

A SPECTRUM OF PATHOGENIC AND NON-PATHOGENIC INTESTINAL PARASITES IN PRE-EMPLOYMENT MEDICAL CHECK-UP FOR WORKERS AND THEIR FAMILIES

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المقدمة: يمثل تحليل البراز دوراً مهماً بين اختبارات قبل التوظيف لفحص الطفيليات المعوية في العمال الجدد.

هدف الدراسة: استكشاف طيف الطفيليات المعوية في عينات غائط العمال قبل التوظيف وعائلاتهم خلال سنة واحدة في مستشفى جامعة الملك عبد العزيز.

طريقة الدراسة: تم اختيار المرشحين بشكل متسلسل من تحليل البراز الواحدة الروتينية لعمال قبل التوظيف. وتم فحص البراز باستعمال أسلوب لثير الفورمالين في مختبر الطفيليات في مستشفى جامعة الملك عبد العزيز.

نتائج الدراسة: تمت دراسة مائتين واثنتين وتسعين عينة براز مختلفة من العمال قبل التوظيف وعائلاتهم. أعمارهم تراوحت من ٣ إلى ٧٢ سنة (متوسط ٢٢) تشمل إناث ٥٨,٦% منهم. اكتشفت الطفيليات المعوية في ١٦١ عاملاً (٥٥%). كان انتشار الطفيليات المعوية في العمال السعوديين منخفضاً جداً عن غير السعوديين، ١٥,٨% مقابل ٥٧,٩% ($p < ٠,٠٠١$). في جميع الحالات الإيجابية، وجدت طفيليات معوية مسببة للمرض في ٤٠% منهم وشهرها كانت الدودة السوتية (٣٩,١%)، دودة أنكلستوما (٣٤,٢%)، و الأميبة الحائلة للأنسجة (١٦,١%). كما وجدت طفيليات غير مسببة للمرض في ١٩,٥% منهم، أشهرها كانت أرومة بلاستوسيسيتيس هومينيس (٣٤,٨%)، الونيدة القزما (٢٩,٨%)، و أميبة القولون (١٥,٥%). وجد نوع طفيلي واحد في ٧٥ حالة (٤٦,٦%) و وجدت طفيليات متعددة مختلفة في ٨٦ حالة (٥٣,٤%). كان هناك ارتباط عالٍ بين كشف الطفيليات المسببة للمرض وغير المسببة للمرض ($p < ٠,٠٠١$).

الخلاصة: عدوى البراز بالطفيليات المعوية المسببة للمرض وغير المسببة للمرض هو اكتشاف شائع في أكثر من نصف العمال قبل التوظيف وعائلاتهم. والارتباط بين الطفيليات غير مسببة للمرض ومسببة للمرض تعكس احتمالية عوامل متبادلة وأن أخطارهم المحتملة لا يمكن تجاهلها. إن فحص البراز الفعال واستراتيجيات علاج الطفيليات المعوية في العمال الجدد يجب أن تفرض بشكل مستمر.

الكلمات المرجعية: اختبارات قبل التوظيف، تحليل براز، الطفيليات المعوية.

Introduction: Stool analysis plays an important role in pre-employment tests for the screening of intestinal parasites in new workers.

Objective: to explore the spectrum of intestinal parasites in stool samples of workers and their families during the pre-employment tests over a one-year period at King Abdulaziz University Hospital (KAUH).

Methods: Subjects were selected sequentially from routine single stool analysis forms labeled for pre-employment tests. Stool specimens were examined using the

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formalin ether technique at the parasitology laboratory at KAUH.

Results: Two hundred and ninety two different stool samples of the workers and their families were studied. Their ages ranged from 3 to 72 year old (mean 32 ± 8.5 SD) and females formed 58.6% of the number. Intestinal parasites were detected in 161 workers (55%). The prevalence of intestinal parasites in Saudi workers was significantly lower than non-Saudi nationals, 15.8% versus 57.9% ($p < 0.001$). Of all the positive cases, pathogenic intestinal parasites were found in 40 % of them and the commonest were *Trichuris trichuria* (39.1%), Hookworm (34.2%), *Entamoeba histolytica* (16.1%). Non-pathogenic parasites were found in 19.5% and the commonest were *Blastocystis hominis* (34.8%), *Endolimax nana* (29.8%), *Entamoeba coli* (15.5%). One type of parasite was found in 75 (46.6%) and multiple different parasites were found in 86 (53.4%). There was a high significant correlation between the detection of pathogenic and non-pathogenic parasites ($p < 0.001$).

