

**PREVALENCE, CLINICAL AND SOCIODEMOGRAPHIC
PARAMETERS OF INTESTINAL PARASITOSIS IN SUSPECTED
EGYPTIAN CHILDREN IN BENHA CITY, EGYPT**

By

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Abstract

Intestinal parasitic infections (IPIs) are a public health problem worldwide. This study included 300 children of both sexes, from 4-16 years old. All were subjected to a structured questionnaire sheet, stool examination using: Direct smear and concentration technique as well as perianal swab. The IPIs prevalence was 12.7%, with 7.9% double infections. The protozoan infections 47.4% was higher than the helminthic ones 44.7%. *Giardia duodenalis* was the commonest protozoan, and *Entrobilus vermicularis* was the commonest worm. The children suffered from abdominal pain (11.1%), diarrhea (3.8%), perianal itching (71.4%) and thrive failure (17.4%). Male positivity was 11.9% and female positivity was 13.2%. Intestinal parasites were detected in 25.5% of population drinking tap water, followed by 6.1% among those drinking filtrated water. Moreover, IPIs prevalence was 8.1% in children having a family size equal or less than 5 members, whereas 18.9% of children having a family size more than 5 members. Moreover the frequency was higher among rural 15.3% compared to urban inhabitants 7.3%, also in farming family was 16.5% followed by 7.7% among other job holders and among children to illiterate mothers 13% followed by children to educated mothers 12.3%.

Key words: Intestinal parasites, Prevalence, Demographic, *Giardia duodenalis*, *Entrobilus vermicularis*, *Entameoba histolytica*, *Hymenolepis nana*.

Introduction

It was estimated that two billion people worldwide were infected with at least one parasite species, and three million suffered from parasitosis. The health problems resulting from parasitism affected populations in the developing countries, more than developed ones, due to their living in poverty with a dominance of parasitic infections caused by intestinal helminths and protozoan (Phillips, 1933). Besides, in developing countries, an inverse relationship between helminthic diseases and allergic diseases has been observed in relation to industrialized countries (Versini *et al*, 2015). Simply, the parasite is an invertebrate organism that needs another organism (host) in order to live, as a source of food and a place for growth and reproduction (Horwitz and Wilcox, 2005). The intestinal parasites are considered public health problem worldwide, especially among the health professionals, pregnant women, children, and travelers causing morbidity and mortality (WHO,

2021). The protozoan infections are parasitic diseases that affect the plants, animals, birds, and some marine life, as well as man also, causing morbidity and mortality (Wiley *et al*, 2020). About 600 million of school children living in tropical and subtropical areas had parasites (Tefera *et al*, 2015), with the high rate of *E. vermicularis* in appendicitis ones (Taghipour *et al*, 2020). *Entameoba histolytica* prevalence varied in the different localities mainly in the underdeveloped countries where amoebiasis was the 3rd important cause of death and about 10% of the world population was infected with amoebic dysentery (Wadood *et al*, 2005).

The prevalence of IPIs was high among the mentally disabled students than non-disabled ones. The unclean fingernails, non-hand washing, water for human consumption, family size and overcrowded community had a significant association with the parasitosis (Fentahun *et al*, 2019). The better understanding of factors as how social, behavioral and cultural awareness affected

the epidemiology of parasites and parasitosis would pave the way to the feasible diagnosis, treatment and preventive measures (Mahmoud *et al*, 2017).

The gastrointestinal parasites by feco-oral transmission or autoinfection as well as zoonotic parasites sporadic as well as epidemic outbreaks recurrently would occur (Le Bailly and Araújo, 2016). Intestinal parasites stick to fingers, vegetables, fruits, and others can transmit infection. Adherence of parasites to fingernails was unpredictable mode of infection (Moses *et al*, 2013). In Egypt, many authors dealt with the gastrointestinal parasites particularly among pre-school and school aged children (Moray *et al*, 1991; El-Safy *et al*, 1991; Massoud *et al*, 2008; Yousef and Uga, 2014; Shoman *et al*, 2015; Ahmad *et al*, 2020). Undoubtedly, the epidemiological surveys, early diagnosis, proper treatment and control measures were indicated (Monib *et al*, 2016).

