

## PREVALENCE OF BACTERAEMIA AMONGST CHILDREN WITH FEBRILE SEIZURES AT THE UNIVERSITY COLLEGE HOSPITAL, IBADAN

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### ABSTRACT

**Background:** Febrile seizures are common among children and these are known to result from the diverse aetiological factors, known to cause fever in children.

**Objectives:** To determine the prevalence of bacteraemia amongst children with febrile seizures at the children's emergency room of the University College Hospital, Ibadan, Nigeria.

**Methods:** This was a prospective study involving 147 children who were presented with febrile seizures over a period of 13 months at the University College Hospital Ibadan. They all had their blood cultures sample taken under aseptic conditions. Other investigations performed on them included a packed cell volume, full blood count and blood film for malaria parasite.

**Results:** A total of 83 males and 64 females with febrile seizures were studied. Their ages ranged from 4 to 60 months with a mean age of 26.35 + 13.76 months. Bacteraemia was diagnosed in 32(21.8%) of the cases. The predominant organism isolated from the blood of these patients was *Staphylococcus aureus*.

**Conclusion:** Bacteraemia is a frequent finding in children with febrile seizures hence, it may be beneficial to carry out blood culture in such children on the suspicion of a probable bacterial infection.

**Keywords:** Seizures, Febrile, Bacteraemia.

### INTRODUCTION

A febrile seizure is a seizure occurring in infancy or childhood usually between three months and five years of age associated with fever but without evidence of intracranial infection or a defined cause.<sup>1</sup> The International League Against Epilepsy (ILAE) defines it further, as a seizure occurring in childhood after one month of age associated with a febrile illness not caused by an infection of the central nervous system, without previous neonatal seizures or a previous unprovoked seizure, and not meeting criteria for other acute symptomatic seizures.<sup>2</sup> Febrile seizures are a common problem encountered in emergency Paediatrics practice, occurring in 2 to 5 percent of children six months to five years of age.<sup>3-5</sup>

There are various causes of fever in these children presenting with febrile seizure. Studies based in Nigeria, sub-Sahara Africa, reported malaria as the leading etiology of fever in such children.<sup>3,6,7</sup> This finding is not surprising as malaria is endemic in Nigeria. However, bacteraemia is also an important cause of fever in these children. Decades ago, Familusi *et al*<sup>2</sup> and Angyo *et al*<sup>6</sup> reported bacteraemia in 3.3% and 3.7% respectively in a cohort of Nigerian febrile

seizure children.<sup>3,6</sup> while James *et al*<sup>8</sup> and Teah *et al*<sup>9</sup> reported a prevalence of 5.4% and 2.9% respectively in Caucasians. More recent studies done on children with febrile seizures by Shah *et al*<sup>10</sup> reported a prevalence of bacteraemia to be 2.1%, while Trainor *et al*<sup>11</sup> in Chicago reported a low prevalence of 1.3%. More recent Nigerian studies on febrile seizures did not specifically mention the prevalence of bacteraemia in the children they studied.<sup>7,12,13</sup>

James *et al*<sup>8</sup> and Teah *et al*<sup>9</sup> studies were retrospective and not all the children studied had blood culture results. It is probable that some cases of bacteraemia would have been missed. Familusi *et al*<sup>2</sup> and Angyo *et al*<sup>6</sup> studies though prospective, however, did not carry out blood culture studies in all of the children studied also making prevalence obtained most likely not fully representative of the actual prevalence. Bacteraemia is detected more frequently in children who are admitted to hospital with febrile seizures when cultures are performed as a routine.<sup>14</sup> The detection of bacteraemia and prevention of serious complications are important goals in the examination of febrile young children.<sup>10</sup> Blood culture is the gold standard test for proving

bacteraemia and for identifying bacteria and their antibiotic sensitivities.<sup>15</sup> This study seeks to determine the prevalence of bacteraemia in children that present in the emergency room of the University College Hospital, Ibadan, with febrile seizures.

## MATERIALS AND METHODS

This was a prospective, cross-sectional study involving 147 children who presented with febrile seizures over a period of 13 months at the children's emergency ward of University College Hospital, Ibadan, Nigeria. All the children recruited met the criteria for being classified as having had febrile seizures and not any other type of seizure.

