British Microbiology Research Journal
16(3): 1-7, 2016, Article no.BMRJ.28317
ISSN: 2231-0886, NLM ID: 101608140

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Prevalence and Risk Factors Associated with Intestinal Parasitic Infection among Patients in Taiz City, Yemen

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Author's contribution

The sole author designed, analyzed and interpreted and prepared the manuscript.

Article Information

DOI: 10.9734/BMRJ/2016/28317
Editor(s):
(1) Joao Lucio Azevedo, University of São Paulo, Department of Genetics, Brazil.
(2) Grzegorz Cieslar, Department and Clinic of Internal Diseases, Angiology and Physical Medicine, Medical University of Silesia, Poland.
Reviewers:
(1) Rina Girard Kaminsky, Institute for Infectious Diseases and Parasitology Antonio Vidal, Tegucigalpa, Honduras.
(2) Mushtaq H. Lashari, The Islamia University of Bahawalpur, Pakistan.
Complete Peer review History: http://www.sciencedomain.org/review-history/15719

Original Research Article

Received 14th July 2016
Accepted 31st July 2016
Published 9th August 2016

ABSTRACT

Aims: To determine the prevalence and associated risk factors of intestinal parasites among patients in Taiz city.
Study Design: A cross-sectional descriptive study.
Place and Duration of Study: This study was carried out on patients visiting general and hospitals in Taiz, Yemen during April to September 2014.
Methodology: A total of 330 stool samples were collected from patients and analyzed by direct wet mount and formal ether concentration techniques. Furthermore, sociodemographic data were collected by using a standardized questionnaire.
Results: The overall prevalence of intestinal parasitic infections was 38.2%. The most predominant parasites found was *Entamoeba histolytica/dispar* (20.6%) followed by *Giardia duodenalis* (12.7%), respectively. Other parasites detected included *Ascaris lumbricoides* (3%), *Hymenolepis nana* (0.9%) and *Schistosoma mansoni* (0.9%). Multivariate analysis confirmed that drinking untreated water, not washing hands after defecation and contact with animals was a significant risk factor with parasitic infections.
Conclusion: The findings of this study indicated that intestinal parasitic infections are still a public

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health problem in Yemen. Statistical analysis indicated that low personal hygiene, lack of access to potable water and contact with animals were important predictors for intestinal parasitic infections. Hence, improving the knowledge on local risk factors such as contact with domestic animal, health status and personal hygiene is warranted.

Keywords: Prevalence; intestinal parasites; risk factors; Taiz; Yemen.

1. INTRODUCTION

The intestinal parasites have considered to be one of the commonest infections worldwide. It is estimated that 3.5 billion people are affected, and 450 million are ill as a result of these infections, the majority being children [1]. Despite the effort and extensive programming of the World Health Organization, prevalence of intestinal parasites has caused economic, social and health losses [2]. Inadequate water sanitation and hygiene are responsible for a major proportion of the burden of disease and death in developing countries [3]. The consequences of these parasitic infections result in growth retardation, physical weakness, intestinal obstruction, hepatic and biliary diseases and malnutrition such as iron deficiency anemia [4,5]. Intestinal parasites have transmitted through the contamination by feces [6].

Many surveys had conducted on intestinal parasites in many regions of Yemen. the most often parasites found were *Entamoeba histolytica*, *Giardia duodenalis*, *Hymenolypis nana*, *Ascaris lumbricoides*, *Ancylostoma duodenale*, *Taenia saginata* and *Schistosoma mansoni*. A study has been conducted in Sana'a recorded that that the prevalence of *Giardia duodenalis*, *Entamoeba histolytica/dispar* and *Cryptosporidium* were (17.7%), (17.1%) and (1%) respectively [7]. In Hadramowat, study has done among restaurant workers reported high prevalence of *Giardia duodenalis* (19.2%) and *Entamoeba histolytica/ dispar*. (16.8%) highlighting that parasitosis reflected the prevalent hygienic problems and their influences on public health of Hadramowat [8]. Indeed, Studies on the prevalence of intestinal parasites in different parts of the country and identifying risk factors in the communities are important to design appropriate intervention strategies. There are still certain localities in Yemen, where epidemiological information regarding intestinal parasites is lacking. Therefore, the purpose of this study was to assess the prevalence and to identify risk factors associated with intestinal parasitic infection among patient in Taiz city.

