



## Original Research Article

# Prevalence of Intestinal Parasites in Afif, Saudi Arabia: A 5-year Restrospective Study

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## ABSTRACT

### Keywords

Intestinal parasites, *Entamoeba histolytica*, *Giardia duodenalis/intestinalis*, Prevalence, Afif, Saudi Arabia

Intestinal parasitic infection is a global endemic, affecting billions of people especially children predominantly in developing countries where poor hygiene and sanitation are evident. The goal of this restrospective study was to determine the prevalence of intestinal parasites detected through routine stool examination in a private clinical laboratory at Afif, Saudi Arabia, from 2010 to 2014 for a period of 5 years. After seeking permission from the hospital manager, data from log books and reports were obtained from the Records department with the assistance of the laboratory staff. Results revealed that *Entamoeba histolytica* (30.6%) and *Giardia duodenalis/intestinalis* (formerly *G. lamblia*) (9.2%) were the most prevalent intestinal parasites among the patients who submitted stool samples for analyses. Brief descriptions of these 2 intestinal protozoans were presented, with emphasis on their diseases caused, modes of transmission and signs and symptoms. Preventive and control measures were likewise discussed purposely to educate the vulnerable people, thus reducing the risk of infection with intestinal parasites. Public health measures like water treatment and sewerage disposal programs were recommended for implementation by the local government.

## Introduction

Affecting approximately more than two billion people, intestinal parasitic infections are globally endemic (Mehraj et al., 2008). An estimated 300 million of the affected individuals suffer from severe illnesses associated with parasites (Al-Mohammed et al., 2010), which result to iron deficiency anemia, retardation of growth in children, and other physical or mental health disorders (Al-Shammari et al., 2001).

The soil-transmitted helminths, *Ascaris lumbricoides* (giant intestinal roundworm), *Trichuris trichiura* (whipworm) and hookworms (*Necator americanus*, etc.) are the most prevalent parasites inhabiting the human intestines (Bethony et al., 2006). According to the Centers for Disease Control and Prevention, *Ascaris lumbricoides* the largest and the most common nematode residing in the small

intestines and affects 1 billion people worldwide (CDC, 2006). Known as the "dwarf tapeworm", *Hymenolepis nana* is the most frequent parasitic cestode in the world (Pillai and Kain, 2003). Infecting about 200 million people, the most widespread protozoan parasitic infection is *giardiasis* caused by *Giardia duodenalis/intestinalis* (Pillai and Kain, 2003; Minenoa and Avery, 2003).

In Saudi Arabia, limited studies have been conducted to determine the prevalence of intestinal parasitic infections and often focused to specific parasites (Barnawi et al., 2007; El-Sheikh and El-Assouli, 2001). In a study among the schoolchildren in Al-Ahsa, *Entamoeba histolytica/dispar* (8.2%), *Giardia duodenalis/ intestinalis*(6.5%), *Entamoeba coli*(4.0%), *Enterobius vermicularis* (1.6%), *Ascaris lumbricoides*, *Hymenolepis nana* and *Blastocystis hominis* (0.9% each) were detected (Al-Mohammed et al., 2010). *Giardia duodenalis/ intestinalis* (10.9%), *Entamoeba histolytica* (4.1%), *Entamoeba coli*(11.3%), *Hymenolepis nana* (3%), *Ascaris lumbricoides*, *Trichuris trichiura*, and *Schistosoma mansoni* were the most common intestinal parasites identified among the schoolchildren of Abha (Asir), Saudi Arabia (Omar et al., 1991). In Riyadh, the most prevalent parasitic infections were *Giardia duodenalis/ intestinalis* (37.7%), *Entamoeba histolytica* (30%), *Entamoeba coli*(10.4%), *Ascaris lumbricoides* (5.5%) and *Hymenolepis nana*(5.4%) (Al-Shammari et al., 2001). Among the young children with acute diarrhea in Jeddah, *Entamoeba histolytica*, *Trichuris trichiura*, *Hymenolepis nana* and *Ascaris lumbricoides* have been positively examined (El-Sheikh and El-Assouli, 2001).

