



## Prevalence of intestinal parasites among gastrointestinal patients in Hun City, Libya: A cross-sectional study

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### ABSTRACT

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**Background:** This cross-sectional study aimed to assess the prevalence and distribution of intestinal parasites among patients attending Al-Masra'a Clinic in Hun city, Aljufra, Libya, from January 2021 to December 2023..

**Methods:** A total of 1,079 stool samples were collected from gastrointestinal patients. Sociodemographic data and risk factors were gathered using a structured questionnaire. Stool samples were examined using light and dark ground microscopy, direct smear techniques with normal saline and Lugol's iodine, and the formalin-ether concentration technique. Ziehl-Nielsen staining was used for microscopic differentiation of parasite developmental forms. Data were analysed using SPSS (version 24), with descriptive statistics and Chi-square tests employed to identify significant associations.

### Keywords:

Intestinal parasites, prevalence, Al-Masra'a Clinic, Libya, public health, sanitation, health education.

**Results:** Intestinal parasites were detected in 13.3% (144/1,079) of the patients, with a significant difference ( $P=0.02$ ). Males had a higher infection rate (68.75%) compared to females (31.25%), with a significant difference ( $P=0.04$ ). The highest prevalence was observed in individuals under 20 years (48.6%), followed by the 20-40 age group (22.2%). *Entamoeba histolytica* was the most common parasite (73.61%), followed by *Giardia lamblia* (10.41%) and *Entamoeba coli* (7.63%). Co-infections were rare (6.25%). The prevalence of infections declined over the study period, from (11.6%) in 2021 to (7.4%) in 2023 ( $P=0.02$ ). Rural areas had a significantly higher prevalence (84.02%) compared to urban areas (15.97%), with a significant difference ( $P=0.04$ ).

**Conclusion:** The study highlights the need for targeted public health interventions, particularly in rural areas, to improve sanitation, health education, and access to healthcare. Enhanced water quality and hygiene practices are crucial to reducing the burden of intestinal parasitic infections in the region.

## 1. Introduction

Intestinal parasitic infections are a significant public health concern, particularly among gastrointestinal patients, who are often more susceptible due to compromised health status and immune function. These infections, caused by a variety of protozoa and helminths, can lead to a range of gastrointestinal symptoms, including diarrhoea, abdominal pain, and malnutrition, which can exacerbate underlying medical conditions (Michaud et al., 2020). The World Health Organization (WHO) estimates that over 1.5 billion people are infected with soil-transmitted helminths globally, with millions more affected by protozoan parasites such as *Giardia lamblia* and *Entamoeba histolytica* (World Health

Organization, 2022).

The epidemiology of intestinal parasites varies significantly across different regions, influenced by factors such as socioeconomic status, sanitation, and access to clean water. In resource-limited settings, the prevalence of these infections is particularly high, often correlating with inadequate hygiene practices and poor living conditions (Crompton, 2001). Moreover, gastrointestinal patients, including those with inflammatory bowel disease (IBD) and other chronic gastrointestinal disorders, are at an increased risk of developing these infections, which can complicate their clinical management and negatively impact their quality of life (Khalil et al., 2018).

Recent studies have highlighted the rising incidence of co-infections, where patients are simultaneously

affected by multiple parasitic pathogens. This phenomenon can complicate the diagnosis and treatment of gastrointestinal diseases, as symptoms may overlap, leading to misdiagnosis and inappropriate therapeutic interventions (Nour et al., 2021). Additionally, the emergence of drug-resistant strains of intestinal parasites poses a growing challenge, necessitating the development of new treatment strategies and public health initiatives aimed at prevention and control (Bashir et al., 2020). This study aims to investigate the prevalence and some risk factors of intestinal parasitic infections among gastrointestinal patients. By examining recent epidemiological data and analysing the impact of these infections on patient outcomes, this study seeks to contribute to a better understanding of the burden of intestinal parasites in this vulnerable population and inform strategies for effective management and prevention.

## 2. Material and Methods:

**2.1 Study area and period:** This study was conducted at "Al-Masra'a Clinic" which is one of the therapeutic Clinic found in Hun city in Aljufra, Libya during the period from **January 2021 to December 2023**.

**2.2 Study design and sample collection:** This cross-sectional study was conducted among a total of 1,079 stool samples were randomly collected from patients with gastrointestinal patients attending the Internal Medicine Clinic during the period from **January 2021 to December 2023**.

