



Intestinal parasitic and bacterial infections among housemaids in Hail, Saudi Arabia

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ABSTRACT

Parasitic and bacterial infection is common throughout the developing countries of the world. However, housemaids originated from those developing countries are considered a possible source of infection for numerous intestinal parasites as well as other enteropathogenic infections. A total of 100 stool samples were collected from housemaids originated from different countries as Ethiopia, Srilanka, Indonesia and Philippines who visited Hail General Hospital, Saudia Arabia (KSA) during a period from November, 2017 to April, 2018. Each stool sample was examined to detect intestinal parasites using routine parasitological techniques. In addition, standard cultures and biochemical techniques were used for the isolation and identification of pathogenic bacteria.

The results revealed that the prevalence rate of intestinal protozoa was 46%. Among those, the infection rates of *Giardia lamblia*, *Cryptosporidium* species *Entamoeba histolytica* and *Entamoeba coli* were 12%, 10%, 16% and 8 % respectively. Furthermore, four species of helminthes were detected which the infection rates as follows, *Ascaris lumbricoides* (6%), *Enterobius vermicularis* (4%), *Ancylostoma duodenalis* (4%) and *Taenia* sp. (5%). On the other hand, 49 % of examined housmaids were positive for bacterial pathogens. As the obtained data revealed that *Clostridium difficile* were the major bacterial pathogen isolated from stool samples (18%) mostly from Srilanka housmaids followed by Enterotoxigenic *E.coli* (ETEC) (12%) most cases were from Indonesia and Ethiopia. While, the infection rates of *Vibrio vulnificus*, *Bacillus cereus*, *Campylobacter coli* and *Aeromonas hydrophila* were 10%, 6%, 2% and 1% respectively. The study was the first study highlighting that the intestinal parasitic and bacterial infections are still an important public health problem among housemaids in Northwestern Saudi Arabia. Therefore, more investigations are required to be conducted on a larger scale.

Key words: Protozoa, Helminthes, Bacteria, Housemaids, Hail, KSA.

INTRODUCTION

Parasitic and enteric pathogenic bacterial infections are endemic worldwide and have been described as constituting the greatest worldwide cause of illness and disease (**Amer et al., 2018**).

Parasitic infections are a major public health problem worldwide; particularly in the developing countries. The prevalence of the intestinal parasitic infections varies from one region to another and it also depends largely on socioeconomic, environmental, and hygienic factors (**Al-Rifai et al., 2020**). On the other hand, bacterial infections were considered one of most important causes of life threatening in developing nations than in wealthy ones (**Nagel et al., 2016**).

Therefore, in high income nations as Saudi Arabia, most of families hire foreign housemaids originated from Bangladesh, Ethiopia, India, Nepal, Sri Lanka, Indonesia, and Kenya which are recognized to be endemic

for intestinal parasitic infections (**Haouas et al., 2021**). Thus, hiring those housemaids might increase the risk of parasitic transmission to the Saudi community. While (**Abu-Madi et al., 2008**) in Qatar recorded three nematodes, *Trichuris trichiura*, hookworms and *Ascaris lumbricoides* as well as and four intestinal protozoal infections (*Entamoeba histolytica*, *Blastocystis hominis* and *Giardia lamblia*) among food handlers and housemaids originated from Africa and Southeast Asia.

Furthermore, (**Taha et al., 2013**) in Saudi Arabia found high prevalence of different intestinal parasites among different nationalities expatriate workers of Pakistanis, Philippines and Sudanese. However, there is an insufficiently data on the prevalence of intestinal parasites and bacterial infections among housemaids in Hail city, Saudi Arabia. Hence, the aim of this study was to determine the prevalence of intestinal parasitic and

bacterial infections among housemaids in Hail, KSA.

MATERIALS AND METHODS

Study area and population

The study protocol was approved by the Ethics Committee in the College of Medicine, Hail University, KSA. This study was conducted during November, 2017 to April, 2018.

Sampling and stool examination

Hundred stool samples were collected from the housemaids who have visited Hail General Hospital, Saudia Arabia (KSA). The samples were collected in sterile plastic containers and transported to the Parasitology and Microbiology laboratory in the Clinical Laboratory Sciences Department, Faculty of Applied Medical Science, Hail University.

Macroscopic examination:

Each stool specimen was examined macroscopically for color, consistency and presence of any blood or mucus.

Direct microscopic examination by using saline and iodine preparations:

A small amount of stool sample was emulsified in 1-2 drops of saline or iodine solution. A cover slip was placed on it by taking care that the preparation was free of air bubbles and macroscopic debris.

