Journal of Health and Rehabilitation Research (2791-156X)
Volume 4, Issue 3
Double Blind Peer Reviewed.
https://jhrlmc.com/
DOI: https://doi.org/10.61919/jhrr.v4i3.1140
www.lmi.education/

# Epidemiology of *Ascaris lumbricoides* in District Karak, Khyber-Pakhtunkhwa Pakistan

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**Keywords**
*Ascaris lumbricoides*, intestinal parasitic infection, prevalence, District Karak, Khyber-Pakhtunkhwa, cross-sectional study, rural health, public health, soil-transmitted helminth.

**Disclaimers**

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|---|---|
| Authors' Contributions | All authors contributed equally to the study. |
| Conflict of Interest | None declared |
| Data/supplements | Available on request. |
| Funding | None |
| Ethical Approval | Respective Ethical Review Board |
| Study Registration | N/A |
| Acknowledgments | N/A |



## ABSTRACT

**Background**: Ascariasis, caused by *Ascaris lumbricoides*, is a significant public health concern globally, particularly in developing regions. This intestinal parasitic infection is prevalent among rural communities with poor sanitation and hygiene practices, affecting various age groups, especially children.

**Objective**: This study aimed to assess the prevalence and risk factors associated with *Ascaris lumbricoides* infection in District Karak, Khyber-Pakhtunkhwa, Pakistan.

**Methods**: A cross-sectional study was conducted with 143 participants aged 2 to 60 years. Fecal samples were collected and analyzed using flotation and sedimentation techniques for the detection of *Ascaris lumbricoides* ova. Socio-demographic data, hygiene practices, and environmental factors were recorded through structured questionnaires.

**Results**: Out of 143 samples, 71 tested positive, indicating a prevalence rate of 49.5%. The prevalence was higher in rural areas (71%) compared to urban areas (31%). Females (58.3%) and children (67.6%) had a higher infection rate. The most common water source was the pressure pump (43%). Mebendazole (65%) was the preferred treatment.

**Conclusion**: The prevalence of *Ascaris lumbricoides* is alarmingly high in District Karak, with rural populations, children, and females being the most vulnerable. Effective public health interventions are needed.

## INTRODUCTION

Several developing countries continue to face serious health issues related to intestinal parasites. An estimated 1.5 billion cases of *Ascaris lumbricoides*-related ascariasis occur worldwide (3). Approximately 10.5 million disability-adjusted life years (DALYs) are lost due to this condition globally (18). Because helminth infections tend to be persistent and develop gradually, they are often described as having distinct clinical presentations compared to other infectious disorders (8). It is widely accepted that most infections severely impede childhood nutrition, especially in areas where poor development is prevalent (16). In clinical practice, a severe A. lumbricoides infection is a significant cause of intestinal obstruction (2). The soil-transmitted helminth *Ascaris lumbricoides*, commonly found in tropical and subtropical regions, is a ubiquitous nematode that causes human infections. Unsanitary conditions have led to an increased prevalence of this infection. Approximately 4 billion people are at risk, including 613 million children of school age (4).

Human gastrointestinal tracts are home to adult A. lumbricoides, which frequently exhibit no outward symptoms. Asymptomatic ascariasis can be identified by detecting eggs in the feces (13). However, pulmonary, intestinal, appendicular, hepatobiliary, and pancreatic ascariasis are among the clinical conditions associated with worm infection (17). Ascaris infection is a major contributor to protein-energy and micronutrient deficiencies in endemic regions (14). These deficiencies can result in stunted growth, reduced cognitive function, impaired immune regulation, and an increased risk of subsequent parasitic diseases. This study was conducted to evaluate the prevalence and intensity of *Ascaris lumbricoides* and to analyze the socio-economic and cultural risk factors associated with the infection in District Karak.

## MATERIAL AND METHODS

This study was conducted in different tehsils of District Karak, which has a population of 706,299 and covers an area of 3,372 square kilometers. The district lies between 70° 40' to 71° 30' north latitudes and 32° 48' to 33° 23' east longitudes. The study site was located at 33.1105° N, 71.0914° E. The summer months of May through September are extremely hot, with temperatures often ranging between 38°C and 42°C (100°F and 108°F). The evenings remain warm, rarely falling below 20°C (68°F). The Department of Zoology at Khushal Khan Khattak University in Karak, Khyber Pakhtunkhwa, Pakistan, approved the study protocol. About 143 samples and questionnaire data were collected from people in various areas of District Karak.

