

## INTESTINAL PARASITES DETECTED DURING PRE-EMPLOYMENT STOOL EXAMINATION AT TERTIARY HEALTH CARE CENTER IN MAKKAH, KINGDOM OF SAUDI ARABIA

By

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### Abstract

This retrospective study determined the intestinal parasites discovered in 2490 new employees in a tertiary health care center in Makkah as regards nationalities, age groups and sex over the period from January 2010 to January 2014 to decrease introduction of communicable diseases. All the data were provided through the electronic hospital information system. The overall positive cases were 16%, significantly higher in females 57.4% than males 42.6%. Differences in distribution of positive records among different geographical areas were highly significant being highest in East Asia 59.8%. *Blastocystis hominis* was the most common parasite. It occurred in 78.9% of positive cases followed by *Entamoeba coli* 9.3%, *Giardia lamblia* 5.8% and *Entamoeba histolytica/dispar* 5.3%. These findings should motivate any other country importing expatriate employees to have effective screening programs for intestinal parasites.

**Key words:** Intestinal parasites, Saudi Arabia, Immigrant employees, pre-employment examination

### Introduction

Over one billion people worldwide harbor protozoa and helminthic parasites. Parasitic intestinal infections have a predilection for developing countries due to overcrowding and poor sanitation but are also found in developed nations, such as the United States, particularly in immigrants or in the setting of sporadic outbreaks (Hechenbleikner and McQuade, 2015). In some Arab Countries, it was a significant health problem (Mezeid *et al*, 2014). Socio-economic factors and hygienic habits affect transmission of intestinal parasites. Infections with these parasites are most prevalent in the tropical and subtropical regions of the developing world where adequate water and sanitation facilities are lacking (Savioli *et al*, 2004).

The Kingdom of Saudi Arabia is considered to be one of the countries with a high number of expatriates. The majority were

laborers come from tropical and subtropical developing countries where low socio-economic levels are present along with poor medical care and hence, the potential high prevalence of parasitic infections among them (Al-Madani and Mahfouz, 1995; Easton, 1999; Aba-Hussain, 2005)

According to Saudi Health Authorities, health care employees should be infection-free and physically intact to avoid disease transmission. The harm of parasitic infection is not exclusive for health care employee as communicable diseases. Stool analysis is a component of pre-employment examination for the screening of intestinal parasites. Many surveys have been carried out in various regions of the KSA including Abha district (Al-Madani and Mahfouz, 1995), Riyadh (Kalantan, 2001), Al-Khobar (Aba-Hussain, 2005), Makkah (Wakid *et al*, 2009) and Al-Baha (Mohammad and Koshak,

2011). However, all these studies were carried out in regions that differ in the environmental and the demographic conditions. In general, prevalence of parasites among expatriates was higher than in Saudi patients (Abahussain, 2005).

This study aimed to study the occurrence of intestinal parasites in the employees before joining work at Makah tertiary health care center and to compare the occurrence of intestinal parasites among different nationalities, age groups and genders in order to minimize introduction of parasites to the Kingdom, Also, to give recommendations to minimize parasitosis.

### **Subjects, Materials and Methods**

A retrospective study was carried out at a Tertiary Specialized Health Care Centre, the Makah Region, Saudi Arabia. Subjects included were health care employees and their families who attend staff clinic for pre-employment medical checkup during the four years covered by data collection from January 2010 to 2014. The regulations in Saudi Arabia require pre-employment medical checkup and screening for infectious diseases for all health care employees before starting the work. The screening techniques involved laboratory stool examination for intestinal parasites.

Each subject was given a single labeled stool sample. The samples were macroscopically examined mainly for enterobiasis and gravid segments. Then, the samples were microscopically examined as the stained direct smear and the concentration-sedimentation method (Garcia, 2001). Sometimes smears were stained with Modified Zeihl-Nelsen stain when indicated for cryptosporidiosis.

