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Prevalence of intestinal parasite infections among patients in local public hospitals of Hail, Northwestern Saudi Arabia

Omar Hassen Amer¹, Ibraheem M. Ashankyty¹, Najoua Al Sadok Haouas^{1,2*}¹Department of Clinical Laboratory Science, College of Applied Medical Sciences, University of Hail, Saudi Arabia²Département de Biologie Clinique B, Laboratoire de Parasitologie-Mycologie Médicale et Moléculaire (LR12ES08), Faculté de Pharmacie, Université de Monastir, Tunisia

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ABSTRACT

Objective: To evaluate the prevalence of intestinal parasites among patients in Hail, Northwestern Saudi Arabia.**Methods:** Stool samples were collected from 130 patients (69 females and 61 males) in Hail General Hospital. Each sample was examined by direct wet mount microscopic examination using both normal saline and Lugol's iodine preparation and concentration techniques using salt and formol–ether solutions. Permanent stained smears were performed for intestinal coccidian using modified Ziehl–Neelsen technique.**Results:** The overall prevalence of intestinal parasitic infection was 45.38% (59 cases). Forty-four (33.84%) were found to be infected with one or more intestinal protozoa, 5 (3.84%) were infected with helminthes and 10 (7.69%) had mixed infection with both helminthes and protozoa. The most common intestinal helminth detected was *Ancylostoma duodenale* ($n = 5$, 3.84%), followed by *Ascaris lumbricoides*, *Taenia* sp. and *Trichuris trichiura* ($n = 2$ for each species, 1.5%). For intestinal protozoa, the coccidian *Cryptosporidium parvum* ($n = 25$, 19.23%) was the most common followed by *Entamoeba histolytica/dispar* ($n = 21$, 16.15%), *Giardia lamblia* ($n = 15$, 11.54%), *Entamoeba coli* ($n = 5$, 3.85%) and *Blastocystis hominis* ($n = 3$, 2.30%). The prevalence of intestinal parasitic infections in females was significantly higher than in males ($P < 0.05$).**Conclusions:** This is the first study highlighting that intestinal parasites are still an important public health problem in Northwestern Saudi Arabia. Therefore, health education would be the best way to prevent from intestinal parasite infections which are mainly food borne diseases.

1. Introduction

Parasitic infections are a major public health problem worldwide; particularly in the developing countries and constituting the greatest cause of illness and disease [1,2]. Current assessments suggest that at least one third of the total population in the world is infected with intestinal parasites. Indeed, it is estimated that about 3.5 billion people in the world are infected with intestinal parasites, of whom 450 million are ill [3,4]. The majority is

living in tropical and subtropical parts of the world. The prevalence of the intestinal parasitic infections varied from one region to another and it also depends largely on the diagnostic methods employed and the number of stool examinations done.

Saudi Arabia is one of the most important countries receiving the largest influx of expatriate workers from different regions of the world including Bangladesh, Philippines, India, Indonesia, Pakistan, Sri Lanka and Egypt. All of these countries are known to be endemic for many diseases including those caused by intestinal parasites. Although, all workers are medically examined twice in their country of origin and when they enter Saudi Arabia, many studies have demonstrated the high rate of infection with intestinal protozoa and helminthes among this population [5–7]. Indeed, previous studies in different regions of Saudi Arabia revealed high prevalence rates of infection with intestinal

*Corresponding author: Najoua Al Sadok Haouas, Department of Clinical Laboratory Sciences, College of Applied Medical Sciences, University of Hail, Campus of Aja, Hail, Saudi Arabia.

Tel: +966 595191419

E-mail: najoua.h@laposte.net

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parasites among specific populations including food handlers (23%), school children (33.8%), expatriates (varying between 14.9% and 55%), and Saudi and Non-Saudi patients attending hospitals (varying between 39.7% and 77.1%) [5–13].

Most of these previous studies conducted in Saudi Arabia were focused on some regions such as Jeddah, Makkah, Al-Madina Al-Munawara and Riyadh providing updated data concerning the prevalence of intestinal parasite infection among different populations. However, to the best of our knowledge, no report is available about the prevalence of human intestinal parasite in Northwestern Saudi Arabia. Thus, the aim of the present study was to determine the prevalence of human intestinal parasitic infections in Hail region.

