

Enteroparasitic occurrence in stools from residents in Southwestern region of Saudi Arabia before and during Umrah season

Saeed A. Al-Harthi, MSc, PhD, Manal B. Jamjoom, MSc, PhD.

ABSTRACT

Objectives: Study of the prevalence of human gastro-intestinal parasitic infections among patients living in Makkah Al-Mukarramah city before and during Umrah season.

Methods: One hundred eighty three stool samples were collected from patients living in Makkah, between the months of March and November 2005. Eighty were collected before the Umrah season began and 103 were collected during the Umrah season. Age, sex, and address were also recorded. Samples were preserved in 10% formol saline. They were examined using the direct smear technique and the formol ether concentration method.

Results: The results suggest a higher prevalence of intestinal parasitic infections (70.5%) among the patients under study. *Entamoeba histolytica*/E. *dispar* and *Giardia lamblia* were found to be the most common intestinal parasites among patients before and during Umrah. The infection rate was higher in the under 30 age group (74.8%) and in persons living away from the Holy Masjid (77.7%). The prevalence of intestinal parasitoses during Umrah (73.8%) was higher than that before Umrah (66.3%).

Conclusion: The present study suggests that the group of people may underline the significant increase in the prevalence of intestinal parasitic infections during Umrah season. This highly significant increase of parasitic infection rate ($p=0.018$) was elicited when results were compared by one-way analysis of variance (ANOVA). The present data were discussed with previous studies.

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From the Department of Medical Parasitology (Al-Harthi), Faculty of Medicine, Umm Al-Qura University, Makkah, and the Department of Medical Parasitology (Jamjoom), Faculty Medicine, King Abdulaziz University, Jeddah, Kingdom of Saudi Arabia.

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Address correspondence and reprint request to: Dr. Saeed A. Al-Harthi, Department of Medical Parasitology, Faculty of Medicine, Umm Al-Qura University, PO Box 13955, Makkah, Kingdom of Saudi Arabia. Fax: +966 (2) 5270000 Ext. 4165. E-mail: alharthi@uqu.edu.sa

Human intestinal parasites account for millions of infections every year all over the world. These parasites produce disease by infecting the small and large intestine. The higher prevalence of infections is predominantly seen in developing countries where possibly attributed to insufficient hygiene practice or environmental contamination.^{1,2} Diverse reports support the prevalence of parasitic infections within defined populations in Saudi Arabia.³⁻¹² The greatly encountered protozoan parasites were *Giardia lamblia* (*G. lamblia*) followed by *Entamoeba histolytica* (*E. histolytica*)/*E. dispar*.^{11,13-15} *Cryptosporidium* species (spp) infections and other coccidian parasitic infections have also been reported with different prevalence rates.^{6,9,12,16} Among helminth infections *Ascaris lumbricoides* (*A. lumbricoides*), *Hymenolepis nana*, and *Enterobius vermicularis* were the most prevalent ones.^{8,14}

Makkah Al-Mukarramah is the holiest city to Muslims. The city lies inland, in the narrow, sandy Valley of Abraham. Its land consists of rugged, rocky (predominantly granite) terrain, with mountain ranges on 3 sides (to the west, south, and east). In the centre of the city is a great mosque named Masjid Al-Haram. Each year, millions of Muslims visit the city to perform Hajj, Umrah, or to visit the Holy Masjid. These worshippers come from all over the globe, including regions highly endemic for intestinal parasites.¹⁷ The city becomes very densely populated particularly in the areas within the vicinity of the Holy Masjid. The majority of residents (Saudi or non-Saudi) work year-round to oversee and serve pilgrims and visitors; many thousands more work in the shops and hotels that cater to pilgrims. The possibility of contact between pilgrims, visitors, and locals are relatively higher, and the exposures of inhabitants to imported infections are rather excessive.¹⁷ Many studies correlate extensive prevalence of parasitic infection with socioeconomic and environmental

health conditions such as degree of crowding and hygiene.^{18,19}

There is no published data regarding the prevalence of intestinal parasitoses among local residents in Makkah Al-Mukarramah city during Hajj or Umrah. During Umrah season, especially in the Holy month of Ramadan, millions of worshippers come to the city and gathered around the Holy Masjid. The increase in population in Makkah during Umrah season could impose a public health hazard to locals. The aim of this study is to assess the prevalence of pathogenic intestinal parasitic infection among communities living near and far from the Holy Masjid before and during Umrah season.

Methods. This investigation was performed in the Holy city of Makkah Al-Mukarramah. It has a population of 1,294,168 (2004 census) (70% are Saudi and 30% are resident of different nationalities). Stool specimens were collected from patients complaining of enteritis and attending selected clinics around and away from the Holy Masjid. All participants were agreed to take part in the study by a written consent. Samples collected during the months of March to May (2005), representing the period before Umrah season and specimen collected from September to November 2005 was considered during Umrah season.

The parasite analysis used in the study is standard protocol.²⁰ Stool specimens were examined by direct saline and iodine wet preparations within 3-5 hours after collection. The rest of the samples were preserved in 10% formal saline to be further examined by concentration technique. Two different concentration methods, formol-ether sedimentation technique, and zinc sulfate flotation technique, were applied to all samples. Specimens were also stained by Ziehl Neelsen²⁰ technique to detect the oocysts of *Cryptosporidium* spp. The statistical analyses of data obtained were performed using Microsoft Excel software through one-way analysis of variance (ANOVA).

