RESEARCH ARTICLE

Prevalence of Intestinal Parasitic Infections among Saudis and Expatriate Workers in Najran, Saudi Arabia

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Abstract

Intestinal parasitic infections are among the most common diseases worldwide. The aim of this study was to investigate the prevalence of intestinal parasitic infections (IPIs) among Saudis and expatriate workers in Najran region, Saudi Arabia. A direct wet smear from each stool specimen (n=407) was examined microscopically for the presence of intestinal protozoa or helminth ova cysts. stools were also examined by the formalin-ether sedimentation technique within 1 hour to detect eggs, cysts, and oocysts of intestinal parasites. The total intestinal parasitic infection rate in the study area, Najran district, was 14.7% (60 out of 407), where protozoal infection was the highest by 11.6%, and that included *Entamoeba histolytica* (7.6%), *Giardia lamblia* (2%), and *Cryptosporidium parvum* (2%). While the infection with *Enterobius vermicularis* was 1.2%. The rate of intestinal parasitic infections was 6.1% in employees, and 3.2% in each of construction workers and house maids. The intestinal parasitic infections in Saudi people were 24.3%. The highest rate of expatriate workers participation in the study was of Egyptians with a percentage of 18.2%followed by Indian and Pakistani with percentages of 11.8% and 9.6% respectively. The highest rate of IPIs infection was in adulthood (30-49 years) with 9.3%. The control of intestinal parasitic infections is a politically and socially sensitive issue. In others, the control of intestinal parasitic infections has proved a useful entry point for other primary health care activities, e.g., in family planning, childcare, health education, and nutrition.

Keywords:

Intestinal parasitic infections, Expatriate workers, Risk factors, Najran, Saudi Arabia.

Introduction

Intestinal parasitic infections (IPIs) are one of the most widespread infections, leading to significant morbidity and mortality in tropical and subtropical countries. It is estimated that more than 3 billion individuals are affected by IPIs globally, and around 450 million are sick because of these infections [1]. Nearly 75% of emerging diseases affecting humans are zoonotic in origin, including parasitic diseases [2]. Cryptosporidiosis is one of the major zoonotic parasites associated with food-borne and water-borne outbreaks [3]. Expatriate workers harbouring protozoans or helminths parasites could be asymptomatic depending on their immunological status and the recurrence of the infection [4].

Many factors contribute to the prevalence of IPIs in endemic areas, including contaminated food and/or drinks, malnutrition, low levels of education, poor hygienic practices, an overcrowded population, poor health status and close contact with infected animals [5-7]. Saudi Arabia is one of the countries that has experienced a rapid socio-economic growth in recent years. This advancement in the living standards

has led to a huge influx of expatriate workers arriving from endemic areas which constitute a potential risk of transmitting parasitic diseases to the local inhabitants [7]. Based on the general authority for statistics, which was published in 2016, the number of expatriates in Najran district was 138,962. This figure constituted around 32% of the total populations of this area. It is compelled by the ministry of health in Saudi Arabia that all the arriving expatriate workers must be free from infections in general and should be physically fit to avoid transmission of microbial and parasitic diseases [8].

Previous studies carried out on stool samples collected from expatriate workers of around 21 nationalities working in Al-Madinah Al-Munawarah reported that between 14-14.9% of those workers concealed potentially pathogenic parasites including *Giardia lamblia*, *Entamoeba histolytica*, *Trichuris trichiura*, *Ascaris lumbricoides*, *Ancylostoma duodenale*, *Hymenolepis nana*, *Strongyloides stercoralis*, *Schistosoma mansoni*, and *Enterobius vermicularis* [9, 10]. Other studies performed in many cities of Saudi Arabia reported various prevalence rates of IPIs, between 55.7% and 41% in Riyadh [11, 12], 40.3% in Jeddah [13] and 46.5% in Abha [14].