This study aimed to evaluate the prevalence of gastrointestinal parasites among outpatients children, Benha University Pediatric Clinics suffered from abdominal pain, diarrhea, and perianal itching correlated to demographic, and socioeconomic factors.

Patients and Methods

The cross sectional study was done from April 2019 to June 2020, among 300 children aged 4-16 years old, at Benha University Pediatric Out-clinic with manifestations suggestive gastrointestinal parasites. A medical sheet was filled out included name,

age, sex, residence, family size father job, mother education, water for consumption.

Stool collections: Morning stool samples urine free were collected in labeled plastic disposable boxes. Samples were macroscopically examined for color, consistency, and gravid segments or adult worms. About 2 or 3gm of each sample was filtered via cotton gauze into a centrifuge tube, mixed with 3 ml. Diethyl-ether, strongly shaken for 5min. and centrifuged at 3000rpm for 15min. Sediment was mounted in iodine solution and microscopically examined (Garcia, 2016).

The perianal scotch or the cello-tape swabs were used after approval of parents and collected for microscopical examined (Cho and Kang, 1975).

Statistical analysis: Data were collected, computerized and analyzed by using Statistical Package for Social Science Version 20 for Windows Statistical program (SPSS) and Graph. The descriptive data were given in frequencies and percentage. Chi-square test (χ^2) associated between two qualitative variables. P-value of 0.05 or less was considered significant.

Results

In this study, 38/300 (12.7%) were positive for IPis, with significant differences regarding age, source of water consumption, family size, residence and parent occupation, But, no significant difference as to sexes and mother education.

Details were given in tables (1, 2, & 3) and figures (1 & 2).

Table 1: Prevalence of intestinal parasites in relation to different children age groups

| Age in (years) | Total cases | Positive No. (%) | <i>H. nana</i> | <i>E. vermicularis</i> | <i>G. duodenalis</i> | <i>Blast. Hominis</i> | <i>E. histolytica</i> | Double infections |
|----------------|-------------|------------------|----------------|------------------------|----------------------|-----------------------|-----------------------|-------------------|
| 4-8 | 148 | 25(16.9) | 2(5.3) | 10(26.3) | 6 (15.8) | 3(7.9) | 2 (5.3) | 2(5.3) |
| 8-12 | 122 | 12 (9.8) | 1(2.6) | 3(7.9) | 4(10.5) | 1(2.6) | 2(5.3) | 1(2.6) |
| 12-16 | 30 | 1(3.3) | 0(0.0) | 1(2.6) | 0(0.0) | 0(0.0) | 0(0.0) | 0(0.0) |
| Total | 300 | 38(12.7) | 3(7.9) | 14(36.8) | 10(26.3) | 4(10.5) | 4(10.5) | 3(7.9) |
| P value | | P < 0.05 | P > 0.05 | P < 0.05 | P > 0.05 | P > 0.05 | P > 0.05 | P > 0.05 |

Table 2: Prevalence of intestinal parasites in relation to different children main complaints

| Clinical complain | Total cases | Positive No. (%) | <i>H. nana</i> | <i>E. vermicularis</i> | <i>G. duodenalis</i> | <i>Blast. hominis</i> | <i>E. histolytica</i> | double infections |
|-------------------|-------------|------------------|----------------|------------------------|----------------------|-----------------------|-----------------------|-------------------|
| Abdominal pain | 126 | 14(11.1) | 2(5.3) | 0(0.0) | 6(15.8) | 1(2.6) | 3(7.9) | 2(5.3) |
| Diarrhea | 130 | 5(3.8) | 0(0.0) | 0(0.0) | 3(7.9) | 1(2.6) | 1(2.6) | 0(0.0) |
| Perianal itching | 21 | 15(71.4) | 0(0.0) | 14(36.8) | 0(0.0) | 0(0.0) | 0(0.0) | 1(2.6) |
| Thrive failure | 23 | 4(17.4) | 1(2.6) | 0(0.0) | 1(2.6) | 2(5.7) | 0(0.0) | 0(0.0) |
| P value | | P < 0.05 | P > 0.05 | P < 0.05 | P > 0.05 | P > 0.05 | P > 0.05 | P > 0.05 |

