



Original Article

Bacterial Contamination of Stethoscope in a Tertiary Care Hospital

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Abstract

Bacterial contamination of stethoscope and its role in transmission of nosocomial infection is little known among the healthcare workers of Bangladesh. The objectives of our study is to evaluate stethoscope handling and cleaning practices, to find out the bacterial agents contaminating the stethoscopes, to determine the antibiotic sensitivity patterns of bacterial isolates from stethoscopes, and to evaluate the relationship between stethoscope cleaning practices with contamination of stethoscope in Rajshahi Medical College Hospital. This observational cross sectional study was carried out in Rajshahi Medical College Hospital during March, 2017. One hundred doctors working in different departments of RMCH were chosen randomly and were asked to fill up a self-explanatory simple questionnaire. Samples from 100 stethoscopes were obtained after swabbing the diaphragm and the bell of the stethoscope with a sterile swab moistened with saline. These swabs were immediately streaked onto blood agar, McConkey agar and chocolate agar following the standard protocol. Out of 100 stethoscopes examined for bacterial contamination, 19 stethoscopes (19%) were found to be contaminated. The organisms isolated were MRSA, pseudomonas aeruginosa, and E. coli. Among the 19 participants with bacterial contamination of stethoscope, 6 doctors (31.6%) said they used to clean their stethoscope at least occasionally and 13 doctors (68.4%) had never cleaned their stethoscope. This difference was found to be statistically significant (p value <0.005).

Key words: bacteria, stethoscope, nosocomial infection, transmission

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Introduction

Nosocomial infection is a significant hazard for the hospitalized patients and health care workers. Incidence of nosocomial infections is about 5-10 cases per 100 admissions¹ and many of them could be prevented if proper precautions are taken. Healthcare workers can acquire microorganism in their hands from their patients leading to universal recommendation of washing hands before and

after handling a patient. Despite this recommendation, hand washing guideline is not strictly followed in many underdeveloped countries and health care workers' hands are still the main route of cross-transmission.² Transmission of infection through medical devices such as stethoscope, thermometer, blood pressure cuffs, neck ties, white coats are also documented.²⁻⁵

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Stethoscopes are probably the most frequently used medical device in the hospital and have been reported to be potential vectors for nosocomial infections throughout the world. Stethoscopes come in direct contact with numerous patients daily and their disinfection after each use is not an established practice. Following contact with infected skin, pathogens can attach and establish themselves on the diaphragms of stethoscopes and subsequently be transmitted to other patients if the stethoscope is not properly disinfected.⁶⁻⁹ There are increasing reports of the risk of transmitting antibiotic resistant microorganisms' e.g. methicillin-resistant staphylococcus aureus, vancomycin-resistant enterococci, ciprofloxacin-resistant pseudomonas etc. from one patient to another on stethoscopes, which is a cause for concern.¹⁰

Bacterial contamination of stethoscope and its role in transmission of nosocomial infection is little known among the healthcare workers of Bangladesh. The objectives of our study is to evaluate stethoscope handling and cleaning practices, to find out the bacterial agents contaminating the stethoscopes, to determine the antibiotic sensitivity patterns of bacterial isolates from stethoscopes, and to evaluate the relationship between stethoscope cleaning practices with contamination of stethoscope in Rajshahi Medical College Hospital.

Materials and methods:

This observational cross sectional study was carried out in Rajshahi Medical College Hospital, a 1000-bed tertiary care hospital of Northern part of Bangladesh. Study period was March, 2017.

Results:

Out of 100 stethoscopes examined for bacterial contamination, 19 stethoscopes (19%) were found to be contaminated.

One hundred doctors working in different departments of RMCH were chosen randomly and were asked to fill up a self-explanatory simple questionnaire exploring the category of the health personnel, the frequency of cleaning their stethoscopes (daily, once in a week, once in two weeks, once in a month, once in more than a month never, or never), awareness about potential role of stethoscope in nosocomial infection etc. and all the 100 stethoscopes were sampled. Samples from stethoscopes were obtained after swabbing the diaphragm and the bell of the stethoscope with a sterile swab moistened with saline. These swabs were immediately streaked onto blood agar, McConkey agar and chocolate agar following the standard protocol. Cultures were identified by colony morphologic characteristics, Gram stain characteristics, and standardized microbiological biochemical tests. Antimicrobial susceptibility testing was carried out using disk diffusion method according to Clinical Laboratory Standards Institute (CLSI 2016) guide lines. Antibiotic disks used for sensitivity testing were methicillin, amoxycillin, amoxycloxacillin, clindamycin, ceftriaxone, cefepime, gentamycin, tetracycline, vancomycin, ciprofloxacin and linezolid.

Out of the 100 doctors, 45 worked in the Department of Internal Medicine, 17 in Paediatrics, 14 in General Surgery, 7 in Cardiology, 6 in Obstetrics and Gynecology, 5 in Neurology, 3 in Neurosurgery, 2 in ICU, 1 in Burn and plastic surgery. Data were entered and analyzed using SPSS version 16.0 computer software and p value <0.005 was considered to be statistically significant.

