

Intestinal Parasitic Infections Among Pupils of Primary Schooling, Zawia city, Libya State

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Abstract

In order to determine the prevalence of intestinal parasite infection among primary school students, a cross-sectional study was conducted in Zawia city. Out of the total number of 8840 stool samples were collected from 30 primary schools. Stool examination was done by direct smear and formalin ether technique. In general, the prevalence of parasite infections was 39% found with intestinal protozoa in their stools. mainly

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common protozoa were *Entamoeba coli* (*E. coli*) (34%), *Entamoeba histolytica/dispar* (*E. histolytica/dispar*,) found in (24.8%), and *Giardia lamblia* (*G. lamblia*) (11.46%). Interestingly, double infections of parasites were observed in some children including *E. coli* and *G. lamblia* (30%), *E. histolytica/dispar*, and *E. coli* (35%). *E. histolytica/dispar*, and *Endolimax Nana* (*E. nana*) (13%). The results of this study are dependent, revealing the presence of the following intestinal helminths: *Hymenolepis nana* (*H. nana*) was 7.03%. Due to the extraordinary hygiene and medical attention provided in primary schools, it's possible that infected with protozoa at a moderate rate were visited.

Keywords: *protozoa, parasites, primary school, Zawia.*

Introduction

In underdeveloped nations, where millions of youngsters harbor large loads of endoparasites, intestinal parasitism is a serious public health threat ^[1]. Parasitic infections are a significant community health issue since they may cause anemia, development retardation, aggressiveness, weight loss, and other physical and mental health problems, especially in children ^[2,3]. These infections affect more than 3.5 billion people, with morbidity of 450 million cases worldwide ^[3]. Human intestinal parasites are responsible for 20,000 deaths annually. In general, the highest frequency and morbidity rates are typically seen in young children and adolescents ^[3,4].

There are three main classes of pathogenic parasites protozoa, helminths, and ectoparasites ^[4]. Being single-celled parasites, protozoa can rapidly multiply inside the host body, consequently developing a critical health problem. Although abdominal pain, vomiting, and dysentery are some of the most often reported symptoms of protozoan infections, most of them are usually asymptomatic. Children who lack

proper nutrition and have inadequate personal cleanliness and access to clean water are considered at risk ^[5].

Many studies on intestinal parasitic infections have been conducted in Libya, all with varying prevalence of infections. The overall prevalence of intestinal protozoan parasites was found to be a wide range which is quite low in comparison to the prevalence of helminths ^[6, 7, 8]. Some Libyan studies found the prevalence of intestinal parasitic infections in certain cities and areas to be as follows: 50% in Benghazi ^[9,10], 15.7 % in Tripoli ^[11], 69.6 % in Zawia ^[12], and 23.82% in Wadi Al-Shati Region ^[13]. It appeared to be high in Sebha (96.5 %) ^[14]. These variations are believed to be due to variances in the study methodology, geographical location, and type of study population. Additionally, the fluctuations in the prevalence may also be linked to differences in the implementations of experiments, socioeconomic status of the population, as well as weather and climate conditions. It has been established that protozoan infections are more common in warmer climates ^[9, 12,14].

Because school children are more contracting with each other and for not pay attention to the instructions on personal hygiene, they are more susceptible to infectious diseases.

Due to their immature immune systems, as well as their activities and personal hygiene habits, children are more susceptible to parasite diseases than adults ^[12, 13]. Therefore, several Libyan Scientifics have investigated the prevalence of intestinal parasites in public in some cities. Among the Libyan schools, the most common intestinal protozoan infections are *E. coli*, followed by *E. histolytica/ dispar* and/or *G. lamblia*, *E. nana*, and *Chilomastix mesnili* (*C. mesnili*) ^[10,11,12,13]. However, different studies reported different rates in different parts of Libya. For example, a study in Tripoli found the rates to be 15.7% ^[15,16],

while they were 10.6% in Zawia city ^[17]. Another study done by E Salem, *et al.*; (2018) reported 4.0% of *E. histolytica* among school children in Sebha ^[18]. A slightly higher prevalence of *E. histolytica* (11.8%) was found among children in Zlieten ^[19], 6.6% *E. histolytica* among primary school children in Derna District, ^[20], 4.83% *E. histolytica* in children in Houn ^[21] and the rate of giardiasis have been different from study to study, it was high (10.29%) in Sirt ^[22]. In general, the prevalence of parasitic infection in primary school was 21.5% in Benghazi, practically, 6.5% was *E. histolytica* ^[23].

