Bacteriological profile of blood cultures from children with presumed septicaemia in a tertiary hospital in Abeokuta, Nigeria

Babatunde. O. Motayo.[1*], P . Akinduti .[2], Joseph.I. Ogiogwa.[1], Olusola.A. Akingbade.[1], Bukola. W. Aboderin. [1], O. Adeyakinu [1] and John. A. Akinbo[1].

1. Medical Microbiology unit, Pathology department Federal Medical center Idi-Aba, Abeokuta, Nigeria.
2. Department of Vetenery Microbiology, College of Vetenery Medicine, University of Agriculture Abeokuta.

E- mail: babatundemotayo@yahoo.com. Tel: +2348062632071.

Abstract: Septicaemia is a common pediatric illness with severe morbidity and mortality particularly in neonates. Various bacterial agents are responsible for this severe clinical condition. Diagnosis of this condition is by blood culture and antibiotic susceptibility testing. A good knowledge of the local epidemiology of causative bacteria is essential because of time lost in turn around time. We have therefore reviwed all blood culture results of children aged 0 to 15 years between January 2010 to December 2010 with presumed septiceamia at the Federal Medical Center Abeokuta. Three hundered and forty one blood samples were cultured at the Medical Micrbiology laboratory, isolates were identified using standard procedure and sensitivity tested against common antibiotics. A 31.1% isolation rate was recorded for all samples ,with neonates accounting for 48(45.3%), followed by age 28 days to 1 year 20(18.9%) and >1<15 years 38(35.8%). *Staphylococus aureus* was the most frequently isolated organism with 44(41.5%) rate, *Escherichia coli* had 19(27.4%), *Klebsiella sp* 15(14.2%). The antibiotic with highest susceptiility was Gentamycin with 58.8%, followed by Amoxicillin/clavunalate (51.9%) isolates showed poor susceptibility results to chephalosporins. Sustainable antibiotic surveillance and good infection control practicses along with regular ESBL testing will help ensure better therapeutic success and improved antibiotic efficacy of peadiatric septiceamia in our Health institutions.

[Babatunde. O. Motayo, P . Akinduti, Joseph.I. Ogiogwa, Olusola.A. Akingbade, Bukola. W. Aboderin, O. Adeyakinu and John. A. Akinbo. **Bacteriological profile of blood cultures from children with presumed septicaemia in a tertiary hospital in Abeokuta, Nigeria.** Nature and Science 2011; 9(12):141-144]. (ISSN: 1545-0740). http://www.sciencepub.net.

Key words: Septiceamia, pediatric, bacteria isolates, antibiotic susceptibility

Introduction

Septicaemia, is symptomatic bacteraemia and a common condition in chidren and neonates with a high rate of morbidity and motarlity (11, 10). There is a high isolation rate in most neonates with studies reporting between 25% to 55% in some parts of Nigera (7, 6). Common symptoms of children presenting with septiceamia include, fever, malaise, difficulty in breathing, tachychardia and refusal of feeds or lethargy (10). In Nigeria septicaemia is a major cause of death in children (3). This high rate has been attributed to predisposing factors such as poor infection control practices, lack of basic amenities for optimal hygiene and lack of portable water (8). Treatment outcome of pediatric septicaemia remains poor in our setting with studies reporting mortality rates of 33% to 41% (1, 2).

Pediatric septicaemia is an established life threatning emergency and needs to be given immediate medical attention of the highest standard, however management of this condition is often based on clinical asessment,based on a combination of symptoms and signs some of which have proved very useful (12). Antibiotic therapy are often commenced based on established empirical regimen guided by epidemiology of isolates reported in an environment. This is because in most resource challenged settings ,results from blood cultures takes about 7 to 10 days before they are available, unlike in developed countries where rapid technologies are readily available that can give results within 48 hours, an example is the Bactec microbiologiclal system by Becton Dickinson (UK). This emphasizes the need of sustained surveillance of agents of pediatric septicaemia in our environment.

Various studies have been conducted both prospective and retrospective in respect of pediatric septicaemia, both in neonates and young children. However in Ogun state and Abeokuta in particular there is insufficient data on this subject. A good knowledge of the prevalent bacteria pathogens and their antibiotic susceptibility pattern will further guide empirical prescribing pending availability of culture results in this community. This study aims to

give insight into the isolation pattern and antibiotic susceptibility of bacteria cultures from pediatric septicaemia in a tertiary health institution in Abeokuta Ogun state.