The data of the pre-employment stool examination were accessed via the electronic hospital information system. Data were extracted and exported onto an excel work sheet containing the Medical Record Number (MRN), name, age, gender, nationalities, stool examination date, result and treatment of positive and follow-up. The Excel sheet

was exported to the statistical program after erasing the name and replacing the MRN by study codes. For positive result, the hospital file was checked: If the file still open >3 months, hospital files were consulted, if available, for any given parasitic treatment and follow-up.

The study protocol was approved by the local institutional review board. Waiver of informed consent was obtained because it was a retrospective study and all data were coded for analysis purpose. Patient confidentiality was protected.

Statistical analysis: Data were computerized and analyzed using SPSS software program. The chi-square test was used to test differences between proportions. A two sided p-value <0.05 were considered significant.

### **Results**

A total number of 2490 pre-employment records were found, out of whom 1184 (48%) were males and 1306 (52%) were females. Saudis represented 35.6% of the tested individuals while the remaining employees were largely from East Asia followed by four other geographical areas; Sub-Saharan Africa, North Africa, West Asia and European. Most of the studied individuals were aged 20-39 years (85.6%) and the highest numbers were recruited during the year 2012: 835 (33.5%). Table 1 shows the general characteristics of the studied individuals versus positivity.

Intestinal parasites were detected in 399 individuals (16% of the total employees) being significantly higher in females 57.4% than males 42.6%. The prevalence of intestinal parasites was also compared in different age groups and nationalities. Differences in distribution of positive records among different geographical areas were highly significant as only 20 % of positive cases were Saudi while 80% were Non-Saudi with the highest percent of positive records being in East Asia: 39.9% from total and 59.8% from positive cases (Fig. 1). The highest rate of positive records was in the age group 20-

39 years (Tab. 1) and in the year 2012 (Tab. 2).

Twenty four percentage of East Asia employees were positive followed by North Africa: (15.4%), European: (13.2%), Sub-Saharan Africa: (11.4%) and West Asia: (10.5%), Saudi: (9%); data expressed (Tab. 1) as overall positive%. *Blastocystis hominis*

was the most common parasite. It occurred in 78.9% of positive cases followed by *Entamoeba coli* 9.3%, *Giardia lamblia* 5.8% and *Entamoeba histolytica/dispar* 5.3% (Tab. 3). Other parasitic species such as *Iso-spora belli* and *Trichuris trichura* were detected in very low numbers.

Table 1: Personal data and results of stool examination of 2490 cases

Variants	No. examined	Positive cases (399)	Overall positive %	P value
<b>Sex</b>				
Males	1184 (52%)	170 (42.6%)	14.4	0.033
Females	1306 (48%)	229 (57.4%*)	17.5*	
<b>Nationalities</b>				
Saudi	887 (35.6%)	80 (20%)	9	0.00
Non Saudi	1603 (64.4%)	319 (80%)	20	
Sub-Saharan Africa	44 (1.8%)	5 (1.3%)	11.4	
North Africa	293 (11.8%)	45 (11.3%)	15.4	
East Asia	993 (39.9%)	239 (59.8%*)	24*	
West Asia	220 (8.8%)	23 (5.8%)	10.5	
European	53 (2.1%)	53 (2.1%)	13.2	
<b>Ages of individuals</b>				
Below 20	5 (0.2%)	Zero (Zero)	Zero %	
20-39 years	2130(85.6%)	347 (87)	16.3%	
40-59 years	342(13.7%)	48 (12)	14%	
Above 60	13 (0.5%)	4 (1)	30.8%	

\* Statistically significant difference

Table 2: Overall cases from years 2010 to 2014

Years	No. examined	Positive cases	Overall Positive Percent
2010	290 (11.6%)	48 (12)	16.6
2011	510(20.5%)	76 (19.1)	14.9
2012	835(33.5%)	137 (34.3)	16.4
2013	553(22.3%)	89 (22.3)	16.1
2014	3553(12.1%)	49 (12.3)	16.2

Table 3: Prevalence of intestinal parasites among foreign expatriates from years 2010 to 2014

