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Prevalence, Profile and Antibiotic Susceptibility Pattern of Bacterial Isolates from Blood

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In the present study, attempt was made to isolate bacterial pathogens in blood and determination of their antibiogram. A total of 448 blood samples were analyzed. Out of which 405 (92%) samples of aerobic blood culture and 43 (8%) samples of anaerobic blood culture. From aerobic culture 111 (27%) pathogens and from anaerobic culture 6 (13%) pathogens were identified. In aerobic culture *Staphylococcus aureus* 71 (64.54%) was the most common cause of bacteraemia followed by *Listeria monocytogenes* 17 (15.45%), *Diplococcus* sp. 7 (6.36%), *Salmonella typhi* 6 (5.45%), *Streptococci* sp. 4 (3.63%), *Klebsiella pneumoniae* 3 (2.72%) and *Campylobacter* sp., *E. coli* and *Haemophilus influenzae* (single isolates of each, respectively). From anaerobic culture *Clostridium perfringens* 6 (13%) were identified. The antibiotic sensitivity test was done by disc diffusion method. The antibiogram of these pathogens showed resistance to cefotaxime, cefadroxil, cefaclor, cefuroxime, ceftazidime, ceftriazone and sensitivity to meropenem, linezolid and amikacin. Thus study indicated that the bacterial blood pathogens are becoming resistant to commonly used antibiotics, which may be due to indiscriminate use of these antibiotics. So it is very much important to have culture and sensitivity test of concern pathogens.

Key words: Blood culture, pathogens, drug resistance, antibiotic susceptibility

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INTRODUCTION

Bacteraemia is an important and frequent condition with increasing mortality (Madsen *et al*., 1999). *Staphylococcal* is one of the most common bacterial isolates causing bacteraemia in hospital patients infections, which permits the organism to gain access to tissue with diverse clinical diseases and the other two pathogens being *E. coli* and *Streptococcus pneumoniae* (Phorde, 1970; Hryniewiez *et al*., 1993). The blood culture is fundamental investigation in infection. Illness is associated with bacteraemia ranges from self-limiting infection to life threatening sepsis that requires rapid and aggressive antimicrobial treatment, which is complicated by increasing worldwide antibiotic resistance (Reacher *et al*., 2000). The emergence of antimicrobial resistance globally has not been uniform for all agents and pathogens, or along the same lines. Even today's environment, there are disproportionate rates of resistance between countries, within countries and even within different geographical regions of the same countries, province or city (Blondeau and Vaughan, 2000). Antibiotic resistance pattern may vary locally and regionally, patterns can change rapidly and they need to be monitored closely because of their implications for public health and as an indicator of appropriate or inappropriate antibiotic usage by physicians in that area (Lalitha *et al*., 1997). Therefore, knowledge of the current drug resistance pattern of the common, local blood pathogenic bacteria in particular region is useful in clinical practice. Therefore, attempt was made to isolate and identify the common bacteria from blood culture and their antibiotic resistance pattern.

MATERIALS AND METHODS

A total of 448 blood samples from patients (270 male, 153 female and 25 children) were collected from hospitals Out of these blood samples, 405 (92%) were aerobically and 43 (8%) anaerobic cultured. In aerobic culture, for adult 10 mL and for children 2-5 mL of blood were inoculated in 50 mL of Brain Heart Infusion broth. The bottles were vented by inserting a sterile cotton-wool plugged needle. For anaerobic blood culture, Hartley's Digest broth were used. These bottles were incubated at 37°C for 24 h. The inoculated broth medium (from day 2) was then sub-cultured every day on blood agar and MacConkey's agar subsequently for 3 days and incubated for another 24 h.

Identification of organism was based on gram reactions, morphology and biochemical characteristics (Forbes *et al*., 1988). Isolates were tested for antimicrobial susceptibility by Bauer *et al*. (1966) disc diffusion technique on Muller Hinton agar using the readymade antibiotics discs (Table 1).