Methods:

The study is a retrospective review of all cases of presumed septicaemia from age group less than 15 years requiring a blood culture and their antibiotic susceptibility pattern at the Federal Medical center Abeokuta, Ogun state Nigeria from January 2010 to December 2010. Blood samples were collected after clinical assessment from the attending clinician. Blood was drawn and aseptically injected into culture bottles containing Brain heart infusion broth in the ratio of one part of blood to 5 parts of broth medium. The blood culture bottles were immediately sent to the laboratory ,where they were incubated at 37^0c for 7 days,3 sub-cultures were made under aseptic conditions after 72hrs, 5 days and on the 7^{th} day on MacConkey, Blood and Chocholate agar plates. The MacConkey and Blood agar plates were incubated at 37^0c in ambient air while the Chocolate agar plates were incubated at 37^0c under microaerophillic condition (in a CO2 jar). The organisms isolated were identified by gram stain, and standard bacteriological techniques (5). Antibiotic susceptibility was done by standard disk diffusion method of Kirby and Bauer (5), and results were interpreted using the NCCLS guidelines for disk diffusion (9).

Results:

A total number of 341 blood culture samples were collected during the study period with a sex distribution of 184(54%) males and 157(46%) females. Bacteria isolates recovered was 106(31.1%) with a gram positive gram negative ratio of about 1:1 and a sex distribution ratio of 1:1.The distribution of isolated organisms were, 29(27.4%) for *Escherichia coli*, 15(14.2%) for *Klebsiella sp*, 9(8.5%) for *Pseudomonas areginosa*, 6(5.6%) *Proteus sp, Staphylococcus aureus* 44(41.5%) and *Streptococus pneumonia* 3(2.8%). Anearobic culture was not consistently carried out hence they were excluded from our study.Table 1 shows distribution of positive blood cultures in the 3 age groups with neonates giving 48(45.3%), group B (> 28 days to 1year) 20(18.9%) and group C (>1 year to<15) 38(35.8%).The most prevalent isolate in all three age groups is *Stapphlococus aureus* with a rate of 42.6% in group A, 50% in group B and 36.8% in group C, followed by *Escherichia coli* with a rate of 36.2%, 25% and 18.4% in age groups A, B and C, followed by *Pseudomonas aureginosa*, then *Proteus species* and lastly by *Streptococus pneumonia* with a distribution of 2.1% in group A and 5.3% in group C (Table 1). Sensitivity pattern of the most prevalent isolates were, *Escherichia coli* with 10.3% sensitivity to erythromycin and streptomycin, 34.5% to gentamycin, 10.5% to ceftarazidime and ceftrazone, 20% to cefuroxime, 37.9% to amoxicilin/clavunalate and 46.7% to Azithromycin. *Klebseilla species* gave 100% resistance to erythromycin,ceftrazidime, Azithromycin and amoxicillin, 6.7% to co-trimoxazole, 40% gentamycin, 13.3% for streptomycin, 30% for ceftrazone ,20% for cefuroxime and 46.7% for amoxi/clav all as shown in table 2. The highest sensitivity was seen in *Proteus species* to amoxicilin/clavunalate with 100% followed by *Pseudomonas aureginosa* to gentamycin(60%). Gentamycin also showed the highest sensitivity to *Staphylococua aureus* with 56.8%, followed by amoxi/clav 54.5%and erythromycin 50%. Generally gentamycin showed highest susceptibility to all isolates with 53.8%, followed closely by amoxi/clav 51.9% and the least susceptible was amoxicillin with 4.7%.

Table 1. Distribution of blood culture isolates in three age groups between January 2010 to December 2010 at Federal Medical center Abeokuta.

	Age group			
Isolates	**Group A (neonates) %**	**Group B (>28/7,1yr)**	**Group C (>1yr<15)**	**Total**
Escherichia coli	17 (36.2%)	5 (25%)	7 (18.4%)	29 (27.4%)
Klebseilla spp	6 (13%)	3 (15%)	5 (13.2%)	15 (14.2%)
P. eruginosaa	2 (4.2%)	0	7 (18.4%)	9 (8.5%)
Protues spp	1 (2.1%)	2 (10%)	3 (7.9%)	6 (5.7)
S. aureus	20% (42.6%)	10 (50%)	14 (36.8%)	44 (41.5%)
S. pneumoniae	1 (2.1%)	0	2 (5.3%)	3 (2.7%)
Total	48 (45.3%)	20 (18.9%)	38 (35.8%)	106

Table 2. Antibiotic sensitivity pattern for all bacteria isolates from blood cultures of children in Abeokuta, Nigeria.