2. Material and methods

2.1. Study area and population

The study was conducted in Hail region between September and December 2012. Hail is located in Northwestern Saudi Arabia (27 °N, 41 °E), characterized by a continental desert climate with hot summers (average high temperature 29.2 °C) and cool winters (average low temperature 13.3 °C). Hail is located in a high altitude (1 140 m above mean sea level) with an annual precipitation of 100.6 mm. Participants in this study were both symptomatic and asymptomatic of Saudi and Non-Saudi patients in the Hail General hospital.

2.2. Stool sample collection

Samples were collected in sterile plastic containers, carefully labeled and transported to the laboratory of parasitology in the Department of Clinical Laboratory Sciences, College of Applied Medical Science, University of Hail. Each stool specimen was processed as follow:

2.3. Macroscopic examination

The stool specimens were examined for the presence of adult worms like *Enterobius*, and proglottids of *Taenia* either with the naked eye or by using a hand lens.

2.4. Direct microscopic examination using normal saline and iodine preparation

About 1–2 mg of stool was emulsified in 1–2 drops of normal saline (0.9%) or Lugol's iodine solution. A cover-slip was then placed and the slide was scanned under 10× and 40× objective lenses of a light microscope. Saline direct smear is used mainly for the detection of intestinal protozoa trophozoites motility. Iodine direct smear allows the examination of the characteristic

features of the protozoa and the identification of the *Entamoeba histolytica/dispar* (*E. histolytica/dispar*) cyst from the commensal *Entamoeba coli* (*E. coli*). Parasitological assessment was performed by qualified laboratory technologists.

2.5. Formol–ether concentration

After completion of direct stool examination, one gram of each sample was emulsified in 10% formalin solution and formol–ether concentration technique was performed as described elsewhere in order to increase the chance of detecting parasites [14].

Permanent stained smears were performed for intestinal coccidian parasites by the modified Ziehl-Neelsen technique according to Utzinger et al. (2010) [15] and modified trichrome stain according to Ryan et al. (1993) [16].

2.6. Statistical analysis

Collected data were entered into a Microsoft Excel data base and then analyzed using the Epi-Info version 6.04 (Centers for Disease Control and Prevention, Atlanta Georgia and WHO, Genève Suisse) statistical software. Prevalence was calculated as percentage value. Statistical association of intestinal parasitic infection prevalence with gender and nationality was analyzed using χ^2 test. A statistically significant association between variables is considered to exist if $P < 0.05$.

3. Results

In total, 130 patients participated in this study. Among them 48 (36.93%) were Saudi and 82 (63.07%) were Non-Saudi. Regarding the gender, 61 (46.93%) were male and 69 (53.07%) were female. The overall prevalence of intestinal parasitic infection among these patients was determined to be 45.38% (59/130). It was 35.41% (17/48) and 51.22% (42/82) among Saudi and Non-Saudi patients, respectively. The prevalence of infection with intestinal parasites was not significantly different among these two groups ($P = 0.08$) (Table 1). However, females were found to have a higher percentage of infection (59.42%) compared to the male group (29.50%). The association between the gender and intestinal parasitic infection was statistically significant ($P = 0.0006$) (Table 1).

Out of the 130 patients examined, 44 (33.84%) were found to be infected with one or more intestinal protozoa, 5 (3.84%) were infected with helminthes and 10 patients (7.69%) had mixed infection with both helminthes and protozoa.

Regarding the number of parasites species detected in each sample, 40 patients (30.76%) were infected with a single parasite species with a single protozoon ($n = 36$) and a single helminth ($n = 4$); seven (5.38%) were infected with two different intestinal

Table 1

Prevalence of intestinal parasitic infection according to the nationality and gender.

Factor	No. examined	Infected number	Prevalence (%)	95% CI	χ^2	P-value
Nationality						
Saudi	48	17	35.41	22.55–50.60	3.05	0.080 0
Non-Saudi	82	42	51.22	40.00–62.31		
Gender						
Male	61	18	29.50	18.86–42.74	11.69	0.000 6
Female	69	41	59.42	46.92–70.86		

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