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Original Article

Prevalence of Entamoeba Histolytica in the Human Population in District Dera Ismail Khan Khyber Pakhtunkhwa, Pakistan

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Abstract

Entamoeba histolytica is highly abundant worldwide because of unsanitary conditions and dietary practices. The study was conducted with the aim of the prevalence of entamoeba histolytica in the human population in the district of Dera Ismail Khan Khyber Pakhtunkhwa, Pakistan. We surveyed patients admitted to the District Headquarters Hospital in Dera Ismail Khan, Khyber Pakhtunkhwa, Pakistan, to find out what percentage of patients had E. histolytica. The study recorded that the total incidence of E. histolytica was 22.8%. Compared to females (22.2%), males were more prone (23.8%). Data by age showed that those between the ages of 6 and 10 (27.8%) had the highest age group and those over 30 (5.5%) had the lowest. Month-by-month, February had the lowest prevalence (12.5%), and July had the highest (20.8%). Slightly more sensitive were males (23.8%) than females (22.2%). The age-wise statistic was lowest in those 30 and over years (5.5%) and greatest in the age range between 6 and 10 years (27.8%). Month by month, February (12.5%) had the lower prevalence, and July (20.8%) was the greatest. When the Entamoeba histolytica parasite finds an ideal habitat and host, it can re-emerge as a dangerous illness. There needs to be an E. histolytica vaccine right now to keep people from getting the very bad disease that Entamoeba histolytica causes. Furthermore, it is imperative to suggest measures aimed at enhancing the ecosystem and preserving the general ecology to actively avoid and manage the spread of E. histolytica. Additionally, monitoring and treating air pollutant concentration, temperature, rainfall, and other climate change variables in Dera Ismail Khan should also be prioritized. The study is conducted in only one city, yet future researchers need to undertake it at a large scale with a large sample size throughout the country.

Keywords: Prevalence, Entamoeba Histolytica, Facial Samples, Descriptive Analyses, Human Population.

Introduction

Amoebiasis is a condition caused by the parasite Entamoeba histolytica. This parasite resides in the lumen of the host's large intestine and sustains itself by consuming the mucous membrane of the intestine and red blood cells. These parasites produce enzymes that degrade the mucous membrane, penetrating the intestinal wall and causing the destruction of its cells, resulting in the formation of painful ulcers. Therefore, dysentery arises (Guillen, 2023). Entamoeba histolytica exists in two distinct forms during its life cycle. The active phase is called the trophozoite, during which the amoeba is capable of movement and reproduction. However, it does not serve as a means of disease transmission. The second kind is the cyst, which is stationary but resilient enough to survive its environment (El-Dib, 2017).

The amoeba enlarges within the intestine, reaching a size of 30-40 microns in diameter. Each vesicle contains four nuclei. These amoeba vesicles are excreted in the stool of an infected individual and can be transmitted to food and drink by flies and cockroaches. When a healthy person ingests the amoeba, infection occurs and the disease spreads (Kantor *et al*., 2018). This protozoan could infiltrate the tissue of the intestinal wall in the host, resulting in symptoms such as intestinal pain, sporadic dysentery or constipation, along with fever, shivering, bloody stool, or soft stool with mucus. The duration of symptoms often ranges from one to three weeks. Nevertheless, a small number of individuals may get extraintestinal infections, such as liver abscesses, lung abscesses, or brain abscesses, which can pose serious and sometimes life-threatening dangers (Lin *et al*., 2022). Amoeba transmission often does not result in disease or exhibit any symptoms. However, amoeba can cause dysentery in individuals with a compromised immune system and in males who participate in homosexual activities (Cornick & Chadee, 2017).

