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Original Research Article

Screening for Colonization of Drug Resistantbacteriain Nasal and Oral Cavity of Haemodialysis Patients

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Abstract:

Background: Nasal colonization with methicillin-resistant Staphylococcus aureus (MRSA) is a well-defined risk factor for subsequent bacteraemia and death in various groups of patients, but its impact on outcome in patients receiving long-term haemodialysis (HD) is under debate.

Aim: To screen for colonisation of drug resistant gram positive and gram negative bacteria in nasal and oral cavity in haemodialysis patients.

Method: we prospectively screened 100 patients who were undergoing haemodialysis. After taking verbal consent nasal and oral swabs were collected one on the first meet and second in the subsequent visit. These swabs were processed as per standard protocol. Staphylococci were screened for MRSA and Inducible Clindamycin resistance & Gram negative bacilli were screened for ESBL, AmpC and MBL as per CLSI guidelines.

Result: Among the 100 enrolled patients bacterial colonisation was seen in 28 nasal,11 oral and 52in both. Out of which colonisation of drug resistant bacteria seen in 13 nasal, 7oral and among 52 patient,30 had nasal and 30 oral colonisation. During the first swab study 42 were resistant gram-negative bacilli out of which33ESBL(28 oral & 5 nasal), 20 MBL (18 oral&2nasal).Among Staphylococci MRSA 31[29 nasal & 2 oral],Inducible clindamycin resistant 20 [17 nasal & 3oral]. In the subsequent visit MRSA and Inducible clindamycin resistance were increased to 78 & 47 respectively in nasal colonisation and resistant gram negative bacilli increased to49 ESBL, 23 MBL & 1 AmpCin the oral swabs.

Conclusion: The prevalence of colonisation with drug resistant gram positive cocci was more in nasal, whereas gram negative in oral and there was marked increase in these in the subsequent visit. Screening may be useful to control infection in this group.

Keywords: ESBL, MBL, MRSA, AmpC, nasal, oral colonization.

Introduction

The incidence of primary bacteremia in hemodialysis (HD) patients is reported to be between 2.0% and 4.5% per 1,000 catheter-day, or one to 2 episodes per patient-year. The use of HD catheters is a major mortality predictor in HD patients. Primary bacteremia is the most common cause of morbidity and the second most common cause of mortality in HD patients. [1] Rates of antibiotic-resistant bacteria are highest among the patients who require chronic hemodialysis. These patients are mainly screened for VRE and MRSA. In the past few years, however, a concerning increase in the prevalence of infections caused by drug-resistant gram-negative bacteria (DRGNB) is documented. Among chronic hemodialysis patients, approximately 25% of blood stream infections are caused by gram-negative bacteria, and this percentage is increasing steadily. [2]

A prospective surveillance study was therefore performed to describe the clinical epidemiology of drug resistant bacterial colonisation among patients who are undergoing hemodialysis.

Aims & Objectives

1. To screen for bacterial colonisation in nasal and oral cavity of patients who are undergoing chronic haemodialysis

2. To know the colonisation with drug resistant strains in these patients.

3. To correlate with the risk factors that are associated with drug resistant bacterial colonisation

Materials and methods

Study Design: Laboratory based prospective study.

Study Period: From July 2015 to July 2016.

Settings: Study was carried out at Hemodialysis unit and Department of Microbiology, MMC & RI.

Methodology

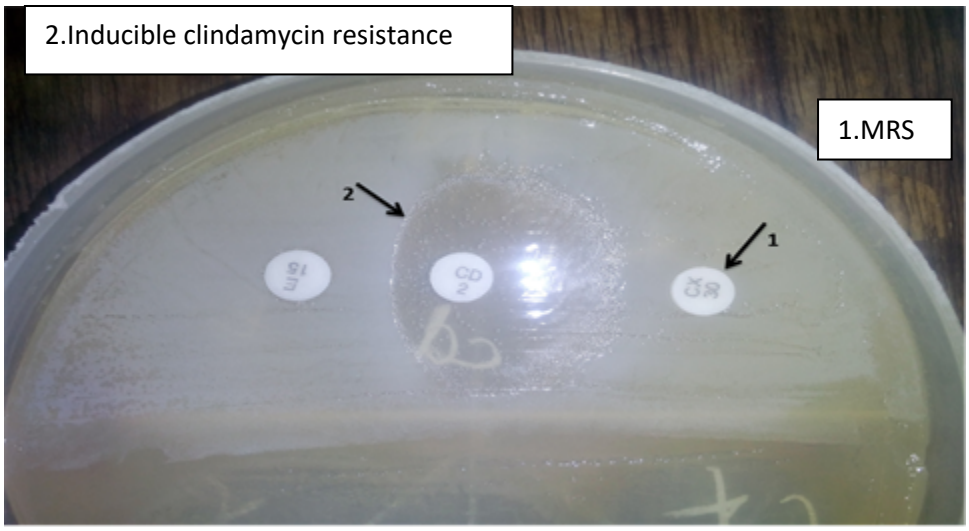
After obtaining clearance from Institutional Ethics Committee (IEC),the present study was conducted including all patients in the HD Unit. The study included 100 patients who were undergoing chronic hemodialysis at this unit. After obtaining verbal consent, detailed history – co morbidities, residency in long term care facility, antibiotic usage, admission to hospital >7 days in previous 3 months was taken. Nasaland oral swabs were collected from these patients with the help of sterile cotton tipped swabs. Both nasal and oral swabs were immediately streaked onto Blood agar and McConkey agar plates and incubated at 37°C for 24hr. Identification of isolates were done by standard microbiological techniques such as colonial morphology, cultural characteristics on blood agar and mac-conkey agar, Gram-reaction, catalase and coagulase tests, and biochemical reactions.