Contrary to the findings of earlier studies, no association between the rate of infections and the examined ages were found to be significant ^[15, 16, 20, 21]. A positive correlation was found between infections and the age groups of schoolchildren, in which the lowest positive rate was in the 6 – 8 age group, and the highest rate was in the 12 – 14 age group ^[15,16,21]. other studies found the prevalence to be high among the 10 – 12 age group ^[17, 22].

It is interesting that there was a significant difference in previous studies on gender may be due to the different areas in Libya. some studies evaluated that females are more infected with parasites compared to males in Tripoli and Zawia ^[16,17]. The higher prevalence in females may be attributed to women's consumption of unwashed fruits and vegetables, before or during washing, which may be contaminated with the infective stages of parasites. In other studies, contrastingly, in Houn, Sirt, and Benghazi, were found that males have higher prevalence rates of intestinal parasites than females ^[21,22,23]. The disparities in prevalence may arise from the fact that males have more access to parks for recreation than females, who frequently work on home duties.

The majority of the positive samples were single infections for instance 95.3% ^[18], and 16.83% ^[11], which were almost identical to the results previously reported. There were 64 cases overall (10.6%) when intestinal protozoa were discovered in the stools. *E. coli* were detected in 22 (3.6%) cases, *E. histolytica*, in 19 (3.1%) cases, and *G. lamblia* in 11 (1.8%) cases, were the most prevalent protozoa. Only three samples showed evidence of double infections ^[17]. The differences in mixed infections may be due to changes in the concentrations of parasites and the sanitary conditions of communities ^[20]. Interestingly, no helminth infections were found among outpatients and school-aged children in most previous studies ^[16, 17, 20, 21]

Although some research has been done on the incidence of parasite infection among Libya's public schools, there are still a number of regions where parasitic infection data is lacking. The advent of a sizable arrival of migrant workers complicates the epidemiological patterns of parasitic illnesses in a developing nation like Libya and has destabilizing effects on the typical pattern of disease transmission. The most recent research in Zawia city was conducted a very long time ago ^[17]. Therefore, the aim of the current study was to determine the prevalence and types of intestinal parasitic infections in primary school pupils in Zawia city. In addition, another objective was to examine the correlations between various factors related to parasitic infection.

Materials and Methods

Study population

This study was carried out among thirty primary schools in Zawia city. Permission to visit the schools and obtain samples from pupils was first granted by the ministry of education. Pupils were selected by

systematic random sampling using the registration list from each of the schools. The children were aged between 6 and 14 years. The study period stretched from September 2015 to May 2019, and all of the samples were analyzed for intestinal protozoa then. A sum of 8840 samples of faecal specimens were collected early in the morning.

Data Collection

For the collection of specimens, each child was given a stool container and on the next day, a single faecal sample was collected. Subsequently, the specimens were transported to the Department of Parasitology at the Medical Research Centre of Zawia and the laboratories of the Medical Technology Faculty, at the University of Zawia. For result investigation, the stool samples were examined by the naked eye for color, consistency, and the incidence of any helminth parasites. They were then observed microscopically by direct wet smears as well as by formalin-ether side-mentation methods. Finally, statistical analysis was performed using a two-tailed χ^2 test. A *P*-value of < 0.05 was considered significant.

Results

This study was performed to detect the prevalence of intestinal parasitism among children in several schools in Zawia city. A total of 8840 stool samples were collected and examined for the presence of intestinal protozoa using the direct smear method. Generally, there was a significant difference between the percentage of infected and uninfected school children (39% and 61%, respectively), as shown in figure 1.

Protozoan intestinal parasitic infections may be caused by one type of parasite or by mixed protozoan infections. Accordingly, this study identified the nature of the infection as a single or double protozoan

infection. The result showed the occurrence of single parasite infection to be the most remarkable (39%), while the double parasite infection was high (61%). Therefore, a critical distinction between single and double parasitic infections existed for schoolchildren ($P = 0.001$) (Figures 2 and 3).

