INVASIVE BACTERIAL DISEASES IN YOUNG INFANTS IN RURAL GAMBIA: A POPULATION-BASED SURVEILLANCE STUDY

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Introduction

Invasive bacterial diseases (IBD) cause significant morbidity and mortality in young infants globally. There are limited population-based data on the burden of IBD in sub-Saharan Africa.

Aims:

To determine the incidence, aetiology and outcome of IBD in young infants in rural Gambia.

Methodology

We conducted standardised, population-based surveillance for IBD among infants aged <91 days, residing within the Basse and Fuladu West Health and Demographic Surveillance Systems, in rural Gambia between March 2011 and December 2017. Children admitted to health facilities within the study area had conventional microbiological investigations. All admitted children were eligible for blood culture. The primary endpoint was IBD defined as isolation of pathogenic bacteria from blood, cerebrospinal fluid (CSF), lung or pleural aspirate. Patients with contaminated cultures were excluded from analysis.

Results

Participants: During the study period, 3794 infants aged <91 days were admitted. 3605 (95.0%) had at least one invasive sample collected for culture (3588 blood; 133 CSF; 16 lung aspirates and 2 pleural fluids).

Culture: Samples from 428 (11.9%) patients yielded contaminants. 254 (8.0%) episodes of culture-confirmed invasive bacterial diseases were detected (bacteraemia 234; meningitis 14; pneumonia 6).

Incidence: The incidence of IBD in infants aged <91 days was 25 cases/1000 person-years (95% CI 22 – 28). In infants aged 30 to <91 days, incidence of IBD was 12 cases/1000 person-years (95% CI 9 – 15). In neonates, the incidence of IBD was 50 cases/1000 person-years (95% CI 43 – 58) while prevalence of IBD was 3.3 cases/1,000 live births (95% CI 2.8 – 3.8). The incidence rate ratio of IBD in infants aged <30 days relative to infants aged 30 to <91 days was 4.26 (95% CI 3.25-5.63).

Aetiology: Figure 1. shows the most common bacteria causing IBD were Staphylococcus aureus (40%), Escherichia coli (15%), Streptococcus pneumoniae (9%) and Klebsiella pneumoniae (5%).

Case fatality: The case-fatality ratios of IBD in infants aged <91 days; 30 to <91 days and neonates were 26% (95%CI 21-32); 19% (95%CI 11-29) and 29% (95%CI 23-37) respectively (Table 1).

Pathogen	Age-stratified case-fatality ratio		
	0 to <91 days	<30 days	30 to <91 days
	No of deaths/No of cases (%)		
Gram-positive bacteria	26/139 (18.7)	17/93 (18.3)	9/46 (19.6)
Staphylococcus aureus	15/102 (14.7)	11/74 (14.9)	4/28 (14.3)
Streptococuss pneumoniae	8/23 (34.8)	3/8 (37.5)	5/15 (33.3)
Streptococcus pyogenes	3/9 (33.3)	3/7 (42.9)	0/2
Gram-negative bacteria	40/115 (34.8)	34/81 (42.0)	6/34 (17.7)
Eschericia coli	16/37 (43.2)	15/32 (46.9)	1/5 (20.0)
Klebsiella pneumoniae	6/12 (50)	6/10 (60)	0/2
Haemophilus influenzae type b	0/9	0/0	0/9
Neisseria meningitidis gr W135	2/9 (22.2)	0/2	2/7 (28.6)
Pseudomonas spp	2/7 (28.6)	1/4 (25)	1/3 (33.3)
Salmonella spp.	2/6 (33.3)	1/4 (25)	1/2 (50)
Burkholderia spp	1/6 (16.7)	1/6 (16.7)	0/0
Other Gram-positive bacteria			
Group B streptococci	0/3	0/2	0/1
Enterococcus spp	0/2	0/2	0/0
Other Gram-negative bacteria			
Enterobacter spp.	3/4 (75)	3/3 (100)	0/1
Other Neisseria spp	2/3 (66.7)	2 (66.7)	0/0
Acinetobacter spp	0/3	0/3	0/0
Morganella morganii	0/3	0/3	0/0
Serratia spp	2/3 (66.7)	1/2 (50)	1/1 (100)
Haemophilus Influenzae (non-type b)	0/2	0/1	0/1
Coliform spp	0/2	0/0	0/2
Chromobacterium spp	1/2 (50)	1/2 (50)	0/0
Pasteurella spp	1/2 (50)	1/2 (50)	0/0
Aeromonas spp	0/1 (0)	0/1 (0)	0/0
Brevundomonas vesicularis	0/1 (0)	0/1 (0)	0/0
Citrobacter freudii	0/1 (0)	0/1 (0)	0/0
Empedobacter bravis	0/1 (0)	0/0	0/1 (0)
Proteus mirabilis	0/1 (0)	0/1 (0)	0/0
Total	66/254 (26.0)	51/174 (29.3)	15/80 (18.8)