**2.3 Data and samples collection:** Patients' sociodemographic data and associated risk factors were collected using a structured questionnaire. Such as gender, age group, level of education, patients residence place, in addition to the time of sample collection. Fecal samples were collected in the sterile container for sample collection and transported to the clinic's laboratory for examination.

**2.4 Examination technique:** Stool samples were processed and diagnosed by the use of both light and dark ground microscopy in order to increase success in the identification of the intestinal

parasites. At first, direct smear techniques were used. Out of them the solutions used for preliminary examination were normal saline solution and Lugol's iodine. Formalin-ether concentration technique was used later in order to increase the yield of detected parasites. Appropriate smears were further stained using Ziehl Nielsen staining which enabled microscopic differentiation between the parasite's developmental forms.

**2.5 Data analysis:** Descriptive statistics were computed to summarize the characteristics of the study participants and to determine the prevalence of intestinal parasites. The data collected in the questionnaires and results collected from laboratory were entered into the Statistical Package for Social (SPSS, version 24) for analysis. Descriptive statistics were used for calculating the number and percentage of both dependent and independent variables. The Chi-square(X<sup>2</sup>) test was performed to verify the possible association between the prevalence intestinal parasite infection and variables such as gender, age group, and possible risk factors. A p-value less<0.05 was declared as statistical significant.

## 3. Results and Discussion

**3.1. Total prevalence of intestinal parasites infection of gastrointestinal patient:** The study found that intestinal parasites were present in (13.3%) of the patients, with 144 out of 1,079 individuals testing positive, figure (1), with significant difference (P=0.02). This moderate prevalence indicates improvements in public health, particularly in sanitation and hygiene, compared to previous research. For instance, Ali and El-Khalil (2021) reported a higher prevalence of 20% among children, highlighting significant demographic disparities in exposure. Hassanein and Zaid (2020) noted that poor hygiene conditions adversely affect community health, while Ghanem and El-Baghdadi (2022) emphasized the crucial role of health education in reducing infection rates among adults. Additionally, Mansour and Al-Sharif (2023) found that infection rates were significantly higher in rural areas, attributing this to urbanization and improved

access to healthcare resources. Collectively, these findings underscore the need for on-going health education and investment in healthcare infrastructure to effectively mitigate the burden of parasitic infections, particularly in light of the observed demographic and geographical disparities.

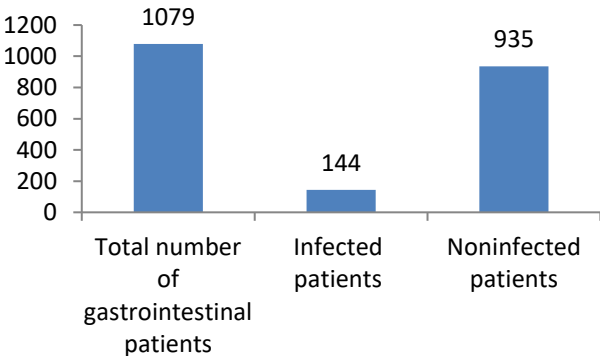


Figure 1: The total prevalence of intestinal parasites infection of gastrointestinal patient

**3.2. The prevalence of intestinal parasites of gastrointestinal patient according to gender:**

The current findings indicated that, among the 144 individuals infected, 99 were male (68.75%) and 45 were female (31.25%), suggesting a greater vulnerability in males, (figure 2). This outcome demonstrated significant differences, with (P=0.04). This gender imbalance corresponds with earlier research, including that of Ali and El-Khalil (2021), which reported elevated infection rates in males, possibly attributable to increased exposure to contaminated settings; Hassanein and Zaid (2020) similarly underscored the significance of occupational hazards and hygiene practices in shaping infection rates. These results accentuate the necessity for health education initiatives that are specific to gender, particularly for males. In addition, research conducted by Ghanem and El-Baghdadi (2022) indicates that levels of education and health awareness influence infection rates, thereby reinforcing the requirement for customized interventions aimed at rectifying these disparities.

