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Research Paper

Bacteriological profile of childhood sepsis at a tertiary health centre in southern Nigeria.

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ABSTRACT
Introduction*: Sepsis is a leading cause of morbidity and mortality in children worldwide, even more so in developing countries. Knowledge of common pathogens and their antibiotic susceptibility pattern is useful for guiding initial treatment while awaiting blood culture results.*
Objective*:To determine the major causative organisms and their antibiotic sensitivity pattern of childhood sepsis at the Niger Delta University TeachingHospital (NDUTH), with the aim of revising existing treatment protocols.*
Methods*: Within a 2 year period (1st January 2014 to 31st December 2015) blood culture results of children with clinical suspicion of sepsis were retrospectively studied.*
Results:*During the study period, 116 (12.11%) of the 958 children admitted into the Children Emergency Ward had blood culture tests. Thirty one (26.72%) had positive blood cultures.Eighteen (58.06%) of the organisms were gram positive while thirteen (41.93%) were gram negative. The predominant organism was Staphylococcus aureus in 16 (51.61%) followed by Klebsiella pneumoniae in 5 (16.13%) patients. The bacterial isolates demonstrated the highest sensitivity to the quinolones.*
Conclusion*:There is need for periodic surveillance of the causative organisms and antibiotic susceptibility pattern of childhood sepsis to guide effective management of patients.*
Keywords*:Childhood sepsis, bacteriological profile, antibiotic susceptibility*

I. INTRODUCTION

Sepsis is systemic inflammatory response syndrome (SIRS) with documented or suspected infection aetiology.[1,2] Systemic inflammatory response syndrome comprises at least two of the following events; tachypnoea, tachycardia, fever or hypothermia, leukocytosis or leukopaenia.[3] Sepsis can progress to severe sepsis, septic shock and multi-organ dysfunction syndrome.[4]

Sepsis is a leading cause of morbidity and mortality in children worldwide[5-7]even more so in developing countries.[8-10] It was reported to be the commonest cause of death among children seen at the emergency unit of NnamdiAzikiwe University Teaching Hospital from 2012 to 2014.[11]Garba et al[12] reported sepsis as one of the major causes of death in children aged one to twelve years at a specialist hospital in Zamfara state.

Prompt diagnosis and effective treatment of sepsis is necessary to prevent complications and death.[10]Clinical diagnosis of childhood sepsis depends on blood culture positivity but in most cases only 50% of all positive blood cultures represent true blood stream infection.[13] International guidelines recommend that appropriate blood cultures should be obtained before commencing antibiotics which should be commenced within the first hour of recognizing severe sepsis.[14] Results of blood cultures and antibiotics susceptibility tests however take about a week thereby necessitating initial empirical treatment of suspected cases with broad spectrum antibiotics.[15] Knowledge of common pathogens is therefore useful for guiding this initial treatment.[15,16]

Methodology

Study centre

This was a retrospective descriptive study, carried out at the Children Emergency Ward of the Niger DeltaUniversity Teaching Hospital (NDUTH) Bayelsa State, over a 2 year period (1st of January 2014 to 31st of December 2015).

Ethical consideration

Ethical clearance was obtained from the Research andEthics Committee of the Niger Delta University TeachingHospital.

Subjects

All children aged 29 days to 17 years who had blood culture within the study period were recruited for the study.

Specimen collection

Blood samples were aseptically collected at theChildren Emergency Ward by Paediatric Residents followingestablished hospital guidelines regarding specimen collection.Samples were collected before the commencement of antibiotics. Five milliliters of venous blood wasaseptically collected into sterile blood culture bottles andimmediately transported to the microbiology laboratory.

Specimen processing

Samples were incubated aerobically at room temperaturefor at least 24 hours, and bottles with signs of growthwere immediately sub-cultured on MacConkey Agar,Chocolate Agar and Blood agar. Gram staining was doneand bacterial isolates were identified and classified bymorphology and appropriate biochemical tests.

Antibiotic susceptibility testing

The Kirby-Bauer disk diffusion method was used toassess the antibiotic susceptibility of the isolates, with theresults interpreted according to the standards of theNational Committee for Clinical laboratory Standards(Clinical Laboratory Standard Institute).[17] Antibiotic resistancewas quantified based on the zone of inhibitionaround the antibiotic disc as either susceptible, intermediatelysusceptible or resistant. Intermediate results wereconsidered resistant. Resistance to more than three classesof antibiotics was considered broad-spectrum or multi-drugresistance.