Conclusion: Infestation of stools with pathogenic and non-pathogenic intestinal parasites is a common finding in more than half of the new workers and their families. The correlation between non-pathogenic and pathogenic parasites reflects mutual risk factors, and their potential hazards cannot be overlooked. Effective stool screening and eradication strategies for intestinal parasites in new workers should be rigorously enforced.

Key Words: Pathogenic intestinal parasites, nonpathogenic parasites, pre-employment, stool analysis.

INTRODUCTION

Intestinal parasitic and protozoan infections are amongst the most common infections worldwide. WHO estimates that more than two thirds of the world's population in tropical countries are infected with one or more species of parasites.¹⁻³ Based on other reports, it is estimated that some 3.5 billion people are affected, and that 450 million are ill as a result of these infections.^{4,5} Each year, some 65000 deaths are directly attributable to hookworm infections, and another 60000 to *Ascaris lumbricoides*. *Entamoeba histolytica* which causes amoebiasis is estimated to cause severe illness in 48 million people, killing 70,000 each year.

Hence, there is a growing trend towards the use of laboratory tests to screen asymptomatic individuals.⁶ Conducting such tests for newly appointed workers (pre-employment) is not only a means of

improving their productivity or regulating hiring practices, but also a way of reducing the transmission of dangerous communicable diseases. These tests have become a standard procedure for assessing the suitability for jobs before issuing local official work permits. Of these tests, stool analysis is an effective screening tool for imported parasitic infections in 'pre-employments' and immigrants.^{7,8} Diverse spectrums of parasites are commonly encountered in a large proportion of stool samples of workers that have just been hired. This could be attributed to the diversity of their geographic origins, their varied socioeconomic backgrounds and living standards.

At the general clinics of King Abdulaziz University Hospital (KAUH), a single sample stool analysis for ova and parasites is requested routinely with every 'pre-employment' medical checkup. This is a

mandatory screening test in all Saudi hospitals before a work permit is issued. In KAUH, the annual cost of stool analyses for new workers is more than 400,000 Saudi Riyals. This work is a trial to explore the spectrum of intestinal parasites found in single stool samples of 'pre-employment' workers and their families over a one-year period at KAUH.

METHODS

Subjects and stool samples

This study was performed in the Clinical Parasitology Laboratory at KAUH, Jeddah, Saudi Arabia. Subjects from the general clinics were selected by going through stool analysis forms labeled for pre-employment examination of new workers and their families. Stool samples in sterile plastic containers sent sequentially for analysis were included in the study. Files of these cases were collected from the Medical Records Department and reviewed for demographic data and other clinical information. The study period was from January 98 until January 99. A single sample stool analysis for ova and parasites was performed routinely in all cases as the government rules for the issue of work permit demands.

Stool analysis method

A single normally passed stool specimen was collected. A stool analysis was performed using formalin ether technique as described by Cheesbrough.⁹ In a conical test tube, 20 grams of stool was mixed in 10 ml of normal saline and strained through a double layer of gauze. The mixture was washed three times with normal saline at a centrifugation speed of 500 g for 5 minutes. The supernatant was removed after the last wash and the deposit mixed in 10 ml of 10% formal-saline and allowed to stand for 10 minutes. Three ml of ether was added and

the mixture was shaken vigorously for one minute. The tube was then centrifuged at 300 g for 10 minutes and the top 3 layers were removed. One drop of iodine was added to the deposit, mixed, and examined under light microscopy for parasitic ova and cysts.

Statistical analysis

Data was entered into a personal computer. Frequency tables and statistical analyses for significant difference were performed by Chi-square test using a SPSS statistical program (Version 10.1).

