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Prevalence Detection of Human Intestinal Helminths in Aljmail City - Libya

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Abstract:

Qualitative detection of helminths in human faeces samples alongside patient questionnaires has been used to study the prevalence of intestinal helminths in Aljmail area. Among of the 66 samples that were examined (i.e. 66 patients), we found 23(34.8%) patients were infested with helminths- Enterobius vermicularis helminths which was more prevalence 22(33.3%) than Strongyloides stercoralis worm infestation 01(1.5%). These infestations have been associated with other parasitic infections including Entamoeba histolytica 2(3.0%), and Giardia lamblia 7(10.6%). Regarding gender, infected males with helminths were 4(6.1%) while infected females were 19(28.8%). Intestinal helminths infestation is associated with various patients complaints, such as 17(25.7%) abdominal pain, 4(6.1%) nausea, 12(18.2%) frequent vomiting, 12(18.2%) flatulence and diarrhoea, 18(27.3%) loss appetite, 15(22.7%) anaemia, and 17(25.7%) anal itching. We found that the prevalence of worm infestation was correlated to patients poor hygiene as 14(21.2%) had long nails, 8(12.2%) had family members infected with worms and 19(28.8%) had primary or lower educational levels. It is required to examine persons with worm infection, prescribe suitable medicine, health attention, and individual hygiene to minimize and prevent helminths infection.

Keywords: Intestinal helminthes, protozoa, helminthes prevalence, Libya.

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الكشف عن انتشار الديدان الطفيلية التي تصيب أمعاء الإنسان في مدينة الجميل، ليبيا

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الملخص

تم استخدام الكشف النوعي للديدان الطفيلية في عينات البراز البشري إلى جانب استبيانات المرضى لدراسة مدى انتشار الديدان الطفيلية المعوية في منطقة الجميل. من بين العينات الـ 66 التي تم فحصها (أي 66 مريضاً)، وجدنا أن 23

(34.8%) من المرضى مصابون بالديدان الطفيلية، الديدان الطفيلية *Enterobius vermicularis* التي كانت أكثر انتشاراً بنسبة 22 (33.3%) من الإصابة بالديدان *01 Strongyloides stercoralis* (1.5%) وقد ارتبطت هذه الإصابة بالعدوى الطفيلية الأخرى بما في ذلك؛ المتحولة الحالة للنسج *Entamoeba histolytica* (3.0%)، والجيارديا اللامبلية *Giardia lamblia* (10.6%). أما بالنسبة للجنس فقد بلغ عدد الذكور المصابين بالديدان الطفيلية 4 (6.1%) والإناث 19 (28.8%). وترتبط الإصابة بالديدان المعوية مع شكاوى المرضى المختلفة، مثل 17 (25.7%) آلام في البطن، 4 (6.1%) غثيان، 12 (18.2%) قيء متكرر، 12 (18.2%) انتفاخ البطن والإسهال، 18 (27.3%) فقدان الوزن الشهية، 15 (22.7%) فقر دم، و17 (25.7%) حكة شرجية. لقد وجدنا أن انتشار الإصابة بالديدان كان مرتبطاً بسوء النظافة الصحية حيث أن 14 (21.2%) لديهم أظافر طويلة و 8 (12.2%) لديهم أفراد من الأسرة مصابون بالديدان و 19 (28.8%) من المستويات التعليمية الابتدائية أو الدنيا. يجب فحص الأشخاص المصابين بعدوى الديدان ووصف الدواء المناسب والاهتمام الصحي والنظافة الفردية لتقليل ومنع الإصابة بالديدان الطفيلية.

الكلمات المفتاحية: الديدان المعوية، الأوليات، انتشار الديدان الطفيلية وليبيا.

1.Introduction

The human is considered the host of nearly 300 species of parasitic worms and over 70 species of protozoa, which were emanated from human predecessors and from surrounding animals (Cox, 2002). Helminths have been infecting humans since prehistoric times and remain impacting on the human health particularly poor people in developing countries (Sanchez-Vegas Villavicencio, 2022).

Helminthic parasites are multicellular, bilateral symmetrical animal having three germ layers, they classify into two phyla: first phylum is Platyhelminthes include two classes- the Cestoidea and the Trematoda, and second phylum is Nematelminthes includes class Nematoda (Chatterjee, 2009).

