IDENTIFYING THE IMPACT OF VERTICAL AND HORIZONTAL TRANSMISSION OF GRAM-NEGATIVE PATHOGENS IN THE NEONATAL INTENSIVE CARE UNIT: RESULTS FROM THE NEOCOL STUDY

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Background

Resistant gram-negative (GN) bacterial sepsis is a major global cause of neonatal mortality. Understanding their tyransmission and pathways (horizontal vertical colonization) is key to preventing neonatal infections.

Aim

To identify transmission pathways of resistant GN bacteria among mothers and hospitalised neonates.

Methods

Prospective cohort study enrolled 189 mother-infant dyads at Cipto Mangunkusumo Hospital, Jakarta (March-November 2024).
Maternal recto-vaginal swabs (at delivery) and neonatal rectal swabs (at delivery, then days 3, 7, and weekly until discharge) were cultured on selective chromogenic agar.
Pathogens were identified using MALDI Biotyper®. Antimicrobial susceptibility was confirmed using VITEK. Clinical surveillance captured infection episodes and outcomes.

Results

Median gestational age (weeks): 36.0 weeks (IQR 33.0 - 38.0)

Median birthweight Total – Median (IQR): 2345 g (IQR 1745 - 2925)

Premature (<37 weeks) Total: 96 infants (50.8%)
- Colonized: 69 infants (60%)
- Not Colonized: 27 infants (36.5%)

Admitted to NICU: 117 infants (62%)
- Colonised: 82 (70.1%) *pvalue*: <0.001
  By day 10, 50% of neonates had acquired **extended-spectrum beta-lactamase (ESBL)**–producing organisms and 25% had acquired **carbapenem-resistant Gram-negative (CR-GN)** organisms (Fig.2)

Mother colonised with the respective organism as the Infant (Fig.3) ESBL 30%, CR-GN 4,7%

Outcome:

- Average Infection Episode per Participant: 0.6 - Colonized 0.8 *pvalue:* <0,001 (Fig. 4)
- Mean Length of Stay: 5 days
  Colonized: 16 days *pvalue:* <0,001 (Fig. 4)

