Community and hospital-acquired invasive bacterial infections in children in Mali : aetiology, antibiotic resistance and clinical outcomes

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Introduction

Febrile illnesses are the leading cause of morbidity and mortality in children under 5 in sub-Saharan Africa. However, invasive bacterial infections (IBI) are poorly documented in this region.

Objectives

Describe the prevalence, aetiology and antibiotic resistance of community and hospital-acquired IBI in children aged 2 months to 5 years-old and hospitalised in a referral health centre in Mali with danger signs of infection.

Methods

- **Study design :** Prospective observational study
- **Study site :** Referral Health Centre, Koutiala, Mali
- **Eligibility criteria :**
  - Age 2 months to 5 years
  - Danger signs of infections: fever, or history of fever in the last 48h (>37.5 °C), or hypothermia (< 35°C), or neurological signs, or symptoms of shock, or respiratory distress, or petechial/purpura at admission
  - Consent to participate in the study

- **Selection of participants:**

  To have a balance of malaria and non-malaria cases, we included all eligible patients with a negative malaria rapid diagnostic test (mRDT) and every third eligible patients with a positive mRDT.

  Admission and treatment of all children in this health centre were free of charge.

- **Laboratory procedures based on routine practices**
  - Blood sample collected on admission for blood culture and malaria confirmation with blood smear
  - Cerebrospinal fluid collected for culture if suspicion of meningitis
  - Further blood cultures if clinical deterioration >48 hours post admission (suspicion of hospital-acquired bacteraemia).
  - Disk diffusion antibiotic susceptibility testing following EUCAST 2016-2017

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- **Analysis:**
  - Weighted analyses to account for under-representation of patients with positive mRDT in study participants
  - Comparison of categorical variables using chi2 test
- **Ethical considerations:**

  Approved by the National Ethical Committee of Mali, and the Comité de Protection des Personnes in France.

Results

- 1784 children were included from August 2016 to August 2017 (980 with negative mRDT, 804 with positive mRDT). 2/3 of children were below 2 years-old.
- An estimation of 6.1% of patients with confirmed malaria had community-acquired IBI compared with 14.8% in malaria-negative patients.
- After weighting, the overall mortality was 12.6% (CI95% 11.0-14.4). Case fatality rate in patients with co-infection IBI-malaria (34.4%) was higher than with severe malaria only (p<0.001) (Table 1).

Table 1: Prevalence and mortality of community and hospital acquired invasive bacterial infections

	Prevalence, weighted % (CI95%)	**Case fatality rate**, weighted % (CI95%)
Community-acquired IBI	10.6 (9.1-12.2)	27.2 (20.9-34.5)
Co-infection IBI-malaria	2.9 (2.1-4.1)	34.4 (19.7-52.9)
IBI without malaria	7.8 (6.5-9.3)	26.2 (19.2-34.5)
Confirmed severe malaria only	40.4 (37.8-43.1)	10.1 (7.7-13.2)
Hospital-acquired bacteraemia	2.5 (1.8-3.5)	32.4 (18.3-50.6)

