A pilot study on the efficacy of nasal rinsing during ablution in reducing acute respiratory tract infection (ARI) among male Hajj pilgrims

Ramiza R. Ramli, MMed ORL-HNS a,*, Irfan Mohamad, MMed ORL-HNS a, Mohd S. Ab Wahab, MRCP b Nyi N. Naing, MMedStats c and Wan S. Wan Din, MMed ORL-HNS d

a Department of Otorhinolaryngology – Head and Neck Surgery, School of Medical Sciences, Universiti Sains Malaysia, Health Campus, Kota Bharu, Kelantan, Malaysia
b Department of Pediatric, School of Medical Sciences, Universiti Sains Malaysia, Health Campus, Kota Bharu, Kelantan, Malaysia
c Institute for Community Development, Universiti Sultan Zainal Abidin, Kuala Nerus, Terengganu, Malaysia
d Kumpulan Perubatan Johor Perdana Specialist Hospital, Kota Bharu, Kelantan, Malaysia

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Abstract

Objective: This study aimed to assess the effectiveness of nasal rinsing during ablution in reducing acute respiratory tract infection among male Hajj pilgrims.

Methods: A quasi-experimental trial study was conducted to compare the effectiveness of nasal rinsing between two groups. The intervention group was instructed to perform nasal rinsing during ablution, while the control group was not asked to do nasal rinsing. Both groups were provided progress diaries to record the symptoms of respiratory tract infection, including cough, rhinorrhoea, nasal blockage, fever, and sore throat, as well as thick phlegm, shortness of breath, epistaxis, and changes in sense of smell. The groups were also instructed to record any visits to clinics for their symptoms throughout their stay in Makkah for the Hajj ritual.

Results: The study showed that nasal rinsing significantly reduced the symptoms of cough, rhinorrhoea, and nasal blockage. The intervention group had an increased...
Introduction

During Hajj season, more than two million people from all over the world congregate in a relatively small area. This mass gathering adheres to the definition set by the World Health Organization (WHO), which states that a mass gathering is a gathering of persons more than a specified number at a specific location for a specific purpose for a defined period of time. This number can be as few as 1000, while another available literature refers to gathering as a result of close contact among pilgrims, intense congestion, shared accommodations, and air pollution. This crowd condition is conducive for the spread of airborne pathogens. Acute respiratory tract infections (ARI) are very common during Hajj, primarily as a result of close contact among pilgrims, intense congestion, shared accommodations, and air pollution. ARI are responsible for most of the hospital admissions during Hajj. 1

Cough (over 90%) is the most common symptom of ARI among pilgrims during Hajj. 5,13,23,24 It is also the most common presentation (50%) for pilgrims returning home from Hajj. 6 Other respiratory tract infection (RTI) symptoms include coryza, fever, and sore throat. 5,23,24 Airborne pathogens can be easily transmitted through the nose. 12 During the Hajj season, the pathogen load is usually greater than what the nasal mucociliary clearance can handle. 15,16,18 Makkah has a hot desert climate, with relative humidity typically ranging from 19% (dry) to 80% (humid) over the course of the year, which dries up the nasal mucus faster, rendering it less effective. Furthermore, the pilgrims are also usually relatively dehydrated, thus producing thicker mucus. All these factors can contribute to symptoms of ARI, even without an active infection. 4,12,23,24

An ablution is an act of purification by washing oneself. In Islam, ablution is the Islamic procedure for washing parts of the body using water, typically in preparation for formal prayers. It has four obligatory acts as follows: washing the face, washing both the arms including the elbows once, running a wet hand over the head, and washing both the feet including the ankles. It also includes the Sunnah acts, which are optional, practiced by Prophet Muhammad PBUH, and involve nasal rinsing. Nasal rinsing was explained in a hadith narrated by Abu Hurairah which quoted the prophet as saying “When one of you makes ablution, then let him enter water into his nose, then expel it”. 7 This technique of nasal washing can be considered as nasal irrigation on its own right.

