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Patterns of infection with intestinal parasites in Qatar among food handlers and housemaids from different geographical regions of origin

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ABSTRACT

Intestinal parasitic infections were surveyed among recently arrived immigrant workers in Qatar destined for employment in food handling occupations. Two overlapping datasets (female workers surveyed in 2005 and 2006, and both sexes in 2006) were analyzed. Seven species were detected, 3 nematodes (*Trichuris trichiura*, hookworms and *Ascaris lumbricoides*) and 4 protozoans (*Entamoeba histolytica*/*dispar*, non-pathogenic *Entamoebae*, *Blastocystis hominis* and *Giardia lamblia*). Overall prevalence of infections, all species combined was 33.9% (13.6% for nematodes and 24.8% for protozoa). There was a significant female bias in the prevalence of all species combined, all protozoans combined, *T. trichiura* and *A. lumbricoides*. Among females, the prevalence of many species fell between 2005 and 2006, but *G. lamblia* almost tripled and *E. histolytica*/*dispar* increased 10-fold. Africa workers were less likely to carry *T. trichiura* and hookworms but more likely to have gastrointestinal protozoa. The highest overall prevalence of *T. trichiura* was 26.3% among females from the Philippines in 2005. None of the Indonesian workers were infected with *A. lumbricoides* whereas those from the Indian sub-continent and the Philippines were more likely to carry hookworms. Quantitative data reflecting abundance of infection (summary statistics are provided), showed the same trends but could not be analyzed further because of the overall low prevalence of each of the species detected. Multiple species infections were not common, although some individuals (0.1%) had 5 species concurrently.

1. Introduction

Intestinal parasitic infections are among the major diseases of concern to public health throughout the world (WHO, 1987). Some of the parasite species responsible are associated with severe morbidity often resulting in mortality, particularly in less developed tropical and subtropical countries (WHO, 1987, 1999). Amoebiasis, giardiasis, ascariasis, hookworm infection, and trichuriasis are among the most common intestinal parasitic infections world wide and are closely related to socio-economic status, poor sanitation, inadequate medical care and absence of safe drinking water supplies (WHO, 1987; Tshikuka et al., 1995; Montresor et al., 1998; Merid et al., 2001; Gamboa et al., 2003). Variability in human behavior, through deeply instilled social practices and traditions can also be a major obstacle in attempts to control directly transmitted parasitic infections over different geographic areas (Nelson, 1972; Clark and MacMahon, 1981).

The potential transmission of intestinal parasites in economically developed, temperate climate zones has emerged as a real possibility among travelers such young people embarking on the ever popular gap-year, immigrant groups, and immunocompromised hosts (Okhuysen, 2001; Jong, 2002; Ekdahl and Andersson, 2005) and has been recognized as a threat to public health for some time (Croll and Gyorkos, 1979). Individuals originating from Developed Nations who have worked in the tropics or Developing Countries or who have traveled extensively in such areas can acquire multiple and mixed parasitic infections including various contagious protozoan and helminth parasites with which they return to their countries of origin (Okhuysen, 2001; Jong, 2002). With current global unrest, refugees and asylum seekers from Developing Nations pour into European countries and other Developed Nations (Molina et al., 1988; Ekdahl and Andersson, 2005; Garg et al., 2005). Another important group is of economic migrants, such as labourers, child care assistants, cooks, servants, etc. who arrive in Developed Countries seeking employment, and these also carrying with them their parasitic infections (Skeels et al., 1982; Wang, 2004). In Developed Countries the sewage systems usually impede further transmission among local populations, but there

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is evidence that despite these transmission can persist in some Developed Nations (Molina et al., 1988; Peruzzi et al., 2006) and that the risk of infection may be enhanced in some sectors of these communities, as for example when returning infected travelers or immigrants take employment in the food industry. For these reasons, several authors in the past have argued for routine faecal inspection in the context of health screening of all new arrivals at immigration centres (Rice et al., 2003).

In recent years, the rapid socio-economic development in Qatar, as in other Gulf countries, has resulted in a mass influx in the number of expatriate workers who serve the society in different vital roles. Most housemaids, food handlers and baby sitters originate from the Indian sub-continent, Southeast Asia and Africa where poor socio-economic levels and inadequate medical care are common (WHO, 1987), thus presenting a potential health hazard to the local community in Qatar (Ibrahim et al., 1993; Al-Madani and Mahfouz, 1995). Changing patterns of intestinal parasitic infections among migrant labourers have been linked to regions of origin (Arfaa, 1981; Salas et al., 1990; Varkey et al., 2007), host gender (Al-Shammari et al., 2001; Wang, 2004; Varkey et al., 2007) and annual fluctuations in parasite transmission rates (Wang, 1998, 2004; Varkey et al., 2007). The possible spread of intestinal parasites throughout the local community needs to be considered, in the context of these working groups which may harbour contagious infections that may be transmitted through close contact with family members in the household where they have gained employment. Furthermore, transmission may occur to more distantly related individuals, as for example through infected food handlers and consumers, respectively.

