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Prevalence of Intestinal Helminths in Kuwait

Abdullah A. Alaqeel

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Abstract

This study aimed to determine the prevalence of intestinal parasites in Kuwait. In this retrospective analysis, data were collected from 6423 patients from January 2022 to July 2023. All patients presented to a hospital in one of the five public health districts in Kuwait (Al-Amiri, Mubarak, Al-Farwaniya, Al-Jahra and Al-Adan) or in the specialized health district (Al-Sabah). The samples were examined via the saline wet mount and concentration methods to detect the presence of worm eggs and larvae. In total, 110 cases of intestinal helminths were detected (1.72%). The most prevalent helminth was Ascaris lumbricoides (74 cases, 67.2%), followed by Ancylostoma duodenale (16 cases, 14.56%), Enterobius vermicularis (7 cases, 6.36%), Trichuris trichiura (6 cases, 5.45%), Tenia solium (3 cases, 2.7%), Schistosoma mansoni (2 cases, 1.8%) and Strongyloides stercoralis (2 cases, 1.8%). The low prevalence of intestinal helminth infections in Kuwait is an indicator of the high level of health services provided to the general population. However, there remains room for further development and improvement of strategies aimed at protecting public health.

Keywords: intestinal helminths, Ascaris lumbricoides, Ancylostoma duodenale, parasites, parasitic infection; Kuwait.

* Introduction

Intestinal parasites are among the most common gastrointestinal diseases in the world. There are an estimated 3.5 billion intestinal parasitic infections worldwide, resulting in approximately 450 million infections (Saki, Khademvatan, Foroutan-Rad, & Gharibzadeh, 2017). Helminth infections are a major health problem,

especially among preschool children (Gebretsadik, Tesfaye, Adamu, & Zewde, 2020; Haque, 2007). Intestinal helminth infections are associated with various symptoms, such as abdominal pain, intestinal obstruction, malnutrition, bleeding, anaemia, intestinal bleeding, nutrient deficiency and poor absorption (Abdi et al., 2017; Alemu, Abossie, & Yohannes, 2019; Dessie, Gebrehiwot, Kiros, Wami, & Chercos, 2019). In 2020, the World Health Organization (WHO, 2020) estimated the number of people infected with parasitic worms reached 1.5 billion, accounting for approximately 24% of the population worldwide; additionally, 10,000–135,000 related deaths were estimated to occur per year (Eslahi et al., 2023).

Parasitic infections transmitted through contaminated food are largely responsible for the global burden of disease (Torgerson et al., 2014). The prevalence of intestinal parasitic infections varies across countries and depends on geographical and environmental factors. Intestinal parasitic infections are more prevalent in developing countries, especially in sub-Saharan Africa, Asia, Latin America and the Caribbean (Ahmed, 2023).

Soil-transmitted helminths are a major cause of parasitic infestation worldwide, including 465 million infections with Trichuris trichiura, 439 million infections with hookworms, and 819 million infections with Ascaris lumbricoides (Alemu, Aschalew, & Zerihun, 2018). Further, Schistosoma mansoni, Hymenolepis nana and Strongyloides stercoralis have been shown to affect health (Chelkeba, Mekonnen, Alemu, & Emana, 2020; Teshale, Belay, Tadesse, Awala, & Teklay, 2017).

Soil-transmitted helminths can be transmitted to humans directly via the faecal–oral route or indirectly through food or water contaminated with human or animal faeces (Chege et al., 2020). Other factors can affect transmission, such as the prevalence of intestinal helminths, increasing population density, poverty, contaminated food, an unhygienic environment, inadequate health services, inadequate sanitation, economic issues, a lack of access to safe drinking water and poor nutrition (Alqarni, Wakid, & Gattan, 2023; Saki, Foroutan-Rad, Asadpouri, 2016; Wudneh & Gebeyehu, 2022). Previous studies of the risk factors for parasitic diseases in Kuwait concluded socioeconomic status, educational level and personal

hygiene influenced the risk of parasitic diseases (Al-Nakkas, Al-Mutar, Shweiki, Sharma, & Rihan, 2004).

Kuwait is in the Middle East, at the northwestern end of the Arabian Gulf. The estimated area of Kuwait is 17,818 square kilometres, and its population is ٤,٨٥٩,٥٩٥ million people, of whom 1,545,893 are Kuwaitis and 3,310,702 are non-Kuwaitis, including Indian, Egyptian, Filipino, Bengali, Syrian, Pakistani and Sri Lankan individuals, who account for 2.311 million of the non-Kuwaitis (Ibrahim, 2022; The Public Authority for Civil Information). Kuwait has 112 health centres that provide primary care services to residents, including general medicine, dentistry, childhood care, maternity care, preventive medicine, school health, laboratory services and radiology. These health centres are divided into five governmental health districts (Al-Amiri, Mubarak, Al-Adan, Al-Farwaniya and Al-Jahra), where secondary care is provided, and one specialized health district (Al-Sabah health district), where specialized health services are provided (General Secretariat of the Supreme Council for Planning and Development, 2020).

