Research Article

Incidence of MDR - bacterial colonization in the surgical ward patients in rural tertiary care hospital, Puducherry

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Abstract

Objective: surgical and non surgical wound infections in diabetics is the major problem faced by the physicians due to poor healing and occasionally leads to life threatening complications if not treated with proper antibiotics. In recent years the frequent and multiple use of antibiotics for the treatment of these infections leads to the development of drug resistance. In the present study we evaluated the microbial and antibiotic resistance profile of the patients admitted in surgical ward with wound infections with reference to the diabetes. **Materials and Methods:** 138 randomized patients of both genders, who were admitted in the surgical wards, with suspected bacterial infection and tested for the antibiotic susceptibility from the period of November 2014 – March 2015. **Results:** Gram negative bacterial infectivity was increased (68.7%) than gram positive infection (31.3 %). It includes multidrug resistance. MDR was found to be high in diabetic patients (97.1%) compared to non diabetic patients (70.3%). **Conclusion:** Diabetic wound harbors the Gram negative bacteria and facilitates development of MDR which could be the risk factor for the spread of bacterial infections in surgical wards.

Keywords: Antibiotic sensitivity, Surgical wound infections, MDR, Diabetes.

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INTRODUCTION

The incidence and prevalence of bacteriological flora in surgical ward infections is changing from places to hospital setting. Despite of the modern facilities, standard operating protocols and aseptic environment, the incidence of surgical infections are increasing. This is mainly because of the emergence of multi drug resistant bacteria[1]. Yearly approximately 10% of patients admitted in surgical wards develop infections, which may leads to serious complications[2]. The infection in surgical ward is associated with various risk factors like, Diabetes Mellitus (DM), personal hygiene, hospital environment, sterilization process and frequent use of antibiotics. The patients may acquirae infection through operating procedure, air borne, and cross infection from infected patients[3]. *Staphylococcus aureus*, *Streptococcus, E. coli, Enterococci, Proteus spp*, *Coagulase-negative staphylococci* and *Pseudomonas aeruginosa* are the commonest pathogen frequently involved in surgical wound infections. The development of drug resistance in these pathogens is common and may lead to failure of antibiotic treatment. In such patients amputation or surgical debridement is the only treatment of choice[4,5]. The treatment of infections in diabetic patients is challenging and if left untreated it may evolve in fatal infections with high mortality.[6]. The present study was carried out with the primary aim of detection of bacterial

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pathogen and their antimicrobial susceptibility in diabetic and non diabetic patients admitted in surgery ward.

MATERIALS AND METHODS

This study includes 138 randomized patients of both genders, admitted in the surgical wards between the period of November 2014 – March 2015. The antimicrobial susceptibility of the isolates was assessed with respect to diabetic and non-diabetic patients. Wound swabs for the culture and susceptibility test was collected using sterile cotton swab. Direct microscopy was performed to assess the load of microbes, 5% blood agar and MacConkey quadrant streaking performed for isolation of bacterial pathogens. The streaked plates were incubated at 37^0C for 18-24hrs. After, 24 hours of incubation the plates examined for isolated colonies. Identification of isolates were done based on the colony morphology, Gram staining, Motility, Catalase test, Oxidase test, Coagulase test, Standard biochemical tests and Oxidation – Fermentation test. All the isolates tested for antimicrobial susceptibility against antimicrobial agents by Kirby-Bauer's disc diffusion method, using 17 antibiotics from different groups, Amikacin, Gentamicin, Ofloxacin, Ciprofloxacin, Teicoplanin, Clindamycin, Co-trimoxazole, Cefoxitin, Vancomycin, Tetracycline, Tobramycin, Levofloxacin, Cefuroxime, Ceftazidime, Ceftrioxone, Imipenem and Clavulanic Acid. All the antibiotic discs were purchased from Hi Media Ltd., Mumbai, India. The antibiotic sensitivity testing was done according to CLSI guidelines. By using the standard control strains i.e. *S. aureus* ATCC 25923, *Enterococcus faecalis* ATCC29212, *K. pneumoniae* ATCC70063 and *P. aeruginosa* ATCC 27853.

RESULTS

Total of 138 patients were included in this study. Among them 81 were male and 57 were female. The diabetic profile of all the patients showed that 23 male and 26 females were diabetic. From the 138 samples tested, 94 cases were positive, in which, 5 were polymicrobial and 89 were monomicrobial. The total number of bacteria isolated were 99 in which Gram negative bacteria (68.7%) was predominant than the Gram positive (31.3%) bacteria. Among the individual isolates, *pseudomonas* was found predominantly (20.2%), followed by *E. coli* (18.2%), *Staphylococcus aureus* (17.2%), *Klebsiella* (16.1%), *Proteus* (12.1%), *Coagulase negative staphylococci* (12.1%) and the other species were also found in less ratio (table 1).