Parasite detected	Frequency	Total Percent (2490)	Percent Positive (399)
<i>Blastocystis hominis</i>	315	12.7	78.9
<i>Entameba histolytica/dispar</i>	21	0.8	5.3
<i>Entameba coli</i>	37	1.5	9.3
<i>Giardia lamblia</i>	23	0.9	5.8
<i>Iso-spora belli</i>	2	0.1	0.5
<i>Trichuris trichura</i>	1	0.0	0.2
Total positive	399	16	100

### Discussion

In the present study, intestinal parasites were detected in 16% of the stool samples during pre-employment testing in health care employees. This finding agreed with previous reports from other areas in Saudi Arabia as 14.9% was detected (Taha *et al*,

2013) in Al-Madina Al-Munawarah, 12.8% (Kalantan *et al*, 2001) in Riyadh, 15% (Zakai *et al*, 2014) in Jeddah and 22.3% (Aba-Hussain, 2005) in Al-Khobar. However, higher prevalence (32.2%) was detected in Riyadh (Al-Shammari *et al*, 2001) among household survey including different popu-

lations mostly Saudi adults and children in rural and urban, which is completely different from the present study. Koshak and Zakai (2003) in Jeddah detected intestinal parasites in 55% among two hundred and ninety Asian health care employees; this might be attributed to the smaller sample size when compared to 2490 in the present study, also most of their studied subjects were from Asia a sector which gave higher percentage of positivity in the current study.

In the present study, differences in distribution of parasites were significant between genders and different geographical areas, being higher in females 57.4% than males 42.6%. The Female predominance was expected because of the large numbers who were employed as nurses.

In general the parasitic positivity was low among Saudi than non-Saudi ones. The Asian more positivity was also understood since most of these countries are tropical and subtropical where such infections are common (WHO, 2000). Hence, importation of expatriate employees may increase the importation of the parasitic infections (Al-Shammari 2001). Similarly, reports in other Gulf countries have indicated that the proportion of parasitic infection was high among foreign employees (Osama *et al*, 1993; Shurie and Srivatsan *et al*, 1996).

The commonest parasite prevalent in this study was the *Blastocystis hominis* (12.7% from total; 78.9% from positive). Amin (1997) reported *B. hominis* among apparently healthy food handlers in Jeddah. *B. hominis* infection is more common in developing tropical and subtropical regions (Sohail and Fischer, 2005). Although, its role in pathogenesis is controversial, it gained acceptance as a human intestinal parasitic agent showing different clinical symptoms and causing illness in some infected individuals (Stenzel and Boreham, 1996). *B. hominis* is considered an opportunistic parasite, its pathogenicity and augmentation of infection was enhanced in presence of stress and in immunocompromised hosts (Chandramathi *et al*,

2012; 2014). They recommended that cancer patients undergoing chemotherapy should be screened repeatedly for intestinal parasites, namely *B. hominis* and *Microsporidia*, as they may reduce the efficacy of chemotherapy treatments.

These facts and recommendations should be considered in oncology centers. *B. hominis* is followed by *E. coli* (1.5% from total; 9.3% from positive). Although *E. coli* parasites considered non-pathogenic, their presence in a stool samples is a reflection of a low state of hygiene and fecal-oral route of transmission which should attract the attention for health awareness in the present subjects.

The third major parasite isolated was *Giardia lamblia* 5.8% similar to previous reports in Al-Khobar (Abahussain, 2005) and Makkah (Zagloul *et al*, 2011). Awa-dallah and, Morsy (1974) reported 14% giardiasis among pre-school and school aged children in Riyadh. However, the overall prevalence rate of *G. lamblia* in Saudi Arabia was 28.5% (Al-Tukhi *et al*, 1996). The lower occurrence of *G. lamblia* infection in the present study may be attributed to the intermittent excretion of the cysts.

The fourth most prevalent pathogenic parasite *Entamoeba histolytica/dispar* was identified in 5.3%, which with 5.5% reported in Riyadh (Al Khalife *et al*, 2006) and comparable to other reports 1.2-4.5% for this parasite in different cities in Saudi Arabia (Al-Madani and Mahfouz, 1995; Abahussain, 2005; Zaghlool *et al*, 2011). However higher records of 17.8 % and 27.5 were detected from Al-Madina Al-Munawarah by Taha *et al*. (2013) and Imam *et al*. (2015) this may be attributed to the environmental conditions and the demographic characteristics of the populations living there. The current epidemiology of amebiasis is somewhat confusing because microscopic identification of the parasites in stool is insensitive and is still a problem in routine diagnostic laboratories due to the failure to distinguish non-pathogenic amoeba such as *E. histolytica/dispar*

and *Entamoeba hartmanni*.