*** Study aim**

This study aimed to determine the distribution of intestinal helminth infections in Kuwait and whether factors such as geographical distribution, age, sex and nationality affect the total number of cases.

*** Study advantages**

Very few parasitology studies have been conducted in Kuwait, which makes this study exciting for several reasons. Because of the lack of research related to intestinal helminth infections, this study may serve as a reference for future studies.

The purpose of publishing our manuscript in a leading and respected open-access online journal is to ensure it can be reached by the largest number of people interested in this area, as sharing this information will encourage other researchers to conduct research in this field.

*** Materials and methods**

*** Study design**

As mentioned, Kuwait is divided into five public health districts—Al-Amiri, serving 622,068 people; Mubarak, serving 995,353 people; Al-Adan, serving 1,069,270 people; Al-Jahra, serving 625,354 people; Al-Farwaniya, serving 1,219,576 people—and Al-Sabah, a specialized health district, serving 321,804 people (The Public Authority for Civil Information).

Kuwait is a nonendemic country with respect to helminth parasites, but many expatriates come to Kuwait from endemic areas. This retrospective study examined all samples obtained from patients in the five public health districts and the specialized health district from January 2022 to July 2023.

Medical records were examined to obtain data from patients who were referred from inpatient and outpatient clinics for a laboratory stool examination and presented with abdominal pain, abdominal colic, constipation, anal itching and enlarged organs or jaundice. These patients were diagnosed and treated in the hospital, and the results were recorded on a standardized data sheet. The personal information and identity of the patients were anonymized to maintain privacy.

*** Sample collection and analysis**

All laboratory tests and examinations were conducted in accordance with Kuwaiti Ministry of Health protocols and WHO guidelines.

A clean plastic container was given to each patient who presented for a stool test. The container was labelled with the patient's information, and the patient was asked to provide a fresh stool sample. The samples were sent to the laboratory for further examination to determine whether they contained helminth eggs or larvae. The saline wet mount and concentration methods were used to determine the presence of worm eggs and larvae. In direct saline wet mount, a drop of saline was placed in the centre of the slide, and a small portion of the sample was selected with an applicator stick and mixed with saline. Each sample was covered with a coverslip and examined with a 10× objective for the presence of eggs and larvae. In the concentration methods, 2–5 grams of each stool were mixed well with 10% formalin and left for 30 minutes. After the stool was filtered, 10–12 mL of 0.85% saline solution was added and mixed well. The sample was centrifuged for 2 minutes at 2000 RPM (or 2500 RPM) then the supernatant was discarded; 1–1.5 mL of the sediment remained. Then, 9 mL of 10% formalin was added to the sediment, and the test tube was capped and shaken well for 30 seconds. Subsequently, the sample was centrifuged for 1 minute at 2000 RPM, the debris was removed with a wooden stick, the top three layers were carefully filtered, the sediment was removed from the test tube, the sides of the test tube were cleaned with a swab, a few drops of

formalin were added and the sediment was mixed well. Then, the sample was examined under a microscope (WHO, 1997).

*** Statistical analysis**

Data were analysed via SPSS software version 25. The chi-square test was performed to detect any significant differences in the number of cases in terms of geographical area, age, sex and nationality. The level of Type I error was <0.05 (i.e. alpha < 0.05). The method through which intestinal helminths spread in Kuwait was estimated by detecting their transmission within governmental health areas. A comparison between the governmental health areas was performed to determine which health area had the highest prevalence of intestinal helminths and to identify which group was the most vulnerable to these diseases.

*** Results**

In the present study, 6423 cases were examined from January 2022 to July 2024. The data were collected from the following public hospitals in Kuwait: Al-Amiri Hospital, 1413 cases; Farwaniya Hospital, 1162 cases; Al-Jahra Hospital, 1221 cases; Al-Adan Hospital, 1554 cases; Al-Sabah Hospital, 257 cases; and Mubarak Hospital, 816 cases. Intestinal helminthic parasitic infections were found in ١١0 (1.٧٧%) of the 6423 patients. Table 1 shows the prevalence of negative and positive cases in the study group.

Table 1: Prevalence of negative and positive cases in the study group.

	Frequency	Per cent
Negative	6313	98.27%
Positive	110	1.72%
Total	6423	100.00%

Among the 110 (1.72%) samples that tested positive for intestinal helminth parasites, ٧4 (66.66%) were positive for A. lumbricoides, 16 (14.41%) were positive for Ancylostoma duodenale, 7 (6.3%) were positive for Enterobius vermicularis (6.3%), 6 (5.4%) were positive for T. trichuira, 3 (2.7%) were positive for T. solium, 2 (1.8%) were positive for S. mansoni and 2 (1.8%) were positive for S. stercoralis.

Table 2 shows the distribution of patients by sex, age and nationality. Males were more likely to be infected than females ($p < 0.001$), patients older than 15 years were more likely to be infected than their younger counterparts ($p < 0.001$), and non-Kuwaiti patients were more likely to be infected than Kuwaiti patients.

Table 2: Chi-square test results for patients positive for intestinal helminths (N = 114) according to sex, age and nationality.

