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Bacterial colonization of blood pressure cuff: A potential source of pathogenic organism: A prospective study in a teaching hospital

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Abstract

Background: Hospital acquired infections (HAIs) occurs frequently among hospitalized patients and Blood pressure cuffs (B.P cuffs), as with other non - invasive devices have been shown to be involved in the transmission of colonizing pathogens. No standard protocol advocating the importance of sterilisation of the B.P cuffs, which imply these devices, are not considered being a significant risk as fomites or no pathogenic risk for HAIs. Hence our study is aimed to know the bacterial colonization in the B.P cuffs using in our hospital and to emphasize the importance of high vigilance and decontamination of B.P cuffs in prevention of cross infections in hospital settings.

Methods: Sample was collected from the inner surface of the B.P cuffs (n=50) before and after decontamination with 70% isopropyl alcohol by using sterile swab soaked in sterile saline. The culture was done as per standard conventional methods.

Results: Among the B.P cuffs (n=50) sampled, 34/50 were showing high contamination (>300cfu/plate), 10/50 showed insignificant growth (10 cfu/plate) and 6/50 showed no growth. The organisms isolated were Methicillin Resistant Staphylococcus aureus (MRSA) 10/50, Coagulase Negative Staphylococcus (CNS) 12/50 and Klebsiella pneumoniae 12/50. After decontamination no growth of MRSA and CNS were found whereas Klebsiella pneumoniae was reduced in number 10cfu/plate in all the previously grown samples.

Conclusion: Our study showed significant level of bacterial colonization in the B.P cuffs. So an urgent need to alert and educate hospital staffs which will strengthen the care for developing and implementing validated standard operating procedure for the maintenance of B.P cuffs.

Keywords: blood pressure cuffs, hospital acquired infections, pathogens, cross infections, bacterial colonisation, disinfection

1. Introduction

Hospital acquired infections occur frequently among hospitalized patients [1, 2, 3, 4] and blood pressure (BP) cuffs as with other non- invasive items like stethoscope, scissors, gloves etc have been shown to be involved in that transmission. [5, 6, 7, 8] colonization of microorganisms might be of greater significance in the case of immunosuppressed, obstetric and orthopaedic patients undergoing joint replacement because of the increased need of sterility [9] Decades of research has been done on fomites borne cross infection. Nosocomial infection from contaminated equipments such as B.P cuff is a major problem [10] significant bacterial colonization with drug resistant organisms on the surface of B.P cuffs can lead to cross infection among patients either directly or indirectly by health care workers hands [11].

Many studies have been conducted in developed countries but few have been conducted in developing countries like India. In many health care settings, patient safety guidelines do not adequately addresses proper usage and maintenance of medical devices like B.P apparatus, stethoscope etc. for the prevention of disease transmission [12]. Hence this study is aimed to know the bacterial colonization in the B.P cuffs using in our hospital and also to emphasize the importance of high vigilance and decontamination of B.P cuffs in prevention of cross - infections in hospital settings.

2. Materials & Methods

Study design: The study is prospective, observational and cross section study.

Study area: Tertiary care teaching hospital

Study period: Two months

Sample size: n=50 - B.P cuffs used in different Outpatients departments (OPD) and in patient (IP) wards.

2.1 Methods

The B.P cuffs (n=50) used in various OPDs and IP wards were sampled as given in Table 1. The sample was collected by using sterile swab soaked in sterile saline. The sampling was taken from the entire inner surface of the cuff touches the patient skin surfaces. After the first sample taken, the B.P cuff contact surface was cleansed with 70% isopropyl alcohol and left for 5 minutes. Then the second sample was collected. Both the swabs were transported immediately to the laboratory. The sample was inoculated in blood agar and MacConkeys agar, incubated at 37^0C for 48 hours. The growth pattern was observed, colonies were counted and species was identified as per standard conventional methods. The drug resistance like Methicillin Resistant Staphylococcus aureus (MRSA) and Extended spectrum of Beta Lactamases (ESBL) was detected by using Cefoxitin 30µg disc and Combined disc method (Ceftazidime 30µg & Ceftazidime + Clavalunic acid 10µg) respectively.

The B.P cuff was considered to be abnormally contaminated when the number of colony forming units (cfu) per plate was 100 or more (ie; 4cfu/cm^2 or more) and highly contaminated when the number was more than 300cfu/25cm^2 (ie; more than 12cfu/cm^2) [13].

