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Full Length Research Article

## Childhood Septicaemia Due To Salmonella Species in Ibadan, Nigeria

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### ABSTRACT

A cross sectional study to assess the incidence and antibiotic sensitivity patterns of *Salmonella* isolates in septicaemic children who were presented at the children's emergency unit and children out-patient clinic, University College Hospital, Ibadan was undertaken. A total of 442 samples from children (6 months and 11 years) with the history of fever were investigated, using blood culture method. The frequency of 151 bacteria isolated, were as follows: *Staphylococcus aureus* 50 (33.1%), *Escherichia coli* 29 (19.2%), *Salmonella typhi* 19 (12.6%), *Staphylococcus albus* 14(9.3%), *Klebsiella* species 12(7.9%), *Pseudomonas aeruginosa* 10(6.6%), *Enterococcus faecalis* 9(5.9%), *Salmonella paratyphi* 6(3.9%) and *Haemophilus* species 2(1.3%). Septicaemia due to *Salmonella* species showed the highest among children aged 5-11years bracket (56%), followed by 1- 5 years group (36%); while those within 0-1 year group showed the lowest frequency of (8%). In the antibiotic sensitivity patterns of *Salmonella typhi* and *Salmonella paratyphi*, only Ceftriaxone showed 100% sensitivity in-vitro. While Gentamicin, Ofloxacin, Cefrazidime; Augmentin, Pefloxacin, Chloramphenicol, Amoxycillin, Cotrimoxazole showed varied sensitivity/resistance in descending order. These findings suggest an increasing resistance to the antibiotics commonly used for salmonellosis and the rate at which bacteria become resistant to antimicrobial agents is of public health concern. This calls for routine bacteriological culture and sensitivity test in the management of bacterial infections. Furthermore, the provision of adequate health care, wholesome water for drinking and domestic use by governments cannot be overemphasized.

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**Keywords:** Childhood septicaemia, *Salmonella*, Ibadan, Nigeria

### INTRODUCTION

Septicaemia is a symptomatic bacteraemia that is a common condition in children with a resultant high morbidity and mortality (Shanap and Mogan, 1984) moreover, the condition is often seen in neonates and young children (Odugbemi *et al.* 1994). Bacteraemia continues to be of public health concern worldwide and, among the microbes commonly incriminated, are *Staphylococcus aureus* and *Salmonella* species (Waldvogel, 2000; Hirose *et al.*, 2001). *Staphylococcus aureus* is one of the most common causes of foodborne-acquired infection, causing a wide variety of fatal disease conditions

such as sepsis, meningitis, endocarditis, food poisoning and toxic shock syndrome (Onasanya *et al.*, 2003).

The *Staphylococcus aureus* bacteraemia produced death rate of 82% mainly in young patients in pre-antibiotic days and, even with the introduction of antimicrobial agents death rates remain high, between 25% and 34.2% (Waldvogel, 2000; Cosgrove *et al.*, 2003). Furthermore, increasing numbers of septicaemic cases due to *Salmonella typhi* are being reported in Africa especially in Kenya and Ghana (Mills-Robertson *et al.*, 2002; Karuki *et al.*, 2004). Typhoid fever manifests as an acute illness, and it is sometimes fatal in adults and children when it results in

inflammatory destruction of intestines and other organs, including the bone marrow (Karuki *et al.*, 2004). Globally, it is estimated that typhoid causes over 16 million cases of illness every year, resulting in 600,000 deaths (W.H.O., 1996). Moreover, the emergence of multi-drug resistance of *Salmonella typhi* to ampicillin, chloramphenicol, cotrimoxazole, cephalosporins or fluoroquinolones has been reported and has become a global challenge (Coovadia *et al.*, 1992; Su *et al.*, 2004).

The current investigation was undertaken to determine the bacterial incidence and antibiotic sensitivity patterns of *Salmonella* isolates in bacterial septicaemic children presented at the children's emergency unit and children out-patient clinic, University College Hospital, Ibadan, Oyo State of Nigeria.