2. MATERIALS AND METHODS

2.1 Study Area and Study Population

A cross-sectional descriptive study has conducted in Taiz city during April to September 2014. Taiz governorate is situated about 250Km South Sana'a, the Capital of Yemen. It lies in the foothills and middle heights, which range from 200-2000 m elevation from sea level The climate has many subtropical features, the mean annual temperature between 20-30C0 with little seasonal variation and relative humidity ranging between 40-60%. The annual rainfall is approximately 800-1200mm, and most of this fall is in March, May, August and September. The majority of the population is working in agriculture, which is the primary source of income.

The study population was composed of individuals with gastrointestinal disorders who presented one or more symptoms (diarrhea ,nausea, vomiting and abdominal pain) and had no history of anti-intestinal drugs in the two weeks prior to screening.

This study was conducted among outpatients at Al-Thawra hospital, Al Jomhury hospital and Al-Ta'won hospital in Taiz city, Yemen. Fecal samples were collected from patients referred to the parasitological lab for stool examination. A total of 330 samples were collected. The objective and methods of the study were explained to all the patients who voluntarily participated and informed consent was obtained. The study protocol was approved by the research and ethical committee of Faculty of Medicine, Taiz University, Yemen. Permission was obtained from the hospital authorities before the commencement of the study.

2.2 Questionnaire

Each participant was asked to respond to a pretest standard questionnaire which included basic individual information (sex, age, residence), socio-demographic data (education,

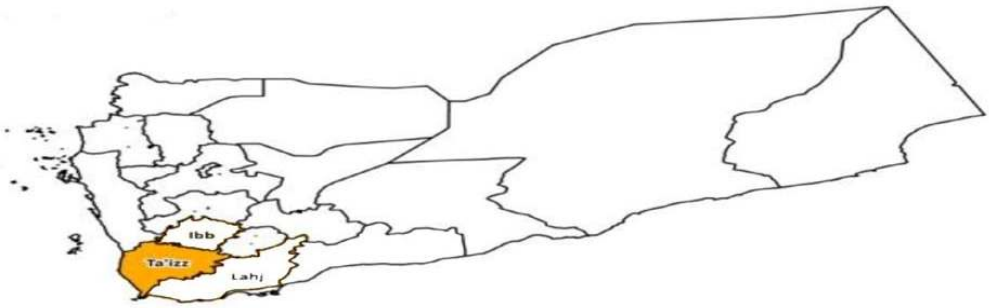

Fig. 1. Map of Yemen

occupation) and health status (water supply, contact with domestic animal) and the answers were filled by each participant.

2.3 Fecal Collection and Examination

Single stool samples were collected from each patient in wide mouthed screw-capped containers and labeled. Wet mount microscopic examination and formol ether concentration techniques were used to detect parasites and lugol iodine was used for cyst identification. The stool specimen was examined for the presence of ova, larvae, trophozoite, and cyst of intestinal parasites.

2.4 Statistical Analysis

Statistical analysis of data was performed using the Statistical Package for Social Sciences version 20. Univariate analyses were used to investigate the association between dependent and independent variables. The significance was defined as P= .05. Those variables that showed significance with P= .05 were used to develop a stepwise forward logistic regression model.

3. RESULTS

3.1 Socio-demographic Characteristics

Over a period of six months a total of 330 fecal samples were collected from outpatients visiting different hospitals and health center, in Taiz City. All of them agreed to participate so that the response rate was 100%. The Majority of the study subjects were living in urban area 255 (77.3%). Of these participants, 192 (58.2%) were males and 138 (41.8%) were females and the mean age of the respondents was 10 years with a standard deviation of 7.63 with ages ranged from 1 to 65 years. Most of the participants were not educated 207 (62.7%). Moreover, One hundred and seventy seven (53.6%) were drinking treated water and 153 (53.6%) whose drinking untreated water (river, well, rain). One hundred and fifty three participants (46.4%) reported a frequent contact with domestic animals.

