

Incidence of bacteremia in antiretroviral-naive HIV-positive children less than five years of age in Benin City, Nigeria

Bacteremia refers to the presence of bacteria in the blood, which usually occurs when pathogens gain entrance to the blood stream through abscesses, infected wounds or burns or from areas of localized disease (1). In human immunodeficiency virus (HIV) infected children, bacterial infections are a major source of morbidity and mortality. The most common opportunistic infections in children in the absence of Highly Active Antiretroviral Therapy (HAART) include pneumonia and bacteraemia (2).

However, in developing countries where access to care and treatment for HIV-positive children may be limited, bacterial invasion of the blood stream becomes readily possible due to the low immunity of such children. This report investigates the bacterial etiology of bacteremia and the antimicrobial susceptibility of causative agents in antiretroviral-naive HIV-positive children, in Benin City, Nigeria.

A total of 415 HIV-positive children (229 males and 186 females) were recruited for this study. HIV tests were done for children less than/or 18 months of age by PCR method, and for children above 18 months by rapid test algorithm method. Blood culture test was carried out on all patients using standard bacteriological methods. Briefly, glucose broth and thioglycollate broth were inoculated with 3 ml each of patient's blood and incubated at 37 °C initially for 12–24 hours, within which sub-cultures were made by inoculating blood agar, MacConkey agar, and chocolate agar. The plates were incubated aerobically in an atmosphere of carbon (IV) oxide. Another set of plates were incubated anaerobically. Broth cultures without growth were incubated for a period of 10 days. Identification of isolates was carried out by standard methods (3). Antibiotic disc susceptibility testing was carried out using NCCLS standard operating procedure (4).

Bacterial isolates were detected in 37.1% (154/415) of HIV-positive blood samples examined. *Staphylococcus aureus* was found in 14% (58/415) of samples, *Escherichia coli* in 8% (33/415), *Klebsiella* species in 4.8% (20/415), *Proteus* species 3.4% (14/415), coagulase-negative staphylococci in 2.9% (12/415), *Pseudomonas aeruginosa* in 2.2% (9/415), and *Citrobacter* species in 1.9% (8/415).

A prevalence of 37.1% of different types of bacteria was recorded in this work. This is far more than the 15.5% reported from rural Kwa-Zulu Natal hospital in South Africa (5). The reason for this high prevalence could be attributed to the fact that the study population was infants and young children who were antiretroviral-naive patients with tendency to suppressed immunity. The frequency of bacterial isolates from this report showed *S. aureus* to be the most predominant organism. This high prevalence of staphylococcal bacteremia could be attributed to the high frequency with which scabies and impetigo interact to cause skin disease in children in developing countries (6).

The overall *in-vitro* antimicrobial susceptibility pattern showed that ciprofloxacin was the most effective and was closely followed by ceftriaxone (Table 1). However, high bacterial resistance was shown with ampicillin, cloxacillin, and erythromycin. The upsurge in the antibiotic resistant pattern seen in this study could be due to antibiotic abuse and self-medication being practiced in many developing countries including Nigeria. In such places, drugs are easily purchased over the counter without any prescription. Moreover, the low cost and availability of these drugs could be another contributing factor to antibiotic resistance in this locality.

In conclusion, the findings of this study revealed that bacteremia is common amongst antiretroviral-naive HIV-positive children less than five years of age. *S. aureus* was the most predominant organism detected. Ciprofloxacin and ceftriaxone were the most effective antibiotics in this study for the treatment of bacteremia in antiretroviral-naive HIV-positive children from this locality.

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Table 1. Antimicrobial susceptibility of bacterial isolates from bacteremic HIV-positive children in Benin City, Nigeria

| Bacteria | No (%) susceptible to | | | | | | |
|----------------------------------|-----------------------|----------|-----------|-----------|-----------|-----------|------------|
| | No tested | AMP | CLX | ERY | GEN | CRO | CIP |
| <i>Staphylococcus aureus</i> | 58 | 1 (1.7) | 3 (5.2) | 8 (13.8) | 25 (43.1) | 45 (77.6) | 47 (81.0) |
| Coagulase-negative staphylococci | 12 | 2 (16.7) | 3 (25.0) | 4 (33.3) | 6 (50.0) | 12 (100) | 12 (100) |
| <i>Escherichia coli</i> | 33 | 2 (6.1) | 6 (18.2) | 10 (30.3) | 20 (60.6) | 32 (97) | 32 (97.0) |
| <i>Klebsiella</i> species | 20 | 0 (0) | 2 (10.0) | 4 (20.0) | 12 (60.0) | 19 (95) | 20 (100) |
| <i>Proteus</i> species | 14 | 0 (0) | 1 (7.1) | 2 (14.3) | 7 (50.0) | 14 (100) | 14 (100) |
| <i>Citrobacter</i> species | 8 | 1 (12.5) | 2 (25.0) | 2 (25.0) | 4 (50.0) | 8 (100) | 8 (100) |
| <i>Pseudomonas aeruginosa</i> | 9 | 0 (0) | 0 (0) | 0 (0) | 1 (11.1) | 7 (77.8) | 8 (88.9) |
| Total | 154 | 6 (3.9) | 17 (11.0) | 30 (19.5) | 75 (48.7) | 137 (89) | 141 (91.6) |

Note: AMP, ampicillin; CLX, cloxacillin; ERY, erythromycin; GEN, gentamicin; CRO, ceftriaxone; CIP, ciprofloxacin.

References

- Cheesbrough, M. District laboratory practice in tropical countries. Cambridge, UK: Cambridge University Press; 2000. p. 124–5.
- Chakraborty R, Shingadia D. Treating opportunistic infections in HIV-infected children (extended). Guidelines for the children's HIV Association (CHIVA); 2007. Available from: <http://www.chiva.org.uk/guidelines/2009/pdf/treating-oi.pdf> [cited 20 June 2009].
- Cowan ST, Steel KJ. Manual for the identification of medical bacteria. 4th ed. London: Cambridge University Press; 1985. p. 217.
- National Committee for Clinical Laboratory Standards. Performance standards of antimicrobial susceptibility testing. Ninth International Supplement 1999; M100-S9.
- Nchabeleng M, Yeung S, Escott S, Wilkinson D, Sturm AW. Bacteremia in HIV-infected children in a rural Kwa-Zulu Hospital. International Conference on AIDS, 9–14 July 2000; 13:abstract no. MoPeB2202.
- Senthilkumar A, Kumar S, Sheagren JN. Increased incidence of *Staphylococcus aureus* bacteremia in hospitalized patients with acquired immunodeficiency syndrome. Clin Infect Dis. 2001; 33: 1412–6.