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Isolation of Multidrug Resistant Bacteria from Patients Medical Charts

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ABSTRACT

Background: Patient's medical charts in hospitals are potentially contaminated by pathogenic bacteria and might act as vehicles for transmission of bacterial infections.This study was aimed to determine the rate of contamination of medical charts by multidrug resistant bacteria.

Methods: Sampling of total 250 patient's medical charts from different wards was done with the help of cotton swabs soaked in sterile normal saline. The swabs thus collected were cultured using standard microbiological procedures. The colonies grown were then identified with the help of colony morphology, Gram's stain and biochemical tests. Antimicrobial susceptibility testing was performed by using Kirby-Bauer disc diffusion technique.

Results: Of the total 250 charts sampled, 98.8% grew bacteria; *Bacillus* spp. in 40.7%, followed by *Staphylococcus aureus* (17%), coagulase-negative *Staphylococcus* spp.(CoNS) (17%), *Citrobacter freundii* (9.6%) and *Acinetobacter* spp. (4.5%). Rate of multidrug resistance was highest in *Acinetobacter* spp. (50%). Among 83 isolates of *S. aureus*, methicillin resistance was found in 29 isolates. Similarly, two out of total 9 isolates of *Enterococcus* spp. were vancomycin resistant.

Conclusions: This study showed that patient's medical charts were contaminated with multidrug resistant bacteria including methicillin resistant *S. aureus* and vancomycin resistant *Enterococcus* spp. Strict hand washing before and after handling medical charts is recommended.

Keywords: Methicillin resistant *S. aureus* (MRSA); multidrug resistant bacteria; nosocomial infection; patient's medical charts.

INTRODUCTION

Healthcare-associated infections are the leading causes of morbidity and mortality around the world.[1] These problems are well established in developing countries.[1] The major sources of infections in hospitalized patients may be healthcare personnel, medical devices or the healthcare environment and visitors.[2] The literatures have evidenced that inanimate objects like stethoscopes, latex gloves, white coats and patient's charts might act as the source of pathogenic bacteria.[3] Hand hygiene is the most effective way of preventing the transmission and spread of the infectious agents.[3]

The emergence of multidrug resistant bacteria has further aggravated the problem caused by nosocomial infection.[4] In this study, we determined the rate of contamination of medical charts by multidrug resistant bacteria.

METHODS

A cross-sectional study was conducted at a tertiary care hospital in Kathmandu, Nepal in 2014. The prevalence (P) of contamination of patient's medical charts was found to be described as around 85% by many studies. So, the sample size was calculated by using the following formula:

Sample size = $Z^2P(1-P)/C^2$ [Z= 1.96 at 95% confidence

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level, C = 0.05].

The sample size was calculated to be around 196. However, samples from total 250 medical charts from different wards were collected from plastic covers using sterile cotton swabs soaked with sterile normal saline. These swabs were immediately inoculated into MacConkey agar, blood agar and chocolate agar by a trained microbiologist. And, the inoculated media were transported to the microbiology laboratory of National Institute of Neurological and Allied Sciences, Kathmandu, Nepal.The inoculated MacConkey agar and blood agar were incubated aerobically at 37°C for 48 hrs, while chocolate agar was incubated in carbondioxide rich environment at 37°C for 48 hrs.

The colonies grown were identified with the help of colony morphology, Gram's stain and biochemical tests.[5,6] Antimicrobial susceptibility testing was performed by Kirby-Bauer disc diffusion technique.[7] Strains of methicillin resistant *S. aureus* (MRSA) were detected by cefoxitin disc diffusion technique.[7] Similarly, strains of vancomycin resistant *Enterococcus* spp. (VRE) were detected by vancomycin disc diffusion method.[7] The bacterial strains showing resistance to three or more antibiotics belonging to different structural classes were considered as multi-drug resistant.[8]

The thickness of each agar plate was maintained to be 4mm, while pH was maintained to be 7.2-7.4. Sterility of each agar plate prepared was checked by incubating one plate of each batch (30 plates) in the incubator. Quality of the antibiotic discs were accessed on the basis of the sensitivity pattern of ATCC strains (*E. coli* ATCC 25922 and *S. aureus* ATCC 25923).The laboratory instruments were regularly monitored for their performance and corrected immediately if any deviations were found. All the procedures were performed under strict aseptic condition following standard microbiological techniques.

Data obtained were analyzed using statistical package for the social sciences version 16.0.

RESULTS

Of total, 250 charts sampled, 247 (98.8%) were found to be contaminated by bacteria. Among which, 66 (26.7%) charts contained single type of bacteria, while 181 (73.3%) charts contained more than one type of bacteria. Among all charts sampled, 3 (1.2%) showed no growth.

Four hundred and eighty nine bacterial isolates were isolated from 247 culture positive charts (250 total charts).The most common bacteria isolated were *Bacillus* spp. (40.7%) followed by *Staphylococcus aureus* (17%), coagulase-negative *Staphylococcus* spp. (17%), *Citrobacter freundii* (9.6%) and *Acinetobacter* spp. (4.5%)(table 1).