The concentration of the antibiotic discs used were as follows: Gatifloxacin 5µg, Streptomycin 10µg, Vancomycin 30µg, Pefloxacin 5µg, Cefixime 5µg, Ofloxacin 5µg, Gentamicin 10µg,Chloramphenicol 30µg, Amoxicillin-Clavulanate 30µg, Ceftriaxone 30µg, Erythromycin 15µg, Cefuroxime 30µg, Tetracycline 30µg, Cloxacillin 5µg, Ceftazidime 30µg, Co-trimoxazole 25µg, Nitrofurantoin 50µg, Ciprofloxacin 5µg.The sensitivity of particular isolates to each tested antibioticwas calculated by the number of isolates susceptibledivided by the total number of isolates and expressedas a percentage.

Treatment protocol

After collection of blood culture samples, the patients were empirically commenced on intravenous ceftriaxone and gentamicin according to clinical protocol.Clinical response was monitored daily and antibiotics werechanged to ciprofloxacin if the patients showed poor responseafter 48 to 72 hours of antibiotics. Antibiotics weresubsequently changed according to the sensitivity patternof isolated organisms after retrieval ofblood culture results. All patients with blood culture-proven sepsis weretreated with intravenous antibiotics for at least 10days before discharge if clinically stable.

Data analysis

Data was collected onto an excel 2013 spread sheetand presented as means and percentages in tabular and graphical forms.

II. RESULTS

General characteristics

During the 2 year study period, 116 (12.11%) of the 958 children admitted into the Children Emergency Ward had blood culture test.

Their ages ranged from 5 weeks to 16 years with a mean age of 3.87 ±4.48 years. There were 62 males and 54females with a male to female ratio of 1.1:1.

Thirty one (26.72%) of the 116 patients had positive blood cultures, comprising of fifteen males and sixteen females in a male to female ratio of 1:1.1.

Isolated organisms

Eighteen (58.06%) of the organisms were gram positive while thirteen (41.93%) were gram negative. The predominant organism was *Staphylococcus aureus* in 16 (51.61%) followed by *Klebsiella pneumoniae* in 5 (16.13%) patients (Table 1).

Table 1: Isolated organisms

Bacterial isolate	Number	Percentage
Staphylococcus aureus	16	51.61
Klebsiella pneumoniae	5	16.13
Pseudomonas aureuginosa	3	9.68
Streptococcus pneumoniae	2	6.45
Proteus mirabilis	2	6.45
Escherichia coli	2	6.45
Coliform	1	3.25
Total	**31**	**100**

Age range of the patients with positive blood culture

As shown in table 2, the bacterial isolation rate was highest in children aged 29 days to <1 year and decreased with increasing age.

Table 2: Age range of the patients with positive blood culture

Age range	Number	Percentage
29 days to <1yr	12	38.71
1-<5yrs	10	32.26
5-10yrs	6	19.35
10-<18yrs	3	9.68
Total	**31**	**100**

Clinical outcome of the patients with positive blood culture

Twenty five (80.65%) of the 31 patients with positive blood cultures showed good clinical improvement with treatment and were discharged home, 4 (12.90%) of them died and the parents of 2 (6.45%) took them home against medical advice before completion of their treatment.

Bacterial isolates in the patients that died

Klebsiella pneumoniae was isolated in two (50%) of the 4 patients that died, staphylococcus aureus in 1 (25%) and Escherichia coli in 1 (25%).

Antibiotic susceptibility pattern of *Staphylococcus aureus*.

As shown in figure 1, staphylococcus aureus demonstrated the highest sensitivity to ofloxacin (62.5%), followed by amoxicillin/clavulanic acid (43.75%) and ceftriaxone (43.75%) respectively.

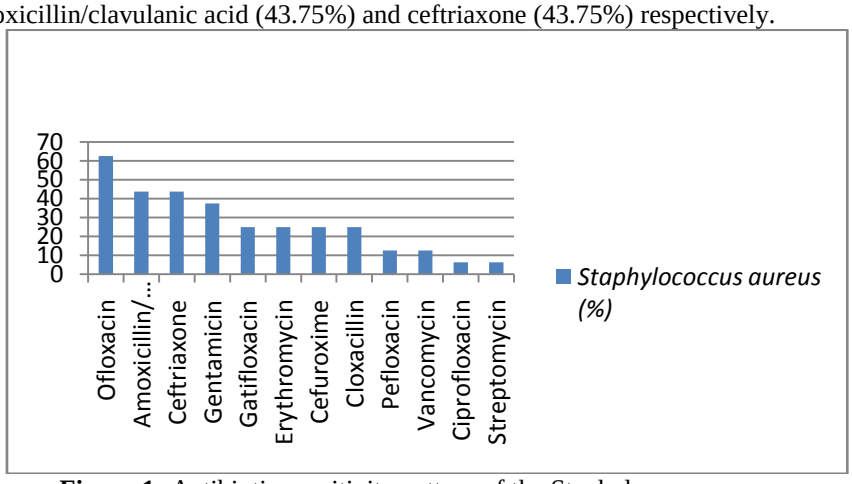

Figure 1: Antibiotic sensitivity pattern of the Staphylococcus aureus

Antibiotic sensitivity pattern of*Klebsiella pneumoniae*

As shown in figure 2, *Klebsiella pneumoniae* demonstrated the highest sensitivity to ciprofloxacin (60.0%), followed by ofloxacin (40.0%), amoxicillin/clavulanic acid (40.0%) and gentamycin (40.0%) respectively.