Moreover, a retrospective analysis of intestinal infections diagnosed at a university hospital in Riyadh revealed that

*Giardia duodenalis/intestinalis*, *Ascaris lumbricoides*, hookworms and *Trichuris trichiura* were identified as the most prevalent parasites among its patients who were predominantly Saudi nationals working in the government (Alkhalife, 2006). Recently, the study of Fareid et al. (2011) found out that the most prevalent intestinal parasites among the diarrhoeal school children at Hail were *Cryptosporidium parvum* (42%) and *Entamoeba histolytica* (30%) while *Cryptosporidium parvum* (32.6%), *Giardia duodenalis* (29.3%) and *Entamoeba histolytica* (14.6%) were the most common in children with non-diarrheic stools.

Consequently, the goal of this current study is to review the stool examination results of patients consulting a private clinical laboratory in Afif Saudi Arabia from 2010 to 2014, with emphasis on the prevalence of intestinal parasites as bases for recommendations to mitigate the risk of intestinal parasitic infections.

## **Materials and Methods**

This retrospective study analyzed the laboratory results of stool examination among the patients of a private clinical laboratory in Afif, Saudi Arabia for 5 years from 2010 to 2014. Formal coordination with the manager of the private clinical laboratory for permission to conduct the survey was carried out. During the duration of the study, routine stool examination was performed to describe the color and consistency of the patient's sample. Microscopy aided in the detection of ova, cysts, larvae or trophozoites of the different intestinal parasites. Positive results were retrieved from the records section with the assistance of laboratory staff. Raw monthly laboratory reports were tallied. Frequency, mean and percentage were utilized to

statistically analyze the data. Patients' information was held with strict confidentiality.

## **Result and Discussion**

A total number of four hundred fifty-six (456) stool samples for analyses were submitted to the clinical laboratory department of a private hospital in Afif, Saudi Arabia for a period of 5 years (2010 to 2014). Figure 1 indicates the frequency of intestinal parasites detected. Of the 456 clinical samples, 182 (40%) stools were positive for *Entamoeba histolytica* in 2010; 150 (33%) in 2011; 78 (17%) in 2012; 137 (30%) in 2013; and 150 (33%) in 2014. *Giardia duodenalis/intestinalis* was detected among 32 (7%) fecal specimens in 2010; 50 (11%) in 2011; 41 (9%) in 2012 and 2013; and 46 (10%) in 2014. Overall, the protozoans, *Entamoeba histolytica* and *Giardia duodenalis/intestinalis* were found in 139 (30.6%) and 42 (9%) stool samples from 2010-2014, respectively. These two protozoans were reported as the most prevalent intestinal parasites among the patients of the aforementioned health institution.

Consistent with previous studies, the results revealed that *Entamoeba histolytica* and *Giardia duodenalis* were the commonest intestinal protozoa in Saudi Arabia. *Entamoeba histolytica* was detected among 30% people in Riyadh; 30% among diarrhoeal schoolchildren in Hail and 14.6% for non-diarrheic samples (Fareid et al., 2011); 8.2% among male primary schoolchildren in Al-Ahsa (Al-Mohammed et al., 2010); 5.2% in Al-Asiah; 4.7% among patients of Al-Noor Specialist Hospital in Makkah (Zaglool et al., 2011); 4.1% in Asir; 2.2% in Jeddah; and 1.01% in Makkah (Al-Faleh, 1982; Omar et al., 1991; Al-Braiken et al., 2003; Al-Harathi, 2004). Meanwhile,

Giardiasis registered 37.7% prevalence in Riyadh (Al-Shammari et al., 2001); 22.6% in Al-Asiah, Qassim region (Al-Faleh, 1982); 29.3% among non-diarrhoeal schoolchildren in Hail (Fareid et al., 2011); 10.9% in Asir (Omar et al., 1991); 9.5% in Jeddah (Al-Braiken et al., 2003); 6.5% in Al-Ahsa (Al-Mohammed et al., 2010); 2.89% in Makkah (Al-Harathi, 2004); and 1.3% among patients of Al-Noor Specialist Hospital in Makkah (Zaglool et al., 2011). Moreover, *Entamoeba histolytica* and *Giardia duodenalis* are considered as the two most prevalent intestinal protozoa in the world. The global prevalence of Giardiasis is 30%, while *Entamoeba histolytica* may reach 80% in some developing countries (El-Sheik and El-Assouli, 2001).

