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RESEARCH ARTICLE

COLONIZATION OF PATHOGENIC MICROBES ON CONTAMINATED NEBULIZER DEVICES FOR RESPIRATORY TRACT DISEASES AT EMERGENCY DEPARTMENT IN HOSPITALS

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ABSTRACT

Poor nebulizer hygiene can result in microbial contamination and risk of infections by pathogens for respiratory tract patients. Swabs were collected from contamination nebulizer cup (n=25) using sterile cotton swabs, percentage of microbial contamination 84(67.2%) bacteria n=74(59.2%) (gram positive n=21(16.8%), and negative bacteria n=53(42.4%)). and yeast n=10(8%) (*Candida spp*.). Frequency of gram negative bacteria higher than the gram positive bacteria and yeast with high significant difference $p \leq 0.05$. In this study concluded that the nebulizer devices are contaminated with microbial pathogens and the transmission of these microbes among the respiratory tract patients and this is due to the disinfection of these devices or did not disinfected well to reduce these microbes.

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INTRODUCTION

The role of medical devices, such as nebulizer in the transmission of healthcare associated infections (HAIs) has long been recognized, however, the evidence that the contaminated environmental and medical device surfaces play a role in the transmission of pathogens has been weak, Studies have demonstrated that pathogens can be transmitted from surfaces to personnel and patients, and that these pathogens are not easily removed by routine cleaning (Hayden *et al*., 2006; Carling *et al*., 2008) Medical devices used in hospitals can be categorized as "critical," "semi critical," and "noncritical, a nebulizer is an electrically classificatae Semi-critical devices powered machine that turns liquid medication into a mist so that it can be breathed directly into the lungs (contact with mucous membranes or non-intact skin) through a face mask or mouthpiece (Daniel *et al*., 2010). A nebulizers have been identified as the potential vehicles can easily transmit microbes and small numbers of bacterial spores which cause major nosocomial infections if these are colonized by fungi or bacteria may also be acquired through the hands of the hospital personnel and contaminated intravenous lines or fluids (Craven *et al*., 1988; Ewig *et al*., 1999; Strausbaugh, 2000). The fluid containing devices such as nebulizers may become heavily contaminated by bacteria and fungi capable of multiplying in water, therefore, the nebulizer should be free of all microorganisms and cleaned meticulously and disinfected with a high-level disinfectant between use on patients (Dancer, 2008). The aim of this study isolate and determine microbial that contamination of nebulizer device and relationship between nebulizer hygiene and the risk of microbial infections.