Table 3: Sociodemographic parameters of children

| Sociodemographic Parameters | Positive, No. (%) | Negative, No. (%) | Total, No. (%) | P value |
|--------------------------------------|-------------------|-------------------|----------------|----------|
| Male | 14 (11.9) | 104 (88.1) | 118 (100) | p > 0.05 |
| Female | 24 (13.2) | 158 (86.8) | 182 (100) | |
| Water consumption: Filter (Sanitary) | 12 (6.1) | 186 (93.9) | 198 (100) | p < 0.05 |
| : Tap | 26 (25.5) | 76 (74.5) | 102 (100) | |
| Family size: ≤ 5 member | 14 (8.1) | 159 (91.9) | 173 (100) | p < 0.05 |
| : > 5 member | 24 (18.9) | 103 (81.1) | 127 (100) | |
| Residence: Urban | 7 (7.3) | 91 (92.9) | 98 (100) | p < 0.05 |
| : Rural | 31 (15.3) | 171 (84.7) | 202 (100) | |
| Father job: Farmer | 28 (16.5) | 142 (83.5) | 170 (100) | p < 0.05 |
| : Other job | 10 (7.7) | 120 (92.3) | 130 (100) | |
| Mother: Educated | 17 (12.3) | 121 (87.7) | 138 (100) | p < 0.05 |
| : Illiterates | 21 (13) | 141 (87) | 162 (100) | |

Discussion

In the present study, single parasite was 38/300(12.7%) and two parasites were 3/38 (7.9%). The parasitic prevalence was 25/148 (16.9%) in 4-8years, 12/122 (9.8%) in 8-12 years and 1/30(3.3%) in 12-16 years with significant difference ($P < 0.05$). The protozoa 18/38(47.4%) were more than helminthes 17/38(44.7%) with *G. duodenalis* the commonest, and co-infections were 3/38 (7.9%). These were: *G. duodenalis* & *E. vermicularis* 2/38(5.3%), *E. histolytica* & *E. vermicularis* 1/38(2.6%). Protozoa were *G. intestinalis* 10/38(26.3%), followed by *E. histolytica* 4/38(10.5%) & *B. hominis* 4/38 (10.5%). Double infections were 2(5.3%) in ages >4-8years, followed by 1(2.6%) in >8-12years, which totaled 3(7.9%).

The present children suffered from abdominal pain 14(11.1%), diarrhea 5(3.8%), thrive failure 4(17.4%), and perianal itching especially at night 15(71.4%), significantly associated with *E. vermicularis*, which may lead to excoriations and bacterial secondary infection as well as sometimes, worm invaded patient genital tract with vulvo-vaginitis and pelvic or peritoneal granuloma (Biserka *et al*, 2017). *E. vermicularis* was detected in an Indian girl's eye (Babady *et al*, 2011) and in Egyptian surgically removed appendices (Amer *et al*, 2018).

In the present study, the parasites were 14/118(11.9%) in males and 24/182(13.2%) in females, but without significant differences ($p > 0.05$), and in 26/102(25.5%) among children on tap water, followed by 12/198 (6.1%) among those on sanitary water with

significant difference ($P < 0.05$). Infections were 14/173(8.1%) in children with a family size equal or < 5 members compared to 24/127(18.9%) those with a family size >5 members with significant difference ($P < 0.05$). The parasites was higher among rural children 31/202(15.3%) compared to 7/98(7.3%) urban ones with a significant difference ($P < 0.05$). Parasites were 28/170 (16.5%) in farm-family children compared to 10/130(7.7%) among non-farm family ones with a significant difference ($P < 0.05$), also, infections were higher among children of illiterate mothers 21/162(13%) compared to those of educated mothers 12.3% (17/138), but without a significant difference ($P > 0.05$).

In the present study, the overall intestinal parasitic infections among children were 38/300(12.7%). This incidence was the lowest rate reported in other Egyptian studies. The rates ranged between 27%-63.5% (El-Masry *et al*, 2007; Mousa *et al*, 2010; Mohammad *et al*, 2012; Hegazy *et al*, 2014; Kamel *et al*, 2014; Younes *et al*, 2015; Monib *et al*, 2016; Dyab *et al*, 2016; El-Nadi *et al*, 2017 and Bayoumy *et al*, 2018). Differences between the present results and others might be due to the difference in ecosystem and/or human behaviors (Ghazali *et al*, 2018). El-Sayed and Kamel (2020) in Egypt reported that the climate changes and global warming have catastrophic effects on human, animal, bird, environmental ecosystems, and viral, bacterial and parasitic agents would be expected to emerge and re-emerge worldwide.