Table 1: Antibiotics disc use in study

Antibiotics	Concentration (μm)	Antibiotics	Concentration (μm)
Cefazolin	30	Pefloxacin	5
Cefotaxime	30	Ciprofloxacin	5
Cefuroxime	30	Ceftriazone	30
Meropenem	10	Ceftazidime	30
Amikacin	30	Cefadroxil	30
Norfloxacin	10	Cefaclor	30
Ofloxacin	5	Linezolid	30

RESULTS AND DISCUSSION

A total of 448 blood samples (405 aerobically and 43 aerobically) were cultured, out of them, 111 (27%) pathogens from aerobic and 6 (5%) pathogens from anaerobic culture were isolated and identified. In aerobic culture, *Staphylococcus aureus* 71 (64.54%) was the most prominent pathogen followed by *Listeria monocytogenes* 17(15.45%), *Diplococcus* sp. 7(6.36%), *Salmonella typhi* 6(5.45%), *Streptococci* sp. 4(3.63%), *Klebsiella pneumoniae* 3(2.72%) and one each strain of *Compylobacter* sp., *E. coli* and *Haemophilus influenzae* were isolated. In anaerobic culture 6 samples were positive for *Clostridium perfringens* (Fig. 1). The frequency of bacteraemia was 53% in male, 35% in female and 12% in children.

The antibiogram pattern of *S. aureus* showed high resistance to cefotaxime (96%), cefadroxil (93%), cefaclor (95%) and ceftazidime (93.10%) and high sensitivity to meropenem (70%), linezolid (74.8%) while *Diplococci* sp. showed high resistance to cefuroxime (91.42%) and ceftazidime (91.50%) and sensitivity to amikacin (100%), linzolid (70%) and meropenem (71.43%). The *Listeria monocytogenes* showed high resistance against cefuroxime (95%) and ceftazidime (93.63%) and high sensitivity to meropenem (100%), linezolid (85.72%) and amikacin (87.5%).

The blood isolate, *Salmonella typhi* was highly resistant to cefotaxime (91.10%) and ceftazidime (97.5%) and sensitive to meropenem (83.34%), linezolid (74.9%) and amikacin (77.15%), while *Streptococci* sp. was resistant to cefotaxime, cefuroxime, ciprofloxacin and pefloxacin (100% each) and sensitive to amikacin, meropenem and linzolid (100% each). The *Klebsiella pneumoniae* showing highest (100%) resistance to cefaclor, cefuroxime, ceftazidime and ceftriazone.

In present study, the single isolate *Compylobacter* showed 100% resistance to cefotaxime, cefadroxil, cefaclor, cefuroxime, ceftazidime, ceftriazone, norfloxacin, ofloxacin, pefloxacin, cefazolin and 100% sensitivity to

Table 2: Antibiotic resistance pattern (%) of various pathogens isolated from blood

Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14
S. aureus	96	92	30	25	95	87	93	33	34	86	35	46	51	73
Diplococci sp.	88	80	27	30	83	91	91	00	40	80	33	50	33	67
Listeria monocytogenes	80	70	00	14	70	95	94	13	33	100	30	40	33	42
Salmonella typhi	91	86	17	25	70	77	98	23	53	78	37	32	57	29
Streptococci sp.	100	75	24	25	50	100	75	00	100	75	50	50	100	75
Klebsiella pneumoniae	66	66	33	33	100	100	100	33	66	100	33	67	67	33
Compylobacter sp.	100	100	00	00	100	100	100	00	00	100	100	100	100	100
E. coli	100	100	100	00	100	100	100	100	100	100	100	00	00	100
Haemophilus influenzae	100	100	00	00	100	100	100	00	00	00	100	100	100	100
Clostridium perfringens	100	33	20	17	67	50	33	50	33	50	00	50	50	50

1 = Cefotaxime, 2 = Cefadroxil, 3 = Meropenem, 4 = Linezolid, 5 = Cefaclor, 6 = Cefuroxime, 7 = Ceftazidime, 8 = Amikacin, 9 = Ciprofloxacin, 10 = Ceftriazone, 11 = Norfloxacin, 12 = Ofloxacin, 13 = Pefloxacin, 14 = Cefazolin