To our knowledge, there were no studies that have been carried out on expatriates to screen for IPIs in Najran district, even though more than a third of the inhabitants of Najran are foreign workers.

The objective of the existing study was to investigate the prevalence of IPIs among Saudis expatriate workers in Najran district, Saudi Arabia.

Material and methods

Ethical consideration

The study protocol was governed by approved rules issued by the ethics committee at Najran University, Saudi Arabia. All scientific rules and policies were followed when dealing with the recovered parasites. Also, all biological waste was disposed of under proper scientific procedures.

Study design and area

In Najran, a cross-sectional study design between 2021 and 2022 was used. Najran is located 1260 kilometers from Riyadh, between 17° 30' 20" North and 44° 11' 3" East. In Najran, the annual average rainfall is 83 mm, and the average temperature ranges from 14.6 to 30.9 °C.

Study population

The study specimens were selected by proportional random stool sampling from the Najran hospitals and clinical laboratories and were obtained from relevant authorities. A total of 407 human stool samples were collected.

Sampling techniques and sample size determination

The study participants were chosen by a systematic random sample from Najran district. The sample size was calculated using Epi Info version 2000 and a formula [15] at 95% level of confidence and 5% level of precision. (n=1.96PQ/D) (n = sample size required, P= prevalence, Q= 100-P, D = the level of precision).

Transportation and collection of samples

A pre-made questionnaire was used to gather information about sociodemographic factors like gender, age, and nationality. Each participant gave one stool specimen in a tight-lid plastic container and transported it into the parasitological laboratory in the Department of Clinical Laboratory sciences, Applied Medical Sciences College, Najran University within an hour of collection.

Stool examination

A direct wet smear from each stool specimen in normal saline and lugol's iodine solution was examined microscopically for the presence of motile protozoan trophozoites and protozoan cysts [16]. Stools were also examined by the formalin-ether sedimentation technique within 1 hour to detect eggs, cysts and oocysts of intestinal parasites, also Ziehl–Neelsen staining method was used for identification of *Cryptosporidium* species [17]. Cellophane perianal tape tests were carried out for detection of *E. vermicularis* in the early morning by the patients or their parents or legal guardians.

Statistical analysis

The data set for each variable was coded, entered into Excel 16.0, and then analyzed using SPSS for Windows version 23. [18]. Results were presented using both descriptive and inferential statistics that included regression and chi square. A p-value of less than 0.05 was regarded as statistically significant foreach test.

Results

Table 1. Relation of age and job with intestinal parasitic infections among saudis and expatriate workers in Najran, Saudi Arabia (N= 407)

Study variables	N		E.H		G.L		C.P		G.N		A.L		T.E		A.G		E.V	
	F	%	F	%	F	%	F	%	F	%	F	%	F	%	F	%	F	%
Job																		
Construction workers	167	41	10	2.5	0	0	2	0.5	0	0	0	0	1	0.2	0	0	0	0
employees	69	17	12	2.9	3	0.7	3	0.7	1	0.2	2	0.5	0	0	0	0	4	1
Student	25	6.1	0	0	0	0	2	0.5	0	0	1	0.2	1	0.2	0	0	1	0.2
Restaurants' food handler workers	16	3.9	1	0.2	2	0.5	0	0	0	0	0	0	0	0	0	0	0	0
house maids	67	16.5	8	2	3	0.7	0	0	0	0	0	0	1	0.2	1	0.2	0	0
Child	3	0.7	0	0	0	0	1	0.2	0	0	0	0	0	0	0	0	0	0
	χ^2 (**Value**: 71.492a - **P V:** 0.002)																	
	Cramer's V (**Value**:0.187 - **P V:** 0.002)																	
Age group																		
Childhood (1-16 years)	27	6.6	0	0	0	0	3	0.7	0	0	1	0.2	1	0.2	0	0	5	1.2
Adolescence (17-29 years)	51	12.5	4	1	1	0.2	2	0.5	0	0	0	0	0	0	0	0	0	0
Adulthood (30-49 years)	255	62.7	22	5.4	7	1.7	3	0.7	1	0.2	2	0.5	2	0.5	1	0.2	0	0
Old age (50+ years)	14	3.4	5	1.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	χ^2 (**Value**: 79.342a - **PV:** 0.0001)																	
	Cramer's V (**Value**: 0.255- **P V:** 0.0001)																	
Total	347	85.3	31	7.6	8	2.0	8	2.0	1	0.2	3	0.7	3	0.7	1	0.2	5	1.2