On the detection of protozoan infection, the result showed that the most common single parasitic infection was *E. coli* (34%), followed by *E. histolytica* / *E. dispar* (23%), *E. nana* (14%), *G. lamblia* (12%), *Blastocystis hominis* (*B. hominis*) (11%). Besides, only 6% of *H. nana* was detected (Figure 2). Amongst protozoa, Amoeba trophozoite was the most frequent of mixed infections. Namely, the most frequent isolates were *E. coli* and *E. histolytica* / *E. dispar* (35%), followed by *E. coli* and *G. lamblia* (30%), *E. nana* and *E. histolytica* / *E. dispar* (13%), *E. histolytica* and *G. lamblia* (10%), and *E. nana* and *B. hominis* (9%) (Figure 3).

The prevalence of intestinal protozoan in school children is indicated by gender. The sequence of this concentrated in table 1 showed that males were found to have higher pervasiveness rates of intestinal parasites than females (25% and 14%, respectively). There was a critical significance between genders ($P = 0.03$) (Table 1 and Figure 4).

According to age groups, the prevalence of intestinal protozoan infections, displayed in figure 5, there is a great increase in intestinal protozoan infections with ascending age groups of school pupils. The lowest positive rate was 9% in the 12 – 14 age group, followed by 13% among the 6 – 8 age group, and 17% in the 9 – 11 age group, which had the highest positive rate. Further analysis indicated a highly significant difference between the age groups ($P < 0.05$).

Over the five years of study, parasitic infections were measured periodically. Further statistical tests revealed that the highest percentage of parasite infection in school children was in 2019 (9.5%), followed by 2018 (9.1%), 2017 (7.4%), 2016 (6.6%), and 2015 (6.4%). Additional analysis showed a significant difference between the years of study ($P = 0.04$) (Table 2 and Figure 6).

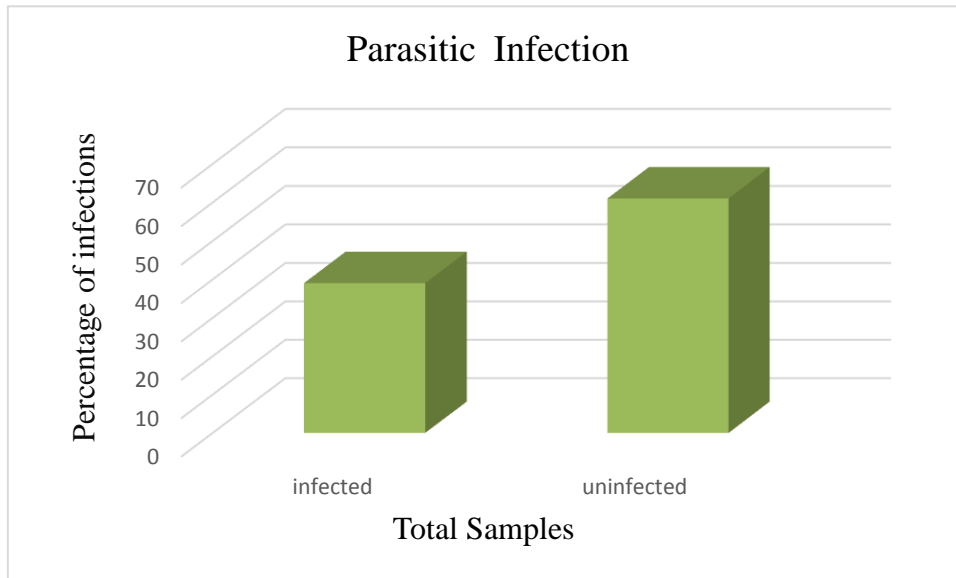


Figure 1. The distribution of parasitic infestations amongst pupils (percentage).