Formol-Ether concentration

One gram of stool was emulsified in 7 ml of 10% formol saline and it was kept for 10 minutes for fixation. It was then strained through a wire gauze. The filtrate was added to 3 ml of ether and centrifuged at 2000 rpm for 2 minutes. It was allowed to settle down. The supernatant was removed and a wet mount was made of the deposit to look for parasites.

In addition, samples were examined as wet saline mounts and in iodine preparation for detection of protozoan oocysts, cysts, helminthic eggs and larvae (**Taha et al., 2013**). Permanent stained smears were performed for intestinal coccidian parasites by the

modified Ziehl-Neelsen technique according to Amer et al. (2016).

Bacterial isolation and identification:

Isolation and identification were done by conventional methods as 1st day of receiving samples cultures on Selenite broth base CM 395 OXOID and C.L.E.D (Cystine Lactose Electrolyte Deficient) agar media HIMEDIA® at the 2nd day from Selenite broth growth cultured on XLD (Xylose Lysine Deoxycholate) HIMEDIA®, MacConkey and Sorbitol MacConkey CM 0813 OXOID (March and Ratnam, 1986), to detect anaerobes used CDMN-TA (C. difficile Moxalactam-Norfloxacin-Taurocholate Agar, Oxoid Ltd., Cambridge, UK) supplemented with 7% horse blood (Carroll and Bartlett, 2011). TCBS agar (Thiosulfate, Citrate, Bile salts and Sucrose) HIMEDIA®, CHROMagar™ Vibrio (Nakashima et al., 2007) and 5% Sheep Blood Agar. Microscopic examination was done

for the isolated bacteria after staining with Gram stain to detect characters. Rapid ID32A for anaerobic bacteria Gram positive (Kim et al., 2013). API®20E and API® CAMPY (BioMerieuxSA, Marcy l'Etoile, France) were used for biochemical identification of Gram Negative strains isolated (Huysmans et al., 1995). Confirm identification was done by Vitk 2 System bioMerieux® in Maternity and Children hospital in Hail KSA.

RESULTS

Parasitological studies

As shown in Table 1, a total of 100 stool samples were examined, 65 of them were positive for intestinal parasitic infections. The current results revealed that four different intestinal protozoa were detected which include *Entamoeba histolytica* (16%), *Cryptosporidium* spp. (10%), *Giardia lamblia* (12%) and *Entamoeba coli* (8 %) (Fig. 1 A, B, C, D). Moreover, our findings showed

that four species of helminth parasites were recovered, *Ascaris lumbricoides*, *Entrobium vermicularis*, *Ancylostoma duodenalis* and *Taenia* spp. 6%, 4%, 4% and 5% respectively (Fig. 2 A, B, C, D). On the other hand, the overall

high infection rate of intestinal parasites were recorded among housemaids originated from Philippines, followed by Indonesia (Table 2).

Table 1: Prevalence of intestinal parasitic infection among housemaids

<i>Parasite</i>	<i>Number Identified</i>	<i>Percent</i>
<i>Entamoeba histolytica</i>	16	16 %
<i>Cryptosporidium</i> sp.	10	10 %
<i>Giardia lamblia</i>	12	12 %
<i>Entamoeba coli</i>	8	8 %
<i>Ascaris lumbricoides</i>	6	6 %
<i>Entrobium vermicularis</i>	4	4 %
<i>Ancylostoma duodenalis</i>	4	4 %
<i>Taenia</i> sp.	5	5 %