Table 1. Bacterial isolates from patient's medical charts (n=247) from different wards of a tertiary care hospital.

Bacteria isolated	Total Numbers (%)
CoNS	83 (17.0)
S. aureus	83 (17.0)
Enterococcus spp.	9 (1.8)
Micrococcus spp.	2 (0.4)
Citrobacter freundii	47 (9.6)
Citrobacter koseri	4 (0.8)
Acinetobacter spp.	22 (4.5)
Pseudomonas aeruginosa	10 (2.0)
Klebsiella pneumonia	6 (1.2)
Klebsiella oxytoca	2 (0.4)
Escherichia coli	2 (0.4)
Providencia spp.	1 (0.2)
Bacillus spp.	199 (40.7)
Corynebacterium spp.	19 (3.9)
Total bacteria	489

Multidrug resistance among the strains of *Acinetobacter* spp. was 50%, followed by *Citrobacter* spp. (39.2%) and *Klebsiella* spp. (37.5%) (Table 2).

Table 2.Multidrug resistant bacteria isolated from patient's medical charts (n=247) in a tertiary care hospital.

Organisms	Total no. of isolates (%)	Multidrug resistant isolates n (%)
CoNS	83 (31.0)	23(27.7)
S. aureus	83 (31.0)	20(24.1)
P. aeruginosa	10 (3.7)	2(20.0)
Citrobacter spp.	51 (19.0)	20(39.2)
Klebsiella spp.	8 (3.0)	3(37.5)
Acinetobacter spp.	22 (8.2)	11(50.0)
E. coli	2 (0.7)	1(50.0)
Enterococcus spp.	9 (3.4)	3(33.3)
Total	268	83(30.9)

Among total 83 isolates of *S. aureus*, methicillin resistance was found in 29 isolates. Similarly, two out of total 9 isolates of *Enterococcus* spp. were found to be vancomycin resistant.

DISCUSSION

Of 98.8% patient's charts (of 250 study samples) contaminated by bacteria, single organism was present in 26.7% of culture positive charts while multiple organisms were isolated from 73.3% of charts showing bacterial growth. Among the bacteria isolated, there were more gram positive cocci (36.2%) than gram negative bacilli (19.2%). Earlier studies also showed similar high contamination rates of medical charts.[9,10] The *Bacillus* spp., which is an environmental flora was the common isolate in our study. Similar to the findings from other parts of world, other bacteria isolated in our study were CoNS, *S. aureus*, *Citrobacter freundii*, *Acinetobacter* spp., *P. aeruginosa*, *Enterococcus* spp. and *Klebsiella* spp.[9-11] The presence of environmental flora in the medical charts is not a matter of great concern as they are not commonly associated with hospital acquired infections but the isolation of the pathogenic bacteria which are the common causes of nosocomial infections from the patients charts (which are regularly handled by health care workers) is a matter of great concern.

The rate of isolation of MRSA from medical charts was higher in our study in comparison to other studies.[9,10] In a study in Nepal, the nasal carriage rates of MRSA among healthcare personnel, visitors/patient attendants and the patients were found to be 10.0%, 8.2% and 3.2%, respectively.[12] However, in another study by Pant and Sharma the carriage rate of MRSA among the healthcare workers in intensive care unit was reported to be quite high (58%).[13] The carriage rate of MRSA among healthcare personnel working in the hospital where we conducted this study might be high.

As in our study, contamination of medical charts by VRE has also been found in another study.[14] Most of the organisms isolated from the medical charts showed multidrug resistance. The highest rate of multidrug resistance was seen among the strains of *Acinetobacter* spp. *Acinetobacter* species is one of the most common causes of nosocomial infections and it is inherently resistant to many antibiotics.[15,16] The medical charts were found to be used for multiple patients without any disinfection. Periodic cleaning of the surface of plastic covers of the medical charts by alcohol may help to reduce the rates of nosocomial infections.[3] Further, it is necessary to wash hands before and after touching of medical charts.[17]

The isolation of highly drug resistant bacteria like MRSA and VRE from the medical charts (which are frequently handled by the healthcare professionals) cannot be neglected and strict implementation of hand hygiene program (along with regular disinfection of the surface of plastic covers of the medical charts by effective disinfectants) is essential. In Nepal, no hand hygiene program is implemented in most of the hospitals. The main reasons for this may be lack of infrastructures, lack of trained manpower and lack of awareness about the importance of hand hygiene.[18] Further, local hand hygiene compliance data are not available. So, in this scenario this study will be a wakeup call for the responsible authorities to implement the hand hygiene programs in hospitals of Nepal.

CONCLUSIONS

The patient's medical charts were found to be contaminated with multidrug resistant bacteria including the superbugs like MRSA and VRE and might act as the sources of nosocomial infections. Thus,our study highlights the importance of effective hand washing before and after handling of medical charts.

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