Nasal rinsing has many effects. First, it washes out antigens and pathogens that may occupy the nasal cavity; second, it dilutes nasal secretions, thus making it easier for mucociliary movement to clear up the thick mucus; and third, hypertonic solution improves mucociliary motility, thus improving mucociliary clearance. 9,10,16,18,19 Nasal rinsing is a proven adjunctive technique in treating allergic rhinitis and rhinosinusitis. 11,14,16,18–20 However, the effectiveness of ablution’s nasal rinsing in reducing symptoms of ARI in an epidemic area had not been tested. If found to be effective, it would be a very suitable intervention, since it is easily performed, inexpensive, and provides a resourceful solution to the current problem during Hajj season. Furthermore, nasal rinsing is part of the Islamic ritual, which Muslims are encouraged (but not required) to perform. Therefore, this study was conducted to evaluate the effectiveness of nasal rinsing during ablution in reducing ARI among male Hajj pilgrims.

Materials and Methods

A quasi-experimental trial study was conducted to evaluate the effectiveness of nasal rinsing as a preventive method for ARI. Ethical clearance for this study was obtained from the Human Ethics Committee of the Universiti Sains Malaysia. All subjects signed the informed consent to participate in the study. Data collection was performed at the Tabung Haji (TH) Headquarters, Abraj Janadiriah, in Makkah, KSA. TH is the Malaysian Hajj pilgrims fund board, which was established for the purpose of Hajj services. The participants were recruited from pilgrims staying in Maktab (a school that included the area of accommodation and was where the pilgrims had their revision classes for the Hajj ritual). Maktab 72 was chosen randomly to be the intervention group, whereas Maktab 74 was chosen to be the control group. Only men were chosen as the study population, because it was easier to interact with the men compared to the women during Hajj, due to religious restrictions.

Subjects included were Malaysian men, aged 18–70 years old, who could understand and follow given instructions and were able to use the progress diary for recording the required study information. The exclusion criteria included participants with chronic lung diseases and active RTI requiring treatment, as well as participants using regular antihistamines, sodium cromoglicate, or nasal steroid sprays. The calculated sample size for this study was 50 subjects, with a 10% dropout rate. A total of 60 participants volunteered and consented for the research, 30 for each group. Both groups were briefed separately regarding the study protocol. The session was held immediately after one of the regular Hajj revision classes held by the TH officers in preparation for the Hajj ritual. The intervention group was briefed on the correct procedures of nasal rinsing in ablution. The participants were instructed to sniff water from their hands and blow it out during ablution at least five times per
day (corresponding to five ablutions required per day prior to each formal prayer) throughout the study period, which was four consecutive weeks in Makkah, from 5 November 2010 until 12 December 2010. The instructions were further reinforced by diagrams in pamphlets and guidance from TH personnel assigned to the Maktab.

Each participant was given a diary to record the presence of respiratory symptoms, including cough, fever, rhinorrhea, sore throat, thick phlegm, and changes in sense of smell. They also were required to note down each medical clinic visit made with regards to their symptoms and the number of nasal rinsing per day, as well as their demographic parameters and other associated medical illnesses.

The control group was selected in a similar manner to the intervention group; however, they were not instructed to do nasal rinsing. They were only instructed to note any symptoms of ARI as mentioned above and medical visits in the diary.

The symptoms, namely cough, sore throat, rhinorrhea, and fever, were used to define ARI due to its practicality for Hajj pilgrims, or any mass gathering.\(^5\,13\) The additional symptoms of thick phlegm, epistaxis, and changes in sense of smell were added in view of the common complaints that are received from former pilgrims. Symptoms of shortness of breath indicate a severe form of ARI, thus were included to assess the severity of the ARI.

Random visits were performed by the researchers to both groups to enhance their compliance with the research protocols. Each diary given to participants also came with a stamped, addressed envelope for the participants to post it back to the researcher if they were unable to return it during the Hajj period in Makkah.

Descriptive statistics was done by presenting mean and standard deviation for numerical variables and frequency percentage for categorical variables. Fisher’s exact test was applied to analyse the categorical variables. The level of significance was set at 0.05. SPSS version 22 software was applied for statistical analysis.

**Results**

Of the 60 participants, 32 returned their diaries. The average age of the participants was 50.29 years old, and the youngest age was 33 years old (SD 9.61). Out of the 32 participants, 19 (59.4%) were from the intervention group, while the other 13 (40.6%) participants were from the control group. The intervention group was noted to practice nasal rinsing at least four times per day.