3. Results

Among the B.P cuffs sampled (n=50), 34/50 (68%) B.P cuffs were showing high contamination (>300cfu/25cm^2) and remaining 10/50 (20%) showed insignificant growth (2-3 cfu/ 25cm^2), 6/50 (12%) showed no growth. The organisms identified as MRSA 10/50 (20%), Coagulase negative Staphylococcus (CNS) 12/50 (24%), and Klebsiella pneumoniae 12/50 (24%) in which 5/12 were ESBL and 7/12 were non- ESBL. (Table 2) The mixed growth was observed in 20/34 (59%) B.P cuffs and 14 samples were showing pure growth viz; MRSA 5/34(15%), CNS 5/34 (15%) and Klebsiella pneumoniae 4/34 (12%). In the mixed growth either two or three types of bacteria was present with high colony forming units. After decontamination of the B.P cuffs with 70% isopropyl alcohol, no growth was found in the cuffs shown growth of MRSA & CNS whereas Klebsiella pneumoniae reduced in number. (ie; >300 cfu to 10cfu/plate). (Table 2)

Heavy contamination was noted in OPDs (68%) than in-patient wards (61%). Amongst the departments where more of B.P apparatus have been used, more bacterial colonization was observed in Medicine (90%), Obstetrics &Gynaecology (88%), surgery (78%), MICU (75%) and less in Paediatrics (25%). (Table 1)

4. Discussion

Our study showed extensive contamination of B.P cuffs using in most of the OPDs and In-patients wards. Less contamination was observed in psychiatric and paediatrics wards. The most highly contaminated B.P cuffs were observed in Casualty, Medicine, OBG, surgery and MICU as given in Table 1, probably because of frequent usage of apparatus and no cleaning in between patients was perceived in any wards. None of the staff nurses and interns were aware of that these routinely using apparatus as a potential source of infection.

A study by Webb *et al.* using cultures taken from blood pressure cuffs found MRSA on 9% of the cuffs, whereas in our study MRSA (20%) was isolated from the cuffs, which was very high[14]. Also in their study, no MRSA was found after a barrier (B.P cuff sleeve) was used. This is in consistent with our study where the cuff was cleansed with 70% isopropyl alcohol and no growth of MRSA and CNS was observed but klebsiella pneumoniae was grown in all the cuffs even after decontamination but in reduced number of colonies. This may be due to improper cleaning procedure and contact time would have given for 10 minutes instead of 5 minutes as per CDC guidelines for non – critical devices [15].

The study by Walker *et al.* assessed the level of contamination and observed 24 cuffs with viable organisms and three grew a mixture of organisms, MRSA 2 cuffs, MSSA 8 cuffs and Clostridium difficile on 8 cuffs [16]. The same mixed growth was seen in our study with higher colonization rate but no Clostridium difficile was isolated. Very earlier study by Base – Smith, Sphygmonometer cuffs were found to have bacterial colonization rates of 81-100% [17] and in our study it was 68% and it is less in comparison but in consistent with the study by Khyati J *et al.* where the colonization rate was 38/50 (76%) [18]. But Meyers *et al.* identified a single blood pressure cuff as a common source of nosocomial infection outbreak in a neonatal intensive care unit[10] whereas in our study no colonization was observed in NICU and overall contamination rate in paediatric departments was only 25%. The reason could be less usage of B.P apparatus in this department.

Increasing rates of drug resistant bacterial infections such as MRSA, VRE, ESBL, MBL etc. make it imperious that the spread of pathogens from patient to patient to be contained.[19] The study done by Walker *et al.* and our study recommended that a barrier between cuff and skin would be a viable option to help prevent the spread of pathogens. There are several options available to help reduce the spread of pathogens by blood pressure cuffs one of which recommends the use of disposables B.P cuffs in their guidelines for control of pathogen transmission [20]. The second one is reusable cuff with lifelong antimicrobial coatings will also effectively reduces the contamination. The third one is use of barriers such as blood pressure sleeve is well supported in many studies [14, 21, 22]. The sleeve would be more cost effective than disposable cuffs and sleeves are available in different names like cuff - guard, arm - guard, tourniquets cover etc. and special order for needed size is also feasible [23].

Disinfecting and cleaning cuffs is by far the most common method used which is economical and cost effective but even after cleaning, organisms are still cultured from B.P cuffs[13] which is similar to our study where Klebsiella pneumoniae was isolated even after cleaning with 70% isopropyl alcohol. Finally hand washing is also important to reduce transmission of pathogens between patients and patient to health care workers.

Table 1: Shows sampling from B.P cuffs using in various departments and its bacterial colonisation rate

S. No	Departments	No of samples collected in each department		No of B.P cuffs showing growth		Isolation rates
		In Patients wards	OPD	In Patients wards	OPD	
1.	Medicine	5	5	4/5	5/5	90%
2.	Surgery	5	4	3/5	4/4	78%
3.	Orthopaedics	4	2	¼	2/2	50%
4.	Paediatrics	2	2	0/2	1/2	25%
5.	Obstetrics & Gynaecology	5	3	4/5	3/3	88%
6.	MICU	4	0	¾	-	75%
7.	Casualty	3	0	3/3	-	100%
8.	Ophthalmology	0	1	-	0/1	0%
9.	ENT	0	2	-	1/2	50%
10.	Psychiatry	0	1	-	0/1	0%
11.	Dermatology	0	1	-	0/1	0%
12.	Blood bank	0	1	-	0/1	0%
	TOTAL	28	22	18/28 (64%)	16/22 (73%)	68%

