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Original Research

Prevalence of Parasitic Infections among Cleaners Working at Public and Private Health Facilities in Dhamar Governorate, Yemen

Mohammed A. Al-Kholani [1,3*], Mohammed T. Al-Maktari [2], Abdulelah H. Al-Adhroey[3] Abdul-Jabbar A. Ghdghd[1], Mohammed A. Ghdghd[1], Rafeeqa A. Al-Dabiani[1], Ruqia A. Al-Esnafi[1], Shafeeqa A. Al-Dabiani[1], Shaima A. Daba'an[1], Shatha A. Odah[1], Wedad M. Daba'an[1]

1 Department of medical Laboratories, Faculty of Medical Sciences, Al-Hikma University, Dhamar, Yemen
2 Department of Parasitology, Faculty of Medicine and Health Sciences, Sana'a University, Sana'a, Yemen
3 Department of Community Medicine, Faculty of Medicine, Thamar University, Dhamar, Yemen

For Correspondence:
Mohammed A. Al-Kholani
Thamar University, Faculty of Medicine, Dhamar, Yemen
Tel: +967 777937519
Email: alkholanimohammed1976@gamil.com

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Abstract

Background: Parasitic infections are one of the major health problems in several developing countries including Yemen.
Aim: This study aimed to estimate the prevalence of parasitic infections among cleaners working at public and private health facilities in Dhamar governorate, Republic of Yemen.
Methods: A cross-sectional descriptive study was conducted in Dhamar governorate from September 2017 to august 2018. Samples of 210 cleaning workers were examined using both direct saline method with iodine stain and spontaneous sedimentation technique in tube (SSTT) for stool specimen: Centrifuged urine method for eggs or trophozoities of urine specimen: Blood film for blood specimen. Data were collected by structured questionnaire about parasitic infections.
Results: The overall prevalence of parasitic infections was 79 %. Where, prevalence rate of single, double and multiple infections was 40.48%, 34.76% and 3.81%, respectively. According to the prevalence of each parasite species separately, the prevalence rate of *Entamoeba histolytica /dispar* and, *Giardia lamblia* was the highest (57.14 %; 41.90 %, respectively). The prevalence of others parasitic infections was found to be 8.10 % for *Ascaris lumbricoides, Enterobius vermicularis* (7.14 %), *Schistosoma mansoni* (2.86 %), *Hymenolepis nana* (1.90 %), *Schistosoma haematobium* (1.43 %), *Hookworms* (0.95 %), and *Trichomonas vaginalis* (0.48%). However, no parasite in blood samples was detected. The prevalence of parasitic infections was higher significantly among male than female (82.75% vs. 66.7%, P=0.025); and significantly increased with the rise of working duration (per year) from one year, two years and 3-6 years to ≥7 years (70.8 %, 70.8 % and 82.1 % to 93.1 % respectively, *P*=0.008).
Conclusion: Prevalence of parasitic infection among cleaning workers in Dhamar is high. Gender and working duration significantly influence the prevalence. The study discovers on a big health problem can be reduced by improving of public measures of prevention and control infection in health facilities and by increasing of personal hygiene and health education among cleaning workers category particularly.

Keywords: Prevalence, parasitic infection, cleaning workers, Yemen.

1. Introduction

Parasitic infections are globally one of the major health problems especially in several developing countries [1,2].

They are distributed throughout the world, with high prevalence in low socio-economic communities in the tropic and subtropics regions [3]. Globally, WHO estimates that two billion individuals are infected with intestinal parasites [4]. The intestinal parasitic infections are acquired by ingestion, inhalation or penetration of skin by infective forms and their high incidence is closely correlated to poverty and poor environmental hygiene [5].

Medical waste' refers to materials generated as a result of patient diagnosis, treatment, or the immunization of human beings or animals. 'Infectious waste' refers to the portion of medical waste that could transmit an infectious disease and chances of this are higher within hospitals than outside [6-8]. Infections in which the source of organisms is the hospital rather than the patient include those derived from hospital personnel, the environment, and medical equipment [9]. One of the most basic measures for the maintenance of hygiene, and one that is particularly important in the hospital environment, is cleaning [10].