Results. A total number of 183 samples are collected from symptomatic patients; 80 samples were collected prior to Umrah season and 103 samples during Umrah season. The age distribution of participants was between 9 months – 65 years and their gender was 84 (45.9%) females and 99 (54.1%) males. Eighty-nine participants (48.6%) live within the vicinity of the Holy Masjid, whereas 94 (51.4%) from other localities approximately 5-10 km away from the Holy Masjid. The overall infection rate obtained was 129 (70.5%), consisting of 53 (66.3%) persons before Umrah and 76 (73.8%) during Umrah season. Out of 53 (66.3%) persons infected before Umrah season, 19 (23.8%) were

living in the area surrounding the Holy Masjid, and 34 (42.5%) were reside away from the Holy Masjid. During Umrah season, out of 76 (73.8%) infected, 37 (35.9%) were living adjacent to the Holy Masjid, while 39 (37.9%) were far away. The infection rate was higher among <30-year-old age group in both time periods (74.8%, 62.6%).

The most common parasites were *E. histolytica*/*E. dispar* (57.9) and *G. lamblia* (6.0). Other parasites encountered were *Cryptosporidium* spp (2.7), *A. lumbricoides* (2.2%), and *Chilomastix mesnili*, (0.5%). The one-way ANOVA statistical analysis showed that the differences between the prevalence of infections before and during Umrah season are highly significant ($p=0.018$). The differences concerning the distance from the Holy Masjid and individuals age were not significant.

Discussion. The prevalence of gastro-intestinal parasitoses detected in the studied samples was 70.5%, infection rate before Umrah was 66.3%, while during Umrah season was 73.8%. The prevalence of intestinal parasitic infections among the patients in this study was higher than the infection rate reported earlier among hospital patients in other areas in the kingdom. Studies conducted in Riyadh reported prevalence rates of 20.8%, 24.4%, and 31.3%.^{3,4,21} It is also higher than that reported in communities in Abha (13.2%)⁵ and Riyadh (32.2%).⁸ Moreover, it is to be much higher than the previous reported (13.24%) that were found among asymptomatic male primary school children in Makkah,⁹ where random samples collected from asymptomatic school children. This result suggests active parasite transmission, despite that the obtained prevalence may not necessarily reflect the real prevalence of infection of the general population in the city. Targeting symptomatic patients complaining of gastrointestinal symptoms (diarrheic stool) could be the factor behind the higher prevalence rate of infection obtained in the current study compared to other published data in the kingdom. In addition, the number of positive cases of protozoal infections encountered could be even higher if specimens were examined within a shorter period after samples collection; as the trophozoite stage die soon after sample collection and their motility will be lost and that would make it difficult to recognize them. Also, no staining preparation was performed as one of the examination methods.

The most common parasites detected before and during Umrah season were *E. histolytica*/*E. dispar* and *G. lamblia*. Previous report from other localities in the Kingdom supported that the most common pathogenic protozoa being *G. lamblia* and *E. histolytica*.^{8,10,22,23}

Both parasitic infections can be transmitted orally by drinking water and both are environmental contaminants of the water supply and have been isolated from water supplies in different parts of the world.^{2,18,24,25} This study did not investigate the water resources of the participant. Hence, the possibility of water supply pollution cannot be eliminated as a potential source of infection, as Makkah city relies on water accessed through wells and from the desalination plants at Shuaybah in the Red Sea. The geographical nature of the city in a population subject to crowding and overpopulated setting may exert a constraint on the water supply and waste disposal systems. The water supply in the central city and surrounding area of the city (Holy Masjid) is predominantly provided by the municipality of Makkah, but water shortage does occur occasionally and water tanks supply water. Earlier studies investigated the role of water supply and indicated that the source of domestic water was the sole factor significantly associated with the higher prevalence rates of infection in selected communities in Asir region, and the possible contamination of the natural groundwater reserves (wells) has been reported.^{8,15} As amoebiasis and giardiasis are very likely to occur by person-to-person contact, particularly among children, crowding, and lack of personal hygiene may exceptionally increase transmission.^{18,19} The higher prevalence of infection with *E. histolytica*/*E. dispar* and *G. lamblia* has also a global distribution with variable infection rates up to 80% in some developing countries for *E. histolytica*/*E. dispar*, and approximately 30% for *G. lamblia*.^{27,28} As Makkah is the host throughout the year to hundreds of thousands of Muslims performing Umrah, the pilgrims might import various parasitic diseases from their countries of origin and the higher risk of spreading infections.^{17,29} There are very close contact and congestion among the pilgrims and locals in various locations mainly in the Holy Masjid. The prevalence of intestinal parasitoses was strongly associated with congestion, crowded places, overcapacity accommodation, and inadequate cleanliness.^{18,19} The study demonstrated that infection rate was higher during Umrah season regardless the resident locations distance from the Holy Masjid.

In the present work, approximately 74.8% of the positive samples were under 30-year-old. The higher incidence rate of parasitic infection among children and young individuals worldwide, are most likely attributed to lack of personal hygiene and the practice of proper hand washing before eating.^{18,19,30} It was found that there is a higher prevalence of infection which infections during Umrah season (73.8%) than before Umrah season (66.3%). Great strains are placed on the city of Makkah especially at the Holy Masjid and the surrounding areas. The large concentration of

people in a limited area creates extensive environmental and health-care demands that require massive effort to keep up with adequate hygiene standard.¹⁷ To cope with this, the city and the pilgrimage sites are intensively cleaned and ongoing programs to improve sanitation conditions are undertaken by the government. However, the continual human's movement patterns that occur in the city represent nonstop implications for the transmission of human intestinal parasites and other health risks.

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