"Red cell" refers to hemoglobin, the red pigment. Parasitic infections, starvation, excessive blood loss, and persistent infections all lead to its depletion, which manifests as anemia (Kumar & Singh, 2016). Anemia is one of several diseases that can cause a decrease in packed cell volume, which is related to packed cell volume. White blood cells are fundamental constituents of blood and are found in the peripheral blood. They serve the purpose of safeguarding the body against pathogens, parasites, cancers, and several other disorders (Silva *et al*., 2017). The five kinds of white blood cells, namely neutrophils, eosinophils, basophils, lymphocytes, and monocytes, differ in terms of size, proportions, and functions (Harmening, 2024).

Amebiasis is prevalent globally, with a higher incidence observed in underdeveloped nations located in tropical and subtropical regions. Infections are more likely to arise in orphanages, correctional facilities, shelters, and prisons, where individuals reside in communal settings (Nagata *et al*., 2012). Amebiasis is the result of infection by the protozoan Entamoeba histolytica. Annually, this condition emerges on a global scale in around 40-50 million individuals and results in 40,000 fatalities. Multiple species of protozoans belong to the amebic group. Among them, E. histolytica is a pathogenic ameba capable of causing both invasive intestinal and extraintestinal diseases *(*Nagata *et al*., 2012). Entamoeba histolytica is a parasitic protozoan that specifically infects the human gut and causes a condition known as Amoebiasis. Following malaria and Schistosomiasis, this illness ranks as the third most significant parasitic infection in terms of mortality in humans. Annually, a global mortality death of around 40,000 to 100,000 was recorded. It has a worldwide distribution and is particularly prevalent in tropical and subtropical regions (Zeb *et al*., 2018). The objective of the current study is to determine the prevalence of Entamoeba histolytica in Dera Ismail Khan City based on age and sex, as well as to investigate the impact of infection on the production of red blood cells.

Materials and Methods

Sixty stool samples were obtained from individuals of all ages and genders visiting District Headquarter Hospital Dear Ismail Khan. The collection period spanned from February 1, 2024, to July 1, 2024. Name, age, and gender were all recorded for everyone from whom a sample was obtained. Dehydration kills the vegetative phases; hence the feces samples were placed in sterile vials with covers to avoid contamination, preserve moisture, and prevent drying. Initially, those exhibiting disease-related symptoms such diarrhea, vomiting, intestinal problems, and fever were visually inspected with stool samples. Subsequently, an extensive analysis of the stool samples was conducted through microscopic examination. This involved extracting an adequate quantity of feces from various regions of the sample

and depositing it onto a pristine glass slide. Subsequently, a small quantity of 0.9% Normal Saline solution was introduced, followed by a few drops of iodine solution. The sample was then covered with a slide cover and the glass slides were scrutinized. We employ the lower magnification (4x) followed by the greater magnification (40x) to identify the parasite (Saidin, Othman, & Noordin, 2019; Sekaran, 2010). Three ml of blood was obtained from individuals who tested positive for Entamoeba histolytica in their stool examination. The blood was then transferred into plastic tubes with secure caps, along with the anticoagulant EDTA. The purpose of this was to measure the red blood cell count using a Complete Blood Count device.

Results and Findings

Prevalence of Entamoeba Histolytica

315 individuals were examined from February to July. 72 (22.8%) of the total were contaminated with E. histolytica. Compared to females (22.2%, 27/148), males (23.8%; 40/167) were marginally more susceptible to infection (Table 1& Figure 1).