Detection of resistant strains done as per CLSI guidelines using the Kirby-Bauer disc diffusion method.[3]

For S. aureus, MRSA and Inducible Clindamycin Resistance were tested as given below.

MRSA- 30 µg cefoxitin disk was placed on Muller Hinton Agar (MHA) and incubated at 33 to 35°C; ambient air for 16–18 hours. A zone diameter of ≤ 21 mm = **MRSA.**

Inducible Clindamycin resistance- 15-µg erythromycin and 2- µg clindamycin disks were spaced 15–26 mm apart on MHA. Flattening of the zone of inhibition adjacent to the erythromycin disk (referred to as a D-zone) = **inducible clindamycin resistance.**



For Gram negative bacteria, ESBL, MBL, and Amp-C were tested as given below.

ESBL-Ceftazidime(30µg) and Ceftazidime-clavulanate(30/10µg) were placed 15-20mm apart. A ≥ **5-mm** increase in a zone diameter for either antimicrobial agent tested in combination with clavulanate vs the zone diameter of the agent when tested alone = **ESBL**

MBL- Imipenem(10µg) and Imipenem-EDTA disc spaced 15-20mm apart. If difference of zone of inhibition between these two drugs is ≥ **5mm =MBL**

AmpC- Cefotaxime(30µg) and Imipenem(10µg) were spaced 15-20mm apart. Blunting towards Imipenem = **AmpC induction**

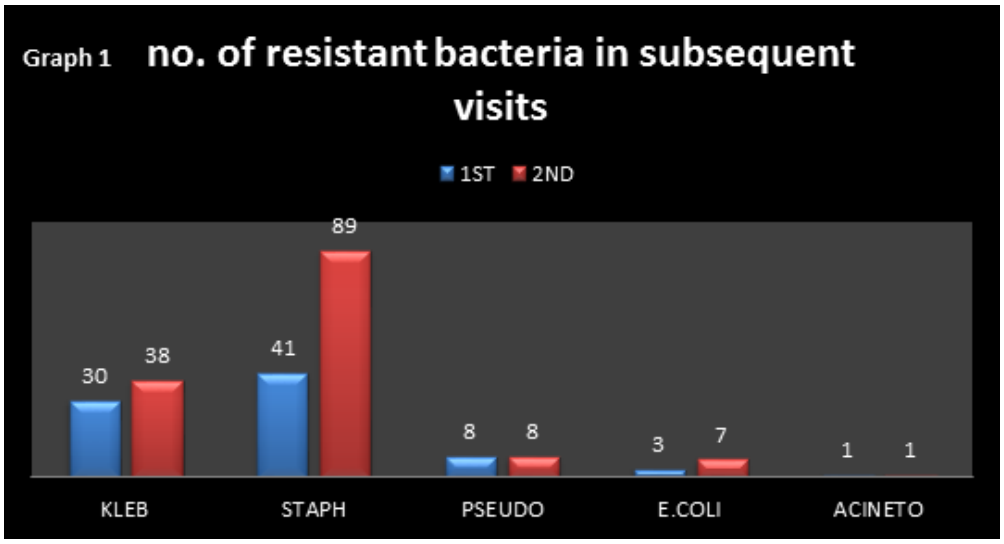
Results

Among 100 patients, 90 had colonisation either in oral cavity or nasal cavity. Out of which 64 were colonized with one or more antimicrobial- resistant bacteria at study enrolment. We documented nasal colonization in 28 patients, out of which 13 are colonized with resistant bacteria. Oral colonization was evidenced in 11 patients, out of which 7 were resistant bacterial colonisation. 52 patients had colonisation in both oral and nasal cavity. Among them resistant bacterial colonisation found in equal no. in oral and nasal cavity, i.e 30. The most relevant nasal and oral colonizing isolations can be found in tables 1.

