

## ARTICLE

## THE FREQUENCY OF BACTERIAL INFECTION AFTER TRACHEAL INTUBATION OF PATIENTS VISITING HOSPITALS AFFILIATED TO JAHROM UNIVERSITY OF MEDICAL SCIENCES

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## ABSTRACT

**Background:** Complications associated with the use of tracheal tubes include those during the intubations, following the placement, and after patient's extubation. Accurate and constant control during intubation can reduce these complications. Today, standard sterilization methods of laryngoscope blades are emphasized not to be able to deactivate all existing pathogens. Therefore, laryngoscope is one of potential intermediates of infection transmission among the patients. This article aimed to study the frequency of bacterial infection after intubation of patients visiting the hospitals affiliated to Jahrom University of Medical Science, Iran. **Methods:** This is a cross-sectional descriptive study. A total of 162 surgical candidates were enrolled as the sample using the convenience sampling method. The patients who developed infections after 24-72 hours from the surgery were selected as the sample by infectious disease specialist. Samples were taken using sterilized swabs from mucus around tonsil area. Direct smears were performed for gram stain and culture on blood agar and MacConkey's environment. **Results:** 76 (46.9%) patients were males, while 86 (53.1%) were females. The mean age was 42.8±16.7 and average surgery time was 1.7±0.57. A total of 34 (21%) developed infection. The highest infection frequency was pseudomonas (8%). The mean age of infection development was 43.29±23.24. Concerning the antibiotic resistance, all microorganisms were fortunately sensitive to all post-operative antibiotics prescribed by the surgeon. **Conclusions:** The results showed that the patients developed infection after intubation, quickly resolved by antibiotics prescribed by the surgeons.

## INTRODUCTION

Tracheal intubation is the placement of a flexible plastic tube into the trachea. This is done when one needs mechanical ventilation or asphyxiation is aimed to be prevented. Tracheal intubation candidate is not usually alert due to sickness or the use of anesthetic drugs. Here, body reflexes disturb intubation. Then, intubation is performed by the help of laryngoscope with proper endotracheal tubes. After securing the placement of endotracheal tube, the end of the fixed tube is connected to the ventilator or Bag Valve Mask (BVM). This is done in operating room or emergency conditions. Tracheal intubation might be necessary for every patient receiving general anesthesia. Tracheal intubation indications are as follows:

1. Opening an airway
2. Preventing gastric content aspiration
3. Requiring continuous suction
4. Facilitating ventilation with positive pressure of lungs
5. Requiring non-supine position during the surgery
6. When the surgical site is near or has air way
7. When maintaining air way is difficult with face mask [1].

Laryngoscope with reusable metal blade is known as the standard intubation method. Standard sterilization method of laryngoscope blades is emphasized not to be able to deactivate all existing pathogens [2, 3]. Therefore, laryngoscope is one of potential intermediates of infection transmission among the patients [4, 5] including infectious agents such as viridans streptococci and coagulase negative staphylococci [6] and negative organisms such as pseudomonas [7]. According to the Iranian Protocol, endotracheal tube connectors are among disposable devices [8]. However, they are repeatedly used due to financial constraints. Therefore, failure to comply with the standards, hand contamination of the specialist and anesthesia staff, and contamination of the part of inserted endotracheal tube can transmit microorganisms during intubation and cause pharyngitis, pneumonia, and other respiratory tract infections as a hospital-acquired infection (HAI). Since the patient develops such infection in hospitals, it is considered hospital-acquired infection. Hospital-acquired infections are a group of infections caused in hospitals or other health centers provided that the patients do not have it at admission or the infection is not at incubation period [9]. HAIs are said to be acquired as a result of hospital stay. Almost 2 million patients develop HAI in the USA annually which costs 4.5 million dollars. HAIs are the 11th leading cause of death in the US [10]. Hospital staff has an important role in the spread of infection. They are among the key elements of HAI control and management [11]. Urinary system is the most common organ involved in HAI followed by respiratory system, blood circulation, skin, and other organs [12]. Nurses can prevent the infection transmission among the inpatients by disinfecting skin, wearing gloves and a mask, substituting infusion sets, taking precautions into account, separating properly, applying standard precautionary principles, observing hand hygiene, preventing accidental contact with needles, avoiding the exposure to infected respiratory secretions [13].

## KEY WORDS

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Complete removal of HAI is not possible at the moment. HAI can only be reduced by proper measures. The study by *Fatemeh Omid et al.* on 100 neonates concerning the bacterial and genetic culture of intubated newborns showed that 34 newborns had positive tracheal tube culture. The most common cultures are coagulase positive staphylococci (30%), coagulase negative staphylococci (23%), and Ecoli (23%), respectively (14). The study by *Karynz et al.* showed that cultivated aerobic micro-organisms were  $26 \times 10^4$  and  $2.16 \times 10^4$  cfu/cm<sup>2</sup> on endotracheal tube [15]. Since the results of the study provides information concerning the frequency of infections after intubation process and potential harmful effects of these infections especially in sensitive patients to complications and injuries caused by infections after intubation, they encourage the authorities to think about solutions to deal with such infections in case of high prevalence. Therefore, the article aimed to study the frequency of such infections after tracheal intubation.