Inclusion criteria in this study included children ages three months to five years with a history of fever (temperature equal or greater than 37.5°C), seizures and normal cerebrospinal fluid (CSF). Children with a febrile seizures, acute head injuries, congenital or acquired central nervous system (CNS) abnormalities and those with abnormal cerebrospinal fluid were excluded from the study.

The detailed history of present illness, type and duration of seizures, past medical history and family history were recorded. A thorough physical examination was performed on each patient at admission with emphasis on the CNS. Blood culture collection was carried out under aseptic conditions. To collect the blood culture sample, one to three mls of venous blood was obtained from a peripheral vein after the skin surface had been cleaned with methylated spirit. A new hypodermic needle was then attached to the syringe containing the blood and the blood was injected into a culture bottle containing glucose broth for the detection of organisms after cleaning the rubber cap of the culture bottle with methylated spirit. This culture bottle was immediately taken to the laboratory to be incubated. This was done aerobically at 37°C for 7 to 10 days. Every child also had full blood count estimation and blood film for malaria parasite done.

Data analysis was done using Statistical package for social sciences (SPSS) version 16. The initial frequencies of the variables were done to generate the mean, standard deviation, minimum and maximum values.

Ethical clearance was obtained with the University of Ibadan/ University College Hospital ethical committee, while informed consents were obtained from the parents/caregivers of the children before they were recruited into the study.

## RESULTS

A total of 83 boys and 64 girls were enrolled in the study. Ages ranged between 4 months and 60 months with a mean age of 26.4+13.8 months. The characteristics of the patients are highlighted in Table 1.

A diagnosis of bacteraemia based on positive blood cultures was made in 32(21.8%) of the cases. Only 3(2%) children with positive blood cultures had a

**Table 1:** Characteristics of patients with bacteraemia

Characteristics	Number of patients (%)
<b>Age group (months)</b>	
0 - 12	3 (9.4)
13 - 36	22 (68.8)
37 - 60	7 (21.9)
<b>White cell count</b>	
<5000/mm <sup>3</sup>	6 (18.8)
5,000 – 10,000/mm <sup>3</sup>	22 (68.8)
>10,000 - < 15,000mm <sup>3</sup>	3 (9.4)
>15,000mm <sup>3</sup>	1 (3.1)
<b>Type of seizure</b>	
Simple febrile seizures	10 (31.2)
Complex febrile seizures	22 (68.8)
<b>Co-morbidities</b>	
Malaria	13 (40.6)
Anaemia	27 (84.4)

**Table 2:** The different types of isolated micro-organisms

Organisms isolated	Number of patients (%)
<i>Staphylococcus aureus</i>	22 (68.8)
<i>Salmonella species</i>	(9.4)
<i>Pseudomonas aeruginosa</i>	2 (6.3)
<i>Klebsiella species</i>	1 (3.1)
Unidentified gram negative bacilli	4 (12.5)
Total	32 (100)

clinical diagnosis of septicaemia made and antibiotics commenced before culture results were obtained.

The predominant organism isolated from the blood of these patients was *Staphylococcus aureus* found in 22(68.8%) of the 32 patients with positive blood cultures. Other organisms were *Salmonella species* 3(9.4%), *Pseudomonas species* 2(6.3%), unidentified gram-negative bacilli 4(12.5%) and *Klebsiella species* in one (3%) patient (Table 2). The highest incidence of bacteraemia was found in the 13 – 36 months group (68.8%).

The bacterial isolates showed sensitivity to the cephalosporins: ceftazidime and cefuroxime; the quinolones: ofloxacin, ciprofloxacin and sparfloxacin. The isolates were, however, resistant to co-trimoxazole, chloramphenicol and tetracycline.

