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Microbial Contamination of Hospital Nebulization and Link to of Nurse's Staff Knowledge in Emergency Departments

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Abstract **Original Research Article**

Background: Nebulization is an important tool in the treatment of respiratory conditions. Nurses are primary health care providers for using the nebulizers in a hospital setting and may have been identified as the potential vehicle which may cause major nosocomial infections if they are colonized by different bacteria and fungi. Aim of the study was to access the knowledge of nursing staff towards the presences of microbes in nebulization inhalation therapy equipment. ***Methods*:** A cross sectional study was conducted at two hospitals in Basra city of period from (1/2-15-5/2018). (50) Nurses who work in Emergency Departments of these two hospitals. consist three parts were used to that where by using questioner presented two the sample consisting there parts, part 1 includes Demographic characteristics. Part 2 consist of (14) a questionnaire related to subject of the study. part 3 : includes collection swabs from contamination nebulize cup (n=25)using sterile cotton swabs .collected sample were placed in sterile tubes containing (5ml)brain heart infusion broth (BHIB) and transferred into the laboratory to incubator at 37^0 C for 12-24 h after that streaked onto 5 special agars. ***Conclusion:*** In this study, the level of knowledge regarding nebulization contaminations among nursing staff was inadequate. Considering the important role of nurses in nebulization contaminations, there is an imperative need for health education to improve the knowledge of the nurses toward nebulization contaminations and types of organism. Nurse's lack of knowledge may be a barrier in prevention of infections. Hence, this study was carried out to assess the current knowledge Relationship sig $p \leq 0.01$.

Keywords: Nosocomial contaminations; Nurse; Knowledge.

INTRODUCTION

Respiratory care equipment's which include humidifiers and nebulizers have been identified as potential vehicles causing major nosocomial respiratory infections if they are colonized by fungi or bacteria [1]. Contaminated respiratory care equipment's may lead to nosocomial infections via [2] routes; firstly: Equipment may serve as a reservoir for microorganisms, especially gram-negative bacilli. The fluid containing devices such as nebulizers and humidifiers may become heavily contaminated by bacteria and fungi which may be capable of multiplying in water [4, 3]. the pathogens may then spread to the patients by aero-solization in the room. Secondly, the contaminated equipment may lead to a direct instillation or delivery of microorganisms to the airways, if the equipment is directly linked to a ventilator system or if contaminated medication is instilled or aerosolized. Many types of equipment such as oxygen masks and nebulizer chambers may be transferred from patient to patient several times daily but they may be seldom cleaned daily [5, 6]. The infection control activities should emphasize the establishment of appropriate preventive guidelines and policies and the continuing education of health care workers to maintain an optimal compliance with the preventive practices [7, 8]. With this in mind the study was planned with aim to determine the rate of bacterial colonization in the nebulizers, chambers in our hospital [9, 10].

MATERIAL AND METHODS

All the nebulizers, in use in the Dept. of emergency & Pediatrics were taken in the study. A cross-sectional study was carried out among the nursing staff of general Basra hospital & Basra maternal and child hostiles, during February to April 2017 .A convenient sampling method was used to recruit

50nurses at the time of data collection of either sex during study period.

Part 1: All 50 nurses' staff (two hospitals25 for each one) was fully informed about purpose of the study. The informed consent was obtained from each participant, and anonymity of the participants was maintained throughout the study [12]. Ethical approval was obtained from the institutional ethics committee. The data were collected on a predesigned, pre structured questionnaire distributed among these nurses, and they were asked to fill the questionnaire.

Part 2: The questionnaire was pretested on a subsample of [7] nurses and modified and necessary changes were made accordingly. The questionnaire comprised questions on knowledge related to nebulization infection. The language of the questionnaire was Arabic and contained 14 questions . All the questions were objective in nature with "Yes" or "No" used liker score (every yes =2 among ,no=1)as the options, although a few questions were Demographic details such as age, sex, duration of service and of the respondents were also recorde. Results were analyzed in the form of percentage and proportions whenever appropriate.