Table 1. Case-fatality ratio of IBD in young infants in rural Gambia

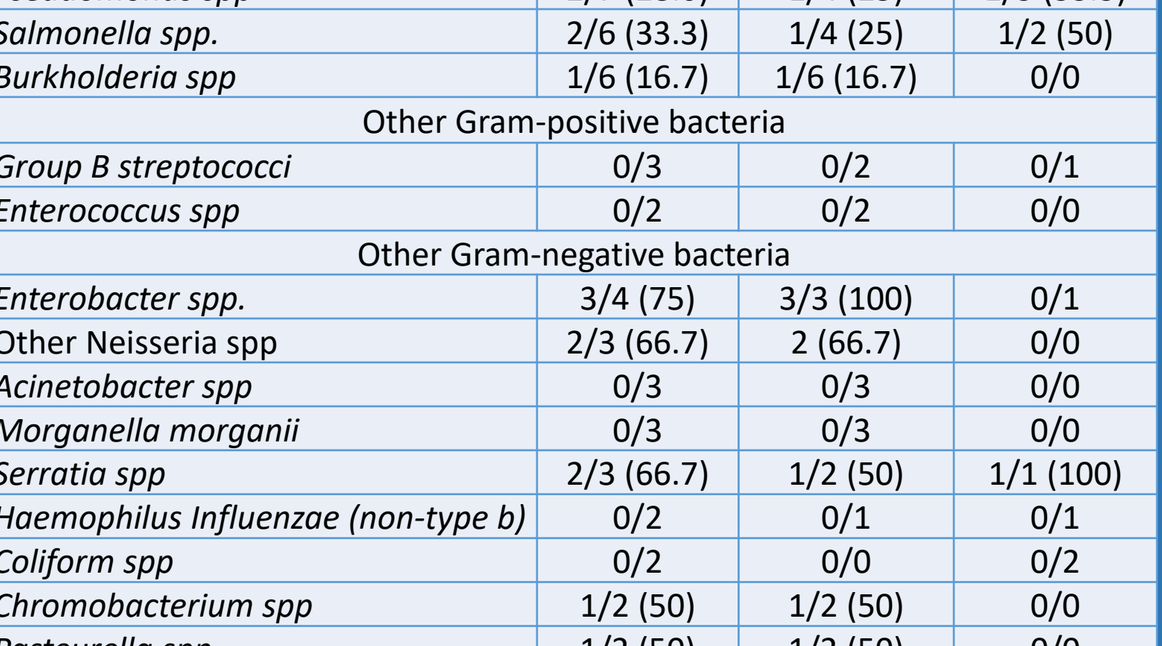

Figure 2. Trends in the incidence of IBD in infants aged 30 to <91 days and 0 to 29 days in rural Gambia

Conclusion

IBD is common in young infants in rural Gambia with high case-fatality. Maternal or neonatal prevention strategies are needed to prevent IBD in young infants.

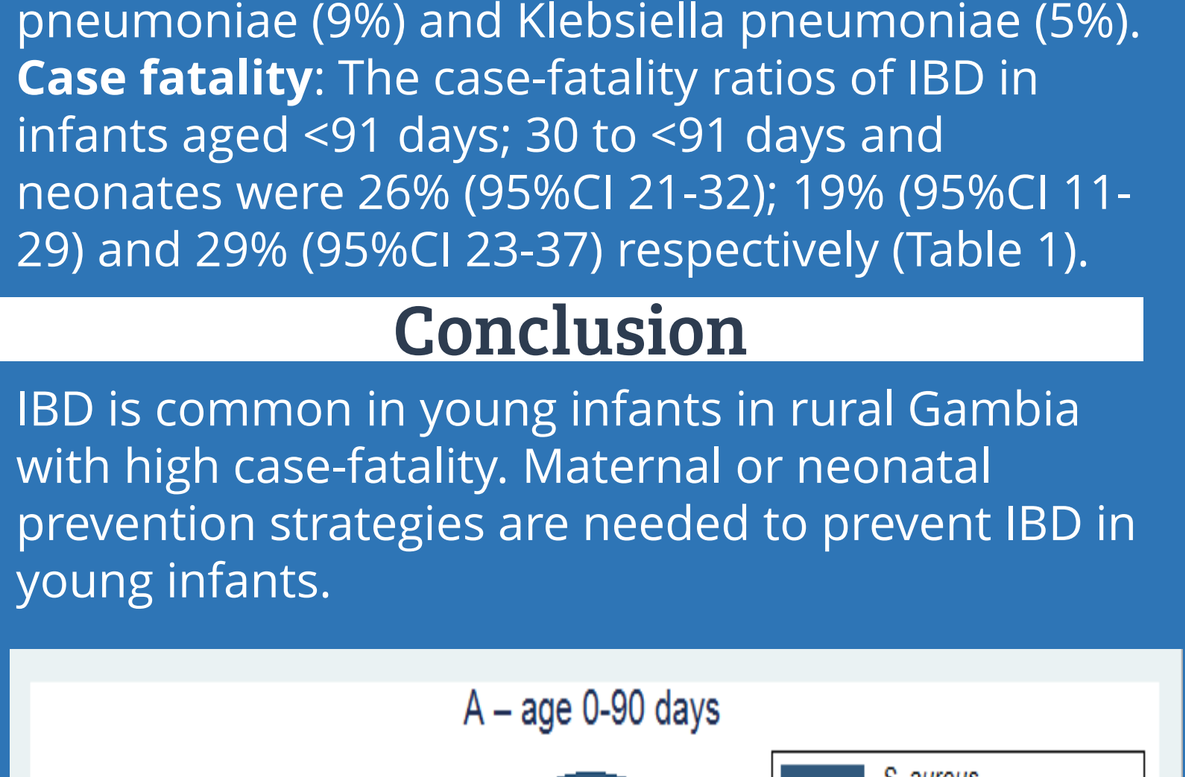

Figure 1. Most prevalent pathogens causing IBD in young infants in rural Gambia

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