

Potential risk for drug resistance globalization at the Hajj

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Abstract

Antibiotics were once considered the miracle cure for infectious diseases. The tragedy would be the loss of these miracles as we witness increased antibiotic resistance throughout the world. One of the concerns during mass gatherings is the transmission of antibiotic resistance. Hajj is one of the most common recurring mass gatherings, attracting millions of people from around the world. The transmission of drug-resistant organisms during the Hajj is not well described. In the current review, we summarize the available literature on the transmission and acquisition of antibiotic resistance during the Hajj and present possible solutions.

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Introduction

Mass gatherings pose a health hazard to the attendees through the transmission of infectious diseases via person-to-person contact, contaminated food or water, respiratory transmission, and vector-borne transmission. The potential for outbreaks due to person-to-person transmission, food- and waterborne disease outbreaks, fast and wide geographic spread of diseases, and the introduction of non-endemic diseases are all feared events during mass gatherings. Possible communicable disease patterns during mass gatherings include: endemic, imported and exported diseases.

Mass gatherings, especially the Hajj, are associated with significant international travel. Annually, more than 5 million pilgrims perform the Hajj or Umrah and these pilgrims come from 184 countries [1,2]. During the Hajj, a large number of pilgrims gather at the same time in a small area to perform the Hajj rituals (Figs. 1 and 2). This requirement increases the risk of

presenting potentially harmful communicable diseases in this population. The journey made by pilgrims is well described [1]. Briefly, in addition to visiting the Holy Mosque in Makkah, pilgrims visit the Plain of Arafat, Muzdalifah and Mina. In Mina, pilgrims stay in tents made specifically for them (Fig. 2).

Challenges during the Hajj include the strain on healthcare systems and the difficulty in communication of risk because of language and culture barriers. To overcome the extension of the healthcare system, the Kingdom of Saudi Arabia established multiple hospitals and clinics specifically designated for the Hajj [1,3,4]. The Saudi Ministry of Health coordinates with the pertinent authorities in the pilgrims' countries to develop suitable material for education and Hajj information [1]. In this review, we summarize the available literature on the transmission of antibiotic resistance during the Hajj and suggest possible solutions.

Pattern of antibiotic use among pilgrims

Pilgrims come from 184 countries, including countries where antibiotics are available over the counter. The availability of antibiotics over the counter contributes to increasing resistance [5]. One of the contributing factors to the transmission



FIG. 1. Crowds of pilgrims at Arafat Mountain.

of antibiotic resistance during the Hajj is over-use of antibiotics [6,7]. In a cohort of 820 pilgrims, 84% received antibiotics for upper respiratory tract infection [7]. In another study of 2070 Pakistani pilgrims, 17% had received antibiotics [6]. Ciprofloxacin is being used to decrease the rate of throat colonization with *Neisseria meningitidis*. In one study, a single dose of ciprofloxacin decreased carriage rate from 8.1% to zero before and after pilgrimage [8]. Of 177 pilgrims, 92% were vaccinated with meningococcal quadrivalent vaccine before the Hajj and 83% received one dose of ciprofloxacin

before leaving Makkah and none had *N. meningitidis* upon return from the Hajj [9]. The current recommendations call for a single dose of ciprofloxacin and ACYW135 meningococcal vaccine for visitors from the African meningitis belt: Benin, Burkina Faso, Cameroon, Chad, Central African Republic, Côte d'Ivoire, Eritrea, Ethiopia, Gambia, Guinea, Guinea-Bissau, Mali, Niger, Nigeria, Senegal and Sudan [3,10]. From 2005 to 2010, about 250 000 to 460 000 pilgrims receive the recommended ciprofloxacin prophylaxis at the port of entry in Saudi Arabia [4].



FIG. 2. Aerial view of the tents of pilgrims at Mina.

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