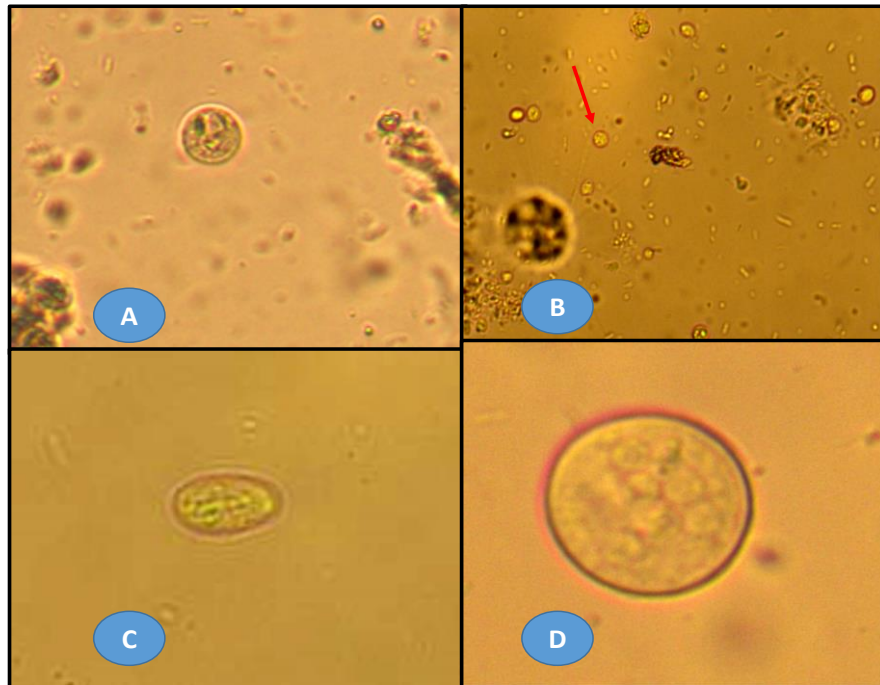


Fig.1: Intestinal parasitic protozoa. (A: *Entamoeba histolytica* cyst; B: *Cryptosporidium* sp. oocyst (Red arrow); C: *Giardia lamblia*; D: *Entamoeba coli* cyst).

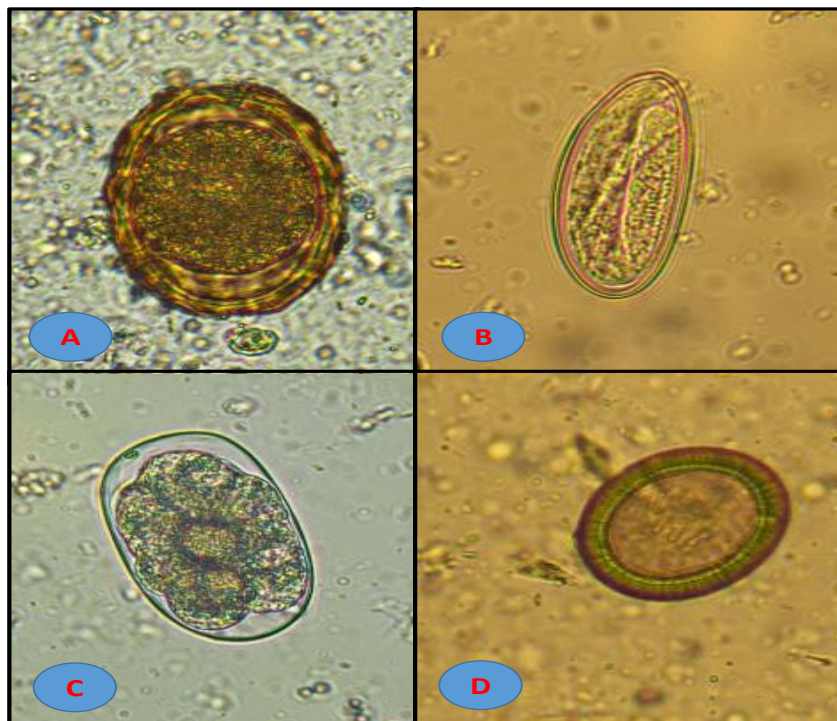


Fig. 2: Intestinal helminths. (A: *Ascaris lumbricoides* egg; B: *Entrobilus vermicularis*; C: *Ancylostoma duodenalis* egg; D: *Taenia* sp. egg).

Table 2: Distribution of identified intestinal parasites among housemaids according to nationalities.

Parasites	Sri Lanka	Philippines	Indonesia	Ethiopia
<i>Entamoeba histolytica</i>	3	4	5	4
<i>Cryptosporidium</i> sp.	1	5	1	3
<i>Giardia lamblia</i>	0	4	3	5
<i>Entamoeba coli</i>	2	4	1	1
<i>Ascaris lumbricoides</i>	3	2	1	0
<i>Entrobilus vermicularis</i>	0	2	1	1
<i>Ancylostoma duodenalis</i>	0	2	2	0
<i>Taenia</i> sp.	0	4	1	0
Total	9	27	15	14

Microbiological studies

Forty nine samples (49) out of 100 stool samples were positive for 6 different types of pathogenic bacterial infection. Macro- morphological characters on different media and microscopical characters were observed. Eighteen (18) cases were identified as *Clostridial difficile* which is widely recognized as the causative agent of a wide spectrum of conditions ranging from asymptomatic carriage of the organism to antibiotic associated diarrhea. Twelve (12) cases were positive to *E. coli*, the ETEC type

(Enterio Toxogenic *E. coli*) after confirmation using Sorbitol MacConkey CM0813 media. Moreover, ten (10) cases were *Vibrio vulnificus* a gram negative rod bacteria associated with eating raw seafood and can lead to septicemia and sepsis, *Bacillus cererus* also isolated from (6) cases, while (2) cases were *Camylobacter coli* and (1) case was *Aeromonas hydrophila* (Table 3).