**Intervention group (n = 19)**

Fourteen (66.7%) participants in the intervention group had episodes of fever during the period of study, and eighteen (85.7%) and seventeen (81%) participants had a cough and sore throat, respectively. All nine (47%) participants who complained about their sense of smell were noted as having hyposmia.

Eighteen (94.7%) participants complained of having thick phlegm, which most of them had to endure for more than seven days (94.4%). None of the participants noted the colour of the phlegm, which could have been used to indicate whether it was infectious or non-infectious. The number of participants that complained of rhinorrhea and nasal blockage were 15 (71.4%) and 14 (73.6%) participants, respectively, and none of the patients noted any history of allergy rhinitis prior to the study (Table 1).

Six (28.6%) participants from the intervention group had symptoms of shortness of breath but did not explain whether the symptom was associated with strenuous activity. Three participants complain of one episode of epistaxis, which was minimal in volume and spontaneously stopped without any medical intervention.

**Control group (n = 13)**

In the control group, 10 (76.9%) out of 13 participants reported having episodes of fever during the research period. Of the 12 (92.3%) participants who experienced a cough, more than half (50.3%) noted a duration of more than seven days. Eleven (84.6%) participants also reported having a sore throat, while 10 (76.9%) participants complained of thick phlegm (Table 2).

Eleven (84.6%) participants had rhinorrhea, ten (76.9%) complained of nasal blockage, and eight (61.6%) had hyposmia. More than half of all the symptoms had a duration between three to seven days. Two (15.3%) participants had one episode of epistaxis, which stopped spontaneously and one (7.69%) complained of shortness of breath, which subsided without needing any treatment (Figure 1).

**Treatment**

Sixteen (84.2%) participants from the intervention group received treatment from medical clinics, whereas only 10 (76.9%) participants from the control group went to a medical clinic seeking treatment for their symptoms. Only three participants from each group did not seek any treatment from medical clinics (Table 3).

As shown in Table 4, all participants regardless of their group had significant symptoms of fever, cough, and sore throat throughout the research period. With regard to the symptoms of rhinorrhea, nasal blockage, and hyposmia, the duration of symptoms and number of participants

| Table 1: Symptoms and duration of ARI in the intervention group. |
|-------------------------------------------------------------|
| Symptoms          | Days of symptoms (%) |
|                  | Less than 3 days n (%) | Between 3 and 7 days n (%) | More than 7 days n (%) |
| Fever            | 5 (35.7) | 6 (42.9) | 3 (21.4) |
| Cough            | 0        | 2 (9.5) | 16 (88.9) |
| Sore throat      | 0        | 6 (35.3) | 11 (64.7) |
| Rhinorrhea       | 2 (14.3) | 5 (35.7) | 7 (50) |
| Nasal blockage   | 0        | 7 (46.6) | 8 (53.3) |
| Hyposmia         | 0        | 6 (66.6) | 3 (33.3) |
| Thick phlegm     | 0        | 1 (5.2) | 17 (94.4) |
| Shortness of breath | 0        | 3 (50) | 3 (50) |
| Epistaxis        | 3 (100) | 0 | 0 |
experiencing them were slightly decreased in the intervention group. The p value for the duration of symptoms less than or equal to 7 days is #.

### Discussion

RTI is very common among Malaysian Hajj pilgrims, and the symptoms include fever, sore throat, rhinorrhoea, nasal blockage, and changes in sense of smell. Methods of intervention to reduce the occurrence of ARI and their troublesome symptoms are becoming a priority in coping with the increasing numbers of pilgrims congregating in a confined place during Hajj. Zakuan et al. and Mohammad A et al. concluded that wearing a face mask had no significant value in protection against RTI for Hajj pilgrims. Influenza vaccination was also not helpful in reducing ARI symptoms, since no significant differences were observed in the occurrence of respiratory symptoms between vaccinated and unvaccinated groups.

