Community Acquired Bacteremia in Nigerian Children: A Preliminary Report

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Overview

- Background
- Community Acquired Bacteremic Syndromes in Nigerian Children- A pilot study
- Epidemiologic surveillance
Epidemiology of Bacteremia in Africa

North Africa
- Two studies covering 14 locations
- 10,230 patients, 10.3% with BSI
- HIV was not reported
- All studies were primarily in adults
- Three commonest isolates: Salmonella 49.9% (S. enterica serotype Typhi 99.0%), Brucella spp 26.8%, Staphylococcus aureus 7.7%

East Africa
- Seven studies covering nine locations
- 21,317 patients, 7.9% with BSI
- 18.6% of included patients tested for HIV
- 23.7% of 3,445 tested were seropositive for HIV-1
- Four studies were primarily in children and four were primarily in adults
- Three commonest isolates: Streptococcus pneumoniae 21.2%, Salmonella 17.8% (non-typhoidal 88.0%), Escherichia coli 9.5%

West and central Africa
- Six studies covering five locations
- 5,887 patients, 12.4% with BSI
- 5.4% of included patients tested for HIV
- 63.3% of 319 tested were seropositive for HIV-1 or HIV-2
- Five studies were primarily in children and one was primarily in adults
- Three commonest isolates: Salmonella 20.8% (non-typhoidal 87.0%), S. pneumoniae 18.9%, S. aureus 17.2%

Southern Africa
- Seven studies covering five locations
- 23,893 patients, 9.8% with BSI
- 5.0% of included patients tested for HIV
- 59.8% of 1,204 tested were seropositive for HIV-1
- Four studies were primarily in children and three were primarily in adults
- Three commonest isolates: Salmonella 29.0% (non-typhoidal 97.0%), S. pneumoniae 24.0%, S. aureus 9.4%

Crump et al. Lancet 2011
Risk Factors that Modify Epidemiology of Childhood Bacteremia in Africa

- Malaria
- Hemoglobinopathies
- HIV
- Malnutrition
- Antibiotic use
- ? Other
Background

- Most populated country in sub-Saharan Africa
- High infant mortality
- High under 5yr mortality
- Poorly defined burden of vaccine preventable bacterial diseases
- Poor immunization coverage
Previous Studies

Limitations of previous studies

- Sub optimal laboratory Methods
- Culture media
- Agar preparation- suboptimal blood agar source
- Identification of isolates- misidentification
- Incomplete characterization
Community Acquired Bacteremic Syndrome in Young Nigerian Children (CABSYNC)

A COLLABORATIVE STUDY
National Hospital Abuja
Zankli Medical Center
MRC Laboratories, The Gambia
Michigan State University
CDC, ATLANTA
Community-Acquired Bacteremia in Young Nigerian Children- A pilot Study

Objectives

• To introduce automated blood culture system to pediatric clinical care
• Pilot study of the etiologic agents of bacteremia in young children in central Nigeria
• Define invasive pneumococcal disease burden
Bacteremia Surveillance in Young Children
Abuja City
Satellite Settlements Around Abuja
Satellite Settlements Around Abuja
Equipping the Laboratory
Laboratory Personnel Training
Methods I

• Enrolment from Sept 2008-
• All children aged 2months-5years
• Fever or hypothermia (temp greater or equal to 38.5°C or less than 34.5°C plus prostration, respiratory distress, convulsion or diarrhea
• Informed consent
Methods II

- Blood drawn aseptically into culture bottle with other clinically indicated tests
- Culture bottles incubated for 5 days (max)
- Positive cultures Gram stained and sub cultured on appropriate agar plates
- Identification by standard biochemical method (API)
Methods-III

- Secondary ID confirmation of bacterial isolates identity an International Reference laboratory (Medical Council Laboratories, The Gambia or Sparrow Regional Laboratories, Lansing USA).

- Antimicrobial activity in serum was determined by inhibition of *Micrococcus luteus* assay.
Methods IV

- *Salmonella* isolates were tested for susceptibility to a panel of 15 antimicrobials used by the NARMS program.
- Antimicrobial MICs of *Salmonella* isolates were determined via the Sensititre automated antimicrobial susceptibility system.
RESULTS
Pre-Consultation

Fig 2. Serum Antimicrobial Activity in Sub-Population by Site

Percent (%)

Site

DMC  GHA  KMC  MGH  NGH  NHA  UATH  ZMC
Distribution of Bacterial Isolates

ACHROMOBACTE
AEROMONAS
KLEBSIella
CANDIDA
CITROBACTER
ENTEROBACTER
FLAVIMONAS
H. INFLUENZA
NON-HAEMOLYTIC
PSUEDOMONAS
SALMONELLA
SERRATIA
STREPT
β-HEAMOLYTIC
Distribution of Salmonellae Isolates

- S.TYPHI
- S.DUBLIN
- S.GRP B
- S.GRP C
- S.GRP D
- S.SPP
- S.ENTRIDITIS
Seasonal Distribution of Etiologic Agents of Bacteremia

Figure 1. Clinically Significant Culture over a 12 month Period
Molecular Pattern of Salmonella Isolates

Certain PFGE pattern clusters correlated well with their antimicrobial resistance profiles.

- All 8 S. Typhimurium isolates, showed the ACSSuT resistance profile, and all five Dublin isolates were completely susceptible to all antimicrobials tested.

- One major clone of Typhi contains 34 isolates, all were resistant to 3 to 7 antimicrobials and majority of them were resistant to AMPC- CHL- SSS-TET- SMX/TMP
Conclusions

• In central Nigeria, Salmonellae spp are the leading cause of CAB in young children
• There is high prevalence of MDR Salmonella infection
• Use of culture-based surveillance alone may underestimate disease burden
• Expanded surveillance is required at other locations
• Epidemiologic studies to identify host and environmental risk factors will inform optimal preventive strategies
Bacteremia Surveillance in Young Children
Future Studies

• Community-Acquired Pneumonia and Invasive Bacterial Disease in Young Children
  – Etiologic agents of community acquired pneumonia, bacteremia, meningitis
  – Identification of host risk factors
  – Incidence estimates

• Epidemiology of Invasive Salmonellosis