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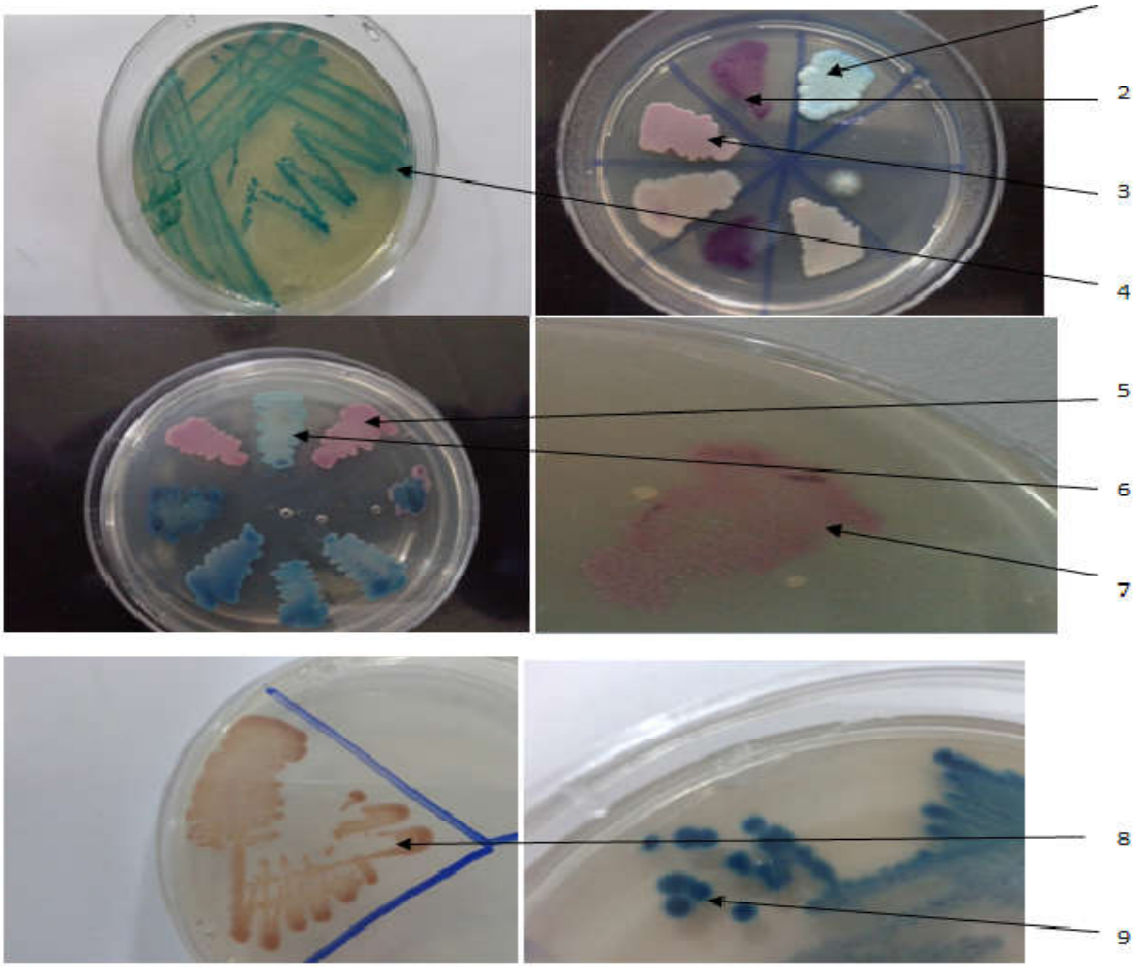
MATERIALS AND METHODS

Setting and Sample Collection

This study was conducted in pediatric emergency special at three Basra's Hospital (Al-Basra general hospital, Al-Mawany general hospital and Al-Basra hospital for maternity and children). Swabs were collected from contamination nebulizer cup (n=25) using sterile cotton swabs, Collected samples were placed in sterile tubes containing (5ml) brain heart infusion broth (BHIB) {HiMedia-India} and transferred into the laboratory to incubate at 37˚C for 12 – 24 h. After that streaked onto Mannitol salt ager base {Salucea-Netherlands} and CHROMagar™ {Paris-France} incubated at 37˚C for 12- 24 h (CHROMagar™ *Staphylococcu aureu*s, CHROMagar™ MRSA, CHROMagar™ *Pseudomonas,* CHROMagar™ *Salmonella*, CHROMagar Orientation), and CHROMagar™ *candida* (incubated at 37˚C for 12- 48 h) (Talan *et al*., 1989; Reddy and Athuluri, 2012). All colonies that appeared were subcultured onto Nutrient agar {Salucea - Netherlands} incubated at 37˚C for 12- 24 h, then gram stained and detected by light microscope. All these agars were prepared according to manufacturer and sterilized by autoclaving at 121˚c for 15 min.