## MATERIALS AND METHODS

This is a cross-sectional descriptive study on 162 surgical candidates of two hospitals affiliated to Jahrom University of Medical Science. The study began after the approval of Research Department. The patients who developed infections after 24-72 hours after the surgery were selected as the sample by infectious disease specialist. Samples were taken using sterilized swabs from mucus around tonsil area. The samples were then sent to laboratory for diagnosis in physiology serum. Direct smears were performed for gram stain and culture on blood agar and MacConkey's environment in order to diagnose the type of bacteria. Cultures were kept at 37 ° C for 24 hours. Then, diagnostic tests were performed for identifying bacteria on separated colonies and determining antibiotic resistance model.

## RESULTS

Out of 162 patients, 76 (46.9%) patients were males, while 86 (53.1%) were females. The mean age was  $42.8 \pm 16.7$  and average surgery time was  $1.7 \pm 0.57$ . The highest frequency of infection was pseudomonas infection (8%). [Fig. 1]

Infection was reported more among women than men (25.9%). The mean age of infection development was  $43.29 \pm 23.24$  and average surgery time was  $1.7 \pm 0.57$ . The average diameter of endotracheal tube was  $7.25 \pm 0.41$ . Concerning the antibiotic resistance, all microorganisms are fortunately sensitive to all post-operative antibiotics prescribed by the surgeon.

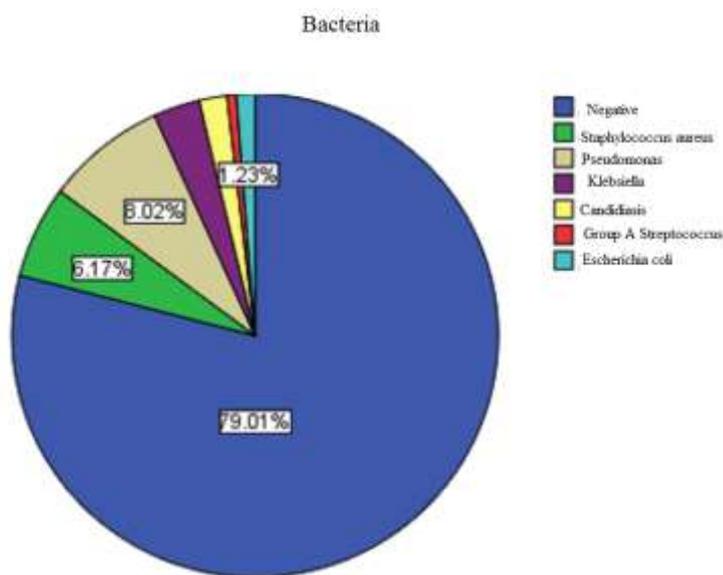


Fig. 1: Frequency of bacterial infection according to type of Micro-Organism.

## DISCUSSION

Using laryngoscope for intubation is one of the most common practices in intensive care units and emergency departments during general anesthesia. Lack of a standard method for disinfecting laryngoscope blades might make them a potential source of infection in future. Therefore, studying the frequency and controlling measures can help stop the secondary infection. The results showed that 21% of all samples developed infection, meaning that 34 out of 162 were infected. The most frequent infection was pseudomonas bacterial strains (8.02%) and the least frequent infection was Group A Streptococcus (1.23%).

A descriptive study by *Irاندust et al.* (2010) on different wards of Musa Ebne Jafar Hospital showed that 52.9% of samples were infected. The most frequent infection was bacterial strains of coagulase-negative staphylococci (36.4%) and the least one was enterococci (9.1%) [16]. The frequency was greater than our study (21%). This is mainly associated with the different washing material and laryngoscope blade disinfection. The study by *Chen et al.* (2009) in Taiwanese operating rooms showed that, out of 49 samples for bacterial culture, 75% were infected [17]. This was far greater than ours which might be because the samples were taken in operating rooms. As a result, infection is greater in operating rooms than other wards. No bacteriological consistency was found in all above mentioned studies, which is mainly associated with the geographical conditions of each region. Infection was reported more among women than men, which might be associated with different histology and mucosal conditions. Finally, we found that all micro-organisms were sensitive to all common prescribed post-operative antibiotics. The review study by *Desousa et al.* (2015) on published articles from 1994 to 2012 indicated high risk of infection transmission and disagreement among guidelines concerning disinfection of these tools [18].

## CONCLUSION

The results showed that patients develop infection after intubation, quickly resolved by antibiotics prescribed by the surgeons. It is essential to conduct studies for easier and effective standards for disinfecting blades and laryngoscope handles in order to reduce potential risks threatening patients and health officials.

### CONFLICT OF INTEREST

There is no conflict of interest.

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### FINANCIAL DISCLOSURE

None

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