Table 1: Study population demographics and number of contamination

	Number	Percentage
Total number of study population	100	
Male	67	67%
Female	33	33%
Total number of contaminated stethoscope	19	
Male	13	68.4%
Female	6	31.6%

Table 2: Pattern of contamination

Isolate	Number of isolates (%)
No growth	81 (81%)
Methicillin resistant staphylococcus aureus	12 (12%)
Pseudomonas aeruginosa	6 (6%)
E. coli (ESBL: Extended spectrum beta lactamase)	1 (1%)

Table 3: Department-wise distribution of bacterial contamination of stethoscope

Department	Number of stethoscope sampled	Number of contamination	Percentage of contamination	Types of contaminating bacteria
Internal Medicine	45	8	17.7%	MRSA
Paediatrics	17	3	17.6%	MRSA
General Surgery	14	2	14.2%	Pseudomonas, E. coli
Cardiology	7	0	0%	
Obstetrics and Gynecology	6	1		Pseudomonas
Neurology	5	2		Pseudomonas
Neurosurgery	3	2		Pseudomonas, MRSA
ICU	2	1		Pseudomonas
Burn and plastic surgery	1	0	0%	

Table 4: Pattern of cleaning the stethoscope

Cleaning practices of the stethoscope (n=100)		
Have cleaned regularly or irregularly	40	40%
Never cleaned	60	60%
Awareness about the need to clean stethoscope (n=100)		
Awareness present	77	77%
Awareness absent	23	23%
Frequency of cleaning of the stethoscope (n=40)		
Daily	4	10%
Weekly	3	7.5%
Once in two weeks	4	10%
Once in a month	7	17.5%
Once in more than a month	22	55%

Among the 60 doctors who never cleaned their stethoscope, 13 were found to be contaminated with bacteria (21.7%). Among the 19 participants with bacterial contamination of stethoscope, 6 doctors (31.6%) said they used to clean their stethoscope at least occasionally and 13 doctors (68.4%) had never cleaned their stethoscope. This difference was found to be statistically significant (p value <0.005). Among the 13 doctors who had never cleaned their stethoscope; 6 (46.1%) were not aware of the risk of bacterial transmission through stethoscope, 4 (30.8%) doctors were aware of the risk but thought that the risk of bacterial transmission through stethoscope was negligible and 3(23.1%) doctors were aware of the risk but they forget to clean their stethoscope.

Discussion:

It is estimated that at any time more than 1.4 million people worldwide are suffering from nosocomial infections.¹¹Infection transmission during hospital stay remains a significant hazard throughout the world and healthcare workers are a potential source of these infections, with pathogens transmitted from their hands and stethoscopes. Though hand washing practices among doctors are universal in developed countries and increasing in developing countries, awareness among healthcare workers about

stethoscope being a potential source of nosocomial infection is not adequate. Variable degree of bacterial contamination of stethoscopes was noted in different studies. In an Ethiopian study conducted in Jimma University Specialized Hospital; out of 176 stethoscopes, 151 stethoscopes (85.8%) were found to be bacterially contaminated. *S. aureus*, *Klebsiella* spp., *Citrobacter* spp., *Salmonella* spp., *Proteus* spp., *Enterobacter* spp, *P. aeruginosa* and *E. coli* were the most common isolates in their study. High contamination rate 100 (90.9%) was observed

among stethoscopes that had never been disinfected.¹² Another study conducted in Nigeria showed, out of 107 stethoscope surveyed, 84 stethoscopes (79%) were bacterially contaminated. Organisms isolated were staphylococcus aureus, pseudomonas aeruginosa, E. coli and enterococcus faecalis. Though the rate of bacterial contamination of stethoscope found in this study was much higher than that is noted in our study, organisms isolated are almost similar.¹³

The implication of the findings is that the stethoscope might be an instrument playing an important role in the transmission of potential pathogenic microorganisms, as well as in the spread of antibiotic-resistant strains in the hospital environment. In our study, the commonest organism isolated from stethoscope is MRSA which is a cause for concern. Although we did not prove that stethoscopes cause spread of infection from one patient to another, we did show that stethoscopes can be contaminated with bacteria and poor cleaning practices were associated with increase chance of bacterial contamination of stethoscope. As even a short period of contact between stethoscope and patient's skin is enough to contaminate the stethoscope, regular cleaning of stethoscope is warranted.¹⁴ Cleaning a stethoscope diaphragm using either chlorhexidine, ethanol based cleanser or isopropyl alcohol led to a significant reduction in bacterial growth in culture, but neither was found to be statistically superior.^{15,16}

We strongly recommend regular disinfection of stethoscope with chlorhexidine or 70% isopropyl alcohol solution or ethanol based cleanser to minimize bacterial colonization of stethoscope and potential spread of infection, especially drug-resistant strains.

Conclusion:

A significant proportion of healthcare workers are not aware about the fact that stethoscopes can be a potential vehicle for transmission of nosocomial infections. Increased awareness and regular stethoscope cleaning practices may have a significant impact on reduction of spread of nosocomial infections through stethoscopes.

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