Statistical analysis: spss chi- square



Picture (1): Microbial contamination nebulizer cup onto special agar

1- *Candida albicans* 2- *Candida krusei* 3- *Candida tropicalis* 4- *Pseudomonas aerogenosa* 5- *Methicillin resistant Staphylococcus aureus* MRSA 6- *Staphylococcus aureus* 7- *Salmonella typhi* 8- *Candida globrata* 9-*klebsiellae spp.*

Table 1. Percentage of microbial contamination nebulizer cup

Bacterial species		Yeast species
Gram positive bacteria n(%)	**Gram negative bacteria n(%)**	**Candida spp. n(%)**
- *Staphylococcus aureus* **9(7.2%)** - Methicillin resistant *Staphylococcus aureus* MRSA **8(6.4%)** - Other *Staphylococcus SPP.* **4(3.2%)**	-*Klebsiella ssp.* **16(12.8%)** -*Pseudomonas aerogenosa* **11(8.8%)** -*Salmonella typhi* **16(12.8%)** - *Proteus ssp.* **10(8%)**	-*Candida albicans* **4(3.2%)** -*Candida krusei* **1(0.8%)** -*Candida tropicalis* **1(0.8%)** -*Candida globrata* **1(0.8%)** -Other *Candida ssp.* **3(2.4%)**
21(16.8%)	**53(42.4%)***	**10(8%)**
Total = 84 (67.2%)		

*p≤0.05

RESULTS

In the present study some microbial isolation from 25 swabs contaminated nebulizer cup,each swabs cultured onto 5 plate agar, microbe isolated and identified depended in shape and color each colon of these microbe grow on specific agar and microscopic examination as result of gram stain and cell shape under microscope, therefore number and percentage of microbial contamination 84(67.2%), bacteria n=74(59.2%)= (gram positive bacteria n=21(16.8%), and gram negative bacteria n=53(42.4%).) and yeast n=10(8%) (*Candida spp.*). Frequency of gram negative bacteria higher than the gram positive bacteria and yeast with high significant difference p≤0.05. Show picture (1) and Table (1).

DISSCUTION

In the present study, CHROMagar was evaluated for the first time as a direct isolation medium for specimens, showed the same ability to detect microbial pathogens as the combination

of the two reference media, the results show that the growth factors included in the formula supported the growth of all microbial pathogens this allowed for easy differentiation of the bacterial colonies depended on Color and morphology characteristics on CHROMagar and This increased the ability of the medium to detect microbial pathogens when mixed cultured on the media (Merlino *et al*., 1996). 84(67.2%) microbes from 25 swabs collected from nebulizer cup these microbes are bacteria (gram positive and negative bacteria) and fungi, Table (3-1) show Gram-negative bacteria were the predominant organisms isolated from nebulizers devices higher than gram positive bacteria and candida spp. with high significant deference $p \leq 0.05$. Therefore, these microbes are very danger, opportunistic microorganism, may be a source of respiratory tract colonization, Respiratory infections are the commonest among nosocomial infections (Rangel-Frausto *et al*., 1994; Blau *et al*., 2006). Hospital nebulizers are frequently contaminated, particularly when cleaning instructions are inadequate, and may be a source of airway infection or reinfection especially following contamination from a patient chronically colonized with microbes, contaminated in-line medication nebulizers generate small-particle bacterial aerosols that may increase the risk of ventilator-associated pneumonia and therefore should be cleaned or disinfected after each treatment rather than every 24 hours, Proper cleaning and sterilization or a high level disinfection of the reusable equipments is essential, to prevent the infections which are associated with the nebulizer devices (Jadhav *et al*., 2013). Blau *et al.* (2006) show the contaminated respiratory care devices may lead to nosocomial infections by two routes, Firstly, the respiratory care devices may serve as a reservoir for microorganisms, especially gram- negative bacilli, The fluid containing nebulizer devices may become heavily contaminated by microbial pathogens which may be capable of multiplying in water, the pathogens may then spread to the patients by aerosolization in the room. Secondly, the contaminated equipment may lead to a direct instillation or delivery of microorganisms to the airways, if the devices is directly linked to a ventilator system or if contaminated medication is aerosolized, nebulizer chambers may be transferred pathogens from patient to patient several times daily but they may be seldom cleaned daily.

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