Category		Observed number	Expected number	χ^2	*Df*	*P* value
	Male	72	55			
Sex				14.1	1	0.000
	Female	38	55			
	0–15	15	55			
Age (years)				44.3	1	0.000
	>15	95	55			
	Kuwaiti	23	55			
Nationality				7.1	1	0.007
	Non-Kuwaiti	87	55			

Owing to the sample size, Fisher's exact test was used for comparisons. The analyses revealed no significant association between any hospital and parasite stage ($\chi^2 = 2.140$, $p = 0.767$).

Table 3: Prevalence of intestinal helminths in six hospitals.

Intestinal helminth	Health district						
	Al-Amiri	Al-Jahra	Al-Sabah	Al-Farwaniya	Al-Adan	Mubarak	Total
Ascaris lumbricoides	45	1	1	1	14	12	74
Ancylostoma duodenale	2	4	0	4	2	4	16
Enterobius vermicularis	0	1	0	2	3	1	7
Trichuris trichiura	1	1	1	1	0	2	6
Tenia solium	3	0	0	0	0	0	3
Schistosoma mansonai	0	1	0	0	1	0	2
Strongyloides stercoralis	0	2	0	0	0	0	2

However, as shown in Table 3, there was a significant association between hospital and type of parasite (i.e., A. lumbricoides) ($\chi^2 = 53.32$, $P < 0.001$). The patients who attended Al-Amiri Hospital had the highest A. lumbricoides infection rate (n = 45, 60.8%), followed by those who attended Al-Adan Hospital (n = 14, 18.9%) and those who attended Mubarak Hospital (n = 12, 16.2%), whereas the patients who attended Al-Jahra, Alfarwania and Mubarak hospitals had the highest infection rate of A. duodenale (n = 4, 25%).

* Discussion

In 2020, the number of people infected with parasitic worms reached 1.5 billion, accounting for 24% of the global population (WHO, 2004). Soil-transmitted helminths causing intestinal parasitic infections include A. lumbricoides (roundworm), T. trichiura (whipworm), Necator americanus and A. duodenale (hookworm). These helminths infect more than 1.5 billion people, which accounts for a substantial proportion of the global population (WHO, 2016). In 2018, the WHO estimated approximately 25% of the world's population was infected with soil-transmitted helminths (WHO, 2018). In 2010, intestinal parasitic infections caused by nematodes were estimated at approximately 450 million hookworm infections, 800 million A. lumbricoides infections, 460 million T. trichuira infections and 300 million Schistosoma species infections (Pullan, Smith, Jasrasaria, & Brooker, 2014).

A study conducted in 2022 by Abdelkareem et al. (2022) among patients living in Riyadh, Kingdom of Saudi Arabia (KSA), reported the prevalence of helminth infection was 4.6%, of which A. lumbricoides accounted for 56.3%. A 2019 study in the United Arab Emirates (UAE)

revealed the prevalence of A. lumbricoides infection was 5.8% (Al-Rifai et al., 2020). In contrast, the overall prevalence of helminth parasites in the current study was 1.77%, which is an indication that Kuwait is a nonendemic country because of its high standard of living.

In a study conducted in 2024 in Jeddah, KSA, the percentage of A. duodenale was 1.06% (Al-Rifai & Wakid, 2024), while a study conducted in 2019 in Qena, Egypt, revealed three positive cases of A. duodenale (0.9%) (Essa, Abdellah, El-Kady, & Elsaman, 2019). In our study there were 16 positive samples (0.25%), which is consistent with the previous results.

In Alrikaby, Hafedh, Hussain and AlAssady's (2022) study, conducted in Nasiriyah, Iraq, 87 positive samples of E. vermicularis (10.9%) were detected, whereas in the 2019 study, which was performed in Qena, Egypt, 4.11% of the infections were E. vermicularis (Essa et al., 2019). In our study, the prevalence of E. vermicularis infections was 0.11%.

In his 2022 study in Taiz, Yemen, Alharazi (2022) showed that intestinal parasite infections were caused by S. mansoni (13.3%), A. lumbricoides (3.8%), T. trichiura (2.9%) and E. vermicularis (1.3%). A 2020 study in the UAE revealed the most common parasitic infections were T. trichiura (12.1%), S. stercoralis (12.1%) and A. lumbricoides egg (9.1%) (El Bakri, Hussein, Ibrahim, Hasan, & AbuOdeh, 2020).

The current study revealed most cases were concentrated in three health districts: 51 (46.3%) at Al-Amiri Hospital, 20 (18.18%) at Al-Adan Hospital and 19 (17.27%) at Mubarak Hospital. These results can be explained by the fact that most expatriates and families with low incomes and low levels of education live in these three districts, which is consistent with the findings of a 2004 study in Kuwait (Al-Nakkas et al., 2004) and a 2016 study in an urban area in Turkey (Alqarni et al., 2023; Saki et al., 2016; Wudneh & Gebeyehu, 2022).

*** Conclusion**

One indicator of the high level of health services in Kuwait is the low rate of spread of intestinal helminths. However, there is still room for further development and improvement of the strategies used to increase individuals' health in Kuwait. Therefore, Kuwaiti health authorities must work to reduce intestinal helminth infections through media awareness campaigns.

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