Part 3: collect swabs from contamination nebulizer cup.(n=25) sterile cotton swabs, collected samples were placed in sterile tubes containing (5ml)brain heat infusion broth (BHIB) (MiMedia-india)and transferred into the laboratory to incubate at 37^0 c for 12-24h. after that streaked onto Macconkey ager ,Mannitol salt ager base {Salucea-Netherland} and CHRO Magar ™ *Staphylococcus aurous* CHRO Magar ™ *MRSA*, CHRO Magar ™ *Pseudomonas*, CHRO Magar ™ *Salmonella* and CHRO Magar ™ candida (incubated at 37^0 C for 12-48 h)[11].

All colonies that papered were subculture onto nutrient ager {Salucea –Netherland} incubated at 37^0 Cfor 12-24 than gram stand and detected by light microscope. All these agars were prepared according to manufacturer and sterilized by autoclaving at 121^0Cfor 15 min. statistical analysis using spss chi-square, frequency, percentage and liker score (mean score).

RESULT

The demographic characteristic of the study population is shown in

Table-1: The distribution of sample according to the demographic characteristics; age, gender, educational level, years of experience

Particulars Age (years		
Class	**No**	**F**
21–25	5	10%
26–30	26	52%
31–35	19	38%
Gender		
male	16	32%
Female	34	68%
Duration of service (years)		
>3	16	32%
4-6	21	42%
7<	13	26%
Educational Level		
Preparatory	16	32%
Diploma	27	54%
Baccalaureate	7	14%

Table-2: Microbial isolated from contamination nebulizer cup present from table (2)

Bacterial				***Yeast species***	
Gram positive	N0(%)	**Gram negative**	No (%)	**Candida SPP**	No (%)
Staphylococcus aurous	9(11%)	***Klebsiella SSP***	16(19%)	***Candida albicans***	4(5%)
Methicillin resistant Staphylococcus aureus MRSA	8(10%)	***Pseudomonas aerogenosa***	11(13%)	***Candida krusei***	1(1%)
Other Staphylococcus SPP	4(5)	***Salmonella typhi***	16(19%)	***Candida tropicalis***	1(1%)
		Proteus SPP	10(12%)	***Candida globrata***	1(1%)
				other Candida SPP	3 (3%)
	21(25)		53(63%)		10(12%)
Total = 84 (67.2%)					

Table-3: Correlation between nurse's knowledge and contamination of nebulizer machine

Known N= (%0)	**Unknown N= (%0)**	**Contamination N= (%0)**	**c.s p=value**
204(29.1%)	496(70.9%)	84(67.2%)	X2=0.999 df = 2 0.01 Sig.

*P≤0.01

DISCUSSION

Our study indicates a potential risk of nebulizer's infection due to microbial colonization of various respiratory devices. The nebulizers and humidifier chambers need to be cleaned more frequently with disinfectants, to control nebulizer's infections. Proper cleaning and sterilization or a high

level disinfection of the reusable equipment is essential [14]. To prevent the infections which are associated with the respiratory therapies such as oxygen therapy, nebulization, etc. Devices or parts of devices need to be rinsed with water after they have been chemically disinfected. The implementation of new and regular hygiene measures for the maintenance of such equipment's is desirable. While Nurses can prevent infection transferring among the patients of a hospital with proper disinfecting the nebulizers, wearing gloves and masks, changing infusion sets, applying prudential measures, proper drugs, using the principles of standard cautions like hand washing .but we found higher significant difference P≤0.01 between relationship of knowledge nurses and nebulizer contamination that percent percentage of knowledge nurses (29.1%) is very poor depended on result of questioner and contamination of nebulizer machine comparisons with incorrect result is higher (70.8%0). And present 84(67.2%) microbes from 25 swab collected from nebulizer cup these microbes are bacteria (gram positive and gram negative) and fungi .this microbes are very danger [15], Opportunistic microorganism.

Recommendations for clinical practice are that nebulizer cup used within a ventilator circuit should be wiped dry and stored open to the, environment to ensure that the lowest amount of contamination Occurs.

Unit head-nurse should ensure that in Emergency Departments nurses are educated on nebulizer decontamination, and that storage protocols are in place, and collect swabs to investigate Microbial Investigate nursing staff adherence and the association between patient diagnosis and micro-organisms identified in nebulizer and the surrounding air at the bedside is recommended.

Conflict-of-Interest: All authors have declared no conflict-of-interest

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Ethical Clearance: Continuous and advanced education for all emergency workers about infection A cknowledgements for all nursing staff of the participating emergency department in two hospitals

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