

Surveying respiratory infections among Iranian Hajj pilgrims

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ABSTRACT

Background: The annual Hajj pilgrimage to Mecca brings over two million people together in a small confined area. Respiratory involvement is the most common disease during this ceremony, and up to now no unique cause has been identified. The present study was conducted to determine the incidence and types of respiratory diseases and their associated etiologic agents.

Materials and methods: During this prospective study, seroconversion was assessed for bacteria, viruses and fungi on 170 Iranian pilgrims prior to departure and 2 weeks after convalescence and returning from the Hajj pilgrimage. Meanwhile, sputum specimens of 252 patients were cultured.

Results: The following viruses were detected: influenza type A and B (21.5%), adenovirus (36.2%), and RSV (1.9%). Among bacteria isolates, β -haemolytic Streptococcus (9.7%), Haemophilus species (9.1%), Gram negative bacilli (20.6%), Legionella pneumophila (6.3%), Mycoplasma pneumonia (0.8%), and Chlamydia (32%) were more common, however, no fungal seroconversion was noted.

Conclusion: We suggest administration of Fluvaccin for high risk groups, adenoviral vaccine for volunteer pilgrims, erythromycin or azithromycine for empiric bacterial therapy, and Oseltamivir or Zanamivir for prophylaxis or treatment of influenza like illness.

Keywords: Hajj, Respiratory infections, Bacteria, Viruses, Fungi.

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INTRODUCTION

The annual Hajj pilgrimage to Mecca in Saudi Arabia, brings more than two million people throughout 140 countries together in a small confined area. Respiratory tract infection is the most common disease occurred during this period (1,2). To our knowledge, there is no any confirmed unique cause for this disease. Some authors have claimed the role of bacteria and viruses as the main

causes of the disease (3-5), however, others have proposed environmental allergens or mycotic spores to be effective in pathogenesis of the respiratory infections (6).

Among bacterial pathogens the following have been more frequently reported by authors: Haemophilus influenzae, Klebsiella pneumoniae, Streptococcus pneumoniae, Staphylococcus aureus, and Streptococcus pyogenes (5). On the other hand, Alzeer et al demonstrated that tuberculosis is the commonest cause of pneumonia requiring hospitalization during Hajj. They also reported that

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gram negatives bacteria, *Legionella pneumophila* and *Mycoplasma pneumoniae* are interfering pathogens too (3). Furthermore Wilder-Smith believes that the incidence of pertussis is high among Hajj pilgrims (4).

Moreover, prior investigators have proposed influenza virus type A & B, adenovirus, parainfluenza, respiratory syncytial virus (RSV), herpes simplex virus (HSV) and enterovirus as the most frequent causative viruses (1).

Most fungi that are pathogenic for humans are saprophytes in nature; they cause infection when airborne spores reach the lung or paranasal sinuses. Respiratory disease due to *Histoplasma capsulatum* occurs either as acute primary pulmonary histoplasmosis or as chronic fibrocavitary pneumonia. *Coccidioides Immitis* may occur as primary pulmonary infection or pleural effusion in respiratory tract. Furthermore, the initial pulmonary infection may be due to inhalation of *Blastomyces dermatitidis*. *Aspergillus* is a cause of allergic fungal sinusitis and massive inhalation of *Aspergillus* spores by healthy person can lead to acute, diffuse, self-limited pneumonitis (6,7). Thus, it is probable that the fungi and other allergens are also the other important factors in pathogenesis of the respiratory diseases among Hajj pilgrims.

On the other hand, the exacerbation of bronchial asthma and chronic obstructive pulmonary diseases (COPD) are also commonly encountered during Hajj (8).

In this study, we aimed to determine the incidence and types of respiratory tract involvement and the distribution of their associated causative agents in Hajj season of 2004-2005.

PATIENTS and METHODS

For this prospective study, the study population included 143 males (84.1%) and 27 females (15.9%) with a mean age of 47.9 years. We have proposed the following operational definitions for some common respiratory syndromes at baseline:

1- *Common cold*: Sore throat, coryzal symptoms, and low grade fever.

2- *Influenza like illness (ILI)*: Fever $>38.5^{\circ}\text{C}$, myalgia, low back pain, coryzal symptoms and cough.

3- *Allergy like illness*: Cough associated with pharyngeal irritation, and wheezing without fever.

4- *Sinubronchitis*: Headache, purulent PND (postnasal discharge) or purulent sputum, cough, and fever.

5- *Pneumonia*: Radiographic findings.

Totally, we investigated 991 serum samples (498 samples before and 493 samples after the departure) for detecting common bacterial, viral and fungal seroconversions, and 357 gargled pharyngeal secretions and sputum specimens for smear staining, culturing and immunologic assays.