Table 2: Shows types of bacteria isolated from B.P cuffs

Type of bacteria isolated (34/50)	Before decontamination		After decontamination
	Number	Frequency	Number
MRSA	10	20%	0
CNS	12	24	0
Klebsiella pneumoniae (non - ESBL)	5 (>300 cfu/25cm^2)	10	5 (10 cfu/plate)
Klebsiella pneumonia (ESBL producer)	7 (>300 cfu/25cm^2)	14	7(8-10cfu/plate)
Total	34	68%	

Conclusion

Prevention is the key factor to reduce the transmission of pathogens through equipments use, such as the B.P cuff. Our study concluded and suggests that the health care workers need to be aware of potential cross contamination from blood pressure cuff used in hospitals which is lacking among them. So there is an urgent need to alert and educate all hospital staffs. This education will strengthen the care for developing and implementing validated standard operating procedure for the use and maintenance of B.P cuffs and other devices by health care workers in all the health care settings.

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References

1. Tikhomirov E. WHO programme for the control of hospital infections. Chemioterapia. 1987; 6:148-51.
2. French prevalence survey study Group. Prevalence of nosocomial infections in France: Results of the nation-wide survey in 1996. J Hosp Infect. 2000; 46:186-193.
3. Jarvis WR. Infection control and changing health - care delivery systems. Emerg Infect Dis. 2001; 7:170-173.
4. Weinstein RA. Nosocomial infection. Emerg Infect Dis. 1998; 4:416-420.
5. Gerken A, Cavanagh S, Winner HI. Infection hazard from Stethoscopes in hospital. Lancet. 1972; 1:1214.
6. Marinella MA, Pierson C, Chenoweth C. The stethoscope a potential source of nosocomial infection. Arch Intern Med. 1997; 157:786-790.
7. Wong D, Nye K, Hollis P. Microbial flora on doctors' white coats. BMJ. 1991; 303:1602-1604.
8. Embil JM, Zhanel GG, Plourde PJ, Hoban D. Scissors: a potential source of nosocomial infection. Infect Control Hosp Epidemiol. 2002; 23:147-151.
9. Stemicht AL, Poznak AV. Significant Bacterial Colonization on the surface of Non – Disposable sphygmomanometer cuffs and Re - used Disposable cuffs. Anesth Analg. 1990; 70:3391.
10. Martin G, Myer *et al.* Longitudinal evaluation of neonatal infections: association of infection with Blood pressure cuff. Pediatrics. 1978; 61:42-45.
11. Cormican MGM, Lowe DJ, Keane P, Flynn J, O'Toole K. The microbial flora of in-use BP cuffs. Ir J Med Sci. 1991; 160:112-113.
12. Madar R, Novakova E, Barka T. The role of non-critical health-care tools in the transmission of nosocomial infections. Bratisl Lek Listy. 2005; 106:348.
13. De Gialluly C, Morange V, De Gialluly E, Loulergue J, Van der Mee N, Quentin R. Blood pressure cuff as a potential vector of pathogenic microorganisms: a prospective study in a teaching hospital. Infect Control Hosp Epidemiol. 2006; 27:940-943.
14. Webb SR. Single - use Disposable Barrier Reduces microbial concentrations on BP cuffs in Dialysis Centre Study. Dialysis & Transplantation. 2002, 2-8.
15. William AR, David JW. and the Healthcare Infection Control Practices Advisory Committee (HICPAC). Guideline for Disinfection and Sterilization in Health care Facilities. CDC. 2008, 11.
16. Walker N, Guptal R, Cheesbrough J. Blood pressure Cuffs: friend or foe? J of Hosp Infect. 2006; 64(2):167-169.
17. Khyati J, Nillesh SC, Jain SM. Blood Pressure Cuff – As a fomite for cross infection. Int J Curr Microbiol Appl Sci. 2014; 3(6):755-758.
18. Base – Smith V. Non disposable sphygmomanometer cuffs harbour frequent bacterial colonization and significant contamination by organic and inorganic matter. AANAJ. 1997; 65(1):28.
19. Sandra Jaber RN. Pathogen transmission from Blood pressure cuffs. Journal of Nursing. 2002. From: www.RNJournal.com
20. Centre for Disease control. Guidelines for isolation precautions: Prevention transmission of infectious agents in health care settings. 2007, Atlanta, Georgia.
21. Hwang Y, Brinton B, Leonard P, Wood M, Carroll K. Investigation of an outbreak of Vancomycin resistant Enterococcus in a low prevalence University hospital. Journal of investigative Medicine. 1998; 46(9):435-443.
22. Manian F, Meyer L, Jenne J. Contamination of blood pressure cuffs at a rate similar to bedside commodes. Infectious control Hospital Epidemiology. 2008; 17(3):180-182.
23. Bowen Medical, Cuff-Guard, Disposable blood pressure cuff covers. www.bowenmed.com.