API 20E, API CAMPY and Rapid ID32A results positive or negative depend on the turbidity or changing colors of indicators which were transformed into numerical biocodes

and identified through the use of numerical analytical profile index for each kit and identification percent as shown in (Table 4). Using VitK 2

system bioMérieux® for confirmative diagnosis and antibiotic susceptibility testing.

Table 3: Number of cases, isolated Pathogenic bacteria, distribution and characteristics

Pathogenic bacteria isolated	Number of cases	Nationality				Characteristics
		Sri Lanka	Philippines	Indonesia	Ethiopia	
<i>C.difficile</i>	18	15	3	0	0	Anaerobic Gram Positive with oval sub terminal spore forming rod shape, well growth on Blood agar and CDMN-TA with characteristic farm yard smell.
<i>E.coli</i>	12	1	2	5	4	Facultative anaerobe Gram Negative rod to coccobacilli, lactose ferments on MacConkey with pink colonies and white colonies on Sorbitol MacConkey.
<i>Vibrio vulnificus</i>	10	0	10	0	0	Gram Negative curved rod, Green color on TCBS media, Green to blue on CHROMagar™, can grow in 6% NaCl could not grow without NaCl.
<i>Bacillus cererus</i>	6	3	0	0	3	Aerobic Gram Positive rod shape, oval central spore, β hemolytic on Blood agar ,Voges Proskauer +ve, grow in NaCl, catalase +ve .
<i>Campylobacter coli</i>	2	0	0	0	2	Curved rod Gram Negative sea gull shape, NO ₃ to NO ₂ positive, CFTR* positive and can grow in Glycine 1%.
<i>Aeromonas hydrophila</i>	1	0	1	0	0	Gram Negative slow grower (72hr) ,greenish blue non lactose ferment rod shape, show hemolytic activity on 5% sheep blood agar .No growth in 4-5% salt, PH range 4-10 optimum temperature 28°C

* Cephalothin resistance

Table 4: API20E, API CAMPY and Rapid ID32A kits results

Isolated Bacteria	Identification %	Identification kit
<i>C. difficile</i>	95% - 98%	Rapid ID32A
<i>E. coli</i>	96% - 99%	API 20E
<i>Vibrio vulnificus</i>	83% - 91%	API 20E
<i>Campylobacter coli</i>	85% - 93%	API CAMPY
<i>Aeromonas hydrophila</i>	96%	API 20E

DISCUSSION

Intestinal bacterial and parasitic infections are the causative agents of common infections with significant public health problems in developing countries (Al Suwaidi A. H. E., 2015; Lamps, 2009). These infections are associated with poor sanitary habits, lack of access to safe water, improper hygiene and the prevalence of infections vary from one region to another (Amer et al., 2018; Zaglool et al., 2011). Concerning to intestinal parasites that detected among housemaids, our findings showed that 65 % of examined patients were positive for intestinal parasitic infections. Moreover, the highest prevalence rates were *Entamoeba histolytica* and *Ascaris lumbricoides* which reached 16% and

6% respectively. This finding is consistent with other studies conducted in Saudi Arabia in different geographical areas (Kang et al., 1998). However, this prevalence is higher than what recorded in previous reports (Al-Megrin, 2010; Haouas et al., 2021). In addition, Al-Rifai et al. (2020) in United Arab Emirates showed that 47.8% of the tested expatriate workers were positive for intestinal parasites. The authors added that *Entamoeba* spp. was the most common (8.1%) followed by *Cryptosporidium* spp. (3.5%). While a previous study was conducted by Amer et al. (2016) in Hail, KSA who found that infection rate of intestine parasites among patients was 45.38%. The difference could be due to the type

of patients used and to geographical locations with different climates or socioeconomic status.