This study addressed health facilities' cleaners as an important category in community particularly in high probability of exposure risk of parasitic infection and its role and its directly working in a decontamination and prevention of microbial infections. Speared of parasitic infection among this category represents source of infection in health facilities in which they working and to public community members. Therefore, this study estimated the prevalence and risk factors of parasitic infections among cleaning workers in public and private health facilities in Dhamar Governorate, Yemen.

2.Motheds

Study Area and design

This study conducted in Dhamar governorate. It is located in the middle of western part of Yemen Republic (precisely to south of Sana'a approximately 100 Km) especially in the central highland between latitude of (14^{o}- 15^{o}) north and longitude of (43^{o} 30– 44^{o} 50) east. It covers an area of approximately 7587 Km^2 in elevation ranges from a few hundred meters to about 3227 m above sea level [11,12].

A cross sectional descriptive study was conducted from September 2017 to August 2018 to estimate the prevalence of parasitic infections among cleaning workers using both direct saline method with iodine stain [13,14], and Spontaneous sedimentation technique in tube for eggs or trophozoites of stool specimen [15]. Centrifuged urine method (about 1000 rpm) for eggs or trophozoites of urine specimen and, thick and thin blood film for malaria diagnosis [13,14].

A total of 210 cleaners working at 23 public and private health facilities in Dhamar city and the surrounded areas were included in the study. All of the participants were Yemeni with a mean age (±SD), 27.86 (±10.32) years. Personal data and stool, urine and blood specimens were collected in health facilities. Identification of parasitic infections carried out in Faculty of Medical Sciences, Al-Hikma University (FMSHU), Dhamar, Yemen.

A structured questionnaire was used in this study. The questionnaire included the demographic characteristics, and potential risk factors of parasitic infections. Cleaning workers were invited to participate voluntary after a clear explanation of the objectives of the study. The approval for this study was obtained from medical laboratory department at FMSHU, Dhamar, Yemen.

Statistical analysis

The collected data were analyzed and presented by descriptive statistics including, frequency, percentage, mean and standard deviation by using, Statistical Package for the Social Sciences (SPSS 11.0, Chicago, IL). Parasites infections distribution on independent variables were assessed by the Chi square test (χ^2) or Fisher Extract rate test. The P value < 0.05 was considered as an indicative of statistical significance.

3. Results

Out of 210 cleaning workers from public and private health facilities included in the study, 119 (56.67%) were aged 19-29 years. Most of the participants were males (77.14%), educated (78.57%) and married or divorce (57.6 %) (Table 1).

Table 1: The general characteristics of cleaning workers at health facilities in Dhamar governorate (no= 210)

Variable	n (%)
Age/Year	
≤ 18	25 (11.90)
(19-29)	119 (56.67)
(30-40)	43 (20.48)
> 40	23 (10.95)
Sex	
Male	162 (77.14)
Female	48 (22.86)
Social Status	
Single	83 (39.52)
Married & Divorce	127 (60.48)
Education Level	
Uneducated	45 (21.43)
Educated	165(78.57)
Working duration/years	
1	89 (42.38)
2	24 (11.43)
3-6	39 (18.57)
≥ 7	58 (27.62)

The present study showed that the overall prevalence of at least one parasite species among cleaners working at public and private health facilities in Dhamar governorate was 79.0 % (166/210) (Figure 1). It was the same rate of the infected cases with intestinal parasitic infections (IPIs). However, four cases of the 210 participants (1.91%) had urinary parasitic infections as co-infection with IPIs. On other hand, no parasite in blood samples was detected. As shown in the figure 2, prevalence rates of single infections, double infections and multiple infections were 40.48% (85/210), 34.76% (73/210) and 3.81% (8/210), respectively.

