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# RETROSPECTIVE DESCRIPTIVE ANALYSIS OF PAEDIATRIC BACTERAEMIA - BARDNESVILLE JUNCTION HOSPITAL, LIBERIA

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## ETHICS

This study meets the exemption criteria for ERB review and was approved for submission to MSF Paediatric Days by the deputy medical director Operational Centre Paris.

## BACKGROUND AND AIMS

Médecins Sans Frontières (MSF) has prioritised addressing antimicrobial resistance in contexts where MSF works. Paediatric sepsis associated with multi-drug resistant pathogens is a leading cause of death worldwide.

The Surviving Sepsis Campaign guidelines 2020 underscore that prior recent global estimates for sepsis incidence and mortality were based on adult data from 7 high income countries only. New estimates which include data from low- and middle-income countries show estimates of more than double the previous levels with the largest change in estimates occurring in children.

The incidence of paediatric bacteraemia and the associated mortality is disproportionately high in low resource settings, with a paucity of data to describe bacteraemia and resistance patterns where facilities may have difficulty collecting routine data and meeting internationally agreed definitions and guidelines for treatment. For those low resource setting that have culture facilities, this is an important resource with which to make an objective diagnosis of bacteraemia.

The purpose of this retrospective study was to describe; antibiogram reported multidrug resistance, associated mortality and timing and selection of initial antibiotic treatment based on patient chart data.

## METHOD

- A total of 806 blood cultures were collected from children 1 month to 16 years of age between 1st January 2020 - 31st July 2020, at MSF Bardnesville Junction Hospital (BJH) in Monrovia, Liberia. BJH admission criteria were such that for all children in whom a blood culture was collected, there were signs of systemic inflammatory response syndrome, equating to all children with fever and all critically ill (triage category red) patients..
- Microbiological analysis was performed in accordance with MSF-Standard Operating Procedures, including gram staining, biochemical testing and Analytical Profile Index identification
- The Kirby Bauer disc diffusion method was used to complete antibiotic sensitivity testing and detection of resistance mechanisms, and it was interpreted using the European Committee on Antimicrobial Susceptibility Testing guidelines
- Data were entered into WHONET software
- For general analysis the following data were collected from patient chart review and entered into an excel spreadsheet; age, date of admission, sex, location with the hospital at the time of culture collection, which antibiotic (if any) received, date of antibiotic, clinical information provided, date of collection, specimen type, culture result (isolate) and antibiogram
- Patient status ‘alive’ or ‘expired’ was extracted from PRAXIS database records using patient identification numbers on retrospective chart review
- On review of culture positive results 111 isolates were interpreted as contaminants and removed, of which 97 were Coagulase-negative *Staphylococcus* (CoNS)
- Statistical analysis was completed using Microsoft Excel

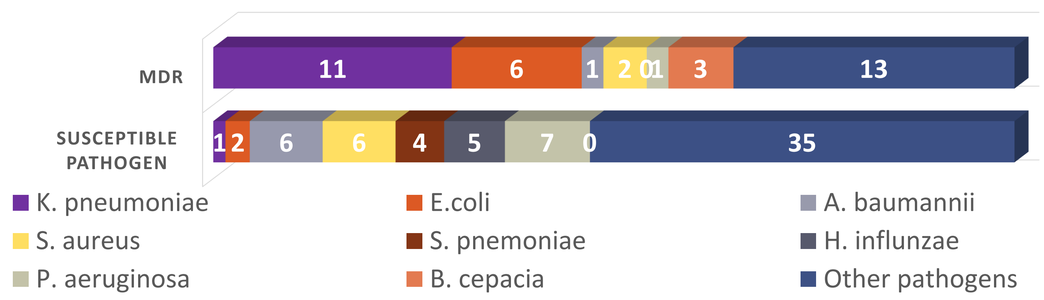
## RESULTS

103 (12.7%) of 806 blood cultures tested were positive for non CoNS paediatric bacteraemia. The 103 isolates corresponded to 100 patients. The mortality rate of bacteraemia was 36 of 100 patients (36%), with the highest burden of mortality in children less than 12 months of age (Table 1).

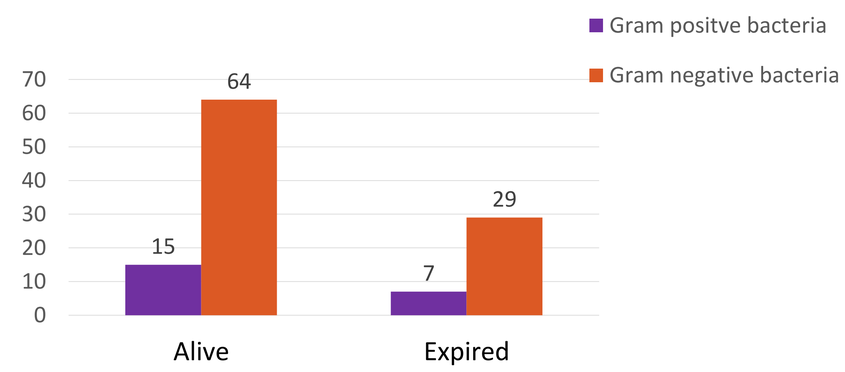
**Table 1.** Age demographic and mortality.

| Age group | Frequency | Expired |
|---|---|---|
| 1-<3 months | 9 | 2 |
| 3- <6 months | 17 | 3 |
| 6- <12 months | 27 | 13 |
| 12 - <24 months | 25 | 8 |
| 24 months - <5 years | 12 | 5 |
| ≥5 years | 10 | 5 |
| Total | 100 | 36 |

There was a high incidence of gram negative, 78 of 103 (78%), and multidrug resistant, 37 of 103 (36%), bacteraemia. Eighty-one isolates were gram negative (81/103 79%) and 22 (22/103 21%) were gram positive (Graph 1). Of the total of 81 gram negative isolates 35 (35/81 43%) were multidrug resistance (graph 1). Of the 22 gram positive isolates (22/103 21%), two (2/22 10%) were Methicillin Resistant *Staphylococcus aureus* (MRSA). There was evidence of extended spectrum beta lactamase resistance and carbapenemase producing *Enterobacteriacae*.




**Graph 1.** Frequency of multidrug resistance among isolated organisms.




**Graph 2.** Patients' outcome by pathogenic microorganism.

Sixty-three of 100 (63%) children received antibiotics the day of blood culture collection, with ceftriaxone the most frequently used. There was no difference in mortality between children with gram negative, gram positive or multidrug resistant bacteraemia.

## DISCUSSION

Most patients with bacteraemia survived (64%), with 36% overall mortality higher than published literature. Confounding factors such as; age, male predominance, duration of sepsis prior to admission, prehospital use of antibiotics, malaria coinfection, immunosuppression and seasonal variance may account for the increased incidence and mortality observed. The exclusion of presumed contaminants, 95% of which were CoNS, may have introduced an interpretation bias to this study. There are no data from Liberia for geographical comparison.

## CONCLUSION

This analysis is the first documented data to describe high rates of gram negative bacteraemia in a paediatric inpatient population, in Liberia, with antibiogram defined local antimicrobial resistant rate exceeding 10%. Further research across a 12-month period addressing confounding factors is needed to better understand the high incidence of paediatric bacteraemia and mortality burden in this population, with a view to the development of a hospital based antibiogram to inform empiric guidelines for sepsis.