Blood samples were obtained under the following condition: Firstly, we justified the group's physician through which the volunteers were selected and informed consents were completed. Then, before departure, blood samples were obtained and transferred to associated laboratories in Tehran University of Medical Sciences. Having separated the serum, it was kept at -20°C for further analysis. Finally, the following techniques were applied: HI (haemagglutinin inhibition), IFA (immunofluorescent assay), ELISA (enzyme linked immunosorbent assay), and using of sterile DMEA media and Dako Kits for virologic tests as well as the following antigens: A/H1N1/ new, A/H3N2/fujian/411/2002-like Caledonia/20/99-like, B/Sichuan/379/99-like, B/Hong Kong/330/2001-like. Furthermore, smear staining and use of specific media for bacterial culture were also achieved. Titration of specific antibodies was performed against *Mycoplasma*, *Chlamydia* and *Legionella*. Meanwhile, CIE (count immunoelectrophoresis) and LAT (latex agglutination test) techniques were applied for mycologic assays. For all titrations we considered four-fold rising of the antibodies as a positive responses.

RESULTS

Among 170 volunteers, 145 (%85.3) were found to have one or more respiratory syndromes (table 1). Of 170 volunteers, 105 presented to medical clinics in Mecca, and their gargled pharyngeal secretions were tested for adenovirus, influenza A & B, parainfluenza and RSV. As shown in table 2, adenovirus was by far the most common viral pathogen.

Table 1. Distribution of different respiratory syndromes among Iranian Hajj pilgrims

Syndrome	Number	Percentage
Common cold	97	57
Influenza like illness (ILI)	18	10.9
Allergy like illness	33	19.4
Sinubronchitis	89	52.4
Pneumonia	1	0.6

Table 2. Distribution of identified viruses with immunologic assay in gargled pharyngeal secretions of Iranian Hajj pilgrims

Virus	Positive	Negative
Adenovirus	38(36.2)*	67(63.8)
Influenza	A	2(1.9)
	B	12(11.4)
Parainfluenza	0	105(100)
RSV [#]	2(1.9)	103(98.1)

* Numbers in parenthesis are percentage

[#] RSV: Respiratory syncytial virus

Table 3. Distribution of four-fold rising of antibody titers against different types and subtypes of influenza virus among Iranian Hajj pilgrims

Influenza subtypes	Antibody	
	Positive	Negative
A/H3N2	8(6.1)*	122(93.9)
A/H1N1	9(6.9)	121(93.1)
B/Hong Kong	11(8.5)	119(91.5)
B/Sichuan	16(12.3)	113(87.7)
Influenza (total)	28 [#] (21.5)	102(78.5)

* Numbers in parenthesis are percentage

[#] The total number of pilgrims who have 4-fold rising antibody against one or more types of influenza viruses

Table 3 presents the frequency distribution of four-fold rising of antibody titers against influenza virus among Iranian Hajj pilgrims.

On the other hand, the most common cultured bacterial pathogens were Enteric bacilli (19.4%) followed by β -haemolytic Streptococcus group (A, C&G) (9.7%), Haemophilus species (9.1%) and Pseudomonas species (1.2%).

Moreover, for Legionella pneumophila, we tested 127 serum samples before the departure and 127 samples at least 15 days after the convalescence of the involved volunteers and detected 8-fold rises in antibody titers. Thus, the prevalence of the legionellosis was 6.3%.

Finally, among 120 samples, IgG antibody against Mycoplasma pneumoniae was detected in only one case with the prevalence of 0.8%, however, Chlamydia was found in 32% of cases. Seroconversion was not noted for other common respiratory fungal agents such as Histoplasma capsulatum, Coccidioides Immitis, Blastomyces dermatitidis, Candida spp., or Aspergillus.

DISCUSSION

Prior investigators have demonstrated that influenza is the most common viral infection among Hajj pilgrims (1-5). Although adenovirus was the most frequently detected virus in our subjects, influenza virus was also noted in 13.3% despite over 85% of vaccination coverage. This could be in part explained by the following facts: antigenic variations of virus, non-observance of the cold chain for keeping the vaccines, undesirable vaccines, and untimely vaccination. On the other hand, the prevalence of adenoviral infection (36.2%) is not in agreement with some studies (1), however, others confirmed our findings (5).

Our pattern of bacterial distribution was more or less the same as previous studies since β -Haemolytic streptococcus (2.4%), Streptococcus pneumoniae (4.8%), Haemophilus influenza (10%),

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Legionella (6%), Mycoplasma (6%), Bordetella (1.2% among immune cases and 7.5% among non-immune cases) and Mycobacterium tuberculosis (20%) have been reported by prior investigators (3,5). Nevertheless, the pattern of bacterial distribution is changed each year during Hajj ceremony.

Furthermore, we did not detect fungi such as Histoplasma capsulatum, Coccidioides immitis, Blastomyces dermatitidis, Candida spp. or Aspergillus species, however, they still may play role in allergic forms of disease.

In conclusion, there is no unique etiologic agent for respiratory infections in Hajj season among Iranian pilgrims. With respect to the high prevalence rate of influenza, we recommend Flu vaccine for the pilgrims, at least 3 weeks prior to departure. Meanwhile, pilgrims should be supported with prophylactic drugs such as Oseltamivir or Zanamivir for influenza. Meanwhile, further studies should be conducted in order to determine the efficacy of adenoviral vaccination for volunteer pilgrims.

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