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STETHESCOPE: A RESERVOIR OF NOSOCOMIAL PATHOGENS

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Abstract – Nosocomial infections are an important cause of increased morbidity and mortality. Stethoscope used by health care workers (HCW) are likely to be contaminated with microorganisms and they become a potential source of nosocomial infections. This study was conducted to screen the stethoscope of clinicians and to find out the common microorganisms on it and determine the cleaning practices of stethoscope among clinicians. A total of 60 stethoscopes were sampled and bacteriological culture was performed. A questionnaire was used to analyze the knowledge, attitude and practice in cleaning of stethoscopes. Out of the 60 stethoscopes screened the contamination rate was 100%. The diaphragm showed greater levels of contamination with pathogenic bacteria followed by the bell and ear pieces. 36% of the clinicians cleaned their stethoscopes every month, 36% cleaned every week. 18% never cleaned their stethoscopes. Our study confirmed that, majority of the stethoscopes used by clinicians are contaminated with both pathogenic as well as non pathogenic bacteria which acts as a potential source for transmission of infection.

INTRODUCTION

Nosocomial infections remain a significant hazard in hospitalized patients. The transmission of nosocomial infections is attributed to health care workers and medical devices acting as a potential source of infection.

The Stethoscope, a symbol of healthcare is one of the medical devices which are very commonly used by almost all the healthcare workers (Singh et al., 2013). HCW'S, despite their best intentions, sometimes act as carriers of infectious agents, thus disseminating new infections among their patients. The transmission of infections from contaminated medical devices such as thermometers, blood pressure cuffs, stethoscopes, latex gloves, masks, pens and white coats is a possible cause of outbreaks of hospital acquired infections (Singh et al., 2013; Pandey et al., 2010) . There are increasing reports of the risk of transmission of multidrug resistant microorganisms through stethoscopes (Bhatta et al., 2011). Antimicrobial resistance is a global phenomenon that has resulted in high morbidity and mortality as a result of treatment failures and increase health care costs.

Objectives

- To screen the stethoscope of clinicians and to find out the common microorganisms on it.
- To determine the cleaning practices of stethoscope among clinicians

MATERIALS AND METHODS

The study was conducted by the Department of Microbiology at R. L. Jalappa Hospital & Research Center, Tamaka, Kolar. 60 Stethoscopes from clinicians were included in the study owned by the respective clinicians.

METHOD

Sterile swabs were first moistened with normal saline and samples were collected from diaphragm, bell and both the ear pieces. The samples were directly inoculated into Thioglycollate broth and were sub cultured on to Blood Agar and Mac Conkey agar, visible growth on blood agar & MacConkey Agar after 24 hours of incubation were subjected to Grams stain, biochemical reactions followed by antibiotic susceptibility testing by

Kirby bauers dics diffusion method. A questionnaire was used to asses the knowledge regarding disinfection practices of stethoscopes among the clinicians.

RESULTS

The total numbers of stethoscopes included in the present study were 60. The type and distribution of bacteria isolated from different parts of the stethoscope, which includes diaphragm, bell, right ear piece and left ear piece are described in (Tables 1, and 2).

Table 1. Organisms isolated from 60 stethoscopes

Non Pathogenic	Pathogens
Micrococci Diphtheroids	MSSA (Methicillin Sensitive *Staphylococcus aureus*) MRSA (Methicillin Resistant *Staphylococcus aureus*) *Citrobacter diversus* *Enterococcus feacalis* *Pseudomonas aeruginosa* *Klebsiella pneumonia*

It was found that out of the 60 stethoscopes screened the contamination rate was 100% of which, 57 (95%) of bell, 56 (93%) of the diaphragm, 49 (81%) of the right ear piece, 52 (86%) of the left ear piece were contaminated with non pathogenic and pathogenic bacteria as shown in (Table 1, 2). The most common microorganisms identified as non pathogens were diphtheroids and micrococci. The pathogens identified were *Methicillin resistant Staphylococcus aueus (MRSA),* Methicillin sensitive *Staphylococcus aureus (MSSA), Klebsiella pneumonia (Extended spectrum betalactamases), Citrobacter diversus (AMP C), Pseudomonas aeruginosa* and *Enterococcus* species. The diaphragm showed greater levels of contamination with pathogenic bacteria followed by the bell and ear pieces as shown in (Table 2).

The questionnaire used to asses the frequency of cleaning, the disinfectants used for cleaning, knowledge regarding the frequency of cleaning, barriers for cleaning the stethoscope, and hand hygiene before using a stethoscope filled by all the clinicians are summarized in (Table 3). It was found that 36% cleaned every month, 36% cleaned every week. 18% never cleaned their stethoscopes though majority (75%) knew that the stethoscopes had to be cleaned with alcohol every day. 50% cleaned their stethoscopes with hand sanitizers and 28% used alcohol (ethyl alcohol and Isopropyl alcohol) for cleaning the stethoscopes.