Cramer's V: small effect size= 0.1, medium effect size=0.3, large effect size= 0.5. $\chi 2$ test is significant if P≤ 0.05 and non-significant if P ≥ 0.05. IPIs: (N: Normal, E.H: *Entamoeba histolytica*, G.L: *Giardia lamblia*, C.P: *Cryptosporidium parvum*, G.N: GIT Nematodes, A.L: *Ascaris lumbricoides*, T.E: Taeniid eggs, A.G: mixed infection amoebiasis and GIT Nematodes, E.V: *Enterobius vermicularis*). F: frequency.

Table 2. Relation of Nationality and Gender with intestinal parasitic infections among saudis and expatriate workers in Najran, Saudi Arabia (N= 407)

Study variables	N		E.H		G.L		C.P		G.N		A.L		T.E		A.G		E.V	
	F	%	F	%	F	%	F	%	F	%	F	%	F	%	F	%	F	%
Race																		
Saudi	84	20.6	9	2.2	0	0	3	0.7	1	0.2	2	0.5	0	0	0	0	0	0
Egyptian	60	14.7	5	1.2	1	0.2	3	0.7	0	0	0	0	1	0.2	0	0	4	1
Sudanese	22	5.4	2	0.5	1	0.2	0	0	0	0	0	0	0	0	0	0	0	0
Yemeni	16	3.9	1	0.2	1	0.2	0	0	0	0	0	0	0	0	0	0	1	0.2
Pakistani	35	8.6	3	0.7	1	0.2	0	0	0	0	0	0	0	0	0	0	0	0
Bangladeshi	18	4.4	3	0.7	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Indian	39	9.6	4	1	1	0.2	2	0.5	0	0	1	0.2	1	0.2	0	0	0	0
Ethiopian	6	1.5	0	0	0	0	0	0	0	0	0	0	1	0.2	0	0	0	0
Kenyan	16	3.9	2	0.5	0	0	0	0	0	0	0	0	0	0	1	0.2	0	0
Ugandan	18	4.4	1	0.2	2	0.5	0	0	0	0	0	0	0	0	0	0	0	0
Filipino	26	6.4	1	0.2	1	0.2	0	0	0	0	0	0	0	0	0	0	0	0
Jordanian	2	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bornesi	1	0.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Indonesian	2	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Moroccan	1	0.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sri Lankan	1	0.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
χ^2 (**Value**: 89.681a - ***P V:*** 0.982)																		
Cramer's V (**Value**: 0.166- ***P V:*** 0.982)																		
Gender																		
Male	223	54.8	16	3.9	4	1	5	1.2	0	0	1	0.2	1	0.2	0	0	2	0.5
Female	124	30.5	15	3.7	4	1	3	0.7	1	0.2	2	0.5	2	0.5	1	0.2	3	0.7
χ^2 (**Value**: 9.039a - ***P V:*** 0.339)																		
Cramer's V (**Value**: 0.149- ***P V:*** 0.339)																		

Cramer's V: small effect size= 0.1, medium effect size=0.3, large effect size= 0.5. χ^2 test is significant if P≤ 0.05 and non significant if P ≥ 0.05. IPIs: (N: Normal, E.H: *Entamoeba histolytica*, G.L: *Giardia lamblia*, C.P: *Cryptosporidium parvum*, G.N: GIT Nematodes, A.L: *Ascaris lumbricoides*, T.E: Taeniid eggs, A.G: mixed infection amoebiasis and GIT Nematodes, E.V: *Enterobius vermicularis*). F: frequency.