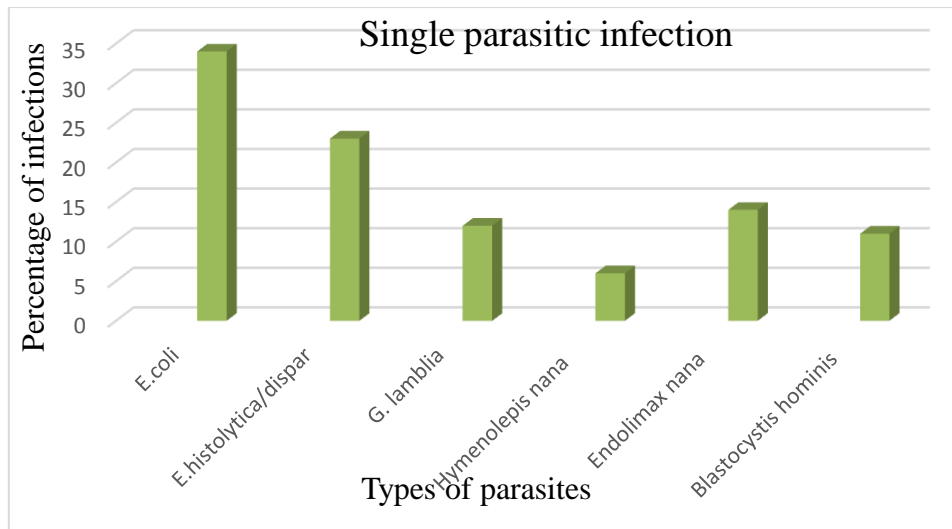


Figure 2. Percentage of intestinal protozoan parasites positive single infections in school children.

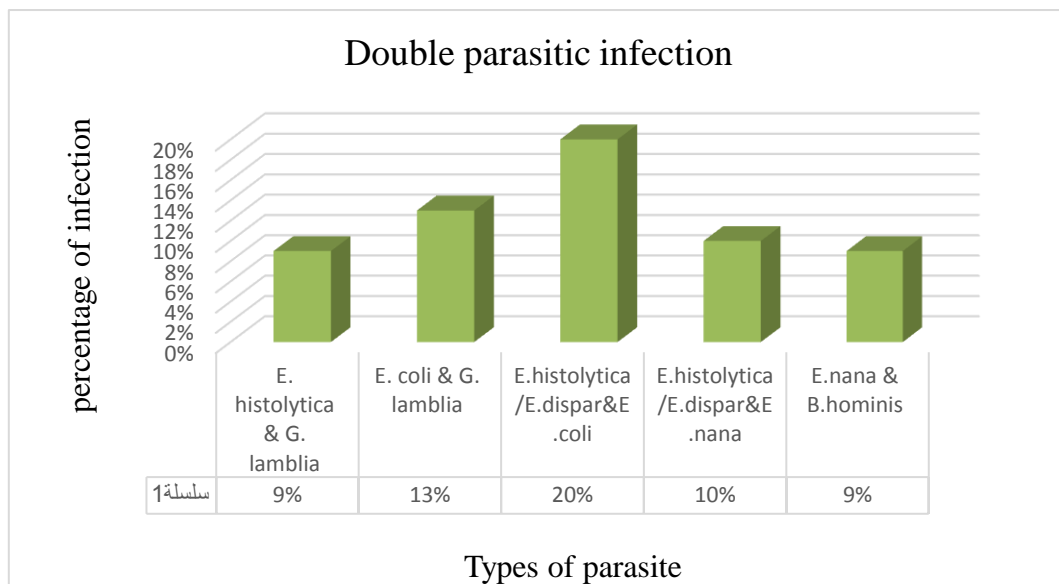


Figure 3. Percentage of the positive double intestinal protozoan infection of pupils

Table 1. The percentage of infected pupils, according to gender.

	Males %	Females %	Chi-square X ²	P-value
Uninfected	75 %	86 %	0.83*	0.031*
Infected	25 %	14%		

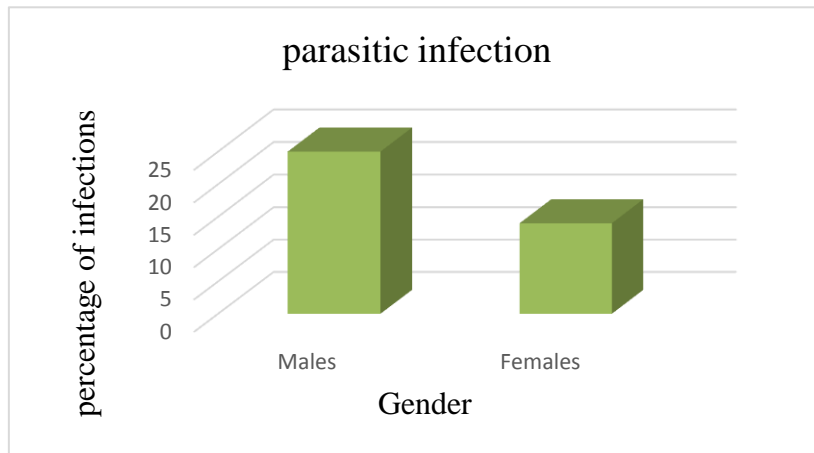


Figure 4. The prevalence of protozoan parasitic infections in primary pupils, according to gender.