Table 1: Nasal & oral colonizations in patients of the Hemodialysis Unit

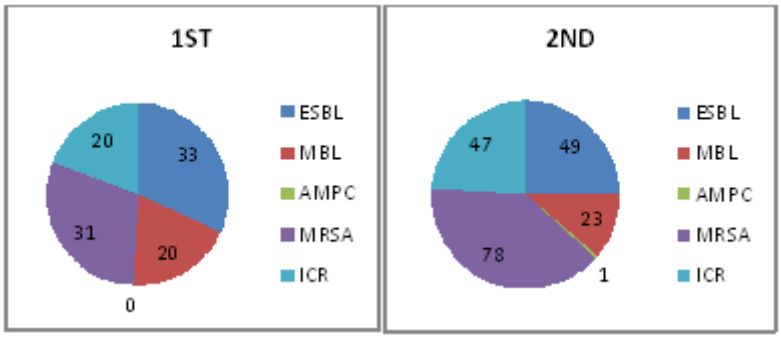
	Nasal	Oral
Staphylococcus aureus	77	20
Klebsiellapneumoniae	6	36
Escherichia coli	0	7
Pseudomonas spp.	0	9
Acinetobacter spp.	1	1

The no. of resistant bacteria were increased during the subsequent visits as shown in the graph 1.



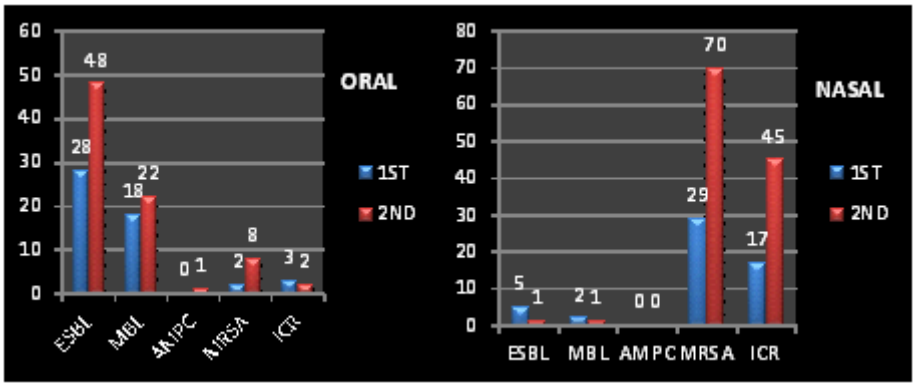
Prevalence of Antimicrobial-Resistant Bacteria-

During the first swab study, 33 ESBL & 20 MBL were found in the resistant gram negative bacteria. Among Staphylococci MRSA was 31, & Inducible clindamycin resistant 20. Which increased in the subsequent visits.



No. of resistant bacterial colonisation during 1st& 2nd meet

Depending on the site of colonisation the no.s were as follows



Comparision of % of nasal& oral colonisation of resistant bacteria

Risk Factors for MDRGN Colonization

Demographics and clinical characteristics of patients with and without MDRGN colonization are presented in Table 2. On logistic regression, antibiotic exposure ≥ 7 d in the previous 3mo and residence in LTCF were independently associated with MDR bacterial colonization.

Table 2. Demographic and clinical characteristics of long-term hemodialysis patients with and without MDR bacterial colonization

	Patients Colonized with resistant bacteria	Patients not Colonized with resistant bacteria
Age ≥ 60 Yrs	29	7
Male	50	23
Hospitalization ≥ 7D	46	12
Antibiotic Exposure ≥ 7D	38	14

Discussion

In this study, there was an almost equal prevalence of drug resistant gram negative bacteria and gram positive. They were recovered from 35% & 40% of chronic hemodialysis patients at enrollment respectively. Although this study did not address infections that are caused by MDR bacteria, colonization is a necessary prerequisite for subsequent infection. Thus, patients who are colonized with MDRGN are at greater risk for subsequently developing an infection with these bacteria. In one study, 15% of hospitalized patients who were colonized with MDR bacteria developed a bacteremia caused by the same colonizing strain of MDR bacteria. [2]

The subgroup of chronic hemodialysis patients who were at highest risk for harboring Drug resistant bacerial colonization at enrolment were patients who resided in an LTCF and those with antibiotic exposure in the previous 3 mo. [3]

In an another study by E.L. Alexander et al in NewYork,86 S. aureus isolates were collected from 45 dialysis patients, out of which 26 were Methicillin-resistant. [4] A study by Aurora et al from Boston showed Eleven (16%) and three (5%) patients were colonized with multidrug-resistant gram-negative bacteria and methicillin-resistant Staphylococcus aureus, respectively, who require chronic haemodialysis.

Conclusion

64% patients were colonised with one or more antimicrobial-resistant bacteria in this study. There was marked increase in these in the subsequent visit, which correlates with the repeated visit of the patient to the hospital. The clinical implication of our findings is that antimicrobial agent especially carbapenem, cephalosporins, fluoroquinolones and metronidazole should be used with caution. There is a need for substantial future research focusing on the epidemiology of DRB in the outpatient dialysis unit. Because the majority of studies have focused on infections that are caused by gram-positive bacteria, especially VRE and MRSA, a first step would require future studies also to focus on infections that are caused by gram-negative bacteria and report their antimicrobial susceptibility profile.

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