Cestodes are worms that infect the human intestine include *Diphyllobothrium latum* (fish tapeworm), *Taenia saginata* (beef tapeworm), *Taenia solium* (pork tapeworm) and *Hymenolips nana* (dwarf tapeworm) (Nagoba and Pichare, 2007). Intestinal trematodes are worms that infect the human include *Fasciolopsis buski*, Hepatic trematodes include *Faciola hepatica* and *Clonorchis sinensis* (Chatterjee, 2009). Intestinal nematodes are worms that infect human intestine include *Ascaris lumbricoides*, *Ancylostoma duodenale*, *Enterobius vermicularis*, *Trichuris trichiura*, *Strongyloides stercoralis*, *Necator americanus* and *Trichinella spiralis* (Nagoba and Pichare, 2007).

Helminths are parasites that live in the infected human gut and can be transmitted through contaminated food or water, or through contact with infected soil or feces. Intestinal helminths infestation is rarely fatal, but they may impair growth, physical fitness, cognition, and reduce children school attendance and performance (Bethony *et al.*, 2006) by causing a range of symptoms, including diarrhea, abdominal pain, and weight loss. In some cases, they can also lead to more serious health problems, such as anemia or malnutrition (khurana *et al.*, 2011). Chronic helminthiasis causes protein-energy malnutrition, iron deficiency anemia, stunting of growth, cognitive impairment, organ damage, deficiency in vitamins (A, B6, B12) and minerals (iron, calcium, and magnesium), block nutrient absorption and diminish immunity, thereby predisposing subjects to serious diseases (Sartorius *et al.*, 2021).

Intestinal helminths infestation is widespread in the tropics and subtropics, and it affects more than 1.5 billion people worldwide, particularly among children in developing countries where sanitation and hygiene are poor (Hotez *et al.*, 2008). A high prevalence of intestinal helminths infection among school age children, reaching 70.8% in some regions (Tekalign *et al.*, 2019). The scarcity of basic health facilities along with limited access to clean water and soap which are the basis of hygiene; therefore, lead to persistence of helminthiasis (Sartorius *et al.*, 2021).

Stool examination is the most common method used to detect intestinal helminths and considered as the most sensitive and specific method for intestinal helminths detection, with a sensitivity of 91.4% and a specificity of 99.1% (Khurana, 2011). It involves microscopic examination of stool samples for the presence of eggs, larvae, or adult worms. Serological tests can also be used to detect antibodies to specific helminths in the blood, which can indicate an active infection. Serological tests can be useful for detecting helminths infections in areas where stool examination is not feasible (WHO, 2021). Imaging studies, such as ultrasound or computed tomography scans, can also be used to detect more severe infections or complications (Khalifeh, 2019).

A faecal examination is the most common method used for prevalence study of helminths infection because it is simple, effective, and non-invasive for detecting entire parasites (Choi *et al.*, 2017). Thus, it has been used in this study with a questionnaire to study the prevalence of intestinal parasites in Aljmail city of Libya. Information

about the occurrence of gut parasites is a crucial step to eradicating or controlling the helminth infestation and there is a lack of information about intestinal helminths prevalent in Libya, particularly in Aljmail city. Therefore, we aimed to study the helminths infection including the presence of ova or adult worm in stool samples in addition to determining the worm type. This would add more knowledge to helminths eradication strategies, which could be useful to be used by people or health authorities in the area.

2. Materials and Methods

2.1. Sample Collection and Analysis

Over a period of four months from March to June 2023, 66 faeces samples were randomly collected from patients at different ages based upon the request of physicians for stool examination. The stool examination was carried out in the Medical Laboratory at Kimat Attafawok Clinic, Aljmail, Libya. The faeces samples were collected in clean, dry, waterproof containers containing no detergents, preservatives, or transport media. The faeces samples were collected in clean, dry, waterproof containers containing no detergents, preservatives, or transport media. Adequate faecal amounts (1-2 ml or 1-2 g) were transferred to clean, dry specimen containers to observe worm's ova and adult worms or their portions. After that, the samples were mixed with saline and iodine preparation then examined microscopely for the detection of the presence of helminths. Liquid stool specimens were examined immediately or within 30 minutes of passage, the semi-formed and soft stool specimens tested within 60 minutes to detect trophozoites motile. If trophozoites were not expected, formed stools were examined within 24 hours after collection. In the case of delay in process, formed stool samples were kept in airtight containers at 4°C to avoid the dryness of the samples (Arora. 2007). To prevent further development of some helminthic eggs and larvae in the stored faecal samples, Formalin or Merthiolate-iodine-formalin were added as a preservative's solutions (Arora. 2014).