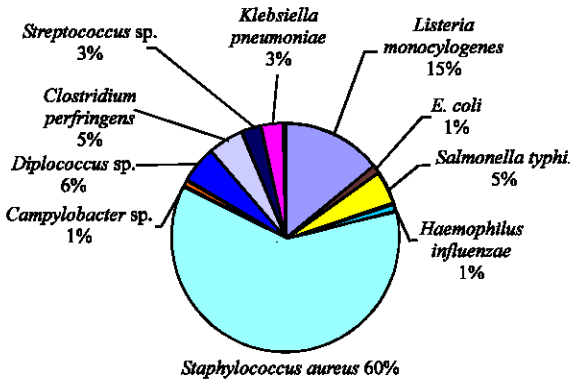

Fig. 1: Frequency of bacterial blood pathogens

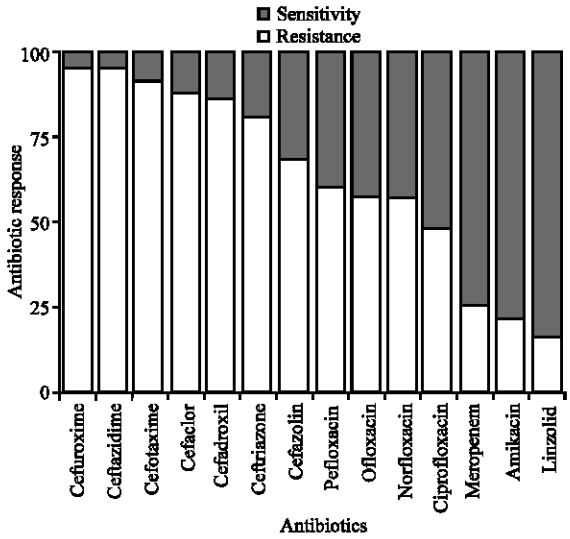

Fig. 2: The antibiotics resistance pattern of the bacterial pathogens isolated from blood

meropenem, amikacin, linzolid and ciprofloxacin, while the single isolate *E. coli* showed resistance to cefotaxime, cefadroxil, meropenem, cefaclor, cefuroxime, ceftazidime, amikacin, ciprofloxacin, ceftriazone, norfloxacin, cefazolin and sensitive to linzolid, ofloxacin and pefloxacin. *Haemophilus influenzae* showed high resistance to cefotaxime, cefadroxil, cefaclor, cefuroxime, ceftazidime, norfloxacin, ofloxacin, pefloxacin, cefazolin and sensitivity to meropenem, linzolid, amikacin, ciprofloxacin and ceftriazone. In anaerobically isolated *Clostridium perfringens* was highly resistance to cefotaxime and sensitivity to norfloxacin (Table 2).

All the pathogens isolated from blood showed high resistance to cefuroxime (96%), ceftazidime (95%), cefotaxime (91%) and highly sensitivity to meropenem (74%), linezolid (83%) and amikacin (77%) (Fig. 2).

Meremikmu *et al.* (2005) also recorded the prominent presence of *S. aureus* (65%) in bacteraemia. The frequency of occurrence of *Streptococci* sp. in blood was 3.63%, which was similarly reported by Sobhani *et al.* (2004). The frequency of occurrence of *Diplococci* sp. (6.36%), *Salmonella typhi* (5.45%), *Streptococci* sp. (3.63%) and *Klebsiella pneumoniae* (2.72%) in present study was similarly reported by Gholam and Kashanian (2005). Rosemarie *et al.* (1994) also reported the presence of *Haemophilus influenzae* in blood culture.

Sobhani *et al.* (2004), Zakaria El-Astal (2004) and Gholam and Kashanian (2005) also reported the presence of highly sensitive blood bacterial pathogens to amikacin and ciprofloxacin and Huang *et al.* (2002) reported highly resistance pathogens to ceftazidime.

