

# Isolation and Identification of Micro Organisms Present in Stethoscopes before and after Alcohol Swab Application

Celastina Synthia X<sup>1</sup>, Dr. Tasneem Banu, MD<sup>2\*</sup>

<sup>1</sup>MBBS II Year, Saveetha Medical College & Hospitals, Thandalam, Chennai, Tamilnadu, India

<sup>2</sup>Assistant Professor, Department of Microbiology, Saveetha Medical College, Kuthambakkam, Tamil Nadu 600124, India

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\*Corresponding author: Tasneem Banu

## Abstract

**Aim:** Nosocomial infections are of great concern in hospital settings especially in intensive care units. Health care professionals and their medical equipment have long been known to act as vectors of pathogens. This study aims at evaluating the presence of bacterial pathogens on stethoscopes of health care workers and to substantiate the effectiveness of alcohol swabs for decontamination of stethoscopes. **Methods:** 50 stethoscopes belonging to physicians, residents, interns and nurses were swabbed before and after decontamination with alcohol swab. The health care workers belonged to the medicine, surgery, obstetrics, paediatric wards and the intensive care unit. **Results:** 36% of the stethoscopes were contaminated. Decontamination with 70% isopropyl alcohol showed a significant decrease in contamination. The predominant organism isolated was Staphylococcus aureus (50%). **Conclusion:** Nosocomial infections carry a higher level of morbidity and mortality. Most stethoscopes harbour potential pathogens. A change in the attitude of health care workers to disinfect their stethoscopes regularly and in between patients will bring about a break in the chain of transmission of infection. We recommend that disinfection of stethoscope should become an integral part of undergraduate and postgraduate education

**Keywords:** Nosocomial infection, stethoscopes, 70% of isopropyl alcohol, disinfection.

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## INTRODUCTION

Physical examination is a necessary part of the diagnosis and treatment of patients in medical practice. Stethoscopes are invariably one of the most frequently used medical devices which come in contact with patients and patient surroundings [1]. They act as vectors of transmission for infection. The hospital environment is teeming with nosocomial flora in spite of routine disinfection. Nosocomial flora includes multidrug resistant pathogens like Methicillin Resistant Staphylococcus Aureus (MRSA), Vancomycin resistant Enterococci (VRE) and multi drug resistant enterobacteriaceae and Pseudomonas. The fact that these potentially pathogenic organisms can survive on inanimate surfaces plays a pivotal role in the transmission of nosocomial infections [2]. Nosocomial infections, also known as hospital acquired infections (HAI) are contracted in a hospital environment after 48 hours of admission. The transmission mainly occurs through health care workers, devices and equipments. Presently there is an increasing trend of multi-drug resistant (MDR) pathogens causing nosocomial infections. Antibiotic resistance is directly proportional to the amount of antibiotics used. The most important

preventive measure for transmission of nosocomial infections is handwashing. Simple measures such as disinfection of stethoscopes can also help in decreasing the spread of infections.

## AIM OF THE STUDY

- To determine the presence of microorganisms on stethoscopes used by health care providers.
- To check the effectiveness of 70% of isopropyl alcohol in killing the microorganisms found on the stethoscopes.

## MATERIALS AND METHODS

It is a hospital based study carried out in the month of January 2019 in a tertiary care institution - SAVEETHA MEDICAL COLLEGE AND HOSPITALS, Chennai, Tamil nadu.

Here 50 swabs from the diaphragm of stethoscopes were collected from doctors, nurses and other healthcare workers before and after rubbing with 70% isopropyl alcohol. Swabs taken from the diaphragm - A swab before rubbing with 70% of

isopropyl alcohol was labelled as "S" and after rubbing with 70% of isopropyl alcohol labelled as "AS". All the collected samples were inoculated within one hour into 5% of sheep blood agar and incubated at 33 degrees for 24 hours.