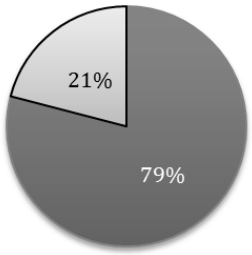

Figure 1: The overall prevalence of parasitic infections among cleaning workers at health facilities (no=210)

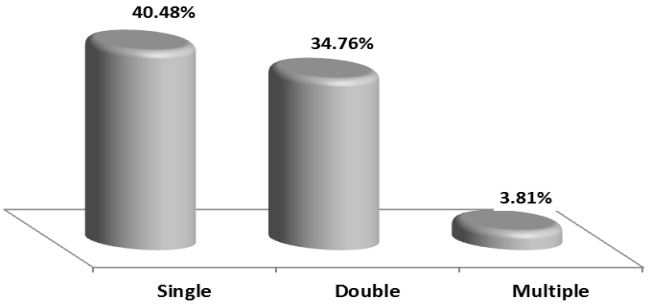

Figure 2: Prevalence rates of single, double and multiple parasitic infections among the study participates (no=210)

Figure 3 shows prevalence of parasitic infections among the participates according to separately parasite species, where the sum of the infection shows greater than the total number of participates, because the double and multiple infections were included.

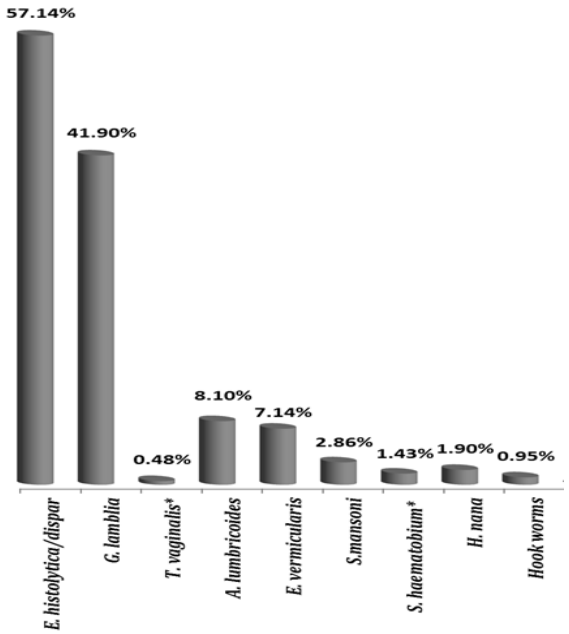

Figure 3: Prevalence of parasitic infections among the study participates (n=210) according to parasite species

* The detected parasite in urine specimens

E. histolytica/dispar (57.14 %, n= 120) and *G. lamblia* (41.90 %, n= 88) were found to be the highest prevalence of protozoan infections. While, prevalence rate of *T. vaginalis* was only 0.48 % (n= 1). *A. lumbricoides* 8.10 % (n=17) was found to be the highest prevalence of helminthic infections. While, prevalence rates of *E. vermicularis, S. mansoni, H. nana, S. haematobium,* and *Hookworms* were 7.14 %, n= 15; 2.86 %, n= 6; 1.90 %, n= 4; 1.43 %, n=3; and 0.95 %, n= 2, respectively. On the other hand, the prevalence of urinary parasitic infections (*S. haematobium*, n=3; and *T. vaginalis,* n=1) was 1.91 % (4/210). These were co-infection with IPIs as double or multiple infections

Table 2 shows levels of infections among the 166 infected cases according to parasite species. The commonest protozoan detected as single infection was *E. histolytica/dispar* (26.51%). While, the commonest helminthes detected was *A. lumbricoides* (3.01%).