Table 1: Pathogenic organism isolates from diabetic and non-diabetic patients

Isolates	Diabetic patients(49)	Non-diabetes patients(89)	Total no. of isolates (n=99)
Coagulase negative staphylococci	5	7	12
Staphylococcus aureus	2	15	17
Enterococcus species	-	1	1
Streptococcus species	-	1	1
Acinetobacter species	-	2	2
Klebsilla species	6	10	16
Pseudomonas species	8	12	20
Proteus species	6	6	12
E.coli	8	10	18
Total	**35**	**64**	**99**

Gram positive bacteria shown high resistance against co-trimoxazole (80.6%) followed by, clindamycin (71%), ciprofloxacin (71%), tetracycline (61.3%) and gentamycin (51.6%) and highly sensitive against cefoxitin (9.7%) followed by, vancomycin (9.7%), teicoplanin (16.1%) and amikacin (25.8%). Among the gram positive bacteria, Coagulase negative staphylococci were highly resistant against co- trimoxazole (100%) and gentamicin (75%) and highly sensitive against, vancomycin (100%), teicoplanin (83.3%) and amikacin (83.3%). *S. aureus* was resistant against, ciprofloxacin (88.2%) and clindamycin (88.2%) and sensitive to cefoxitin (88.2%) and vancomycin (100%). Gram negative bacteria shown high resistant against, ciprofloxacin (81%) followed by, ceftazidime (79.4%), gentamicin (73.5%), ofloxacin (70.6%) and ceftrioxone (70.6%) and more sensitive against, imipenem (72.1%). Among the individual isolates, *Pseudomonas* was resistant against, ciprofloxacin (90%), ceftazidime (80%) amikacin (80%), ceftrioxone (75%) and tobramycin (75%) and more sensitive to imipenem (90%). *E.coli* was more resistant to ofloxacin (88.9%), ciprofloxacin (83.3%), cefuroxime (77.8%) and ceftazidime (77.8%) and more sensitive to amikacin (83.3%). *Klebsilla* was resistant to ceftazidime (87.5%) gentamicin (81.2%), tobramycin (81.2%), ceftrioxone (81.2%), cefuroxime (81.2%) and ofloxacin (75%) and sensitivity was more to Imipenem (75%).

Table 2: Antibiotic sensitivity pattern of Gram positive bacteria

Antibiotic	Coagulase negative staphylococci (CONS)	*Staphylococcus aureus*	Streptococcus sp.	Enterococcus sp.	Total
Total	12	17	1	1	31
Amikacin	2	5	0	1	8 (25.8%)
Gentamicin	9	5	1	1	16(51.6%)
Ofloxacin	4	8	1	1	14(45.2%)
Ciprofloxacin	6	15	0	1	22(71%)
Teicoplanin	2	2	1	0	5(16.1%)
Clindamycin	6	15	0	1	22(71%)
Co- trimoxazole	12	12	0	1	25(80.6%)
Cefoxitin	0	2	0	1	3(9.7%)
Vancomycin	1	2	0	0	3(9.7%)
Tetracycline	7	11	0	1	19(61.3%)

Table 3: Antibiotic sensitivity pattern of Gram negative bacteria

Antibiotic	*Acinetobacter baumanii*	*Klebsilla* sp.	*Pseudomonas* sp.	*Proteus sp.*	*E. coli*	Total
	2	16	20	12	18	68
Amikacin	0	5	16	5	3	29(42.6%)
Gentamicin	1	13	14	9	13	50(73.5%)
Tobramycin	1	13	15	6	8	43(63.2%)
Ofloxacin	1	12	13	6	16	48(70.6%)
Levofloxacin	1	8	14	9	10	42(61.8%)
Cefuroxime	0	13	12	5	14	44(64.7%)
Ceftazidime	1	14	16	9	14	54(79.4%)
Ciprofloxacin	1	11	18	10	15	55(81%)
Ceftrioxone	1	13	15	9	10	48(70.6%)
Imipenem	0	4	2	4	9	19(27.9%)
Clavulanic acid	1	6	7	7	5	26(38.2%)

By comparing the infection rates of diabetic and non diabetic patients, it was 69.4% in DM patients and 67.4% in NON-DM patients. 97.1% of the bacteria that caused infection in DM patients were multi drug resistant (MDR) which is 70.3% in case of non-diabetic patients (Table-4).

Table 6: Multi drug resistance rate of bacteria in DM and Non-DM wounds

	No of cases	No positive cases	No of isolates	No of MDR bacterial isolates
Diabetic	49	34(69.4%)	35	34(97.1%)
Non-diabetic	89	60(67.4%)	64	45(70.3%)
Total	**138**	**94(68.1%)**	**99**	**79(79.8%)**

DISCUSSION

Monitoring of Surgical site infections (SSIs) include infections that acquired within 30 days of the surgical procedure. Surgical ward harbors, pre, post and non surgical patients. All these cases put together contribute to the high rate of infection in surgical wards[7]. This study showed that Gram negative bacteria was most prevalent than the gram positive cocci in surgical ward infection. Most of the previous researches have reported that the gram positive cocci was predominated in wound infections[8]. The prevalence of individual organism, *pseudomonas* was predominant followed by E. coli, *S. aureus* and *klebsiella*. In previous studies, *S. aureus* had been described as the predominant organism in wound infections[9] but in our study *pseudomonas* was the first predominant organism which correlates with the other studies[6]. This study also demonstrates that Gram negative bacteria were more resistant (68%) to most of the antibiotics as compared to Gram positive bacteria[8], Which is compatible with the other studies. In our study, GNB were more than GPC and MDR rate of GNB was greater than GPC. This shows that DM wounds harbors gram negative bacteria and facilitates development of MDR[10,11]. The infection rate of DM wounds and NON-DM wounds was 69.4% and 67.4% respectively. Even when the rate of infection was about the same in both DM and NON-DM patients, the MDR rate in DM isolates were 97.1% and NON-DM was 70.3%. This shows that these patients may act as source for the spread of multi-drug resistance bacterial infections in surgical wards[12,13,14,15].