Malaria was found in 13(40.6%) of the cases of bacteraemia, while anemia was found in 27 (86%) of them. Most of these children (68.2%) had complex febrile seizures. Most of the children with bacteraemia (68.8%) also had white cell counts ranging between 5,000 and 10,000/mm.<sup>3</sup>

## DISCUSSION

Community acquired bacterial infections remain a major cause of morbidity and mortality in the tropics.<sup>15</sup> The prevalence of bacteremia in this study was 21.8% and the predominant organism isolated in our study was *Staphylococcus aureus* (68.8%). This is higher than what was reported in the past by Familusi *et al*<sup>6</sup> in the same center 3 decades ago. This was a prospective study where every child presenting with febrile seizure was studied while Familusi *et al* study only selected some of the children for blood culture thus the probability of missed cases is very high. This rather high prevalence of positive blood cultures in this study may suggest that blood culture could be included as part of routine work up for patients with febrile seizures. The finding of *Staphylococcus aureus* as the predominant isolate in our study is in keeping with some previous reports,<sup>16,17,18</sup> but at variance with some other reports.<sup>3,6,9,14,19</sup> Similar observations were reported by Akpede in Nigeria and Al-Zamil in Saudi Arabia.<sup>16,20</sup>

Reports from the temperate regions, free of malaria endemicity, revealed that the commonest organism isolated from the blood cultures of these children was *Streptococcus pneumoniae* and they also observed a drastic decline in the prevalence of bacteraemia following *Streptococcus pneumoniae* immunization, hence they advocate minimal laboratory investigations in children presenting with simple febrile seizures, who have been fully immunized.<sup>10,11,19,21</sup>

A history of febrile seizures should not dissuade an emergency room physician from performing a blood culture.<sup>8</sup> Documentation of parasitaemia does not exclude other infections but can be misleading in a sick child. This is clearly demonstrated in this present study where 13 of the 32 children with bacteraemia also had malaria. There are no specific symptoms and signs associated with malaria. In the tropics acute fever without localizing signs is often equated with malaria and the prevalence of bacteraemia in such children has remained largely unknown.<sup>22</sup> Although malaria is a predominant infection in healthy under-fives with fever,

bacteraemia with or without malaria occur with an important high frequency<sup>16,17</sup> and while presumptive treatment of malaria is justified in such children, evaluation for bacteraemia should be given consideration.<sup>17,22</sup> The higher prevalence of bacteraemia in the tropics could be due to the influence of malaria.<sup>23,24</sup> The presence of bacterial infections in children with malaria could be detrimental to outcomes as those with double infection of malaria and other bacterial infections experience greater morbidity and mortality.<sup>16,17,25</sup>

It is recommended that evaluation for bacteraemia and other infections be considered in patients with febrile seizures especially in the presence of clinical signs or if unduly unwell after the episode of seizure. Other reports have also highlighted the problems of concurrent infections, including bacteraemia in children with malaria.<sup>16,17,18</sup>

The most common isolated agent was *Staphylococcus aureus*. Bacteraemia is defined as growth of bacteria with recognized pathogenic capacity in at least one blood culture bottle in patients with acute febrile illness and clinical findings suggesting infectious disease.<sup>18</sup> If sampling for blood culture has been done observing asepsis, the growth of *Staphylococcus aureus* is not considered as contaminant.<sup>20</sup> Common contaminants include *Staphylococcus epidermidis*, *Corynebacterium* species, Propioni-bacterium species, Bacillus species and *alpha-haemolytic streptococcus*.<sup>17</sup> These are not considered positive blood culture unless identified on 2 sets of blood culture in patients with intravascular device or patients with no apparent infectious focus.<sup>15</sup>

Bacteraemia is a serious infection, which can lead to multiple complications and even death. Therefore the possibility of this diagnosis should be kept in mind when managing a child with febrile seizures. Children younger than 36 months in this study were at increased risk for bacteraemia or sepsis probably secondary to the immaturity of their immune system.<sup>20</sup> Most of them developed anaemia (86%), which was worsened by the co-existence of malaria in some of these children. The problem of multiple infections like co-existence of bacteraemia and malaria in children is highlighted in this study and this could make assessment and management of these children very challenging for the Paediatrician.

Most of the children (68.2%) had complex febrile seizures. The recent advocacy for minimal testing in febrile seizure patients is largely restricted to patients with simple febrile seizures; while those presenting with complex febrile seizures, on the other hand, must be

evaluated and managed with diagnostic and therapeutic measures based on the differential diagnosis.<sup>26</sup>

## CONCLUSION

Bacteraemia is a frequent finding in children with febrile seizures, hence, it may be beneficial if blood cultures are carried out in such children on the suspicion of a probable bacterial infection.

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