isolates	Antibiotics susceptibility pattrn to various isolates N(%)									
	Ery	**Amo**	**Gen**	**Strep**	**Ctx**	**Caz**	**Cef**	**Cot**	**Aug**	**Azith**
E. coli	17(10.3)	17(0)	17(34.5)	17(10.3)	19(10.5)	19(10)	25(20)	17(6.9)	17(37.9)	15(46.7)
Klebsiella spp	15(0)	15(0)	15(40)	15(13.3)	10(0)	10(30)	10(20)	15(6.7)	15(46.7)	7(0)
P. aeruginosa	9(0)	9(0)	9(60)	9(33.3)	7(0)	7(14)	7(43)	9(11.1)	9(55.6)	6(16.7)
Proteu spp	6(16.7)	6(0)	6(50)	6(16.7)	4(0)	4(25)	4(75)	6(16.7)	6(100)	3(0)
S. aureus	44(50)	44(11)	44(56.8)	44(41)	30(17)	30(17)	36(42)	44(4.5)	44(54.5)	21(4.8)
S. pneumoniae	3(100)	3(0)	1(33.3)	3(0)	0(0)	0(0)	0(0)	2(0)	3(66.7)	0(0)

Keys: N = number of isolates tested, **%** = percentage susceptible, Ery – Erythromicin, Amo – Amoxicillin, Gen – Gentamycin, Sterp – Streptomycin, Ctx - Ceftazidime, Caz - Ceftrazone, Cef – Cefuroxime, Cot – Co-trimoxazole, Aug – Amoxicillin/Clavunalate, Azith - Azithromycin

Discussion:

Our current study reviewed blood cultures of children less than 15 years of age,the bacteria isolation rate was 31.1% of all samples reviewed in the year. This is lower in comparison to a study done at Calarbar Nigeria that reported a rate of 44.9%(7),and another study done at Ile –ife that reported a rate of 55% (4). However our report of 31.15% isolation rate was higher than a recent report of 18.2% done at Aminu Kano Teaching Hospital, Kano (10), and another done at Ilorin 30.8% (8). This shows that some centers with a similar capacity and possibly higher patient turnout are able to enforce a fairly efficient infection control policy. Our center also has an Infection control team that is responsible for maintaining infection control practices in the hospital, although other external factors such general hygiene practices of patients and their family members and availability of portable water in the community could also play a role in the high rate of isolated organisms reported in our study. Age group distribution of isolates in our study showed that group A (Neonates) gave the highest with 45.3% followed by group C (>1<15) 35.8% and lastly by group B (>28days to 1yr). Our report of 45.3% for neonates was higher to that of Mokuolu et al (2002) which was 30.8% and significantly higher than that of AKTH(Aminu Kano teaching hospital) Kano with a neonatal isolation rate of 25.7% (9). The age group distribution in our study is in agreement with similar studies done in Nigeria with neonates accounting for majority of bacteria blood culture isolations (7, 8, 10), this higher incidence generally observed in neonates has been attributed to the immature immune system in children of this age group (10).

The ratio of gram positive to gram negative organisms isolated was about 1:1 with GPC having 47% and GNB 59% isolation rate, this is similar to the distribution reported at National hospital by Iregbu et al (2006) our report differs from other reports such as Aeleke et al (2006), and Ako-Nai et al (1999) which had majority of isolations as gram positive. *Eschericia coli* and *Klebsiella specie* constituted 74.6% of all gram negative bacteria isolations. This data further emphasises the importance of these 2 organisms in blood stream infections as similar findings have been reported (8,10). *Staphylococus aureus* was the most frequently isolated organism with a rate of 41.5% of all organisms isolated, this is worrisome bearing in mind that pathogenic *staph a* is a predominant hospital acquired pathogen with high transmission potential and ability to form biofilm (6).Variations in the distribution of blood culture isolates have been attributed to geographical location and time changes (10).

Antibiotic susceptibility results showed that Gentamycin had the highest susceptibity to all isolates tested with a rate of 53.8% followed by amoxi/clav with 51.9% the report of our study shows that there significant reduction in susceptibility to Gentamycin when comparired to similar reports that show a high level of susceptibility to this antibiotic such as 86.6% (7) and 70.7% for GNB and 76.7% for GPC (10), our report is however similar to that of Iregbu et al (2006) that reported 60% resistance. A more worrisome observation is the poor susceptibility of isolates to the chephalosporins in our study, for instance Ceftazidime showed only 10% sensitivity to all isolates tested, Ceftrazone showed 10.5% sensitivity to *E. coli* and 30% to *klebseilla sp*, Cefuroxime showed 30% susceptibility to all isolates tested and 41.7% susceptibility to *staph a*. This is rather alarming as this indicates a high degree of beta-lactamase resistance including extended spectrum beta-lactamse(ESBL) producers, this would possibly make piscribtion choice difficult as these class of resistant organisms often fail to achieve therapeutic goals after showing in-vitro susceptibility(6). This is an indication for wider and