Table 3. Parameter estimates contrasting the persisting group variables versus Each of the other groups variables and its predictors' unique contributions in the multinomial logistic regression (N = 407)

IPIs	f	Predictors /persistent						
		Workers' job	Workers' Nationality	Workers' age	Childhood	Adolescence	Adulthood	Workers' gender
E.H	**CF**	13.423	13.669	-1.516	-16.699	-1.516	-1.421	-0.522
	WC	0.000	0.000	4.247	0.000	4.247	6.291	1.925
	OR	675358.60	863523.751	0.220	5.592	0.220	0.242	0.593
	Sig	0.994	0.996	0.039*	0.990	0.039*	.012**	0.165
G.L	**CF**	6.090	0.209	15.076	-0.075	15.076	15.413	-0.587
	WC	0.000	0.000	0.000	0.000	0.000	0.000	0.672
	OR	441.227	1.233	3528783.066	0.928	3528783.066	4940296.29	556
	Sig	0.999	1.000	0.997	1.000	0.997	0.997	0.412
C.P	**CF**	-3.326	13.925	15.770	16.811	15.770	14.566	-0.076
	WC	6.015	0.000	0.000	0.000	0.000	0.000	0.011
	OR	0.036	1115384.868	7057566.175	19996437.4	7057566.175	2117269.852	0.927
	Sig	0.014	0.998	0.996	0.996	0.996	0.997	0.918
G.N	**CF**	6.090	14.906	-0.062	-0.075	-0.062	15.546	-19.073
	WC	0.000	0.000	0.000	0.000	0.000	-	-
	OR	441.227	2974359.476	0.940	0.928	0.940	5646052.933	5.207E-9
	Sig	1.000	0.998	1.000	1.000	1.000	-	-
χ^2 value		65.541	65.346	51.315				9.490
Sig		0.007	1.000	0.001				0.303
Df		40	120	24				8

*The reference category is normal without infection

**f: factors, CF: multinomial logistic regression coefficients for the models, WC: Wald chi-square test, OR: odds ratio associated with the effect of a one standard deviation increase in the predictor. df: Degrees of Freedom Sig.: p-values of the coefficients

***IPIs Infestation: (E.H: *Entamoeba histolytica*, G.L: *Giardia lamblia*, C.P: *Cryptosporidium parvum*, G.N: GIT Nematodes ,

 * p<.05; ** p<.01; *** p<.001

Table 4: Parameter estimates contrasting the persisting group variables versus each of the other groups variables and its predictors' unique contributions in the multinomial logistic regression (N = 407)

IPIs	F	Predictors /persistent			
		Workers' job	Workers' Nationality	Workers' age	Workers' gender
A.L	**CF**	6.090	14.500	16.693	-1.280
	WC	0.000	0.000	0.000	1.083
	OR	441.227	1982906.370	17774611.083	0.278
	Sig	0.999	0.999	0.998	0.298
T.E	**CF**	13.456	0.209	16.693	-1.280
	WC	0.000	0.000	0.000	1.083
	OR	697870.569	1.233	17774611.086	0.278
	Sig	0.998	1.000	0.998	0.298
A.G	**CF**	6.090	0.209	0.075	-19.073
	WC	0.008	0.000	0.000	-
	OR	441.227	1.233	0.928	5.207E-9
	Sig	0.930	1.000	1.000	-
E.V	**CF**	6.090	0.209	17.792	-0.992
	WC	0.000	0.000	0.000	1.164
	OR	441.227	1.233	53323833.488	0.371
	Sig	0.999	1.000	0.997	0.281
χ^2 value		65.541	65.346	51.315	9.490
Sig		0.007	1.000	0.001	0.303
Df		40	120	24	8

*The reference category is normal without infection

**f: factors, CF: multinomial logistic regression coefficients for the models, WC: Wald chi-square test, OR: odds ratio associated with the effect of a one standard deviation increase in the predictor. df: Degrees of Freedom. Sig.: p-values of the coefficients

***IPIs:(A.L: *Ascaris lumbricoides*, T.E: Taeniid eggs, A.G: mixed infection amoebiasis
and GIT Nematodes, E.V: *Enterobius vermicularis*).