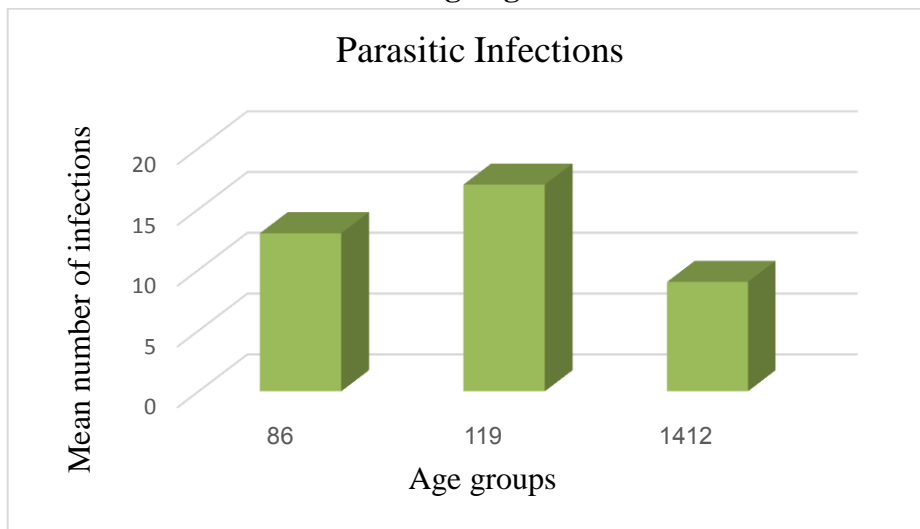
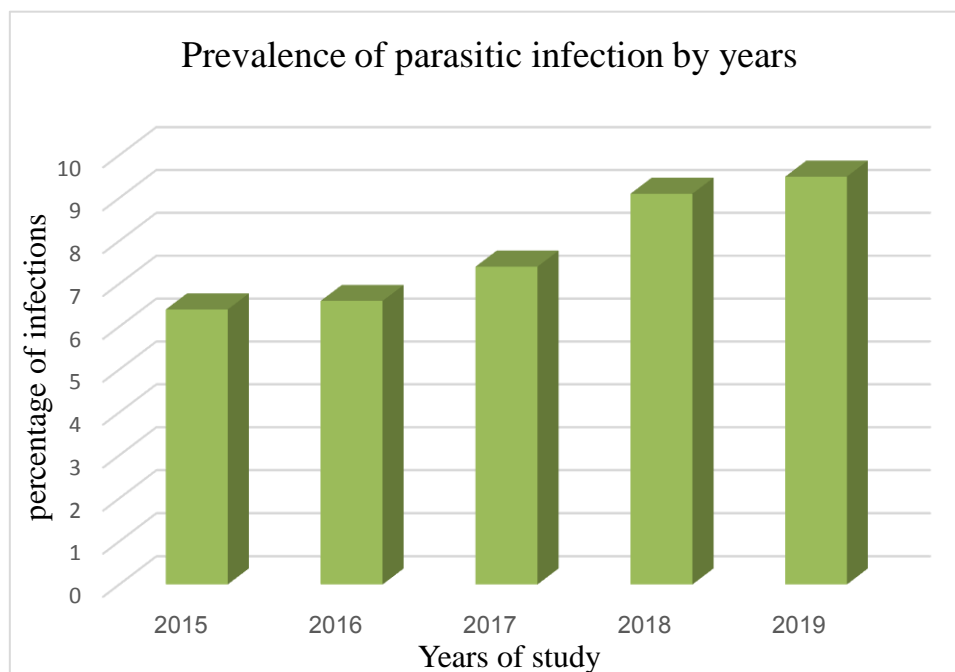


Figure 5. The prevalence of intestinal protozoan in school pupils, according to age groups

Table 2. The prevalence of parasitic infections in school pupils, according to the study period.