## MATERIALS AND METHODS

This study was carried out between May and October 2002 among children brought to the children's emergency unit and children out-patient clinic, University College Hospital. Blood samples sent to the blood culture bench of the Department of Medical Microbiology, University College Hospital were examined. The samples were collected from children (6months and 11 years) with presenting complaints of unresolved fever of more than two days duration. Two milliliters (2 mls) of each blood sample was inoculated into Brain heart infusion broth and incubated at 37°C in a humidified incubator that generates 5% carbon dioxide atmosphere. The cultures were inspected daily for bacterial growth for seven days. The cultures with detectable bacterial growth were subcultured onto blood agar and MacConkey agar plates respectively and incubated aerobically at 37°C for 24-48 hours. Suspected *Salmonella* colonies were identified morphologically and biochemically according to standard bacteriological methods (Barrow and Feltham, 1993). Serological identification was done according to the Kauffman-White Scheme by slide agglutination test using polyvalent and monovalent (O), (H) and (Vi) antisera (Wellcome Research Laboratories, UK.) (Edwards and Ewing, 1972). Other bacteria were identified according to standard methods (Barrow and Feltham, 1993).

The in-vitro antibiotic sensitivity tests for *Salmonella typhi* and *Salmonella paratyphi* were carried out by an agar-disc diffusion method (Matsen and Barry, 1974) against discs of Chloramphenicol (CHL) 30µg, Amoxyllin (AMX) 25 µg, Cotrimoxazole (COT) 25 µg, Ceftriaxone (CRO) 30 µg, Ofloxacin (OFX) 10 µg, Pefloxacin

(PEF) 10 µg, Augementin (AUG) 30 µg, Gentamycin (GEN) 10 µg and Ceftazidime (CAZ) 30 µg, using Oxoid Iso-sensitest agar CM471.

The data were analyzed to determine the percent incidence of the microorganisms and antibiotic sensitivity *Salmonella* species respectively. Also the distribution frequency of *Salmonella* species septicaemia among the children was determined (Chartfield, 1983).

## RESULTS

A total of 151 bacterial isolates were recovered from 442 septicaemic children brought to the children's emergency unit and children out-patient clinic, University College Hospital., Ibadan. Staphylococci (42.4%) were the most common bacteria in this study namely *Staphylococcus aureus* with an incidence of (33.1%) and *Staphylococcus albus* (9.3%). The incidence of other bacteria encountered, were as follows: *Escherichia coli* was (19.2%); *Salmonella typhi* (12.6%); *Klebsiella* species (7.9%); *Pseudomonas aeruginosa* (6.6%); *Enterococcus faecalis* (5.9%); *Salmonella papratyphi* (3.9%) and *Haemophilus species* (1.3%) Table1.

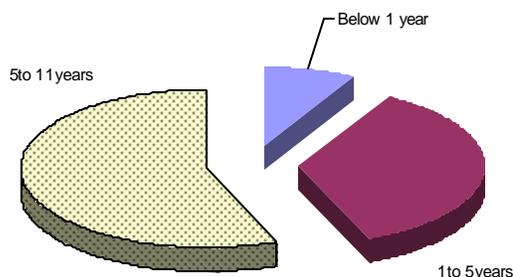
**Table 1:**

Frequency of Isolation of Bacterial Isolates from Septicaemic Children in University College Hospital Ibadan.

Organism	No isolated (%)	No isolated in Males (%)	No isolated in Females (%)
<i>Staphylococcus aureus</i>	50 (33.1)	28 (30.8)	22 (36.7)
<i>Escherichia coli</i>	29 (19.2)	18 (19.8)	11 (18.3)
<i>Salmonella typhi</i>	19 (12.6)	13 (14.3)	6 (10.0)
<i>Staphylococcus albus</i>	14 (9.3)	9 (9.9)	5 (8.3)
<i>Klebsiella species</i>	12 (7.9)	8 (8.8)	4 (6.7)
<i>Pseudomonas aeruginosa</i>	10 (6.6)	6 (6.6)	4 (6.7)
<i>Enterococcus faecalis</i>	9 (5.9)	4 (4.4)	5 (8.3)
<i>Salmonella paratyphi</i>	6 (3.9)	4 (4.4)	2 (3.3)
<i>Haemophilus species</i>	2 (1.3)	1 (1.1)	1 (1.7)
<b>Total</b>	<b>151 (100)</b>	<b>91 (100)</b>	<b>60 (100)</b>

Fig. 1 shows that *Salmonella* septicaemia was most common (56%) among children of age 5-11 years bracket and below bracket followed by 1-5 years and below group (36%); while those within 0-1 year group showed a frequency of (8%).