Due to the prevalence of *E. histolytica* and *G. duodenalis* in Saudi Arabia, a brief description of these intestinal parasites is essential. In addition, preventive and control measures are thoroughly discussed to educate the public.

### ***Entamoeba histolytica***

The disease caused by the enteric protozoan parasite, *Entamoeba histolytica* (Figure 2) is called amebiasis (CDC et al., 2010). Infection can occur when an individual ingests a quadri-nucleated cyst from fecal contaminated food or water (Petri et al., 2009). Two to ten percent of diarrheic children in developing countries suffer from amebiasis. Intestinal amebiasis and amebic liver abscess are its two major clinical syndromes, which constitute in an estimated 50 million global infections and 100,000 deaths annually (Stanley, 2003). Preventive measures include food and water precautions, hand hygiene and avoiding fecal exposure during sexual activity (Bercu et al., 2007; Petri and Singh, 1999; Stanley, 2003). Drinking purified or boiled water and

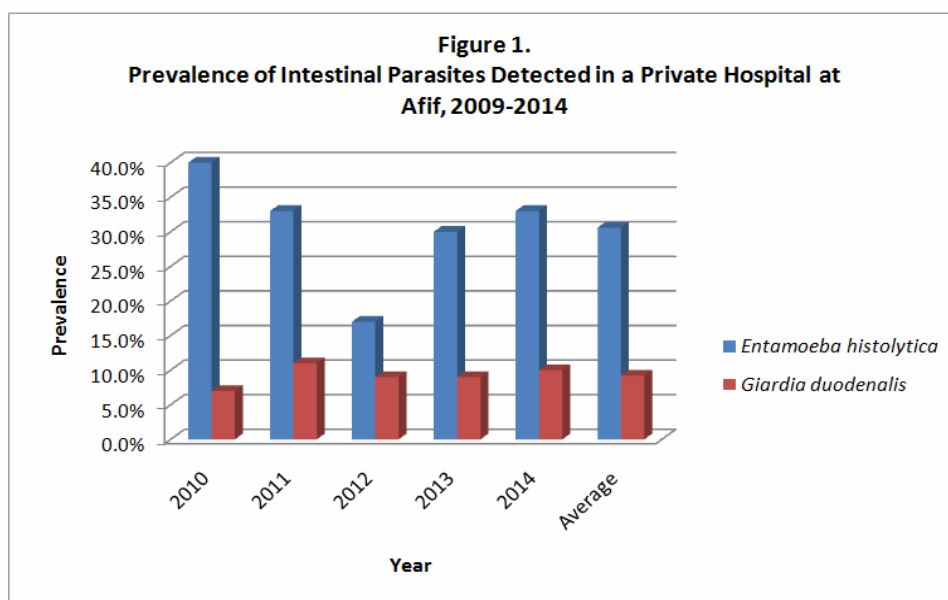
avoiding consumption of uncooked vegetables or unpeeled fruit must be observed when traveling to tropical countries with poor sanitation. Public health measures are purification, water chlorination, and sewage treatment programs (Petri and Haque, 2011; Petri and Haque, 2009).