2.2. Questionnaire of the subjected patients to qualitative detection of intestinal worms.

A questionnaire was carefully prepared and build-up to determine the correlation between the incidences of intestinal helminths in subjected patients to qualitative detection of intestinal worms. Moreover, to determine the risk factors such as personal and food hygiene that related to prevalence of intestinal worms infestation.

2.3. Interpretation of results

Detection of helminths ova or adult helminths or any part of them in the qualitative examination of human faeces samples indicates infected patients by helminthiasis. Non-detection of helminths ova or adult helminths or any part of them in the qualitative examination of human faeces samples that indicate to absence of infected patients by helminthiasis.

2.4. Statistical Analysis

Data obtained in this study were analyzed using CHI-Square. A statistically significant difference was considered if $P < 0.05$ was obtained.

3. Results and Discussion

The qualitative detection of helminthes in 66 patients faeces samples revealed that 23(34.8%) were infected with helminthes while helminthes were not in 43(65.2%) of samples (Table 1). This figure is considered high comparing to other prevalence Libyan studies reported that, the infection was 14.9% in Sebha city, (Ibrahim *et. al.*, 2020), 14.6% among schoolchildren in Tripoli city (Ben Musa. *et. al.*, 2007), 29.6% in Nalout city (Al Kilani *et.al.*, 2008), 28.8% of *Giardia lamblia* and 16.3% of *Entamoeba histolytica* Sirt city, and in Zawia city was high 69.6% (Shawesh *et. al.*, 2019). In our result, the prevalence was high corresponding to Nalout, Sirt, and Zawia studies, which might be due to pastoralism nature of these areas that leads to more chance of contamination of soil with soil-transmitted helminth from animals. In contrast, Tripoli and Sebha cities are big cities where animal husbandry is limited.

The detected helminths types were *Enterobius vermicularis* 22(33.3%) and *Strongyloides stercoralis* (1.5%) (Table 2). While protozoa types that associated with intestinal worms infestation were *Entamoeba histolytica* and *Giardia lamblia* (Table 5). Similar results were reported in Zawia city revealing that *Entamoeba histolytica* and *Giardia lamblia* were the most common parasites (Shawesh *et. al.*, 2019). Another study among schoolchildren in Tripoli reported that *Giardia lamblia* was common parasite, followed by *Enterobius vermicularis* and then *Ascaris lumbricoides* (Ben Musa *et. al.*, 2007). Determination of helminth and the protozoa type present in the gut as well as the levels of pus cells and red blood cells in the stool is important in terms of provide information about the underlying patient condition and help for appropriate treatment and preventive strategy (Garcia *et. al.*, 2017).

Human stool investigation is important to provide information about the burden of parasitic infections, the prevalence and distribution of worms, and help guide public health in reducing the transmission and effects of these infections (Olsen.2009).

Based on gender group, we found that infected males with helminths were 4(6.1%) and females were 19(28.8%) this were statistically significant ($P < 0.05$) (Table 3). Similar results were reported elsewhere (Shawesh *et. al.*, 2019); (Tekalign *et. al.*, 2017); (Agustaria *et. al.*, 2019). Differences in prevalence between male and female might

be due to females (mothers) were more likely get the infection from their children who may acquire the infection from school or from contacting other children. This may be supported by our findings, as helminths infection was higher among children compared to adult (Table 4). The helminths infestation was high 10(15.1%) among 1-7 years old, and 4(6.1%) among 8-14 years old ($P < 0.05$). Children may acquire the worm infection from school, contacting other children or from their mothers while taking care of them, which may relate to poor hygiene at school or home (Agustaria *et. al.*, 2019). Relationship between age and intestinal worm infestation is important for comprehending of determinants, occurrence, and distribution of these infections, and improving targeted precluding and treatment systems (Crompton. 1999). In addition to the fact that, stool examination of entire family is important for providing an understanding of the prevalence, intensity, and clinical manifestations for success helminths treatment (WHO. 2015).