The sedimentation process involved conical centrifuge tubes, which are narrow-bottomed tubes used to hold fecal samples and allow sedimentation to occur. The sediment was then collected at the bottom for examination. Sample

processing was done by treating the stool samples with 10% formalin in a Falcon tube. The mixture was allowed to stand for at least 30 minutes, allowing the eggs to settle at the bottom of the tube. The sediments were examined under a microscope for the presence of *Ascaris lumbricoides* eggs (6).

Two grams of feces were added to 10 ml of 4% NaCl solution and carefully mixed. A test tube was filled with the suspension, and an additional 4% NaCl solution was added. After applying a coverslip to the top of the test tube and waiting 10 to 15 minutes, the coverslip was removed vertically and examined under a microscope (10×) (1). The Data collected through the questionnaire was analyzed for statistical analysis of the infection rate and risk factors

## RESULTS

In our study, the highest prevalence was recorded in Karak at 39% (n=39), followed by Takht-e-Nusrati and Banda Daud Shah at 26% (n=19) and 18% (n=13), respectively. The highest infection rate was among the 11–20-year age group at 33% (n=24), followed by the 2–10-year age group at 25% (n=18). Other age groups, 21-30, 31-40, and 41-50, had infection rates of 19% (n=14), 12% (n=9), and 11% (n=6), respectively. Gender was not associated with infection, as we observed 47% in males (n=32) and 53% (n=38) in females. The duration of the disease was more frequently observed in the 1–6-month range at 69% (n=49), compared to one year at 22% (n=17) and two years at 5% (n=4). The highest prevalence of infected cases was recorded during the summer season, while the other three seasons (winter, autumn, and spring) showed lower infection rates. The most common symptoms experienced by patients were abdominal pain (46%, n=33), weight loss (30%, n=22), and worms in the stool (22%, n=16). Stool sample tests were used more frequently (49%) than blood tests (23%). The infection was categorized as single (66%) and double (19%). Socio-demographic characteristics studied included financial conditions, with 62% (n=39) of the patients identified as poor, 29% (n=19) as middle class, and 9% (n=14) as rich. Of the patients, 69% (n=49) lived in rural areas, while 30% (n=22) were from urban areas. Most of the subjects did not have any animals at home (78%), while 16% had pets and 5% had small ruminants. Most subjects were both vegetarian and non-vegetarian (92%). The source of water used was primarily from pressure pumps (66%), followed by public pipelines (19%). Frequent contact with soil was common among infected persons (71%), and only 18% were involved in geophagia. Daily routines were disturbed by the infection in 73% of patients, and 54% were psychologically affected.

Treatment duration was recorded as a few weeks (73%), six months (16%), and one year (12%). The most frequently used drug was mebendazole (60%, n=42), followed by albendazole (35%, n=25). Eighty percent of patients completed their medication course, while 20% did not.

**Table 1 Demographic and Clinical Characteristics of Study Participants, Prevalence of *Ascaris lumbricoides*, and Associated Risk Factors in District Karak, Khyber-Pakhtunkhwa, Pakistan**

| Categories | Frequency | Percentage |
|---|---|---|
| Tehsil Wise distribution | | |
| Karak | 39 | 54 |
| BD shah | 13 | 18 |
| Takht e Nusrati | 19 | 26 |
| Gender | | |
| Male | 32 | 47 |
| Female | 38 | 53 |
| Age groups | | |
| 2-10 | 18 | 25 |
| 11-20 | 24 | 33 |
| 21-30 | 14 | 19 |
| 31-40 | 9 | 12 |
| 41-50 | 6 | 11 |
| Duration of the disease | | |
| 1-6 months | 49 | 69 |
| One year | 17 | 22 |
| Two years | 4 | 5 |
| More than two years | 1 | 1 |
| Season of infection | | |
| Summer | 46 | 64 |
| Winter | 11 | 15 |
| Autumn | 9 | 12 |
| Spring | 6 | 8 |
| Symptoms during infection | | |
| Abdominal pain | 33 | 46 |
| Weight loss | 22 | 30 |
| Worms in stool | 16 | 22 |
| Diagnosis Test | | |