 * p<.05; ** p<.01; *** p<.001

The total IPIs in the study was 14.7% (60 out of 407) where protozoal infection was the highest rate of infection by 11.6% (47 out of 407). The isolated protozoa included *Entamoeba histolytica* 7.6% (31 out of 407), *Giardia lamblia* 2% (8 out of 407), and *Cryptosporidium parvum* 2% (8 out of 407). While the infection with *Enterobius vermicularis* was 1.2% (5 out of 407) (Table 1).

There was a very high significant relation between IPIs and job, χ2 (N=407) value = 71.492a, p= 0.002 and small effect size, Cramer's V (N= 407), value 0.187, p= 0.002, that the highest rate of IPIs was in non-worker with 6.1% (25 out of 407), then in construction workers and house maids with 3.2% (13 out of 407). Also, it was found the infection with *Giardia lamblia* was highest in employees and house maids with 0.7% (3 out of 407) (Table 1).

In addition, there was non-significant relation of nationality with intestinal parasitic infections, χ2 (N=407) value = 89.681a, p= 0.982 and non-significant effect size, Cramer's V (N= 407),value 0.166, p= 0.982, that the highest infection rate of IPIs was in Saudi people with 3.6% (15 out of 407), then in Egyptian workers with 3.4% (14 out of 407) and Indian workers with 2.2% (9 out of 407) (Table 2).

There was a very high significant relation between IPIs and age groups, χ2 (N=407) value = 79.342a, p= 0.0001and small effect size, Cramer's V (N= 407), value 0.187, p= 0.002, that the highest rate of IPI was in Adulthood (30-49 years) with 9.3% (25 out of 407), (Table 1).

A Multinomial Logistic Regression in IPI infection was used to analyze predictors for intestinal parasitic infection, such as *Entamoeba histolytica, Giardia lamblia, Cryptosporidium parvum*, GIT Nematodes, *Ascaris lumbricoides, Taenia spp.,* and *Enterobius vermicularis*. The reference category for the outcome variable was normal cases without infection; each of the other categories was compared to this reference group. The main interest of current analysis was focused on the relationship between type of job, nationality of workers, age, and sex. (Tables 3 and 4).

Table (3) contained the outcome of ", E.H: *Entamoeba histolytica*, G.L: *Giardia lamblia*, C.P: *Cryptosporidium parvum*, G.N: GIT Nematodes" compared to normal cases without infection (reference category). For *Entamoeba histolytica* cases relative to normal cases without infection, in relation to age participants from adolescence (17-29 years) (OR = 0.220) and adulthood (30-49 years) (OR = 0.242), compared to old age (50+ years), are more likely to be incarcerated more than once. However, type, nationality, and sex of expatriate workers were not a significant predictor of IPIs.

The relative log odds of infection by *Entamoeba histolytica* versus normal cases without infection would decrease by 16.699 if moving from old age (50+ years) to childhood (1-16 years). However, the relative risk ratio switching from old age (50+ years) to childhood (1-16 years) was 5.592 for being infection by *Entamoeba histolytica* versus normal cases without infection. In other words, the expected risk of *Entamoeba histolytica* infection is higher for age who are childhood (1-16 years)

For *Entamoeba histolytica* cases relative to normal cases without infection, age participants from adolescence (17-29 years) – This is the relative risk ratio for a one unit increase in adolescence (17-29 years) for *Entamoeba histolytica* cases relative to normal cases without infection level given that the other variables in the model are held constant. If a subject were

to increase adolescence (17- 29 years) score by one unit, the relative risk for *Entamoeba histolytica* cases relative to normal cases without infection would be expected to increase by a factor of 22% given the other variables in the model are held constant. More generally, we can say that if a subject were to increase adolescence (17-29 years) score, we would expect infection to be more likely to *Entamoeba histolytica*.