The present study showed the increasing antibiotic resistance against the common bacterial isolates. Resistant bacteria could be mutant form of wild bacteria due to over-use or misuse of broad-spectrum antibiotics.

Ideally blood culture and antibiotic susceptibility should be performed for the proper management of microbial infections. It is not possible to delay initiation of treatment until laboratory reports are available. In such instances and without culture facilities, knowledge of local antimicrobial resistance pattern from accurate bacteriological records of culture reports may provide guidance towards an empirical therapy before sensitivity pattern are available.

In present study all the pathogens isolated from blood showed high resistance to cefuroxime, ceftazidime,

cefotaxime and highly sensitivity to meropenem, linzolid and amikacin. The study indicated the common antibiotics pattern in this region, which helps in prescribing the proper antibiotics against bacteraemia and avoid the misuse or overuse of unwanted or resistant antibiotics for proper treatment to patient. The increasing resistance of organisms indicates that periodic monitoring and possibly modification of empirical therapy are required.

REFERENCES

Bauer, A.W., W.W.M. Kirby and J.C. Sherris, 1966. Antibiotic susceptibility testing by a single disc method. AMJ Clin. Pathol., 45: 493.

Blondeau, J.M. and D. Vaughan, 2000. A review of antimicrobial resistance in Canada. Can. J. Microbiol., 46: 867-877.

Forbes, A. Betty, F. Daniel and S. Weissfeld, 1998. Bailey and Scott's Diagnostic Microbiology. 10th Edn.

Gholam, R. and M. Kashanian, 2005. Bacteraemia in a general hospital in Kerman: An Analysis of 376 isolated bacteria and their antibiogram.

Hryniewiez, W., 1993. Patterns of antibiotic resistance in bacterial strains isolated in Poland. APUA News Sletter, 11: 1-3.

Huang, S.S., B.J. Labus, M.C. Samuel, D.T. Wan and A.L. Reingold, 2002. Antibiotic Resistance pattern of Bacterial isolates from blood in San Francisco Country, California, 1996-1966. CDC, 8: 2.

Lalitha, M.K., D.J. Manayani L. Priya, M.V. Jesudason, K. Thomas and M.C. Steinhoff, 1997. E test as an alternative to conventional MIC determination of surveillance of drug resistant *S. pneumoniae*. India. J. Med. Res., 106: 500-503.

Madsen, K.M., H.C. Schoheydr, B. Kristensen and H.T. Sorensen, 1999. Secular trends in incidence and mortality of bacteraemia in a Danish country. 1981-1994: APMIS., 107: 346-352.

Meremikmu, Martin M., Chukwuemeka E. Nwachukwu, Anne E. Asuguo, Joseph U. Okebe and Simon J. Ustalo, 2005. Bacterial isolates from blood cultures of children with suspected septicaemia in calabar, Nigeria. BMC Infect. Dis., 5: 110.

Phorde, J.J., 1970. Antibiotics sensitivities of common bacterial pathogens isolated In: Addis Ababa: A preliminary report. Eth. Med. J., 8: 107-113.

Reacher, Mark H., Anita Shah, D.M. Livermore, M.C. Wale Catriona Graham, A.P. Johnson, H. Heine, M.A. Mannickendam, K.F. Barker, Dorot and Robert C. George, 2000. Bacteraemia and antibiotic resistance of its pathogens report and wales between 1990 and 1998; trend analysis. BMJ, 320: 213-216.

Rosemarie, T., Santana-Arciaga, M. Rosario Capeding, A. Tirador, L.T. Sombrero and M. Velmante, 1994. The Epidemiology of Invasive *Haemophilus influenzae* Disease among Filipinos. Phil. J. Microbiol. Infect. Dis., 23: 52-59.

Sobhani, A., H. Shodjai and S. Javanbhat, 2004. Drug resistance pattern in isolated bacteria from blood cultures. Acta Medica Ranica, 42: 46-49.

Zakaria El-Astal, 2004. Bacterial pathogens and their antimicrobial susceptibility in Gaza strip, Palestine. Pak. J. Med. Sci., 20: 365-370.