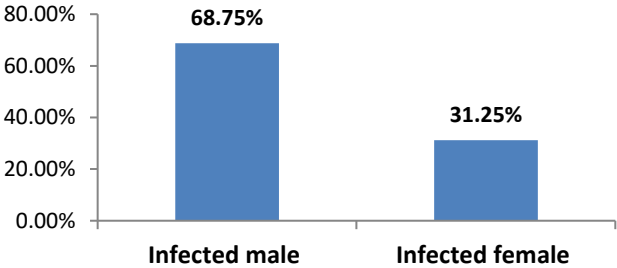


Figure 2: The prevalence of intestinal parasites of gastrointestinal patient according to gender

**3.3. The prevalence of intestinal parasites of gastrointestinal patient according to age group:**

Figure (3) showed the distribution of intestinal parasite infections among 144 patients, with highest significant prevalence (P=0.04) observed in those under 20 years (48.6%), followed by the 20-40 age group (22.2%). Lower rates were recorded in the 41-61 age group (18.1%) and those over 61 years (11.1%). The high prevalence among younger individuals can be attributed to low health awareness, poor hygiene, and increased exposure in schools and group activities. These findings align with Alqeer and Gemechu (2022), who reported high infection rates among individuals under 20, as well as Ali and Hebron (2021), who documented similar outcomes among children in Libya; Hasanin and Zaid (2020) also highlighted poor sanitation as a key factor contributing to higher infection rates in younger age groups. In contrast, the lower prevalence in older age groups reflects the positive impact of health awareness programs in reducing infections.

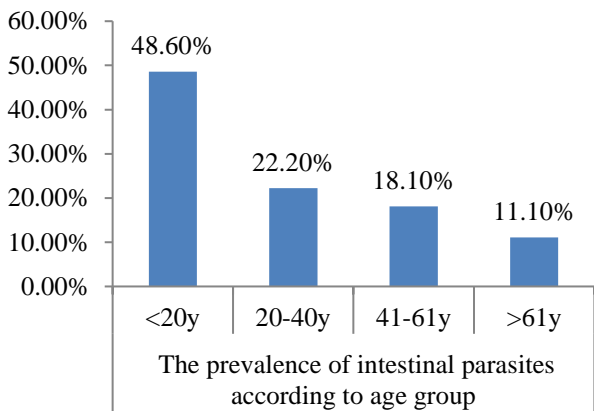


Figure 3 : The prevalence of intestinal parasites of gastrointestinal patient according to age group

**3.4. The distribution of different intestinal parasite species in gastrointestinal patients:** This study in Figure (4) shows that Entamoeba histolytica was the most significant common type of intestinal parasite (P=0.000), which caused (73.61%) of the infection. This confirms an important part played by E. histolytica in cases of gastrointestinal diseases in the studied population group. The rate of finding Giardia lamblia and Entamoeba coli were much lower, respectively (10.41%) and (7.63%). Co-infections were relatively rare; (6.25%) of the participants in the sample tested positive for E. histolytica and G. lamblia concurrently. These findings are in line with other previous studies carried in Libya. For instance, El-Sherbini and Ghenghesh (2020) identified E. histolytica to be a significant causative agent of intestinal illnesses in Tripoli with lesser proportions of (30%). The study carried out in Sebha by Ebrahim et al., (2022) discovered that G. lamblia was more common in that area and this indicated that geographical factors over sanitation, water quality and hygiene may have impacted positively on parasitic dominance. The prevalence of co-infections found in this study, which is significantly lower than 5%, correlates with other studies, particularly that of El-Kaoua et al. (2019), in Benghazi. Falling from a high of (12.3%) in the eastern region, such fluctuations indicate how local ecological and economic settings influence

parasites’ transmissibility across various regions in Libya. The present study indicates the high burden of E. histolytica infection and thereby highlights the need for enhanced and targeted public health measures such as water quality intervention and upgrading the knowledge on hygiene and diagnostic and treatment services. In order to overcome these regional differences and enhance control activities, further investigations and comparative studies are needed.

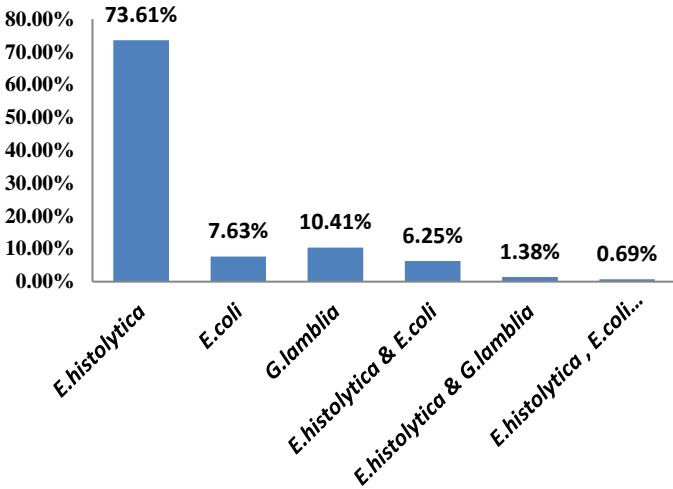


Figure 4: The distribution of different types intestinal parasites in gastrointestinal patient