In general little is known about the extent of intestinal parasitic infections in inhabitants of countries in the Middle East, notably those in the Arabian Peninsula, but some reports have been published (Astal, 2004). For example Florendo (1989, 1997) reported very high prevalence of *Entamoeba histolytica* (>70%) and *Giardia lamblia* (>20%) among the inhabitants of communities in Oman and these same species were the dominant parasites in a study of patients at a hospital in Riyadh (Bolbol and Mahmoud, 1984), although prevalence was much lower, and in a household study in Riyadh of residents as well as expatriates (Al-Shammari et al., 2001). Several publications have reported also on parasitic infections in immigrant food handlers and labourers in the region (Idris and Al-Awfy, 1990; Idris and Shaban, 1992) but none have been published with respect to immigrants to Qatar. No quantitative data exist in the public domain, and the study described in this paper was conducted to fill this gap in our knowledge.

2. Materials and methods

2.1. Study population and sample collection

The present study was based on cross-sectional survey of intestinal parasitic infections among immigrants in specific jobs (food handlers and housemaids) arriving to work in Qatar for the first time during the period between 2005 and 2006. Random samples were collected from healthy labourers at Medical Commission soon after arrival, during their participation in routine health examinations prior to starting work. Age, sex and nationality were recorded for each participant. The study was approved by the research committee in Hamad Medical Cooperation, Qatar. The background and the aim of the study were explained to all participants and their sponsors. Fresh fecal specimens were collected in 25 ml clean wide-mouth, covered plastic containers. Each container was labeled with a reference number of the person supplying it and care was taken to ensure that the stool specimen was not contaminated with water or urine. Stool samples were immediately transferred to the Parasitology laboratory at Hamad Medical Hospital for processing.

2.2. Stool examination

Working in a safety cabinet, 5 g of stool specimen was preserved in an Ecofix preservative vial and the contents were broken down by carefully stirring with seekers until no large clumps remained. The sample was mixed vigorously by vortex and the homogenized stool was kept for half an hour at room temperature to ensure adequate fixation. The preserved specimen was mixed vigorously by vortex and filtered through a macro-con filtration unit to remove bulky debris (Meridian Bioscience, Inc.). After filtration, 10% formalin and ethyl acetate were added, the sample was centrifuged for 10 min at 3000 rpm and the fluid containing diethyl ether and formalin was discarded. The pellet was re-suspended by agitation, poured onto a microscope slide containing one drop of iodine and examined microscopically for the identification and quantification of parasite eggs/cysts. The latter were expressed as either eggs/gm/faeces (EPG) or cysts/gm/faeces (CPG) and the means of EPG and CPG were calculated from all samples to represent the abundance of infection. The cysts of amoebae species other than *E. histolytica*/*dispar*, and most likely comprising *Entamoeba coli*, *E. hartmanii*, *Endolimax nana* and *Iodamoeba butschlii* could not be distinguished and these were pooled together and recorded as non-pathogenic amoebae.

2.3. Statistical analysis

In general the prevalence rates were low and hence quantitative analyses were not appropriate, although means, standard errors of the means, and ranges are presented. Prevalence data are shown with 95% confidence limits, calculated as described by Rohlf and Sokal (1995) employing bespoke software. Prevalence was analyzed by maximum likelihood techniques based on log linear analysis of contingency tables using the software package SPSS (Versions 12.0.1). Since data for female subjects were available for both 2005 and 2006, and for males only in 2006, we carried out the analysis in two stages. For each species and combination of species in turn, we first fitted a model with 3 factors, infection in female subjects (binary factor, present or absent), year (2 levels, 2005 and 2006) and geographical region of origin (4 levels, Philippines, Indonesia, Indian sub-continent and Africa). In a second step we fitted models confined to 2006, but incorporating both male and female subjects. In this case the models entailed the presence/absence of infection, sex of the subjects (2 levels, males and females) and nationality (3 levels, Philippines, Indian sub-continent and Africa). Indonesian females were excluded because no samples were received from Indonesian males.

For both sets of analyses, full factorial models were fitted. Beginning with the most complex model, involving all three factors, those combinations that did not contribute significantly to explaining variation in the data were eliminated in a stepwise fashion beginning with the 3-way interaction. A minimum sufficient model was then obtained, for which the likelihood ratio of Chi^2 (χ^2) was not significant, indicating that the model was sufficient in explaining the data (these values are not given here but can be supplied by JMB on request). The importance of each term (i.e. interactions involving infection) in the final model was assessed by the probability that its exclusion would alter the model significantly and these values are given in the text.

3. Results

One thousand seven hundreds and thirty seven housemaids and food handlers originally from the Philippines, Indonesia, Indian