Percentage of parasites infection					Chi-square X^2	P value
2015	2016	2017	2018	2019	8.1*	0.04*
6.4%	6.6%	7.4%	9.1%	9.5%		

**Figure 6. Prevalence of the different parasitic infections over the study period.**

Discussion

This study aimed to estimate the prevalence of intestinal parasitic (protozoa) infections among children in some primary schools in Zawia city. The health centers and hospitals are operated by qualified nurses, medical doctors, administrative staff, laboratory technicians, and diagnostic laboratories. The parasitic disease infection has been very low

until 2010. The 2011 revolution and the following wars heavily affected the services, particularly the health sector ^[21].

Infections of intestinal protozoa can significantly contribute to the burden of gastrointestinal illnesses. This is especially true in Africa where different conditions can favor transmission. Children are usually the main risk groups. In this discussion, there is a representation of the systematic review plus the meta-analysis regarding the prevalence of intestinal protozoan infections all over the world, especially among children ^[4,12,13]. A current review has compiled the eligible data on infection prevalence from primary schools in Zawia, Libya. Previous literature displays a variance in infection prevalence rates.

The lowest and highest intestinal protozoan infection prevalence rates have been reported in studies conducted in Zawia City. Such variation is expected since the socioeconomic and environmental status can fluctuate between different cities in the country. Also, variations rely on the methods of detection that have been used. The rate of infections among children has been reported to be 31% ^[20]. This may be a result of poor hygiene as the disease is transmitted through food, figures, and water that are contaminated by faeces ^[17,21,23]. The increased number of children having intestinal protozoan infections within Zawia is aligned with the 24.2% rate of infection reported within Libya. The findings are attributable to the aforementioned reasons ^[21,23].

Additionally, there have also been some significant reductions in intestinal protozoan infection trends. This may be a result of improved hygiene and sanitation, the development of socio-economic aspects, and the establishment of preventive control measures and the strategy to control such aspects. In contrast, the findings have also shown that protozoa infections are gradually increasing from 19.3% in 2005 up to

2010 and 25.2% from 2011 to 2015. Therefore, the rising trend might result in insufficient financial support, inadequate political commitment, and reduced aspects of community involvement within the implementation associated with effective strategies aimed at reducing infections within Zawia City ^[20].

According to the results, the study detected over 70 people of 740 to be infected with different protozoan species such as *E. histolytica* / *E. dispar*, *B. hominis*, *G. lamblia*, and also *E. coli*. *E. histolytica* and *G. lamblia* primarily cause diarrhea and are responsible for Amebiasis and Giardiasis, respectively ^[3,4]. Very few studies regarding the prevalence of intestinal parasites within the South of Libya have been performed.

No proven data shows the prevalence of parasitic diseases in primary schools in Zawia is caused by the available drinking water ^[15,22]. These sources of water include bottled water, old wells in the city, the new water distribution system in town, and the old water system. It is believed that most parasitic diseases are endemic. The most common parasitic diseases in primary schools are protozoa parasites and they mostly affect females ^[21]. There are many factors responsible for this, such as the transmission routes and the continuous exposure to the parasitic infection source ^[20,21]. Primary school students like playing a lot, and they end up getting exposed to the parasites that exist in vegetation ^[20]. Furthermore, water scarcity in some areas of Zawia is also another factor causing the spread of protozoa parasites among primary school children ^[6,7]. Most schools have old wells where students get their drinking water leading to the spread of the parasite ^[17,20]. The results of the study will equip individuals with more knowledge regarding parasitic diseases in primary schools in Zawia and will help to come up with

comprehensive strategies for controlling the prevalence of parasitic diseases in collaboration with the government ^[16,19].

The highest incidence rates were observed in September and October, followed by the winter months. The high temperature and climate in the spring and summer months could be a reason for reducing incidence rates and could affect the viability of protozoan cysts. More so, differences in infection rates over a period of months within the past studies might contribute to the socio-economic and weather conditions of the people responsible for the study.

The present study data showed that *B. hominis* has been the most common parasite detected, with an infection rate of 6.8%. Therefore, the parasite represented 64.1% of total infections. The findings are nearly identical to the previous studies, which reported similar infection rates ^[21].

Understanding the prevalence of intestinal parasites and the associated factors within various localities are key to identifying increased risk groups, and also for designing appropriate intervention mechanisms. From this view, this present study has attempted to assess the prevalence of intestinal parasitic infections and to associate risk factors among primary school students in Zawia, Libya ^[1,2].

The overall prevalence of intestinal parasitic infections among participants is considerably high. The reports from various schools in Zawia have shown the elevated prevalence of intestinal parasitic infections that range from 35% to 80.

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