In the present study, *Isospora belli* and *Trichuris trichura* were not sufficiently recorded and none had cryptosporidiosis, although it was detected by Bolbol (1992) and Al-Braiken (2008) in young children in Riyadh and Jeddah but in the present study the subjects were adults apparently healthy. On the other hand, Al-Braiken (2008) in Jeddah studied the intestinal parasites identified among children with gastroenteritis in both inpatients and outpatients were *B. hominis* 0% inpatient vs. 9.5% outpatient, *E. histolytica/dispar* (8.3% inpatient vs. 5.9% outpatient), *G. lamblia* (12.5% inpatient vs. 2.7% outpatient), *Cryptosporidium* spp (8.3% inpatient vs. 2.3% outpatient), *A. lumbricoides* (0% inpatient vs. 0.4% outpatient), hookworm (4.2% inpatient vs. 0.8% outpatient), and *Trichuris trichiura* (4.2% inpatient vs. 1.05% outpatient). Besides, Makki and Arafa (2010) on randomly selected 161 apparently healthy immigrant workers in Dammam City, with ages ranged between 21 to 40 years, found that 99/161 (55.3%) suffered from parasitosis. These were in descending order, they were *E. histolytica* (50.5%), *G. lamblia* (38.8%), *E. vermicularis* (12.1%), *E. coli* (12.1%), *Trichuris trichiura* (11.1%), *Hymenolepis nana* (11.1%), *S. haematobium* (10.1%), *A. lumbricoides* (9.09%), *S. mansoni* (7.07%), *Dicrocoelium dendriticum* (5.05%), and *Fasciola* species (3.03%). So, it seemed that in the Eastern Kingdom, the immigrant employees were mainly from Asian countries with more or less medical supervisions of them favored more zoonotic parasitic fauna. In Egypt, a high attention should also be attracted to intestinal parasitic infections imported with expatriate workers. The Central Agency for Public Mobilization and Statistics (CAPMAS) reported in 2013 that Asian immigrant workers represented about 32% of total foreign workers.

Although the present study was strengthened by the use of large sample size with good statistical power and considerable du-

ration coverage of four years, but there were some limitations. A single specimen from each pre-employment subject might lead to an underestimation of the prevalence of parasitosis. The validity of using a single stool sample for the screening for parasites was controversial, sometimes proved insufficient (Kawatu *et al*, 1993), and sometimes with-out significant differences in parasitic infections prevalence (Cabada *et al*, 2015).

### **Recommendations**

The protocol for stool screening should include stool analysis repeated on three samples collected on three consecutive days to ensure the highest possible accuracy in detecting parasites. A hospital based study could affect the generalizability of the prevalence and incidence parasitosis, so multicenter study is recommended. Checking of electronic files of positive subjects revealed that neither treatment nor follow-up were done for the pre-employment subjects which is a must.

Health care employees especially food handlers should receive appropriate antiparasitic therapy based on the results of their stool analysis and retesting should be done to minimize the risk of transmission to the community. In addition, these employees should be given health education to improve their social habits and food safety.

### **Conclusion**

The intestinal parasites were common in the pre-employment stool screening of newly employees detected in 16%. The differences in the distribution of intestinal parasites were significant between genders and in the different geographical areas and more attention are needed for the proper treatment and retesting for positive cases. The importing expatriate employees must have effective screening programs as well as the eradication strategies for the intestinal parasites.

Besides, the food handlers should be periodically examined and treated when indicated and followed-up.

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### Explanation of figures

Fig. 1: Distribution of parasites among immigrant employees and Saudis.

Fig. 2: *Entamoeba histolytica*, Fig. 3: *Blastocystis hominis*