In this pilot study, we found that there was a significant decrease in the symptoms of ARI when nasal rinsing during ablution was performed (Table 4). Symptoms that were significantly reduced with nasal rinsing included cough, rhinorrhoea, and nasal blockage. Symptoms of fever, hyposmia, thick phlegm, and sore throat were not affected; however, these general respiratory symptoms occur not only in confirmed respiratory infection, but may also be present in non-infectious conditions, such as allergic responses, vasomotor rhinitis, and chronic rhinosinusitis. It is difficult to differentiate infectious from non-infectious respiratory symptoms, purely on the clinical basis. Thus, from this study, although we can say that nasal rinsing in ablutions during Hajj reduced certain respiratory symptoms, specifically cough, rhinorrhoea, and nasal blockage, we still cannot be sure whether these reductions in symptoms were related to a reduction in infectious causes, non-infectious causes, or both.

In this study, nasal rinsing during ablutions had no effect on the symptom of fever, suggesting that nasal rinsing alone did not prevent respiratory infections, such viral pharyngitis or aspiration pneumonia. Sore throat, thick phlegm, and hyposmia are also common in allergic rhinitis and chronic rhinosinusitis sufferers. Post-nasal drip causes irritation to the throat as it drains excessively, therefore causing sore throat and thick phlegm. The thick phlegm could also be explained by mucus loosening from the regular nasal rinsing, which was then interpreted as excessive mucus by the participants. As for hyposmia, inflamed and oedematous nasal mucosa decreases the space for airflow to reach the organ of smell, which is located at the roof of the nasal cavity, hence reducing the sense of smell in the participants.

In this study, we also noted that there was a significant increase in medical clinic visits in the intervention group when compared those of to the control group (Table 3). These findings suggest that the intervention group was more health conscious and opted to see the doctor regularly after

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### Table 2: Symptoms and duration of ARI in the control group.

| Symptoms       | Days of symptoms (%) |   |   |
|----------------|----------------------|--|--|
|                | Less or equal to 7 days | More than 7 days |
|                | Less than 3 days  | Between 3 and 7 days |  |
| Fever          | 4 (40)  5 (50)  1 (10) |   |   |
| Cough          | 2 (16.6)  3 (25)  7 (58.3) |   |   |
| Sore throat    | 2 (18.1)  5 (45.4)  4 (36.3) |   |   |
| Rhinorrhoea    | 1 (9.1)  9 (69.2)  1 (9.1) |   |   |
| Nasal blockage | 2 (20)  8 (61.5)  0 |   |   |
| Hyposmia       | 0  8 (100)  0 |   |   |
| Thick phlegm   | 1 (10)  4 (40)  5 (50) |   |   |
| Shortness of breath | 1 (100)  0  0 |   |   |
| Epistaxis      | 2 (100)  0  0 |   |   |

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### Table 3: Clinic visits and treatment for the intervention and the control group.

| Group          | Numbers of clinic visits (%) |   |   |
|----------------|-------------------------------|--|--|
|                | No visit | One visit | More than 2 visits |
|                | n (%)    | n (%)     | n (%)             |
| Intervention   | 3 (15.8)  12 (63.1)  4 (21) |   |   |
| group (n = 19) |                     |   |   |
| Control        | 3 (23)  7 (53.8)  3 (23) |   |   |
| group (n = 13) |                     |   |   |

Fisher’s exact test, p = 0.369.

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### Figure 1: Symptoms of ARI in intervention and control groups.
initiating an unfamiliar procedure for nasal rinsing. Almost all the intervention group’s participants felt slightly uncomfortable the first few times they did the nasal rinsing, but the procedure became more tolerable over time. Another complaint was a sharp tingling sensation upon sniffing the water from their hands. TH provided medical treatment when needed. Patients were also counselled to try nasal rinsing to avoid the symptoms of ARI, and therefore, could be a compliment to other forms of intervention. Future research should be aimed at finding other practical methods of interventions that take into account the ritual of Hajj, so they can be easily applied by the pilgrims. Eventually, a successful method for preventing URI among the increasing number of pilgrims will be identified.

Conflict of interest

The authors have no conflict of interest to declare.

Authors’ contributions

RRR, WSJWD and MSJW designed the study and the data collection methods. RRR and NNN analyzed and interpreted the data, provided logistical support, and conducted the final review of the results. RRR and IM wrote the initial and RRR wrote the final draft of the article. All authors have critically reviewed and approved the final draft of the manuscript.

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