Types of pathogenic bacteria isolated showed that the prevalence rate of *Campylobacter coli* and *Aeromonas hydrophila* were high comparing to the sample size. This study findings were in direct contrast with reports from Djibouti and Ethiopia (**Hlashwayo et al., 2020**) that *Aeromonas* spp and *Campylobacter coli* only isolated from diarrheal cases not from asymptomatic one. *Bacillus cererus* also showed high percentage from Sri Lankan cases as **Perera and Ranasinghe (2011)** reported that Sri Lanka is in need of an active surveillance system to reduce the disease which showed in Sri Lanka National Health Account 2005-2009 and this were due to the in proper food safety control and eating of raw meat. Cases from Philippines were the highest and only in

the isolation of *V. vulnificus* which is one of the major food born disease ,associated with eating raw seafood and contaminated sea water (**Heng et al., 2017**). Given that the increased use of antibiotics in aquaculture resulted in the emergence of antibiotic resistance, considerable effort has been made in seeking alternative ways to control infections (**Defoirdt et al., 2004**) .In this study, twelve cases of *E. coli* were isolated, ETEC type which related to consumption of food and water contaminated with fecal material or secondary transmission (person to person), usually cause traveler's diarrhea most of cases were isolated from Indonesian which agreed with the prevalence range reported by **Ruthashini and Selvasingam (2014)**. In addition, the highest number of cases were with *C. difficile* (15 cases) were from Sri Lanka housemaids.

CONCLUSION

As most of these expatriate workers used in as baby sitter or housmaids from parasitic and bacterial endemic countries, there are possibilities for them to carry them as asymptomatic carriers and to transmit them. Health education, raising awareness and strengthening the existing screening methods especially for domestic helpers and baby sitters are

among the ways to control the problem of intestinal parasitic and bacterial infections in the general population in Hail. Moreover, updating the epidemiologic survey of these intestinal infections using the appropriate diagnostic tools is required to develop an effective prevention and control strategies.

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الملخص العربي

العدوى الطفيلية والبكتيرية بين الخادمت في حائل بالمملكة العربية السعودية

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العدوى الطفيلية والبكتيرية شائعة في جميع أنحاء البلدان النامية في العالم. لذلك فإن الخادمت المنحدرات من تلك البلدان النامية يُعتبرن مصدرًا محتملاً للعدوى بالعديد من الطفيليات المعوية بالإضافة إلى الأنواع المختلفة من البكتيريا المُمرضة للأعضاء. في هذه الدراسة تم جمع ١٠٠ عينة براز من الخادمت من دول مختلفة مثل إثيوبيا وسريلانكا وإندونيسيا والفلبين الذين زاروا مستشفى حائل العام ، بالمملكة العربية السعودية خلال الفترة من نوفمبر ٢٠١٧ إلى أبريل ٢٠١٨. حيث تم فحص كل عينة براز للكشف عن الطفيليات المعوية باستخدام الفحص الروتيني للطفيليات. بالإضافة إلى ذلك ، تم استخدام المزارع القياسية والتقنيات البيوكيميائية لعزل وتحديد البكتيريا المسببة للأمراض.

أوضحت النتائج أن معدل انتشار الطفيليات المعوية بلغ ٤٦٪. ومن بين هؤلاء ، كانت معدلات الإصابة بأنواع الجيارديا اللمبية وأنواع الكريبتوسبورديوم ومتحولة حالة النسيج إنتاميبا هستوليتكا ومتحولة القولون إنتاميبا كولاى هي ١٢٪ ، ١٠٪ ، ١٦٪ و ٨٪ على التوالي. علاوة على ذلك ، تم الكشف عن أربعة أنواع من الديدان الطفيلية التي كانت معدلات الإصابة بها على النحو التالي أسكارس الأنسان ٦٪ ، دبوسية الانسان إنتروبيس ٤٪ ، أنكيلوستوما الأنسان ٤٪ و أنواع شريطية التينيا ٥٪. من ناحية أخرى ، كانت ٤٩٪ من الخادمت اللاتي تم فحصهن إيجابيات لمسببات الأمراض البكتيرية. كما كشفت البيانات أن المطثية العسيرة بكتيريا كلوستريديم ديفيسيل كانت العامل الممرض البكتيري الرئيسي المعزول من عينات البراز (١٨٪) ومعظمها كانت من الخادمت القادمة من سيريلانكا. في حين كانت الإشريكية القولونية المعوية ١٢٪ وكانت معظم الحالات من إندونيسيا وإثيوبيا. في حين تم عزل بكتيريا الضمة (فيبريو) فولنيفيكوس من ١٠ حالات من الخادمت الفيليبينات و بكتريا باسيلس سيريس من ٦ حالات ، وحالتان من بكتريا العطيفة القولونية وحالة واحدة فقط من بكتريا أيروموناس هيدروفيليا. وتعتبر هذه الدراسة أول دراسة تسلط الضوء على أن العدوى الطفيلية والبكتيرية المعوية منتشرة ولا تزال تشكل مشكلة صحية عامة مهمة بين الخادمت في شمال غرب المملكة العربية السعودية. لذا يجب إجراء المزيد من الدراسات ولكن على نطاق واسع.