**3.5. The distribution of intestinal parasites in gastrointestinal patients over a three-year period from 2021 to 2023:** The data over three years (2021-2023) shows a decline in intestinal parasite infections among 1,079 gastrointestinal patients, with 144 diagnosed as infected and 935 non-infected. In 2021, 76 infections were reported out of 656 patients, decreasing to 44 out of 289 in 2022, and 24 out of 134 in 2023. This downward trend (p-value 0.02) suggests improvements in healthcare, sanitation, or treatment protocols have effectively reduced parasite prevalence, (Table 1). When comparing these results with similar data from Libya, Ali and El-Khalil (2021) reported high infection rates, particularly among children, due to inadequate sanitation facilities in certain regions. Their study highlighted a significant prevalence of intestinal parasites, especially in areas with poor

hygiene standards. Similarly, Hassanein and Zaid (2020) emphasized the impact of poor sanitation and low health awareness on increased infection rates, particularly among younger populations. While the current study demonstrates a gradual reduction in infections, the Libyan data reflects on-going challenges in controlling these infections, underscoring the need for further improvements in environmental and public health conditions in certain regions.

Table 1: The prevalence of intestinal parasites of gastrointestinal patient according to time of collection

| Infection             | Time of examination |            |            | Total       |
|-----------------------|---------------------|------------|------------|-------------|
|                       | 2021 year           | 2022 year  | 2023 year  |             |
| Infected patients     | 76                  | 44         | 24         | 144         |
| Non-infected patients | 580                 | 245        | 110        | 935         |
| <b>Total</b>          | <b>656</b>          | <b>289</b> | <b>134</b> | <b>1079</b> |
| <i>P=0.02</i>         |                     |            |            |             |

**3.6. The prevalence of intestinal parasites of gastrointestinal patient according to patients residence:**

The results (Table2) show a significantly higher prevalence of intestinal parasite infections in rural areas at (84.02%), compared to urban areas at 15.97%, as emphasized by the p-value of (0.04). This difference suggests that environmental and lifestyle factors specific to rural settings, such as poor sanitation, limited access to health care, and lower public health awareness, contribute substantially to an increased risk of infection. Conversely, urban areas tend to have the advantage of better healthcare, sanitation, and health information, which leads to lower rates of infection. The results of this results align with other investigations conducted in Libya. Ali and El-Khalil (2021) noted comparable patterns, indicating that rural communities in Libya experience elevated infection rates as a result of insufficient sanitation facilities and restricted access to clean water and healthcare resources. The results discovered that children residing in rural regions exhibited

heightened susceptibility to intestinal parasites as a result of inadequate hygiene practices and environmental pollution. In a related study, Hassanein and Zaid (2020) emphasized that the absence of organized public health measures and a deficiency in health education in rural Libya contribute to the persistence of elevated infection rates, in contrast to urban locales which benefit from superior infrastructure and enhanced health consciousness. The present study, in tandem with previous investigations in Libya, highlights the need for specific public health programs in rural areas.

Table 2: The prevalence of intestinal parasites of gastrointestinal patient according to patients residence

| Residence       | No. & (%) of infection |
|-----------------|------------------------|
| <b>Rural</b>    | 121(84.02%)            |
| <b>Urban</b>    | 23(15.97%)             |
| <b>Total</b>    | 144(100%)              |
| <i>(P=0.04)</i> |                        |

**4.0 C 4. Conclusion**

This study investigated 1,079 gastrointestinal patients, reporting a 13.3% prevalence of intestinal parasites, with 144 confirmed cases. Although lower than previous studies, these findings highlight the on-going need for public health efforts in sanitation, hygiene, and education. The highest infection rates were observed among individuals under 20 years, emphasizing their vulnerability and the necessity for targeted interventions. Entamoeba histolytica was the most prevalent parasite (73.61%), underscoring the importance of focused prevention and control measures. A significant decline in infection rates over three years (p = 0.02) reflects the positive impact of current health strategies, though sustained efforts are crucial to maintain and build on these improvements.

Enhancing sanitation, access to clean water, healthcare services, and public health education can further reduce the prevalence of intestinal parasites. Community health initiatives and regular screening programs are particularly important for disadvantaged groups. Future research should aim to

identify specific risk factors in rural areas and assess the effectiveness of intervention strategies for infection prevention and control.

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