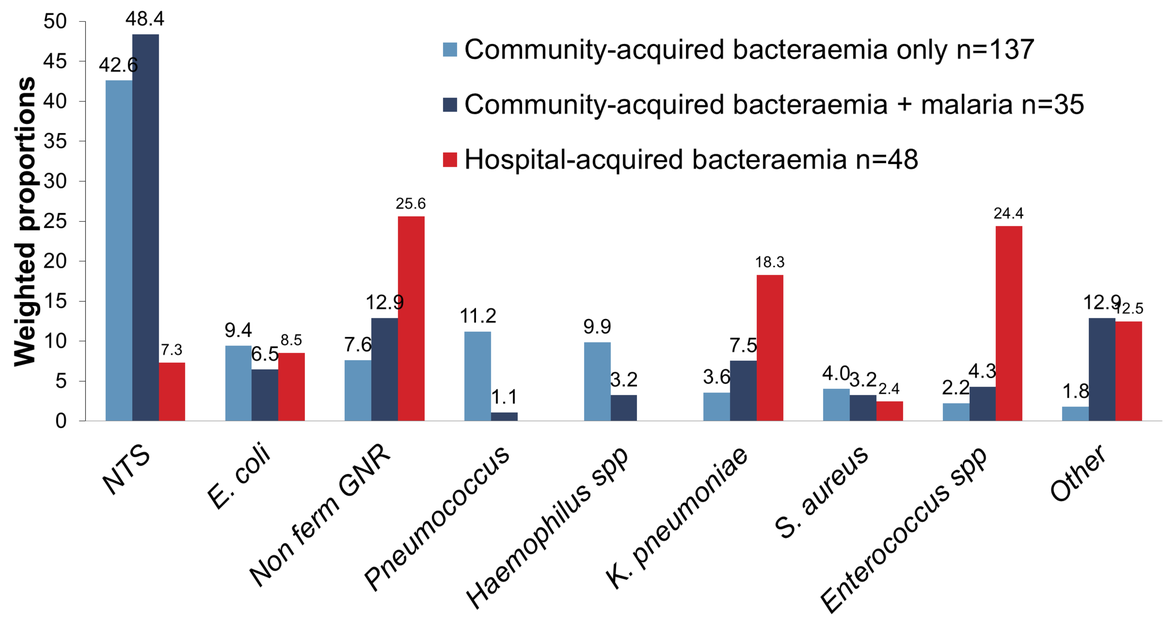

Figure 1: Aetiology of community and hospital acquired invasive bacterial infections. NTS=Non-Typhi *Salmonalla*; Non ferm GNR=Non fermentative Gram-negative rods

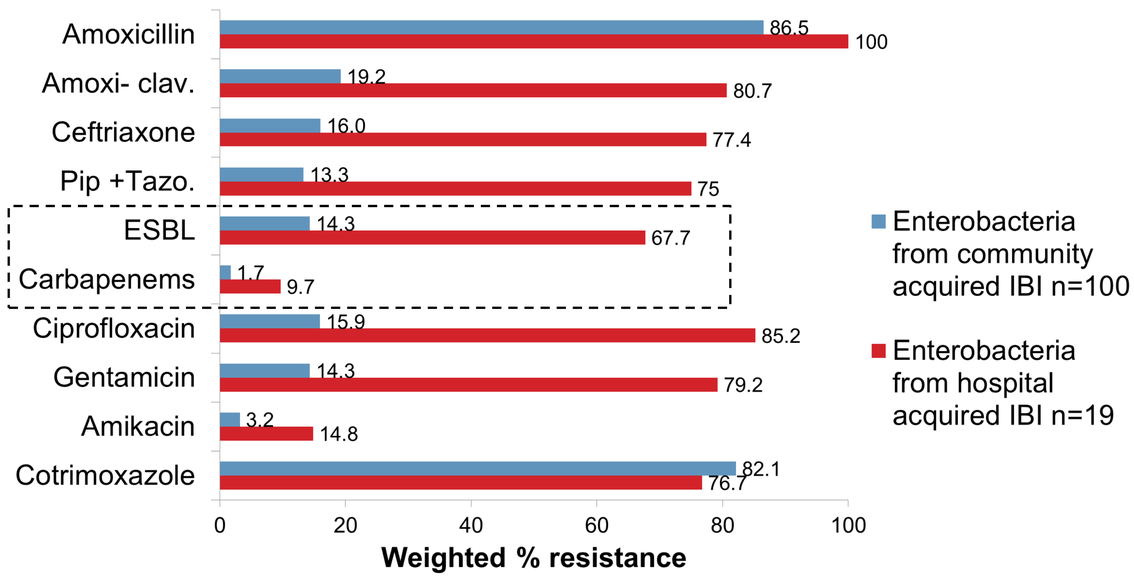

Figure 2: Proportion of antibiotic resistance among Enterobacteria isolated from community and hospital acquired invasive bacterial infections.

Conclusion

- Non-Typhi *Salmonella* was the main cause of community-acquired IBI as previously shown in multiple studies in sub-Saharan Africa.
- The mortality of children with community or hospital-acquired IBI was high. Mortality of children with co-infection IBI-severe malaria was much higher than severe malaria only.
- The high proportion of multidrug-resistant bacteria, specifically in hospital-acquired IBI, led to improved individual patient management with appropriate antibiotics, reinforcement of antibiotic stewardship and infection prevention measures in the paediatric hospital.

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