### *Giardia duodenalis/intestinalis*

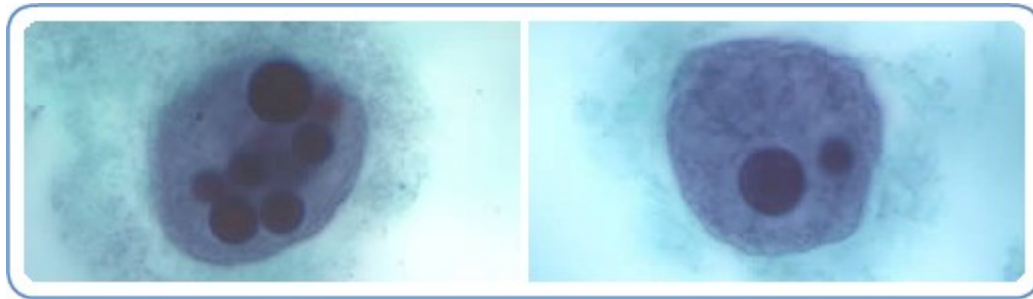
Formerly known as *G. lamblia* (Figure 3), this enteric protozoon causes a diarrheal disease called giardiasis that can be spread by swallowing *Giardia* picked up from fecal contaminated surfaces; drinking contaminated water; eating contaminated uncooked food; contact with a person with giardiasis; and traveling to endemic countries (CDC et al., 2012). Typically developing in 1-2 weeks after infection, signs and symptoms of giardiasis include foul-smelling, greasy diarrheic stools; stomach or abdominal cramps; bloating; flatulence; fatigue; anorexia; upset stomach or nausea; and dehydration (Greenwood et al., 2008; Okhuysen, 2001; Swaminathan et al., 2009). Measures to prevent and control giardiasis include practice of good hygiene;

avoiding to drink contaminated water; avoiding consumption of contaminated food; and no fecal contamination during sexual contact (CDC et al., 2012). Food and water precautions and hand hygiene are the key preventive measures to reduce the risk of infection with *Giardia* (Greenwood et al., 2008; Okhuysen, 2001; Swaminathan et al., 2009).

Intestinal parasitic infections like amebiasis and giardiasis are a significant public health concern in Afif, Saudi Arabia. Two protozoans, *Entamoeba histolytica* and *Giardia duodenalis/intestinalis* are identified as the most prevalent intestinal parasites detected through routine stool examination in a private clinical laboratory at Afif. In order to mitigate the risk of infection, preventive and control measures are necessary including health education and promotion of good personal hygienic practices like handwashing and proper sanitation. Public health measures such as water treatment and sewerage disposal programs should be implemented by the local government.



**Figure.2** Trophozoites of *E. histolytica* with ingested erythrocytes (red blood cells) stained with trichrome. Photo Credit: DPDx, CDC



*Giardiaduodenalis/intestinalis* trophozoites in a Giemsa stained mucosal imprint. Photo credit: DPDx, CDC



## References

- Al-Braiken FA, Amin A, Beeching NJ, Hommel N, Hart CA. 2003. Detection of *Cryptosporidium* amongst diarrhoeic and asymptomatic children in Jeddah, Saudi Arabia. *Ann. Trop. Med. Parasitol.* 97(5): 505-510.
- Al-Faleh FZ. 1982. The prevalence of *Entamoeba histolytica* and other parasite in school children. *Com. Hlth. Saudi Arabia.* 32-34.
- Al-Harhi SA. 2004. Prevalence of intestinal parasites in schoolchildren in Makkah, Saudi Arabia. *The New Egypt J Med.* 31(4):37-43.
- Alkhalife IS. 2006. Retrospective analysis of intestinal parasitic infections diagnosed at a university hospital in Central, Saudi Arabia. *Saudi Med J.* 27(11):1714-8.
- Al-Mohammed HI, Amin TT, Aboulmagd E, Hablus HR, Zaza BO. 2010. Prevalence of intestinal parasitic infections and its relationship with socio-demographics and hygienic habits among male primary schoolchildren in Al-Ahsa, Saudi Arabia. *Asian Pacific Journal of Tropical Medicine.* 906-912.
- Al-Shammari S, Khoja T, El-Khwasky F, Gad A. 2001. Intestinal parasitic diseases in Riyadh, Saudi Arabia: prevalence, sociodemographic and environmental



