table 3.4

Month wise Percentage Prevalence

Month	Sample Observations	Infected Samples	% Prevalence	*P* Value
December	25	8	32%	
January	20	4	20%	
February	35	9	25.7%	**<0.05**
March	37	13	35.14%	
April	23	4	17.4%	
Total	140	38	27%	

Figure 3.4a

Month wise prevalence percentage of Enterobiasis.



DISCUSSION

According to reports, Pakistan has a prevalence of *E. vermicularis*, or pinworm, ranging from 2% (Farooqi, 1964) to 34.05% (Niaz et al., 2019). This intestinal parasite, which primarily affects youngsters, is still a serious threat. Infectious eggs are consumed, mostly via infected fingers that transport the infection directly from the anus to the mouth. This transfer is frequently facilitated by the itching of the perianal folds caused by the presence of eggs, which is made worse by actions like nail-biting, poor hygiene, and insufficient handwashing techniques.

According to the current study, 27% of children in District Mardan, Pakistan, between the ages of 1 and 14 have *E. vermicularis.* This percentage is in line with earlier research by Niaz et al. (2019), which found that 34.05% of people had the condition. Variable prevalence rates are seen when comparing with other regional studies: 3.5% in Peshawar (Siddiqi & Bano, 1979), 3.03% in Dir (Pal & Subhani, 1989), and 11% in District Malakand (Khan et al., 2019). Notably, Jamil (1999) reported a frequency of 13.8% in Islamabad, but Maqbool et al. (2007) reported a prevalence of 16.3% in Lahore. According to other research, rates in Swat occupational categories range from 14.1% (Khan et al., 2017a) to 8% (Khan et al., 2015).

The prevalence rates in Rashakai, Sheikh Maltoon, and Mardan City were 34%, 24%, and 22.5%, respectively, within District Mardan. The location most impacted turned out to be Rashakai. Compared to Niaz et al. (2019), the study's overall prevalence rate was lower, which may indicate a drop in infection rates.Pinworm infection was more common in females (28.95%) than in males (25.00%). This is in contrast to research that found no discernible gender differences by Park et al. (2005), Hazratitappeh et al. (2002), and Requena et al. (2007). Studies like Afrakhteh et al. (2016) and Amiri et al. (2016), however, provide evidence that gender-based disparities do not exist. In line with findings by Taylor et al. (2018) and Nithikathkul et al. (2001), children ages 1 to 5 years had the greatest infection rate (34.33%). Other parts of the nation also reported varying prevalence percentages for *E. vermicularis*. According to Farooqi (1964), Ali (1993), Chaudhry et al. (2004), and Sajjad et al. (2009), the prevalence was 0.6%, 2.3%, and 1.8%, respectively. These discrepancies might be explained by variances in geographic location, cultural customs, personal cleanliness, and climate.

The study found that a number of variables, such as population density, frequent medication use, and personal cleanliness, affect the incidence of *E. vermicularis*. Playing on the floor, thumb-sucking, nail-biting, and insufficient handwashing are examples of poor hygiene behaviors that have been closely linked to increased infection rates (Sung, 2001). Infection rates were noticeably greater in children who engaged in behaviours like thumb-sucking and poor nail cleanliness than in children who did not. The results highlight the need of raising public health awareness and enhancing personal cleanliness in order to reduce the prevalence of *E. vermicularis*. The prevalence of enterobiasis in Pakistani children might be considerably decreased by addressing behavioral risk factors in conjunction with educational treatments.

CONCLUSION

The study's overall conclusions show notable differences in *E. vermicularis* prevalence according to age, sex, region, and season. In order to lessen the burden of *E. vermicularis* infections in these susceptible groups, focused public health interventions—such as health education, better sanitation, and routine screening—are necessary, as evidenced by the high prevalence rates seen in Rashakai and among younger age groups.

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