RESULTS

Two hundred and ninety two different stool samples from asymptomatic preemployment workers and their families were studied. Their ages ranged from 3 to 72 years old (mean age of 32 ± 8.5 SD). Females were 171, which made up 58.6% of all cases, as shown in Table 1. Indonesian nationals numbering 92 workers (31.5%) predominated, followed by Filipino nationals 46 (15.8%) as shown in Table 1. Only 19 were Saudis, that is, 6.5% of all cases. The prevalence of intestinal parasites in workers with Saudi nationality was significantly lower than non-Saudi nationals, 15.8% versus 57.9% ($X^2=12.7$, $p<0.001$).

Positive infestation with intestinal parasites was found in the stools of 161 workers, which accounts for more than half of the studied group (55.1%). Of these positive stool results, pathogenic parasites were detectable in 72.7% of them. The commonest pathogenic intestinal parasites were *Trichuris trichuria* (39.1%), followed by Hookworm (34.2 %), *Entamoeba histolytica* (16.1%), *Ascaris lumbricoides* (6.8%), and others (10.4%) as shown in Table 2. Non-pathogenic parasites were detected in 35.4% of all positive stool samples. The commonest of these were

Table 1: General characteristics of the pre-employment workers

Item	All Cases		Positive Stool for Parasites		
	Frequency	Percent	Frequency	Percent of Positive Cases	Percent within Group
Sex:					
Male	121	41.4	66	41.0	54.5
Female	171	58.6	95	36.6	55.6
Nationality:					
Saudi	19	6.5	3	1.9	15.8*
Non-Saudi	273	93.5	158	98.1	57.9
Indonesian	92	31.5	57	35.4	62.0
Filipino	46	15.8	26	16.1	56.2
Nepali	36	12.3	28	17.4	77.8
Indian	29	9.9	17	10.6	58.6
Srilankan	18	6.2	7	4.3	38.9
Egyptian	11	3.8	5	3.1	45.5
Moroccan	8	2.7	2	1.2	25.0
Other	27	9.9	16	9.9	59.3
Total	292		161		55.1

* $\chi^2=12.7$, $p<0.05$ **Table 2: Distribution of the different pathogenic intestinal parasites in the positive cases**

Parasites	Frequency	Percent of positive cases	Percent of all cases
Pathogenic parasites	117	72.7	40.1
Trichuris trichuria	63	39.1	21.6
Hookworm	55	34.2	18.8
Entamoeba histolytica	26	16.1	8.9
Ascaris lumbricoides	11	6.8	3.8
Strongyloides stercoralis	5	3.1	1.7
Giardia lamblia	4	2.4	1.4
Hymenolepes nana	4	2.4	1.4
Trichostrongylus	3	1.9	1.0
Chlonorchis sinensis	1	0.6	0.3

Table 3: Distribution of the different non-pathogenic intestinal parasites in the positive cases

Parasites	Frequency	Percent of positive cases	Percent of all cases
Non-pathogenic parasites	57	35.4	19.5
Blastocystis hominis	56	34.8	19.2
Endolimax nana	48	29.8	16.4
Entamoeba coli	26	16.1	8.9
Iodamoeba butschilli	13	8.1	4.5
Chilomastix	3	1.9	1.0
Trichomonas hominis*	1	0.6	0.3

*X point -6

Table 4: Distribution of multiple parasitic infestations

Parasites type	Frequency	Percent of all cases	Percent of positive cases
Total	292	-	-
Negative stool	131	44.9	-
Positive stool	161	55.1	-
Single parasite	75	25.7	46.6
Multiple types	86	29.5	53.4
Two	48	16.4	29.8
Three	17	5.8	10.6
Four	10	3.4	6.2
Five	7	2.4	4.3
Six	4	1.4	2.5

Blastocystis hominis (34.8%), *Endolimax nana* (29.8%), *Entamoeba coli* (15.5%), *Iodamaeba butschilli* (8.7%), and others (2.5%) as shown in Table 3. There was a very strong correlation between the presence of pathogenic and non-pathogenic parasites in the stool samples ($X^2=20.9$, $P<0.001$). The spectrum of different types of parasites varied from a single parasite in 75 cases (25.7%) to multiple types of parasites in 86 cases (29.5%), as shown in Table 4.