sustainable antibiotic surveillance and routine ESBL testing in our laboratories to ensure effective antibiotic therapy with high clinical cure rate. The high resistance displayed by the more cheaper antibiotics such Amoxicillin and Co-trimoxazole increases the chances of pediatric mortality and morbidity because of increased cost of management of these infections as even the expensive chephlaoporins have also displayed a high resistance rate in our study setting in contrast to other reports that give encouraging susceptibility results such as 81.4% for Ceftrazone (10) and 67% Ceftazime susceptibilityfor coliform (7). Amoxi/clav was bearly able to display an average susceptibility against *Staph a* with 54.5% rate and 11.4% susceptibility of Amoxicillin against *Staph a*. Again this is an indication of possible MRSA (methicillin resistant staph aureus) infection majority of which could be hospital acquired. This is an indication of nosocomial infection acquired possibly during intravenous manuplations or other invasive practices in the childrens emergency unit. This call for renewed effort towards reducing chances of events that may lead to nosocomial transmission by doctors and other care givers . Further controlled studies are however needed to evaluate possible risk factors of nosocomial infections in children in our study setting. A significant limitation to this report is the exclusion of data on anaerobes , this was because anaerobic culture was not consistently done during the study period making it difficult to justify any data generated.

We conclude our report by saying that the generally poor susceptibility pattern displayed by the isolates makes it difficult to recommend a particular antibiotic regimen, however based on the general performance of the antibiotics tested, a combination of Gentamycin and Amoxicillin/clavunalate will be appropriate for emperical therapy pending availability of culture results. It is also recommended that tertiary health institutions such as our center acquire better and rapid testing technologies for blood culture testing in other to improve upon the turn around time of blood culture results. We also suggest adoption of routine testing protocols for ESBL producers to guide antibiotic prescription particularly in children.

***Correspondence**: Motayo B.O. Pathology Department, Federal Medical Center Abeokuta.
E- mail: babatundemotayo@yahoo.com.
Tel: +2348062632071.

REFERENCES

1.Adeleke S.I., Belonwu R.O: Bacteria isolates in neonatal septicaemia in Kano Nigeria (2002-2003). *Pinnacle Int J Med Sci*.(2006) 1(1): 17-20.
2.Adejuyigbe E.A, Adeodu O.O, Ako-Nai K.A, Taiwo O, Owa J.A: . Septicaemia in high risk neonates at a teaching hospital in Ile-Ife, Nigeria. *East Afr Med J*,(2001) 78(10): 540-3
3.Asindi A.A, Ekanem A.D: Neonatal septiceamia in Calabar Nigeria. *East Afr Med J*.(1998) 65(5):335-41.
4.Ako-Nai A.K, Adejuyibge E.A, Ajayi F.M, Onipede A.O: The bacteriology of neonatal septicaemia in Ile-Ife, Nigeria. *J Trop Pediatr*(1999) 45(3): 145-51.
5.Cheesbrough M. Microbiology: *In Medical Laboratory manual for Tropical countries*. ELBS edition. University Press, Cambirdge.(1991) 32: 26-58.
6.Irebgu K.C., Elegba Y.O., Babaniyi I.B:, Bacteriological profile of neonatal septicaemia in a tertiary hospital in Nigeria. *Afr Health Sci*.(2006) 6(3): 151-154.
7.Meremikwu M.M., Nwanchukwu C.E., Asuquo A.E., Okebe J.U., Utsalo S.J: Bacteria isolates fron Blood cultures of children with suspected septiceamia in Calabar, Ngeria. *BMC Infectious Diseases*(2005) 5:110 doi:10.1186/1471-2334-5-110
8.Mokuolu A.O., Jiya N., Adesiyun O.O: Neonatal septiceamia in Ilorin: bacterial pathogens and antibiotic sensitivity pattern. *Afr J Med Sci*(2002) 31, 127-130.
9.National Committiee for Clinical Laboratory Standards. Performance standards for antimicrobial disk susceptibility testing supplement (2003)M100-S 12. Wayne, Pa:NCCLS.
10.Nwadioha S.I., Nwokedi E.O.P., Kashibu E., Omidayo SM.S., Okwori E.E: A review of bacterial isolates in blood cultures of children with suspected septicaemia in a Nigerian tertiary Hospital. *Afr J Micro Res*.(2010)4(4): 222-225.
11.Odugbemi T, Oduyebo O, Animashaun T: Typhoid fever microbiologic aspect. *Nig Postgrad Med J*. (1994)1:39-43.
12.Singh S.A., Dutta S, Narang A: Predictive clinical scores for diagnosis of late onset neonatal septicemia. *J Trop Pediatr*. (2003)49(4):235-239.

11/11/2011