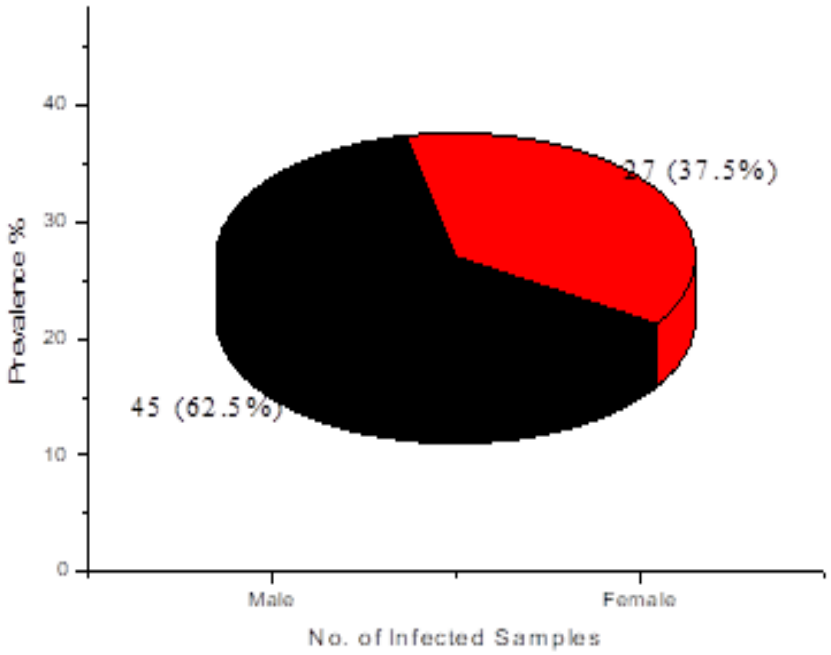
Table 1

Gender-Specific Prevalence of Entamoeba Histolytica

Variable	No. of Infected Samples	Prevalence%
Male	45	26.9
Female	27	18.2
Total	72	45.1

Figure 1

Gender-Specific Prevalence of Entamoeba Histolytica



Further, we evaluated the distribution of E. histolytica and found that it was most common in July (20.8%) and least common in March (12.5%). Monthly percentages for February, April, May, and June are 13.8%, 20.8%, 15.2%, and 19.4%, respectively (Table 2 & Figure 2).

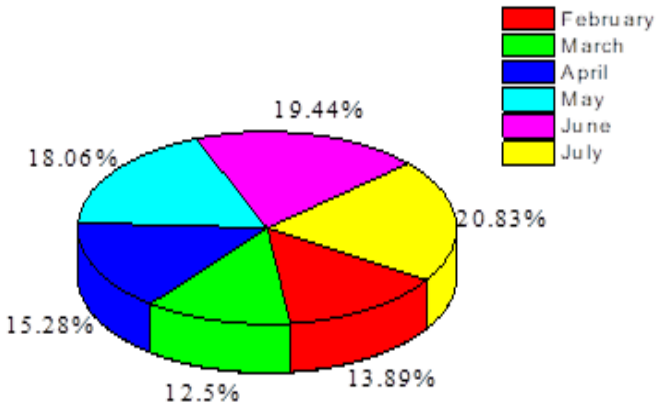
Table 2

The Frequency of E. Histolytica by Month

Parameters	No. of Infected Samples	Prevalence%
February	10	13.8
March	09	12.5
April	11	15.2
May	13	18.0
June	14	19.4
July	15	20.8

Figure 2

The Frequency of E. Histolytica by Month



The prevalence of E. histolytica was highest in the age group of 6 to 10, with a rate of 27.8%, it was reduced in the age group of 30 and above (5.5%). The percentage of individuals aged 11 to 15 years (19.4%), 0 to 5 years (13.9%), 16 to 20 years (15.2%), 21 to 25 years (11.1%), and 26 to 30 years (6.9%) was as detailed in Table 3 and Figure 3.

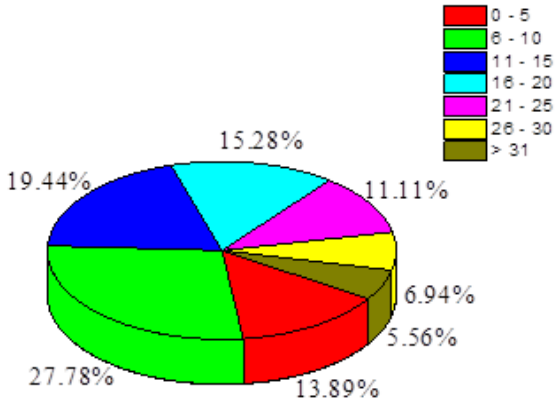
Table 3

The Prevalence of Entamoeba Histolytica by Age Group

Variable	Number of Infected Samples	Incidence%
0 – 5	10	13.9
6 – 10	20	27.8
11 – 15	14	19.4
16 – 20	11	15.2
21 – 25	08	11.1
26 – 30	05	6.9
> 31	04	5.5