DISCUSSION

Our study revealed that the contamination rate was 100%. Studies by Jones *et al.*(1995) showed a contamination rate of 88.7% to 100% (Jones *et al*., 1995), 89.6% (Brethnach *et al.,* 1992;) the contamination rate in the above mentioned studies were lower when compared to our study .The predominant colonizers of the stethoscopes were diphtheroids and micrococci which are commonly found on intact skin and environmental flora. A small percentage of isolates constitute the pathogenic flora as shown in (Table 1, 2). However isolation of MRSA, MSSA, ESBL producing klebsiella pneumonia and AMPC producing Citrobacter even in a small percentage of stethoscopes are significant and plays an important role in transmission of Hospital acquired infections. Isolation of MRSA (8.3%) from the diaphragm, 3% from the bell and right ear piece is a matter of concern as they have emerged as a significant threat in nosocomial infections. We found that that isolation rate of MRSA was higher in our study

Table 2. Distribution of isolates in different parts of the Stethoscope

	Diaphragm(60)	Bell(60)	Right Ear Piece(60)	Left Ear Piece (60)
Diphtheroids	21	20	10	13
Micrococci	16	20	28	30
MSSA	9	12	9	9
MRSA	5	2	2	0
Klebsiella pneumonia	0	1	0	0
Citrobacter diversus	1	0	0	0
Pseudomonas aeruginosa	2	0	0	0
Enterococcus faecalis	2	2	0	0
Total	56 (93%)	57(95%)	49 (81%)	52(86%)

Table 3. Details of the Questionnaire.

1	Stethoscope Used	Own	60
2	Last Cleaned	Today	7
		Yesterday	3
		Last week	13
		Last month	26
		Never	11
3	Cleaning Frequency	Before/After every patient	5
		Every week	22
		Every month	22
		Never	11
4	Cleaner used	Ethyl/Iso Propyl alcohol	17
		Hand Sanitizer	30
		Soap and water	2
		None	11
5	Knowledge of frequency at which Stethoscope has to be cleaned	Daily	45
		Weekly	9
		Monthly	6
6	Barriers to cleaning stethoscope	Lack of time	27
		Forgetfulness	24
		Sharing of stethoscopes	3
		No barriers identified	6
7	Hand hygiene before using stethoscope	Yes	32
		No	28

when compared to a rate of 7.3% in the study conducted by Pandey (Pandey *et al*., 2010). It was found that 53% of clinicians performed hand hygiene before using the stethoscope. The reason for lack of stethoscope cleaning practices were lack of time in 45%, forgetfulness in 40% and sharing of their stethoscopes in 5% of the clinicians.

Contaminated medical equipment's and health care workers have been implicated as the carriers of pathogenic organisms (Brethnach, *et al*., 1992;). The knowledge, attitude and practices regarding the role of stethoscopes as carriers of infectious agents were assessed by a questionnaire in this study. From the questionnaire, it was found that majority of the clinicians used their own Stethoscopes (100%), but cleaning frequency and regular disinfection was not followed by most of the clinicians (20%) inspite of their knowledge relating to the risk of transmission of various infections from one person to another as shown in (Table 1, 2, 3). In this study, specimens of diaphragm, bell and both earpieces were cultured separately. Bacterial contamination was seen in diaphragm (90%), bell (90%) and Earpieces (78%). The common isolates are mentioned in (Table 3). Poor stethoscope cleaning and disinfection were significantly associated with the contamination. Wilkins (Robert *et al*., 2007;) stated that the most effective cleaning agent identified was 70% Isopropyl alcohol. It was found that in his study (Robert *et al*., 2007) 23% never cleaned their stethoscopes as compared to 20% in our study.

CONCLUSION

Our study confirmed that, majority of the stethoscopes used by clinicians are contaminated with both pathogenic as well as non pathogenic bacteria which acts as a potential source for transmission of nosocomial infection. In the era of drug resistance and the environment being a major reservoir of these bacteria, importance should be given to cleaning this equipment as they enter the area of "bed space". Inadequate or no cleaning will help in transmission of bacteria among patients within the hospital resulting in nosocomial infections and a threat to emergence of multidrug resistant pathogens resulting in treatment failure. These observation mandates the implementation of stethoscope infection control practices in our hospital to prevent transmission of MRSA infections. There is a need for further studies to ascertain the ideal disinfectant to clean stethoscopes in our hospital.

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