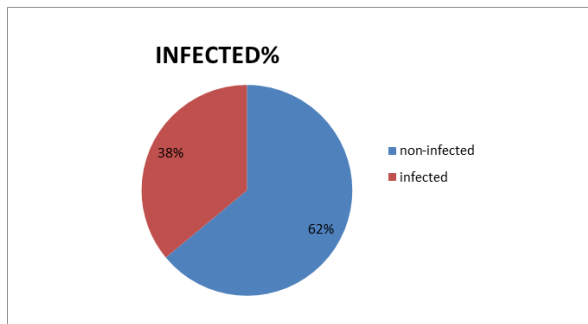
The identification of bacteria was performed by conventional methods. For gram positive cocci tube and slide coagulation tests were done and for gram negative bacteria basic biochemical tests were done to confirm the identification.

## RESULTS

Total swabs collected = 100

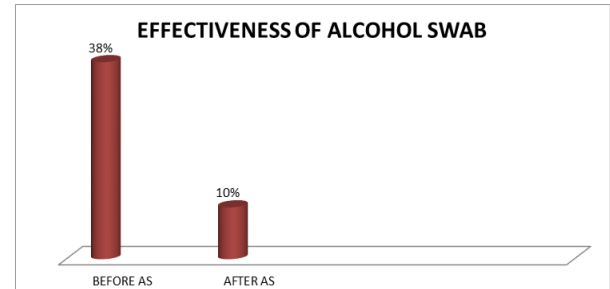
- 50 swabs before rubbing with 70% of alcohol swab (S).
- 50 swabs after rubbing with 70% of alcohol swab (AS).

19 out of 50 swabs (38%) before rubbing with alcohol grew micro organisms (Fig-1)



**Fig-1: Percentage of Infected Stethoscopes**

Five of the fifty swabs after decontamination with 70% of isopropyl alcohol still grew micro organisms (Fig-2).



**Fig-2: Effectiveness of Alcohol Swab**

There is a drastic reduction (73%) in microbial growth after cleaning with alcohol swab.

The number of swabs collected from the stethoscopes of health personnel working in different wards are depicted in Table-1.

**Table-1: Number Of Swabs Were Collected From Different Wards**

SL. NO	WARD	NO.OF SWABS
1-10	General Medicine	10
10-20	Intensive Care Unit	10
20-30	Obstetrics & Gynaecology	10
30-40	Surgery	10
40-50	Pediatrics	10

The different types of micro organisms found on the stethoscopes from various ward are shown in the Table-2.

**Table-2: Organisms Grown From Swabs from Different Wards Prior To Decontamination**

SL.NO	WARD	ORGANISM
1	General medicine	Staphylococcus aureus(2) Micrococci(2)
2	Obstetrics & Gynaecology	Staphylococcus aureus(4) Micrococci(1) Klebsiella(1)
3	Intensive Care Unit	Micrococci(3)
4	Surgery	Staphylococcus aureus(4)
5	Pediatrics	Staphylococcus aureus(2)

5 swabs out of fifty were still positive for microorganisms even after application of alcohol swab and the data is given in the Table-3.

**Table-3: Organisms Grown From Swabs from Different Wards after Decontamination**

SL. NO	WARD	ORGANISM
1	General Medicine	staphylococcus aureus(1)
2	Obstetrics & Gynaecology	staphylococcus aureus(2)
3	Surgery	staphylococcus aureus(2)

The overall positivity rate of swabs and their percentages from different wards are shown below in Figure-3.