Figure 3

Age-wise distribution of Entamoeba Histolytica



Discussion

Intestinal parasite prevalence is often associated with variables including living standards, healthcare quality, personal and environmental cleanliness, sanitation, and clean water availability. A study was done in different areas of District Dera Ismail Khan Khyber Pakhtunkhwa, Pakistan, to find out how common Entamoeba histolytica species were among people who had diarrhea frequency of E. histolytica species in District Dera Ismail Khan has not been documented in any published sources.

The finding indicates that E. histolytica was prevalent at a rate of 22%. In children attending schools in Delhi, India, the frequency of E. histolytica is 11% (Chandrashekhar *et al.*, 2020). In 383 people chosen at random from the Amoebiasis endemic region in Vietnam, the prevalence of E. histolytica was 11.2% (Al-Areeqi *et al.*, 2017). Overall, 29.35% of the stool samples from various localities in Belem, Para State, Brazil, were positive for E. histolytica (Soares et al., 2019). E. histolytica, accounting for 30% of cases, was the predominant intestinal parasite seen in this investigation, consistent with prior research findings. E. histolytica has the highest frequency worldwide, particularly in tropical and sub-tropical nations. Iraq is one of these countries. The humid atmosphere creates optimal environmental conditions for the maturation of the Entamoeba cyst, which may subsequently be transmitted to humans. Additionally, E. histolytica can be transmitted straight to humans without the requirement for an intermediary host (Al-Mozan, Daoud, & Dakhil, 2017).

In the present study, the age groups of 6-10 years (27.8%) and 11-15 years (19.4%) exhibited the maximum prevalence, while the infection rate was lower in the following age groups: 0-5 years (13.9%), 16-20 years (15.2%), 21-25 years (11.1%), 26-30 years (6.9%), and >31 years (5.5%). The findings suggest that the prevalence of the parasite is higher in the younger age group due to the weaker resistance of children compared to adults. Parasitic illness primarily affects younger individuals who are exposed to crowded environments, such as schools and playgrounds (Obateru *et al.*, 2017).

Children are very vulnerable to illness due to their underdeveloped immune system. Primarily, youngsters often neglect to cleanse their hands before a meal and exhibit poor personal and fecal hygiene practices (Gupta *et al.*, 2020). The study also examined the seasonal fluctuation between months and E. histolytica. The current study found that the maximum prevalence occurred in July, with a rate of 20.8%, while the lowest prevalence was recorded in March, with a rate of 12.5%. The infection rate exhibited a progressive increase from May to July, potentially because of the elevated temperatures characteristic of the hot season, which subsequently led to an upsurge in cases of diarrheal disorders resulting from the consumption of water contaminated with pathogens (Ngobeni, Gilchrist, & Samie, 2022).

Conclusions

When the Entamoeba histolytica parasite finds an ideal habitat and host, it can re-emerge as a dangerous illness. There needs to be an E. histolytica vaccine right now to keep people from getting the very bad disease *that Entamoeba histolytica* causes. Furthermore, it is imperative to suggest measures aimed at enhancing the ecosystem and preserving the general ecology to actively avoid and manage the spread of *E. histolytica*. Additionally, monitoring and treating air pollutant concentration, temperature, rainfall, and other climate change variables in Dera Ismail Khan should also be prioritized.

Limitations, and Implications

The study is conducted in only one city, yet future researchers need to undertake it at large scale with a large sample size throughout the country.

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Declaration of Interest

We the authors declare that there is no clash of interest.

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