Clinical symptoms of intestinal helminths infestation are different in severity; light infestation could be asymptomatic while heavy infestation may cause serious illness that mostly related to digestive system however, chronic infestation might include symptoms such as anemia, growth retardation and general weakness (Degarege *et. al.*, 2022). In our study, abdominal pain was more common 17(25.7%) statistically significant ($P < 0.05$) other digestive symptom include nausea 4(6.1%) and frequent vomiting 12(18.2%). These symptoms might be resulted from the effect of heavy worms infestation which may block intestine lumen, interfering with digestion and absorbance of food, mucosa inflammation and irritation (Gedefaw, 2018) The presence of helminths in the intestine also causes other abdominal complications such as flatulence and diarrhea, particularly when intestinal infection associated to another infection as *E. histolytica*. In this study, both flatulence and diarrhea were 12(18.1%). In some cases, the presence of helminths in the intestine can lead to bloating, and malabsorption of nutrients, which can further contribute to the development of diarrhea (Al-Mekhlafi, 2019). Patients that have worms infestation may also suffer from loss of appetite due to inflammation or irritation, which can lead to abdominal pain and discomfort and further contribute to the loss of appetite (Gopalakrishnan, 2015). All these complications and symptoms that occurs in the abdomen region of the worm-infected patient may lead to malnutrition, which causes anemia. In our result, the anemia was statistically significant ($P < 0.05$) among helminths-infected patients 15(22.7%) (Table 6). Anemia is important when trying to detect worms in human stool because certain helminths infestations can cause chronic blood loss, which can lead to iron-deficiency anemia (Gedefaw, 2018).

Infected patients with worms and one of their family members who suffer from worm infestation were 08(12.2%). Differences in the prevalence of intestinal worms concerning family members were statistically insignificant (Table 6). This was surprising because interfamilial parasitic infestation is very common. In this study, interfamilial parasitic infestation was statistically insignificant might be due to low load of helminths, which may pass to patient gut from contaminated soil or food. Moreover, our result showed that pinworm (*Enterobius vermicularis*) infestation is the most among the patients, which is often asymptomatic (Rawla and Sharma. 2023). Anal itching is the most common symptom of pinworm; *Enterobius vermicularis* (Rawla and Sharma. 2023), in this study 17(25.7%) patients were suffering from anal itching. This was expected ($P < 0.05$) because the nature of the female pinworms (*Enterobius vermicularis*) to lay their eggs around the anus that hatch and appear as larvae, then retain back into intestine, and develop into adult parasite, all of these can move in the bowel, reach and pass through the anal region causing itching (Gopalakrishnan, 2015). In this study, Pinworms *Enterobius vermicularis* was the most type of worm infection 33%, this may explain the statistically significant ($P < 0.05$) of anal itching (Table 6). Moreover, important of the anal itching in terms of personal hygiene as 14(21.2%) of patients had long nails at ($P < 0.05$), long nails carry worm eggs under nails after itching thus can transmit worm infection to others (Table 6). Poor hygiene practices, such as not washing hands after using the toilet, not wearing shoes in areas with contaminated soil, or eating unwashed fruits and vegetables, can increase the risk of helminths infestation (Wuletaw. 2019).

The incidence of worm infection in patients who have a primary or lower - educational level were 21(31.8%), differences in prevalence were statistically significant ($P < 0.05$). lower – education patients are more likely to be exposed to worm infection than others due to reduced health awareness about prevention of parasites infestation (Table 6). Individuals with lower levels of education mostly are low income living condition and may have less knowledge about hygiene practices and limited access to healthcare services, which can increase the risk of helminths infections.

Conclusions

Based on this study, the prevalence rate of intestinal helminths infection was 34.8 %. Regarding age, children aged 1-7 years were more infected than other age groups, with *Enterobius vermicularis* being the predominant helminths. Concerning gender, female patients were infected with helminths more than in males. Some patients, who were infected with intestinal helminths infection, have been associated with various infections such as *Entamoeba histolytica*, and *Giardia lamblia*. some intestinal helminths patients have associated various complaints such as abdominal pain, frequent vomiting, anaemia, and anal itching. Some patients may have less knowledge about hygiene practices.