- associates. *Tropical Medicine & International Health*. 6:184–189.
- Barnawi AB, Tonkal AM, Fouad MA, Al-Braiken FA. 2007. Detection of *Entamoeba histolytica/dispar* in stool specimens by using enzyme-linked immunosorbent assay in the population of Jeddah City, Saudi Arabia. *J Egypt Soc Parasitol*. 37(1):143-50.
- Bercu TE, Petri WA, Behm JW. 2007. Amebic colitis: new insights into pathogenesis and treatment. *Curr Gastroenterol Rep*. 9(5):429–33.
- Bethony J, Brooker S, Albonico M, Geiger SM, Loukas A, et al. 2006. Soil-transmitted helminth infections: ascariasis, trichuriasis, and hookworm. *Lancet*. 367:1521–1532.
- CDC, National Center for Emerging and Zoonotic Infectious Diseases (NCEZID), Division of Foodborne, Waterborne, and Environmental Diseases (DFWED). 2010. Amebiasis. Atlanta: Center for Disease Control & Prevention, USA.
- CDC, National Center for Emerging and Zoonotic Infectious Diseases (NCEZID), Division of Foodborne, Waterborne, and Environmental Diseases (DFWED). 2012. Giardiasis. Atlanta: Center for Disease Control & Prevention, USA.
- CDC. 2006. DPDx: Laboratory Identification of Parasites of Public Health Concern. Atlanta: Center for Disease Control & Prevention, USA.
- El-Sheikh SM, El-Assouli SM. 2001. Prevalence of viral, bacterial and parasitic enteropathogens among young children with acute diarrhea in Jeddah, Saudi Arabia. *J Health Popul Nut*. 19(1):25-30.
- Fareid MA, Alshankyty IM, Amer OH. 2011. Prevalence of Intestinal Parasitic and Bacterial Pathogens in Diarrhoeal and Non-diarrhoeal School Children's at Hail, Saudi. *New York Science Journal*. 4(6): 106-113.
- Greenwood Z, Black J, Weld L, O'Brien D, Leder K, Von Sonnenburg F, et al. 2008. Gastrointestinal infection among international travelers globally. *J Travel Med*. 15(4):221–8.
- Mehraj V, Hatcher J, Akhtar S, Rafique G, Beg MA. 2008. Prevalence and Factors Associated with Intestinal Parasitic Infection among Children in an Urban Slum of Karachi. *PLoS One*. 3(11):e3680.
- Minenoa T, Avery MA. 2003. Giardiasis: recent progress in chemotherapy and drug development. *Curr Pharm Des*. 9: 841–855.
- Okhuysen PC. 2001. Traveler's diarrhea due to intestinal protozoa. *Clin Infect Dis*. 33(1):110–4.
- Omar MS, Abu-Zeid HAH, Mahfouz, AAR. 1991. Intestinal parasitic infections in schoolchildren of Abha (Asir), Saudi Arabia. *Acta Tropica*. 48(3): 195–202.
- Petri WA Jr, Haque R. 2011. Amebiasis. In: Goldman L, Schafer AI, eds. *Cecil Medicine*. 24th ed. Philadelphia, Pa: Saunders Elsevier: chap 360.
- Petri WA Jr, Haque R. *Entamoeba* species, including amebiasis. In: Mandell GL, Bennett JE, Dolin R, eds. *Principles and Practice of Infectious Diseases*. 2009, 7th ed. Philadelphia, Pa: Elsevier Churchill Livingstone:chap 273.
- Petri WA Jr, Singh U. 1999. Diagnosis and management of amebiasis. *Clin Infect Dis*. 29(5):1117–25.
- Pillai DR, Kain KC. 2003. Common Intestinal Parasites. *Current Treatment Options in Infectious Diseases*. 5: 207–217.
- Stanley SL Jr. 2003. Amoebiasis. *Lancet*. 361(9362):1025–34.
- Swaminathan A, Torresi J, Schlegelhauf P, Thursky K, Wilder-Smith A, Connor BA, et al. 2009. A global study of pathogens and host risk factors associated with infectious gastrointestinal disease in returned international travelers. *J Infect*. 59(1):19–27.
- Zaglool DAM, Khodari YAW, Gazzaz ZJ, Dhafar KO, Shaker HAS, Farooq MU. 2011. Prevalence of Intestinal Parasites among Patients of Al-Noor Specialist Hospital, Makkah, Saudi Arabia. *Oman Medical Journal*. 26(3):182-185.