For *Entamoeba histolytica* cases relative to normal cases without infection, age participants from adulthood (30-49 years) – This is the relative risk ratio for a one unit increase in Adulthood (30-49 years) for *Entamoeba histolytica* cases relative to normal cases without infection level given that the other variables in the model are held constant. If a subject were to increase and adulthood (30-49 years) score by one unit, the relative risk for *Entamoeba histolytica* cases relative to normal cases without infection would be expected to increase by a factor of 24% given the other variables in the model are held constant. More generally, we can say that if a subject were to increase and adulthood (30-49 years) score, we would expect infection to be more likely to *Entamoeba histolytica*.

Discussion

There are significant intestinal parasitic infestations worldwide at all times of the year. Amoeba sp., Ascaris sp., Hookworm infection, and Trichuris sp. are among the 10 most common infections in the world [19].

IPIs does not have high risks and does not have major deaths and morality rate, but it needs health care in many cases. Malabsorption, diarrhea, blood loss, diminished work capacity, and reduced growth due to intestinal parasitic infections are significant health and social issues in many countries. Furthermore, other parasitic infections such as abdominal *Angiostrongyliasis*, intestinal *Capillariasis*, and *Strongyloidiasis* are of local or regional public health concern [19].

The total IPIs in our study was 14.7% (60 out of 407). These results were largely consistent with the previous results in the Saudi Arabia including several districts [20, 21] and the large percentage of infection gave great importance to the infection of humans in the region, which in turn affected human health. However, in the rest of the world, especially developing countries such as Egypt and India, where the sources of rivers are located, the IPIs infection has spread widely. The IPIs rate was 97.4% monthly in India [22] and 73.5% in Sierra Leone [23]. The reason for these high percentage is lack of health awareness and lack of attention to personal hygiene.

Giardia lamblia and *E. histolytica* were the most common intestinal parasites among the study participants. Both can be transmitted orally by drinking water and both are environmental contaminants of the water supply [24]; they are also the most common in Saudi Arabia [25].

The pathogenic intestinal protozoans *Giardia lamblia* (3.4%), and coccidians (1.7%) were recorded among the Philippines [26]. *Giardia* has long been considered to cause diarrhea, and its presence is typically associated with upper gastrointestinal symptoms. Patients suffering from giardiasis often complain of periodic abdominal pain and recurrent or persistent diarrhoea. Intestinal coccidians cause transient, self-limiting infections, which may manifest as mild diarrhea in immunocompetent individuals. However, in immunocompromised, diarrheal episodes may be severe and prolonged [26].

The highest infection in Saudi people was due to high infection in house maids. The presence of a higher prevalence among Egyptians and Indians,

who already have high prevalence rates in their own countries [27], suggests that stricter strategies should be targeted at these high-risk groups. Indians and Egyptians make up a sizable portion of the total sample of positive specimens. They require more frequent stool tests and health education regarding specific hygienic precautions to prevent the infection from spreading, especially after arriving in their countries after travel. This study was consistent with the findings of previous study in Saudi Arabia and others study [27, 28] which recognized that intestinal parasitic infection among food handlers is still an important public health problem in the Kingdom of Saudi Arabia.

the absence or few of parasitic infections in this study may be considered not unusual. Even though helminths like *Ascaris, Trichiuris,* and hookworm are thought to be the most widespread parasites, particularly in developing countries. [29]. Most people who submit their stools for testing as part of pre-employment screening have similar results, so it's possible that some study participants received treatment with an anthelminthic medication prior to submitting stool samples for evaluation. Since prior use of deworming medications was not considered, it is also possible that the parasite rates that were obtained were understated.