For *in-vitro* antibiotic sensitivity patterns of *Salmonella typhi* and *Salmonella paratyphi*, 100% sensitivity was demonstrated to Ceftriaxone only for *Salmonella typhi* and *Salmonella paratyphi*. While Gentamicin, Ofloxacin, Cefrazidime; Augmentin, Pefloxacin, Chloramphenicol, Amoxicillin, Cotrimoxazole showed varied sensitivity/resistance in descending order as shown in Table 2.



**Fig. 1.**  
Age distribution of Salmonella Septicemia among the Children

**Table 2:**  
Antibiotic Sensitivity Pattern of Salmonella Isolates

Antibiotic	Sensitive Isolates				Resistant Isolates			
	<i>Salm typhi</i>	(%)	<i>Salm paratyphi</i>	(%)	<i>Salm typhi</i>	(%)	<i>Salm paratyphi</i>	(%)
Cotrimoxazole	3	15.8	1	16.7	16	84.2	5	83.3
Amoxicillin	8	42.1	3	50.0	11	57.9	3	50.0
Chloramphenicol	12	63.2	3	50.0	7	36.8	3	50.0
Augmentin	14	73.7	4	66.7	5	26.3	2	33.3
Pefloxacin	14	73.7	4	66.7	5	26.3	2	33.3
Cefrazidime	15	78.9	5	83.3	4	21.1	1	16.7
Ofloxacin	17	89.9	5	83.3	2	10.5	1	16.7
Gentamicin	17	89.9	5	83.3	2	10.5	1	16.7
Ceftriaxone	19	100.0	6	100.0	0	0	0	0

## DISCUSSION

The results of the current study indicate that neonate septicaemia is a problem especially in Nigeria as earlier observed by Odugbemi *et al.*, (1994). The frequency of Staphylococci (42.4%) namely *Staphylococcus aureus* with a prevalence of (33.1%) and *Staphylococcus albus* (9.3%) isolated in this investigation is lower than 83.3% earlier documented from Australia by Cosgrove *et al.*, (2003). This suggests that *Staphylococcus aureus* septicaemia is a problem in Nigeria as it is in other parts of the globe. The incidence of *Salmonella typhi* (12.6%) and *Salmonella paratyphi* (3.9%) is higher than (1%) earlier recorded in children by Christen (1980). This worker reported that affected children under 17 years suffered from *Salmonella* septicaemia every year. The high age incidence of *Salmonella* species septicaemia in the age bracket 5 and 11 years as opposed to children of 1 year and below conforms to the age incidence of <5 and 15 years earlier recorded by Brooks *et al.* (2005). It is rather

unfortunate that in West Africa and other parts of Africa there is no regional typhoid surveillance recognized by World Health Organization though the crude typhoid fever incidence rate was put as medium for West Africa (Crump *et al.*, 2004). The antimicrobial susceptibility data obtained for *S. typhi* and *S. paratyphi* in this study indicate no antimicrobial resistance was shown by *S. typhi* and *S. paratyphi* in this study to Ceftriaxone whereas Brooks *et al.*, (2005) documented 2%. The antibiotic resistance manifested in the current study in respect of ampicillin, conform to earlier findings by Coovadia *et al.* (1992) and Su *et al.* (2004). However, highest *in vitro* resistance was observed for cotrimoxazole compared with other antimicrobial agents tested in this study. Moreover, the antibiotic resistance to cotrimoxazole by *S. typhi* and *S. paratyphi* is higher than the 57.1% recently reported by Brooks *et al.*, 2005. These findings call for concern against the backdrop of the empirical policy of cotrimoxazole prophylaxis for infants exposed to HIV infection as the policy may be counter

productive. Antimicrobial drugs resistance generally jeopardizes the effectiveness of the treatment of bacterial, viral, fungal and parasitic infections worldwide.

In developing countries like Nigeria, reducing the incidence of Salmonella septicaemia especially in children requires the provision of safe drinking water, observance of good personal hygiene by mothers, hygienic food preparation and effective sewage disposal. Furthermore, the provision of adequate health care, wholesome water for drinking and domestic use by governments cannot be overemphasized

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