CONCLUSION

The bacteria isolated from the diabetic surgical wound infections are often multidrug resistance in nature.

Isolation of such patients will definitely help to prevent transmission of these highly infectious and MDR bacteria to other patients admitted in same ward. The change in flora in surgical wound infections highlights the change in surgical practice in recent years. The newer antibiotics and antiseptics used in routine surgical practice had provoked the bacterial population to change their ecosystem on regular basis. The emergence of highly resistance pathogenic strains is an alarming situation in surgical practice. Proper use of antibiotics with good surgical practice is need of a time.

REFERENCES

1. Hiroshi Nikaido. Multidrug Resistance in Bacteria. Annu Rev Biochem. 2009; 78: 119–146.
2. Y.Kavitha, S.Khaja Mohiddin. Bacteriological profile of diabetic foot infections in a teritiary care teaching hospital. Indian Journal of Basic and Applied Medical Research; September 2014 Sep; 3(4): 260-266.
3. Spread of infection in hospitals. Lecture delivered at the Royal College of Surgeons of England on 9th April 1958 by R. A. Shooter, M.D. Bacteriologist, St. Bartholomew's Hospital, Reader in Bacteriology, University of London.
4. Wilbin Xavier, Mangalanandan T. Sukumaran, Ajit Kumar Varma, Harish Kumar, and Gopi Chellan. Emergence of multi drug resistant bacteria in diabetic patients with lower limb wounds. Indian J Med Res. 2014 Nov; 140(5):700.
5. Jayashree Konar, Sanjeev Das. Bacteriological Profile of Diabetic Foot Ulcers, With a Special Reference to Antibiogram in a Tertiary Care Hospital in Eastern India. 2013 dec 02; 2 (48): 9323-9328.
6. Urvish Trivedi, Shamini Parameswaran, Andrew Armstrong, Diana Burgueno-Vega, John Griswold, Sharmila Dissanaike and Kendra P. Rumbaugh, Prevalence of Multiple Antibiotic Resistant Infections in Diabetic versus Nondiabetic Wounds. J Pathog. 2014; 1-6.
7. Ramesh Rao, S. Sumathi, K. Anuradha, D.Venkatesh, S.Krishna. Bacteriology of postoperative wound infections. Int J Pharm Biomed Res 2013; 4(2): 72-76
8. Jeena Amatya, Manish Rijal and Reena Baidya. Bacteriological Study of the Postoperative Wound Samples and Antibiotic Susceptibility Pattern of the Isolates in BandB Hospital. JSM Microbiology 2015; 3(1): 1-6.
9. Olowe O.A, Titilolu FT, Bisi-Johnson M. A. and Mosanya JT. Antibiogram of Surgical Site Infection in a Tertiary Health Care Facility in Osogbo, South Western Nigeria. Current Trends in Technology and Science. 2014; 3(2): 93-97.
10. T. Mathangi and P. Prabhakaran., Prevalence of bacteria isolated from type 2 diabetic foot ulcers and the antibiotic susceptibility pattern. 2013; 2 (10): 329-337.
11. P. Ramakant and A. K. Verma and R. Misra and K. N. Prasad and G. Chand and A. Mishra and G. Agarwal and A. Agarwal and S. K. Mishra 12., Changing microbiological profile of pathogenic bacteria in diabetic foot infections: time for a rethink on which empirical therapy to choose? 2010 sep11; 54: 58-64.
12. Lyudmila Boyanova and Ivan Mitov. Antibiotic Resistance Rates in Causative Agents of Infections in Diabetic Patients. Expert Rev Anti Infect Ther. 2013; 11 (4): 411-420.
13. C.Manikandan and P. Prabhakaran. Clinical and bacteriological profile of diabetic foot infections in Pattukkottai area hospitals, Tamilnadu, India. 2015 April; 3 (4): 166-173.
14. Martínez-Gómez Dde A, Ramírez-Almagro C, Campillo-Soto A, Morales-Cuenca G, Pagán-Ortiz J, Aguayo-Albasini JL., Diabetic foot infections. Prevalence and antibiotic sensitivity of the causative microorganisms. Enferm Infecc Microbiol Clin. 2009 Jun; 27(6): 317-21.
15. Shankar EM, Mohan V, Premalatha G, Srinivasan RS, Usha AR., Bacterial etiology of diabetic foot infections in South India. Eur J Intern Med. 2005 Dec; 16(8): 567-70.

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