In the present study, the detected parasites were protozoa and helminthes (47.4% & 44.7%) respectively, with (7.9%) double infections. This more or less agreed with Monib *et al.* (2016) in Assuit reported (7.3%) for mixed double infections, but less than Bauomy *et al.* (2010) in Cairo who reported (17.3%). Besides, *G. duodenalis* was the commonest one detected (26.3%) and (5.3%) in double infection. This agreed with Ward (2009) in Bangladesh and Erismann *et al.* (2017) in Burkina Faso where it was the commonest protozoan ranged between 20-40%. Also, *E. histolytica* was detected (10.5%) and (2.6%) in double infections. This agreed with El-Nadi *et al.* (2017) in Sohag who reported (13%).

In the present study, *E. vermicularis* was the commonest among children (36.8%) and (7.9%) in double infections and was higher in age group 4-8 years (26.3%). This nearly agreed with El-Masry *et al.* (2007) in Sohag, Gunawardena *et al.* (2013) in Sri-Lanka Kamel *et al.* (2014) in Sharkia, Bayoumy *et al.* (2016) in El-Wadi El-Gadded, and Fan *et al.* (2019) in Marshall Islands. Undoubtedly, *E. vermicularis* is worldwide-parasite, with infections occurring most frequently in school or preschool aged children and in crowded conditions and rarely, eggs may become airborne and be inhaled and swallowed by the patient (CDC, 2019).

In the present study, *H. nana* prevalence was (7.9%). This agreed with slightly higher than (6.5%) that was reported in Burkina Faso (Erismann *et al.*, 2017), but lower than (14.9%) reported by El-Masry *et al.* (2007) and even (17.5%) reported in Yemen rural children (Al-Mekhlafi, 2020). CDC (2021) reported that *Hymenolepis* infection (dwarf tapeworm) is found worldwide, in children in countries with inadequate sanitation and hygiene.

In the present study, the recovered parasites from children were 11.9% in males and 13.2% in females, without a significant difference. But, Oluwafemi (2003) in India reported that some parasitic infections as *E.*

histolytica were higher in girls than boys. Also, in the present parasitic infections were (25.5%) among children consuming tap water, while those consumed sanitary water was (6.1%) with a high significant association that agreed with Mekonnen and Ekubagewargies (2019) in Ethiopia.

In the present study, the detected parasites were (8.1%) in children with small family members, but the infections among children with family members more than five were (18.9%). Also, the parasitic infections rate was higher among rural children (15.3%) compared to urban ones (7.3%). Moreover, the present parasitic rate was higher than (53.4%) in Dakahlia Governorate rural areas (El-Beshbishi *et al.*, 2005) and even (47.8%) in Menoufia Governorate rural areas (Bakr *et al.* (2009). Forson *et al.* (2018) in Ghana reported that usually the intestinal parasites were prevalent in children from over-crowded families particularly in rural areas.

In the present study, the intestinal parasites were (13%) among children of educated mothers as compared to (12.3%) of illiterate mothers. This agreed with El-Beshbishi *et al.* (2005) in Dakahlia and even Pozio (2020) in Italy who reported that lower socioeconomic status, low level of parents education and high crowding index were highly significant risk factors for parasitosis. Macpherson (2005) in India reported that the improved and new serological, molecular and imaging diagnostic tests and development of broad spectrum chemotherapeutic agents led to the attenuation of morbidity and mortality due to parasitic zoonosis in economically advantaged regions.

Conclusion

Generally speaking, personal hygiene practices play a crucial role in preventing the gastrointestinal parasites transmission.

The present parasitosis was lower than the other Egyptian results, but early diagnosis and proper treatment are indicated. The preschool and preschool-aged children must be included in the National Parasitosis Control Program.

Recommendations

Necessary sanitary strategies, health education, improving socio-economic conditions, and personal hygienic measures by safe food and water sources, regular screening and rapid treatment for parasitic infections must be in the concern of the Public Health Authorities.

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Explanation of figures

Fig. 1: Prevalence of intestinal parasites in relation to different child age groups.

Fig. 2: Prevalence of intestinal parasites in relation to different children main complaint.

Fig. 3: Sociodemographic parameters of children.