Therefore, it is necessary to diagnose children and other people with helminths infection. Educate mothers in preventing intestinal worm infections among their children. Treatment of infected cases, health awareness, and personal hygiene will be helpful to decrease the risk of helminths infection. The findings of the study provide insights into the prevalence and diagnosis of helminths infections, and it can be used to inform public health policies.

Table 1. Infected patients and non-infected patients by intestinal worms.

Categories	Total number	Infected patients	Non infected patients
66 patients		23 (34.8 %)	43 (65.2%)

Table 2. Worms types that infected intestine of patients.

Infected patients	<i>Enterobius vermicularis</i>	<i>Strongyloides stercoralis</i>
23 (34.8 %)	22 (33.3 %)	01 (1.5%)

Table 3. Infected and non-infected patients by intestinal helminths based on gender.

Gender	Total number	Infected patients	Non-infected patients
Male	23(34.8%)	4(6.1%)	19(28.8%)
Female	43(65.2%)	19(28.8%)	24(34.8%)
66		P value = 0.029	

Table 4. Infected and non-infected patients based on their age.

Age	Total number	Infected patients	Non-infected patients
1-7 years	27(40.9%)	15(22.7%)	12(18.2%)
8-14 years	21(31.9%)	4(6.1%)	17(25.8%)
15-21 years	9(13.6%)	2(3%)	7(10.6%)
> 21 years	9(13.6%)	2(3%)	7(10.6%)
66		P value = 0.034	

Table 5. Protozoa types associated with intestinal worms infection.

Results of stool examination for Helminths detection	Total Number	Protozoa types associated to helminths infected patients		Pus cell	R.B. Cs	protozoa types non associated
		<i>E. histolytica</i>	<i>G. lamblia</i>			
Infected patients	23	2(3.0%)	7(10.6%)	4(6.1%)	0(0%)	10(15.2%)
Non-infected patients	43	5(7.5%)	9(13.6%)	10(15.2%)	3(4.5%)	16(24.2%)

Table 6. Prevalence of intestinal helminths according to questionnaire of patients.

No	Questionnaire	Type of Response	Number of responses	Number of infected patients	Number of non-infected patients	P-value
1-	Do you suffer from abdominal pain?	Yes	57(86.4%)	17(25.7%)	40(60.6%)	0.031
		No	9(19.6%)	6(9.1%)	3(4.5%)	
2-	Do you suffer from anaemia?	Yes	22(34.4%)	15(22.7%)	7(10.6%)	0.000
		No	44(66.7%)	8(12.1%)	36(54.5%)	
3-	Are you suffered from frequent nausea?	Yes	19(28.8%)	4(6.1%)	15(22.7%)	0.135
		No	47(71.2%)	19(28.8%)	28(42.4%)	
4-	Are you suffered from frequent vomiting?	Yes	20(30.3%)	12(18.2%)	8(12.2%)	0.005
		No	46(69.7%)	11(16.6%)	35(53.1%)	
5-		Yes	52(78.9%)	18(27.3%)	34(51.5%)	0.939

	Do you suffer from loss of appetite?	No	14(21.2%)	5(7.5%)	9(13.6%)	
6-	Do you suffer from of flatulence?	Yes	29(43.9%)	12(18.1%)	17(25.7%)	0.324
		No	37(56.1%)	11(16.6%)	26(39.3%)	
7-	Do you suffer from of diarrhea faeces?	Yes	27(40.9%)	12(18.1%)	15(22.7%)	0.173
		No	39(59.1%)	11(16.6%)	28(42.4%)	
8-	Do you suffer from anal itching?	Yes	30(45.5%)	17(25.7%)	13(19.6%)	0.001
		No	36(54.4%)	6(9.1%)	30(45.5%)	
9-	Do you have any family member who suffer from helminths infection?	Yes	26(39.3%)	8(12.2%)	18(57.6%)	0.575
		No	40(60.6%)	15(22.7%)	25(37.9%)	
10-	Poor hygiene (long nails)	Yes	15(22.7%)	9(13.6%)	6(9.1%)	0.020
		No	51(77.3%)	14(21.2%)	37(56.1%)	
11-	Education level	Primary or less	47(71.2%)	21(31.8%)	26(39.4%)	0.008
		Secondary or higher	19(28.8%)	02(3%)	17(25.8%)	

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