| Categories | Frequency | Percentage |
|---|---|---|
| Stool Test | 55 | 77 |
| Blood Test | 16 | 23 |
| Number of Infection | | |
| Single | 47 | 66 |
| Double | 14 | 19 |
| Treatment duration | | |
| Few weeks | 52 | 73 |
| Six months | 12 | 16 |
| One year | 7 | 12 |
| Financial condition | | |
| Poor | 39 | 62 |
| Middle class | 19 | 29 |
| Rich | 14 | 9 |
| Drugs used | | |
| Mebendazole | 42 | 60 |
| Albendazole | 25 | 35 |
| Area of living | | |
| Rural | 49 | 69 |
| Urban | 22 | 30 |
| Animals at home | | |
| Pets | 12 | 16 |
| Small ruminants | 4 | 5 |
| Foot type | | |
| Vegetarian | 2 | 2 |
| Non-vegetarian | 4 | 5 |
| Both | 65 | 92 |
| Source of water | | |
| Pressure pump | 47 | 66 |
| Public pipeline | 14 | 19 |
| Others | 10 | 15 |
| Medication course | | |
| Complete | 57 | 80 |
| incomplete | 14 | 20 |
| Contacts with soil | | |
| Yes | 51 | 71 |
| No | 20 | 29 |
| Geophagia | | |
| Yes | 13 | 18 |
| No | 58 | 82 |
| Psychological influence | | |
| Yes | 39 | 54 |
| No | 32 | 45 |
| Total prevalence | | |
| Positive | 71 | 49.5 |
| Negative | 72 | 50.5 |

## DISCUSSION

According to recent studies, the overall prevalence of ascariasis in the Karak District is 49%, indicating that the infection is relatively common in this area. Several studies have been conducted on the prevalence of ascariasis in Pakistan. One study in Lahore, Punjab province, reported a prevalence of 0.88% in children (1). Another study conducted in Lake Tana, Northwest Ethiopia, reported a prevalence of 14.8%, which is lower than the current study's findings (7). In the current study, the prevalence of *Ascaris lumbricoides* was 49.5% in soil samples, higher than the 6.3% prevalence reported in Uganda by Kabatereine (10). A study in Brazil by Fleming (5) reported a prevalence of 48.8%, almost equal to the current study. However, a study in Upper Dir (19) reported a prevalence of 73.87%, higher than in the current study. *Ascaris lumbricoides* may survive in clusters of family members with inadequate sanitary conditions, poor fecal disposal, and urbanization, allowing it to spread from person to person. These conclusions are supported by (15). In the current study, the 2–10-year age group also had a relatively high prevalence rate of 25%, which aligns with previous studies (12) that have identified children aged 3–13 years as the high-risk group for *Ascaris lumbricoides* infections, as found in a study conducted in the rural community of Assam (22). Children who are repeatedly exposed to contaminated soil or water may experience prolonged infections (20). However, some

studies have not found a significant difference in prevalence between males and females. Another study in a rural community in Venezuela (9) found that gender was a significant predictor of ascariasis, with females having a higher risk of infection. The presence of pets or animals in the home has also been investigated as a potential risk factor for *Ascaris lumbricoides* infection. A study by (21) found that having dogs and cats in the home was associated with a higher prevalence of infection.

## CONCLUSION

*Ascaris lumbricoides* infection rates are high in Pakistan, particularly in the southern region. Compared to rural areas, more people in urban areas are exposed to the infection, likely due to the higher concentration of healthcare centers. The prevalence of ascariasis in the Karak District is relatively high, consistent with other studies in different regions of Pakistan. Lack of access to clean water, poor sanitation practices, inadequate hygiene practices, and overcrowding are significant risk factors for ascariasis. Children and females are at higher risk of infection than males. The disease is usually short-term but can cause complications if left untreated or if there is repeated exposure to the parasite. The summer season had the highest prevalence of *Ascaris lumbricoides* infections in the Karak District, with significantly fewer cases reported during the other three seasons. Various factors, including weather conditions, soil moisture, and environmental influences, may affect the seasonality of ascariasis. In District Karak and other endemic regions of Pakistan, health education and awareness campaigns should be encouraged to reduce

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