Table 2: Single, double and multiple infections among the infected specimens (n=166) according to parasite species

Parasite species	n (%)[1]	%[2]
Single infection(n=**85)**		
E.histolytica/dispar	44 (51.76)	26.51
G.lamblia	33 (38.82)	19.88
S.mansoni	2 (2.35)	1.20
E.vermicularis	1 (1.18)	0.60
A.lumbericoids	5 (5.88)	3.01
Double infection(n=73)		
E.histolytica/dispar and *G.lamblia*	47 (64.38)	28.31
E.histolytica/dispar and *T.vaginalis*[3]	1 (1.37)	0.60
E.histolytica/dispar and *S.mansoni*	2 (2.74)	1.20
E.histolytica/dispar and *H.nana*	2 (2.74)	1.20
E.histolytica/dispar and *E.vermicularis*	11(15.07)	6.63
E.histolytica/dispar and *A.lumbericoids*	4 (5.48)	2.41
E.histolytica/dispar and *Hook worms*	1 (1.37)	0.60
G.lamblia and *S. haematobium*[3]	1 (1.37)	0.60
G.lamblia and *A.lumbericoids*	1 (1.37)	0.60
S.mansoni and *Hookworm*	1 (1.37)	0.60
E.vermicularis and *A.lumbericoids*	2 (2.74)	1.20
Multiple infection(**n=8**)		
E.histolytica/dispar, G.lamblia and S. haematobium[3]	2 (25.00)	1.20
E.histolytica/dispar, G.lamblia and H.nana or A.lumbericoids	3 (37.50)	1.81
E.histolytica/dispar, A.lumbericoids and E. vermicularis or S.mansoni	2 (25.00)	1.20
E.histolytica/dispar, G.lamblia, E.vermicularis, H.nana and A.lumbericoids	1(12.50)	0.60

1:Percentage of total single, double or, multiple infection; 2: Percentage of total infected specimens (n=166), and 3: in urine specimens.

Regarding double infections among the 166 infected cases, the commonest protozoan detected with other protozoa were *E. histolytica /dispar* with *G. lamblia* (28.31%). The commonest protozoan detected with helminthes were *E. histolytica/dispar* with *E. vermicularis* (6.63 %). While, the commonest helminthes detected with other helminthes were *E. vermicularis* with *A. lumbricoides* (1.20%).

Regarding multiple infections, the commonest parasites as multiple infections represented 1.81% (3/166) of combination *E. histolytica/dispar*, *G. lamblia* and *H. nana or A. lumbricoides*. On other hand, overall single protozoan infections were found to be 90.6% (77/85) more common than the single helminthic infections 9.4 % (8/85).

Table 3 shows that the prevalence of parasitic infection was higher among males than females (82.7% and 66.7%, respectively). The prevalence rate increased with working duration /years of cleaning workers in health facility from

who had a history of one year, two years and 3-6 years to ≥7 years of working duration (70.79 %, 70.83 % and 82.05 % to 93.10 %, respectively). Distribution of prevalence infections significantly associated with gender and working duration variables (*P*=0.008 and *P*=0.025, respectively).

Table 3: Prevalence of parasitic infections according to the general characteristics of participates

Variable	Infected n (%)	Non-infected n (%)	X^2	*P*
Age/Year				
≤ 18	21(84.00)	4(16.00)	1.17	0.761
(19-29)	91 (76.47)	28(23.53)		
(30-40)	35 (81.40)	8(18.60)		
> 40	19 (82.61)	4(17.39)		
Sex				
Male	134 (82.70)	28(17.30)	5.76	0.025
Female	32 (66.67)	16(33.33)		
Social status				
Single	63 (75.90)	20(24.10)	0.82	0.389
Married & Divorce	103 (81.10)	24(18.90)		
Education				
Uneducated	38 (84.44)	7 (15.66)	1.01	0.410
Educated	128 (77.58)	37 (22.42)		
Working duration/Year				
1	63 (70.79)	26 (29.21)	11.78	0.008
2	17 (70.83)	7(29.17)		
3-6	32 (82.05)	7 (17.95)		
≥ 7	54 (93.10)	4 (6.90)		

Table 4 shows that the overall single, double and multiple IPIs among cleaning workers were 41.43%, 34.76% and 2.86%, respectively. The double IPIs (27.43% and 43.6% to 43%, respectively) and multiple IPIs (0.9% and 5.13% to 5.17 %, respectively) increased with working duration of cleaning workers from who had a history of 1-2 years, and 3-6 years to ≥7 years of working duration. Relation between Levels of IPIs and working duration appeared a significant difference (*P*=0.019).