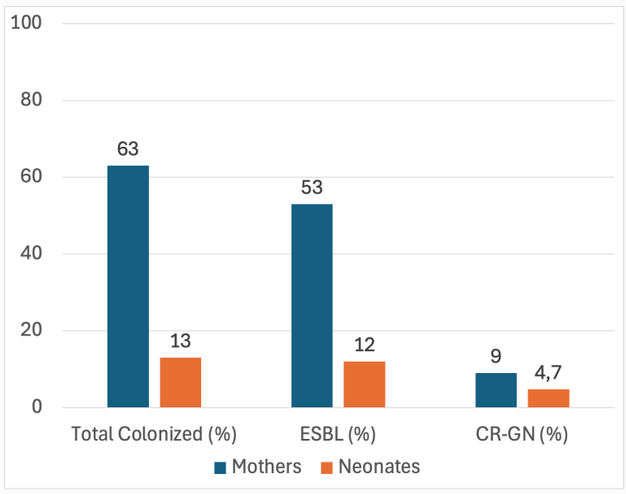

Figure 1. Maternal vs Neonatal Colonization at Birth

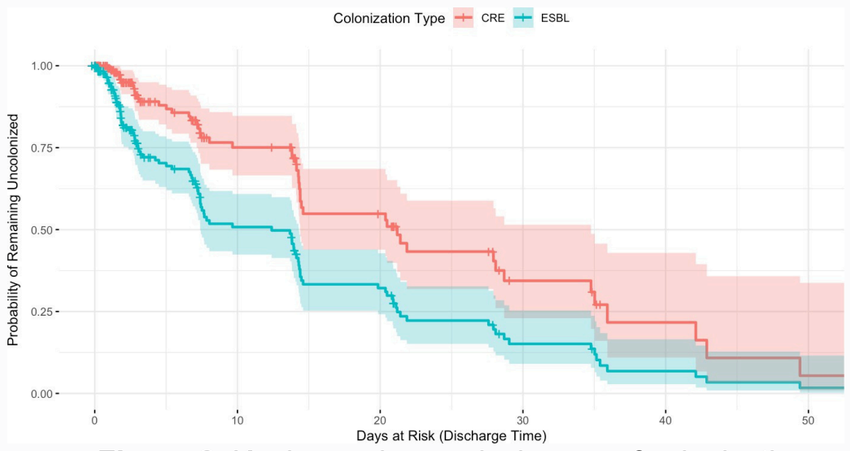

Figure 2. Kaplan-meier survival curve of colonisation status over time

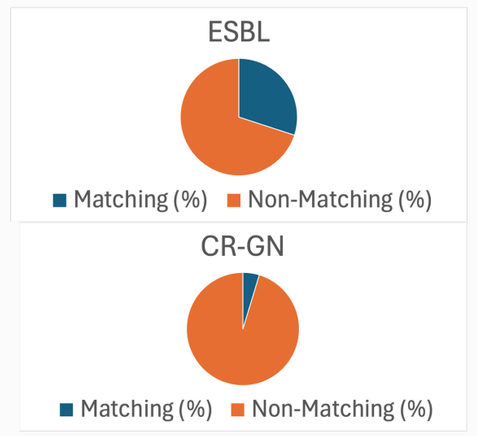

Figure 3. Matching Organisms (Mother-Infant)

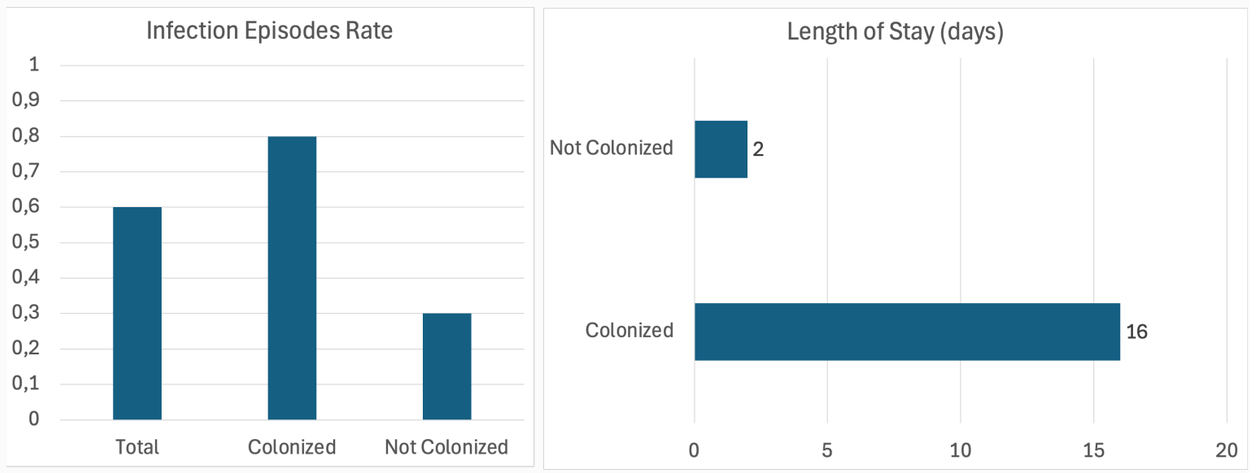

Figure 4. Outcomes in Infection Episodes and Length of Stay by Colonization Status

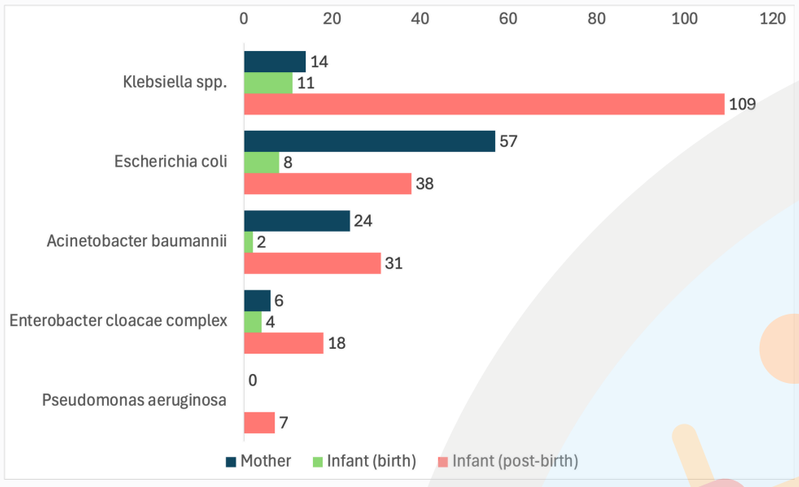

Figure 5. Infant Colonising organisms

Conclusions

Mothers had high prevalence of GN colonisation, predominantly with ESBLs. Early concordant infant colonisation at birth supports likely vertical transmission of these bacteria. Increased colonisation during hospitalisation suggests considerable horizontal transmission of ESBLs and CR-GNs from the hospital environment which require intensified implementation of infection prevention and control strategies.

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