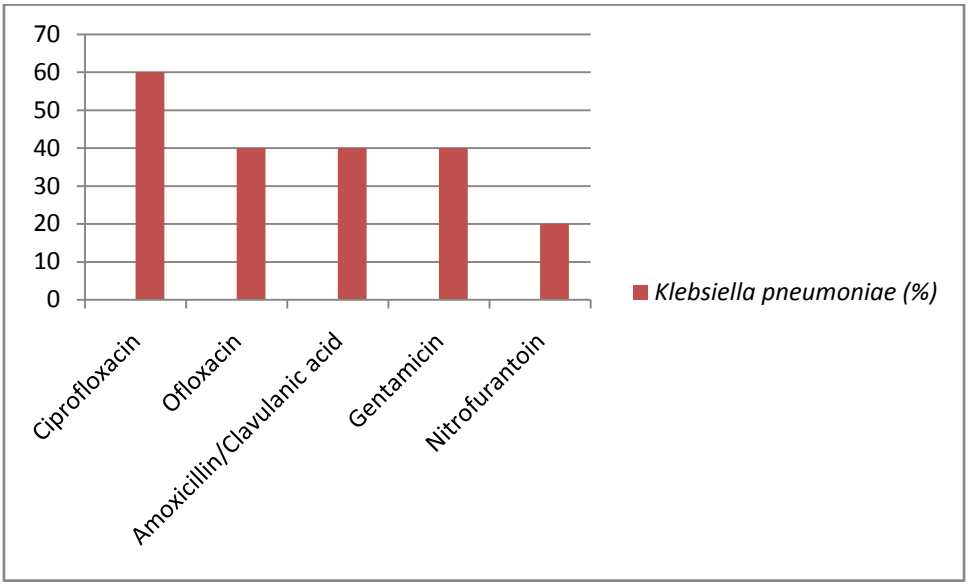

Figure 2: Antibiotic sensitivity pattern of*Klebsiella pneumoniae*

III. DISCUSSION

Twenty six point seven two percent of samples in the present study showed significant bacterial growth. This is not surprising as it has been reported that though diagnosis of childhood sepsis depends on blood culture positivity, less than 50% of all positive blood culture represent true blood stream infection.[13]Okon et al[16]at the University of Maiduguri Teaching Hospital reported a lower bacterial growth rate of 11.5% whileOgunleye et al[18] reported a much higher rate of 34.16% among septicaemic children seen at the children emergency ward of the University College Hospital Ibadan. These low bacterial isolation rates may be due to administration of antibiotics prior to blood culture collection which is not uncommon in our society.

There were more gram positive bacterial isolates compared to gram negatives, which is similar to reports from Uzodinmaet al[15] in Lagos and Prabhu et al[19] in India. Okonet al[16] however had a higher prevalence of gram negative bacterial isolates. Staphylococcus aureus was the predominant bacterial isolate in the current study. This is similar to findings from other authors[10,15,18,20] in Nigeria and India.[19]Bacterial isolation rates in the present study showed a decrease with increasing age which is similar to findings by Okonet al[16] in Northern Nigeria. This may be due to the fact that immunity to infections in childhood tends to increase with increasing age.[21]

Bacterial isolates in the present study demonstrated the highest sensitivity to the quinolones which is similar to reports from other centres in Nigeria[15,20,22]This could be attributable to the fact thatmicroorganisms tend to become resistant to commonlyused antibiotics while remaining sensitive to the rarely used ones like the quinolones.[22] In addition, indiscriminateuse of antibiotics for both prophylaxis and treatment of sick children which is the common practice in Nigeria may lead to emergence of resistant strains.[22] Studies show that though use of fluoroquinolones in children may be associated with tendon, bone and joint disorders, these were comparable with their occurrence in a control group.[23] These disorders from fluoroquinolone use also tend to be transient.[24]

IV. CONCLUSION

Childhood sepsis is a common cause of morbidity at the Niger Delta University Teaching Hospital, Bayelsa State, Nigeria. Gram positive organisms were the predominant bacterial isolates with *Staphylococcus aureus* being most prevalent. The bacterial isolates demonstrated the highest sensitivity to the quinolones. There is need for periodic surveillance of the causative organisms and antibiotic susceptibility pattern of childhood sepsis to guide effective management of patients.

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