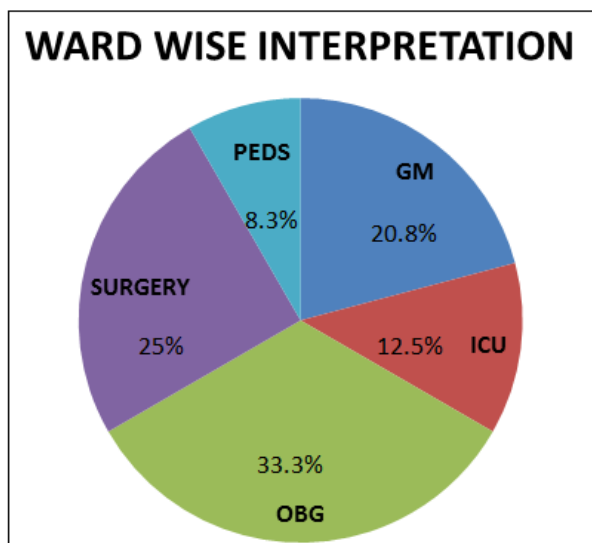


Fig-3: Contaminated Swabs from Different Wards

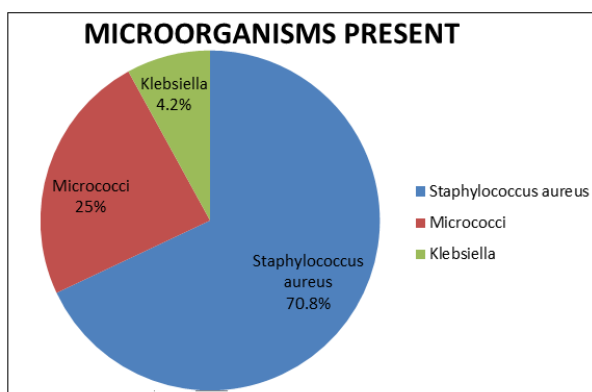


Fig-4: Percentage of Microorganisms Present In the Infected Stethoscopes

## DISCUSSION

In our study, we found that 19 (38%) of the stethoscopes used by the health care professionals were contaminated with microorganisms. The study by Youngster et al revealed 87.5% of contaminated stethoscopes [3]. Similar higher rates of contamination have been reported by Lokkur *et al.*, [4]. However a lower rate of contamination is reported by others which is in accordance with our study. A study by Bukharie *et al.*, only 30% of the stethoscopes were contaminated with micro organisms [5]. In study by Alothman A *et al.*, total of 47.7 % stethoscopes were contaminated, among which, 68.3 % were from physicians [6]. In the study by Kuhu Pal *et al.*, 52% of the stethoscopes were contaminated [8]. Only one study Bukharie *et al.*, had contamination rates less than us.

There was a 28% decrease in the contamination rate of our stethoscopes compared to the global average.

10 stethoscopes were analyzed each from Intensive care unit, General medicine, Surgery, Paediatrics and Obstetrics and Gynaecology wards. 19 out of 50 (38%) stethoscopes were positive for microbial contamination. Even after decontamination with alcohol swabs, 5 (26.3%) stethoscopes still had microorganisms. The efficacy of isopropyl alcohol was calculated to be 73.7%. Nunez *et al.*, have found out that there were bacterial contamination to an extent of 132 colony forming units per stethoscope in their study. Disinfecting the stethoscope diaphragm with iso propyl alcohol resulted in an immediate reduction in the bacterial count to 0.3 colony forming units per stethoscope and concluded that propyl alcohol-based disinfectants had the best results 99 % reduction of colonies [9]. In study by Lokkur *et al.*, there was decrease in colony forming units from 15.38 to 1.54 when alcohol was used for decontamination [4]. 70% isopropyl alcohol rub showed a significant reduction of contaminating organisms from 38% to 10% in our study. Schroeder et al have found that cleaning the stethoscope heads reduces bacterial counts on stethoscopes [7].

When we consider the distribution of contaminated stethoscopes, 33.3% was found to be from Obstetrics and Gynaecology department which is in accordance with the study by Kuhu *et al.*, (34.6%) [8].

The predominant microorganism isolated in our study was *Staphylococcus aureus* which constituted 70.8% of the total microorganisms followed by *Micrococci* (25%) and *Klebsiella* (4.2%). Alothman et al have reported the presence of coagulase negative staphylococcus (92%) and micrococci (8%) from 13 swabs (18%) [6]. In the study by Youngster *et al.*, *Staphylococcus* was the predominant organism (47.5%). Huda *et al.*, had 29.7% of gram positive cocci and gram negative bacilli [3]. Nunenz *et al.*, had 40% of micrococci which was similar to our study [9]. Longtin *et al.*, had 20% enterococcus and 7% enterobacteriace [10]. Alothman *et al.*, had 92% of Coagulase negative *Staphylococcus*.

## CONCLUSION

The overall contamination rate of stethoscopes is very less compared to the global average .That coupled with a minimal percentage of enterobacteriace isolated, gives us a strong platform to work ahead against spread of nosocomial pathogens.

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