DISCUSSION

This work was conducted to explore the variety of intestinal parasites found in the stool analysis of 'pre-employment' workers seen at KAUH. Female predominance (58.7% of studied cases) was expected because of the large numbers who were employed as housemaids of the university staff, and health care workers.

In this study, intestinal parasites were detected in more than half (55%) of the stool samples of all examined workers. Pathogenic parasites were noticeable in around 40% of the studied workers. The commonest pathogenic intestinal parasites found were *Trichuris trichuria* (39.1%), followed by Hookworm (34.2%), *Entamoeba histolytica* (16.1%), and *Ascaris lumbricoides* (6.8%). These findings largely agrees with other previous studies in a nearby geographical area.¹⁰⁻¹² The results

were anticipated since most of the examined workers were from tropical and subtropical countries where such infestations are common.^{4,13} Multiple infestation with several different parasites (e.g., hookworms, roundworms and amoebae) are common, and their harmful effects are often aggravated by co-existent malnutrition or micronutrient deficiencies.^{4,5} Although the studied sample size was small, the low prevalence of intestinal parasites in Saudi workers is probably a reflection of the better socioeconomic backgrounds, living standards, and hygiene compared to the other studied cases. Confirmation of these findings needs to be explored thoroughly.

The other finding in this study is that non-pathogenic parasites were detectable in 19.5% of all stool samples. The commonest non-pathogenic parasites were *Blastocystis hominis* (34.8%), followed by *Endolimax nana* (29.8%) and *Entamoeba coli* (15.5%). Although infections with these parasites usually present no symptoms, the presence of non-pathogenic parasites in a stool sample is a reflection of a low state of hygiene.¹³ Non-pathogenic parasites are prevalent but are usually harmless except in immunocompromised hosts.¹³ This study demonstrated a high significant correlation between the detection of pathogenic and non-pathogenic parasites. It has been recommended that certain workers such as food handlers and housemaids should be

treated even for the non-pathogenic parasites since these parasites may overshadow the pathogenic parasites.^{14,15} Moreover, some studies have shown that the presence of non-pathogenic parasites may depress food intake in some individuals.¹⁶

The number of parasitic infestations is increasing, with cases occurring in all WHO regions.⁴ Recent reports estimated that by the year 2025 more than half of the population in developing countries will be urbanized and, as a consequence, a large number of people will live in shanty towns where *E. histolytica*, *Giardia lamblia*, *A. lumbricoides* and *Trichuris trichiura* will find favorable grounds for transmission.

In our experience at KAUH, only one single specimen is usually presented for the stool analysis of pre-employment subjects, who are frequently not followed up after receiving their laboratory results. The validity of using a single stool sample for the screening for parasites is very much in doubt.¹⁷ Although most of these workers are apparently healthy, a persistent carrier state of parasites should be excluded. In order to prevent the spread of pathogenic parasites, subjects should receive appropriate anti-parasitic therapy based on the results of their stool analysis. In addition, these workers should be given health education to improve their social habits and food safety.

A repeat of stool analysis is recommended in certain cases to ensure the absence of pathogenic parasites. Some authors have recommended that stool analysis should be repeated on three samples collected on three consecutive days to ensure the highest possible accuracy in detecting parasites and that there should be a follow-up of infected subjects after they have received the appropriate treatment.^{18,19} Protocol for stool screening and the use of sensitive techniques may be strictly implemented for workers employed in such jobs as housemaids and food handlers. The

cost-effectiveness of the routine screening of three stool samples before work permits are issued needs to be explored.

In conclusion, pathogenic intestinal parasites were common in the pre-employment stool screening of workers and detected in 40% of asymptomatic new workers at KAUH. This could be attributed to their geographic origins and their different socioeconomic backgrounds and living standards. Although infestation with non-pathogenic parasites usually shows no symptoms, their presence in a stool sample is a reflection of low level of hygiene. Non-pathogenic parasites correlate highly with pathogenic parasites and their hazards need to be explored. Effective strategies for screening, eradication and prevention of intestinal parasites in new workers should be formulated and carried out.

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