3.2 Prevalence of Intestinal Parasite Infection

Five species of intestinal parasites were identified with an overall prevalence of (38.2%). From Table 1, *Entamoeba histolytica/disper* seemed to be the commonest parasites found with a prevalence rate (20.6%) followed by *Giardia duodenalis*(12.7%). In contrast, intestinal helminthes including *Ascaris lumbricoides*(3%), *Hymenolepis nana* (0.9%) and *Schistosoma mansoni* (0.9%) showed a lower prevalence rate as compared to intestinal protozoa (Table 1). Overall prevalence of intestinal parasitic infection showed no age- dependency relationship) x2 = 2.819, P= 0.937. Moreover, there was no significant difference between males and females (x2 = 0.732, P= 0.392).

3.3 Risk factors for Intestinal Parasitic Infections

The results of the univariate and multivariate analysis for risk factors associated with intestinal parasitic infection are summarized in (Table 2). Univariate analysis identified five factors that significantly associated with the infection among the participants. These factors are close contact with animals (OR = 0.519, 95% CI =0.329- 816; *P*= .004), never or occasionally washed fruits and vegetables before eating (OR= 0.619, 95% CI= 0.394–0.974; *P*= .0038), never or occasionally washed hand after defecation (OR = 0.291; 95% CI 0.183-0.463; *P*= .001) and drinking untreated water (OR = 2.41, 95% CI= 0.150- 0.387), Those do not practice hand

Table 1. Prevalence of intestinal parasites among patients in Taiz city

Type of parasites	Infected	%
Protozoa		
Entamoeba histolytica/dispar	68	20.6
Giardia duodenalis	42	12.7
Helminthes		
Ascaris lumbricoides	10	3
Hymenolepis nana	3	0.9
Schistosoma mansoni	3	0.9
Total	126	38.2

washing before eat (OR =1..636, 95% CI= 0.985 – 2.717; *P*= .056) had higher infection rate. After that, multivariate analysis was done using binary logistic regression and enter by stepwise method with 95% CI, factors that remained significantly associated with infection were drinking untreated water (OR = 3.391, 95% CI=2.062- 5.577; *P*= .001), not practicing hand washing after defecation (OR = 2.869, 95% CI=1.741-4.727; *P*= .001) and contact with animals (OR= 2.125, 95% CI=1.291– 3.499). There was a statistical significant difference in the variables observed.

4. DISCUSSION

Intestinal parasitic infections of humans are important threats to healthy living in developing countries [9]. These infections are usually associated with poor sanitary habits, lack of access to safe water and improper hygiene. The degree of each factor and prevalence of infections varies from one region to the other [10]. Knowledge on the distribution and extent of intestinal parasitic infections in a given community is a prerequisite for planning and evaluating intervention programs [11].

The current study revealed that prevalence of intestinal parasitic infections was 38.2% based on a single stool sampling. Similar finding was reported from a study conducted on outpatient seeking health care in Sana'a city (40.3%) [7]. However, much lower compared to the prevalence studies reported from different regions of Yemen including Al-Mahweet governorate (90%) [12] and Ibb (57.4%) [13], but still it seems high in comparisons to studies carried out in Iran (19.7%) [14] Oman (18%) [15] and Makkah (6.2%) [16].These differences could be attributed to the difference in method used, health awareness, and living Standards [17].

Entamoeba histolytica/dispar was found the most dominant parasite in this study. This finding has been supported by the previous studies conducted in Yemen [12,13]. In contrast, other studies conducted in Yemen found that the most predominant parasite was *Giardia duodenalis* [7]. This may probably due to limitation of methods used for fecal analysis, formalin-ether sedimentation, to distinguish morphologically between *Entamoeba histolytica* and *Entamoeba dispar*. More specialized methods now exist to distinguish them [18,19] but remain in accessible in the majority of developing countries[20].

The first most important significant associated factor with the occurrence of intestinal parasitic infection was people who came in contact with animals. Those people who came in contact with animals had a two times higher risk of exposing to parasitic infection than those people who did not come in contact with animals. According to Anuar and his colleges whose reported that, the cysts of *E. histolytica/ E. dispar* could be deposited on the surface (fur) of the domestic animals during close contact with infected humans or from the environment and then later transmitted to a next person [21]. Furthermore, several molecular studies carried out on *Giardia* revealed that animals have implicated as a source of protozoan infection (zoonotic transmission) [22].