Table 4: Prevalence single, double and multiple intestinal parasitic infections according to working duration

Working period /years	Single n (%)	Double n (%)	Multiple n (%)	Negative n (%)	X^2	*P*
1	36 (40.45)	27 (30.34)	0 (0.0)	26 (29.21)	19.810	0.019
2	12 (50.00)	4 (16.67)	1 (4.17)	7 (29.17)		
3-6	13 (33.33)	17 (43.59)	2 (5.13)	7 (17.5)		
≥7	26 (44.83)	25 (43.10)	3 (5.17)	4 (6.90)		
Total	87 (41.43)	73 (34.76)	6 (2.86)	44 (20.95)		

4. Discussion

The present study was the first that looking at parasitic infections among cleaning workers at health facilities in Dhamar governorate, where showed that the overall prevalence of parasitic infections among them was 79 %. This finding was high compared to findings of many studies were conducted on other various populations reported that, overall prevalence rates of intestinal parasitic infections ranged from 26.4% to 58.7% in other Yemeni areas [16-21] and from 7.7 % to 57.9 % in Arabic and regional countries [22-26].

Although, prevalence rates of parasitic infections in Yemeni and regional studies mentioned were lower than findings of this study. High prevalence rates have also reported among school children in Al-Mahweet, Yemen (90%) [27] and, among patients in Ethiopia country (83%) [28]. Generally, the high prevalence of parasitic infection in this study reflects the elevated poor of personal hygiene, and health education about parasitic infections among cleaning workers category which working in critical facilities.

Protozoan infections were more common than helminthic infections in this study. This was comparable to that have reported in study conducted on patients in Sana'a, Yemen [19] and, in studies conducted on various populations in Saudi Arabia [29,30], United Arab Emirates [22], Italy [31] and India [32,33]. While, Ethiopian study has indicated to the opposite findings [28]. Prevalence of parasitic infections among males was significantly higher than females in the present study (p=0.025). This was comparable to that have reported in previous Yemeni [34,20], Palestinian [35], United Arab Emirates [22], and Iranian [36] studies.

Findings the present study showed a significantly increasing of overall prevalence rate of parasitic infection with working duration/years of cleaning workers in health facilities (*P*=0.008). Levels (single, double and multiple) of IPIs rates and working duration also significantly related (*P*=0.019), where prevalence rates of the double and multiple IPIs increased with working duration, these may be attributed to the prolonged exposure to parasitic infection among the participants without cyclic screening and appropriate treatment. On the other hand, the study's findings showed that, parasitic infections rate among males was significantly higher compared to females (*P*= 0.025). This may be due to, the few number of females in the sample study and the difference in the tasks nature. The main limitations which faced this study were the limited resources and the unavailable facilities that led to the inability to: differentiate cysts of *E. histolytica* from *E. dispar* by molecular technique; detect specific *Entamoeba species* by ELISA; and detect *Cryptosporidium* and other intestinal coccidian by Modified acid-fast staining technique.

5. Conclusions

The present study shows that prevalence of parasitic infection among cleaning workers in health facilities in Dhamar is high. Protozoan infections are more common than helminthic infections. Gender and working duration of cleaning workers significantly influence the prevalence: Males have a higher prevalence rate than females whereas, prevalence rate increases with rise of working duration. This study discover on a big health problem represents a

warning bell on a worrisome source of parasitic infections in health facilities can be reduced by more effort of health public ministry and population and other related sides to improve the public measures of prevention and control infection in health facilities generally and by increasing of personal hygiene and health education among cleaning workers category particularly. More and large surveys are required in medical, administrative staff to reflect the factual size behind the high prevalence and risk factors of parasitic infections.

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Conflicts of interest
The authors declare that there are no conflicts of interest.

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