The highest rate of IPIs was in adulthood (30-49 years) with 9.3% in our study but the infection in children in school age was 0.3% and the prevalence rate in children was low because the sample size in children was low. In our sample, as in the rest of the world, children under 12 were the most affected. The overall seropositivity of intestinal parasites was 24%, but it was 40% among 6 ± 14 year-olds [30]. Intestinal parasite seropositivity was 24% overall, but it was 40% in children aged 6 to 14 years.

Conclusion

There was a very high significant relation between intestinal parasitic infection and expatriate workers with prominent infection in female house worker and in adulthood (30-49 years). In particular, for those employed in the catering industry, pre-employment examinations should unquestionably be reviewed. It is recommended to have a follow-up examination when you get back from vacation, especially if you came from a nation with a high prevalence of the disease. It is also recommended to have a biannual screening that involves taking two stool samples two days apart from each food handler. Due to the development of safe and effective medications, the enhancement and simplification of some diagnostic techniques, and advancements in the biology of parasite population, the prevention and control of intestinal parasitic infections are now more feasible than ever. The development and implementation of control measures against intestinal parasitic infections have been made possible in recent years by general health care strategies that place an emphasis on preventive medicine and community involvement in the management of endemic disease.

Conflict of Interest

There is no conflict of interest to declare.

Acknowledgements

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الملخص العربى

معدل انتشار عدوي الطفيليات المعوية بين السعوديين والعمالة الوافدة بمنطقة نجران بالمملكة العربية السعودية.

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تعد الأمراض الطفيلية المعوية من بين أكثر أنواع العدوى شيوعًا في جميع أنحاء العالم. وتهدف هذه الدراسة إلى معرفة معدل وبائية الأمراض الطفيلية المعوية بين السعوديين والعمالة الوافدة بمنطقة نجران بالمملكة العربية السعودية. تم فحص 407 عينة من البراز في المعمل بطرق مختلفة، اختبار الفحص المباشر لعينة البراز واختبار الفحص المباشر لتشخيص امراض البروتوزوا المعوية وأخيرا باختبار الايثر والفورمالين لتشخيص الامراض الطفيلية المعوية المزمنة وتحت الحادة. فكانت معدل الإصابات الطفيلية المعوية في منطقة الدراسة بمنطقة نجران 14.7% (60 من 407) حيث كانت معدل الإصابة بالكائنات الأولية البروتوزوا أعلى نسبة إصابة بنسبة 11.6%.وكانت نسبة الإصابة بداءُ الأَميبَات 7.6%ُوداءُالجيارديَّاتوداءُ خَفِيَّاتِ الأَبواغ 2%ُكلا منهما. في حين بلغت نسبة الإصابة بـ السُرْميَّة الدُوَيْدِيَّة 1.2%. كانت أعلى نسبة إصابة بالعدوى بين الموظفين بنسبة 6.1%، ثم في عاملات المنازل بنسبة 3.2% (13 من 407). وكانت نسبة الإصابة لدى السعوديين 24.3%. وكانت أعلى نسبة مشاركة في الدراسة هم العمالة الوافدة المصرية بنسبة 18.2% ثم يليهم الهنود والباكستانيون بنسبة 11.8% و9.6 % على التوالي. وكان أعلى معدل للإصابة في مرحلة البلوغ (30-49 سنة) بنسبة 9.3 %. ومن النتائج السابقة يتبين ان السيطرة على الأمراض الطفيلية المعوية هي قضية حساسة سياسيا واجتماعيا. وأيضا تعتبر السيطرة على العدوى الطفيلية المعوية من اهم أنشطة الرعاية الصحية الأولية الأخرى، على سبيل المثال، تنظيم الأسرة, ورعاية الأطفال والتثقيف الصحي والتغذية.