Another significant factor associated with parasitic infection as presented by Logistic regression analysis was drinking untreated water. Those who were drinking treated water (Chlorinated) had a three times higher risk of exposing to parasitic infection than those who were drinking untreated water. The World Bank has reported that the main source of drinking water in Yemen is the ground water [23]. Usually, the Yemeni people, mainly in rural area are considered the dams as main sources of drinking water. These dams have exposed to high pollution, especially during the rainy season due to soil runoff contaminated with parasite (oo)cysts and ova from animal and human faces.

Table 2. Univariate and multivariate analysis for risk factors associated with only intestinal helminthes infection of the study population

Variables		Infection rate%	Crude OR (CI 95%)	*P* value	Adjusted OR (CI95%)
Gender	Male	52.4	1	0.093	
	Female	47.6	1.469 (0.937 -2.302)		
Age	≤ 12	75.4	1	0.392	
	> 12	24.6	0.802 (0.482 – 1.330)		
Residence	urban	72.2	1	0.09	
	rural	27.8	0.634 (0.377 – 1.068)		
Education	Educated	49.2	1	0.154	
	Not educated	50.8	1.384 (0.885 -2.164)		
Income (Yemeni Ryal) (20000 Y.R. = 100 USD)	≤ 20000	59.5	1	0.153	
	> 20000	40.5	0.721 (0.460-1.130)		
Family size	> 5	52.4	1	0.674	
	≤5	47.6	0.909 (0.583– 1.418)		
Animal contact	Yes	62.7	1	0.004*	
	No	37.8	0.519 (0.329- 816)		2.125 (1.291 – 3.499)
Use of latrine	Always or often	72.2	1	0.216	
	Never or occasionally	27.8	1.358 (0.836 – 2.207)		
Washing hand before eating	Always or often	77.0	1	0.056*	
	Never or occasionally	23.0	1.636(0.985 – 2.717)		
Washing fruits and vegetables	Always or often	53.2	1	0.038*	
	Never or occasionally	46.8	0.619 (0.394– 0.974)		
Hand washing after defecation	Always or often	38.9	1	0.001*	1
	Never or occasionally	61.1	0.291 (0.183 -0.463)		2.869(1.741-4.727)
Drinking water	Treated water (Chlorine)	32.5	1	0.001*	1
	Untreated water	67.5	0.241(0.150 – 0.387)		3.391(2.062-5.577)

***** *Confirmed by logistic regression*

Logistic regression analysis shows a significant association between low personal hygiene practices with intestinal parasitic infections. People who did not practice hand washing after defecation had 2.869 (OR = 2.869, 95% CI 1.741-4.727) *P*< .001, times more likely to be exposed to parasitic infection than those who practiced hand washing after defecation. It has been well documented that the contaminated hands play a major role in faecal-oral transmission in developing countries and washing hands before eating or after defecation has been considered as a secondary barrier [21]. In 2000, a study conducted by Curtis and 201 his colleagues revealed that water availability may affect the frequency of hand washing. 202 They had been stated that a mother needs 20 liters of water to wash her hands after using 203 the latrine, changing a nappy, before preparing food, eating, giving food to the infant and 204 handling of cooking or drinking utensils [24].

4. CONCLUSION

The present study showed high prevalence of intestinal parasites in the study area. 210 Moreover, the prevalence of intestinal helminthes in this study was lower than intestinal 211 protozoa. Furthermore, lack of access to potable water, don't practicing hand washing after 212 toilet, and contact with animals were important predictors for intestinal parasitic infections. 213 Hence, improving the knowledge on local risk factors such as contact with a domestic 214 animal, health status and personal hygiene is warranted.

ACKNOWLEDGEMENTS

The author acknowledge Dr. Ibtesam Al-asbahi and Dr. Rashad Abdul Ghani for their generous help.

COMPETING INTERESTS

Author has declared that no competing interests exist.

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Peer-review history:
The peer review history for this paper can be accessed here:
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