Multidrug-resistant bacterial and fungal colonisation and transmission dynamics in hospitalised neonates

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NEOSEAP
Neonatal Sepsis in Southeast Asia and The Pacific

The Global Burden of Neonatal Infections

3m — Cases of neonatal sepsis occur each year

~0.5m — Deaths globally in babies due to neonatal sepsis

~17% — Mortality rate

In the context of rising antimicrobial resistance (AMR), this burden is rising, particularly in resource-constrained healthcare settings

Paulson, K.R et al. The Lancet 2021, 398, 870-905.
Ou, Z. et al. BMC public health 2022, 22, 1-13.

The Global Burden of Neonatal Infections

Predominantly gram negative pathogens in LMICs

Key pathogens:
Klebsiella pneumoniae
Acinetobacter baumannii

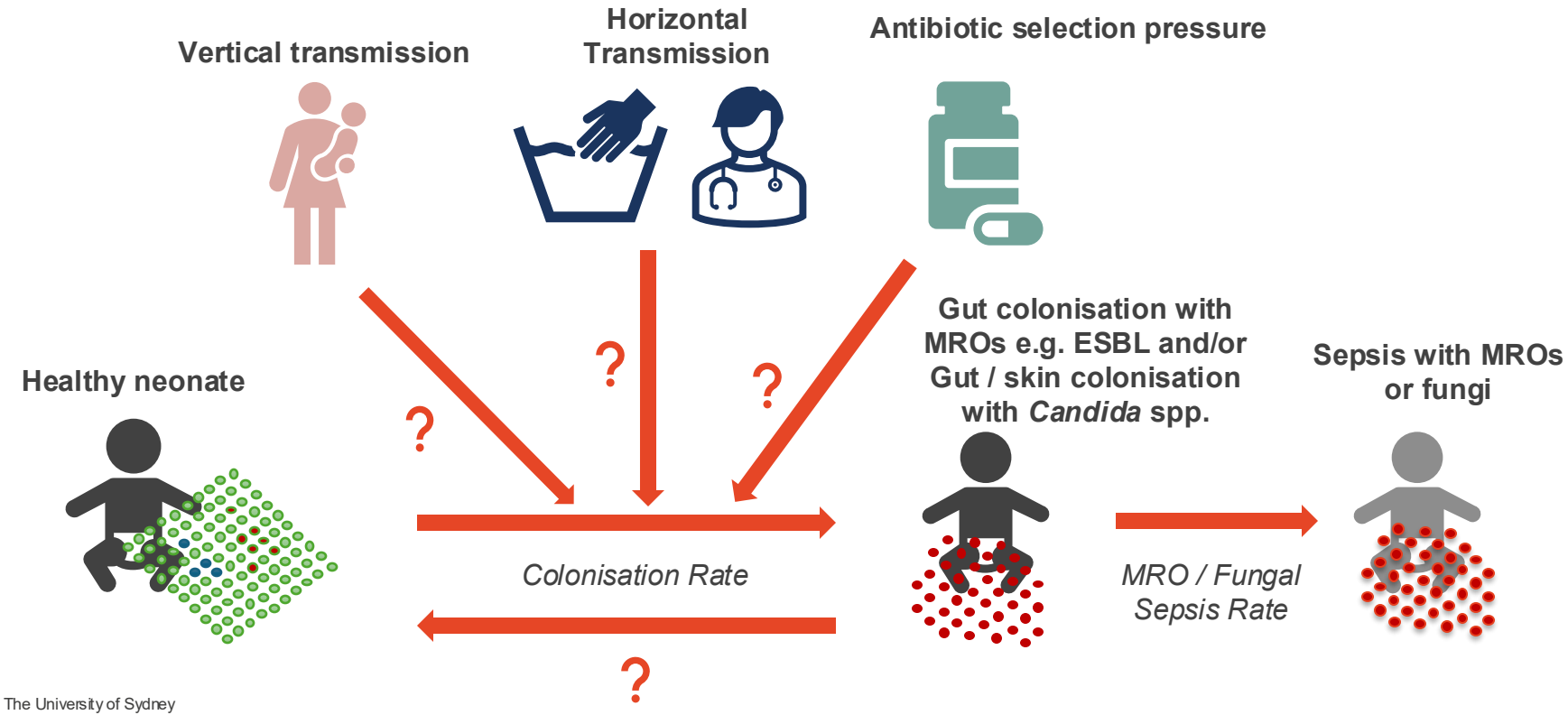
High resistance to first-line antibiotics

Increased mortality and prolonged hospitalisation

Multidrug-resistant gram-negative infections now account for 1 in 3 neonatal sepsis deaths globally

Fleischman et al. ADC 2021
GBD collaborators & GRAM study, 2024

Understanding the transmission dynamics of bacteria & fungi in the NICU



Study Design

Aim?

Characterise neonatal **colonisation**, identify **acquisition pathways** and **risk factors**, and generating evidence to inform **infection prevention strategies** and **optimise empiric treatment**

Where?

Maternity hospital, in Ho Chi Minh City, Vietnam

Who?

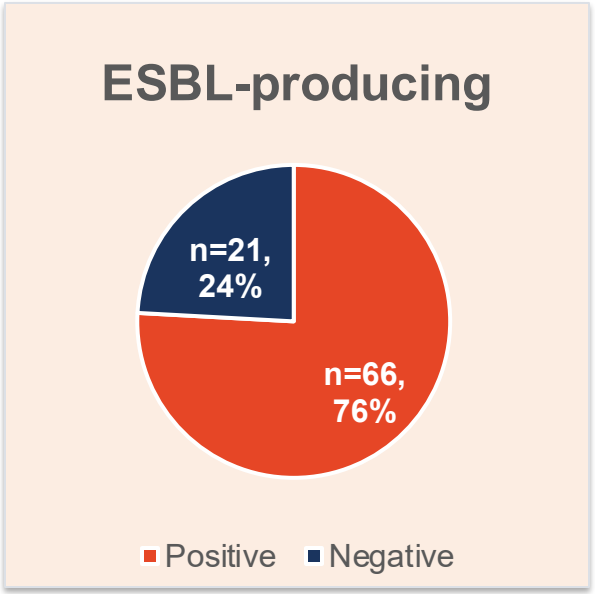
87 mother-infant dyads recruited

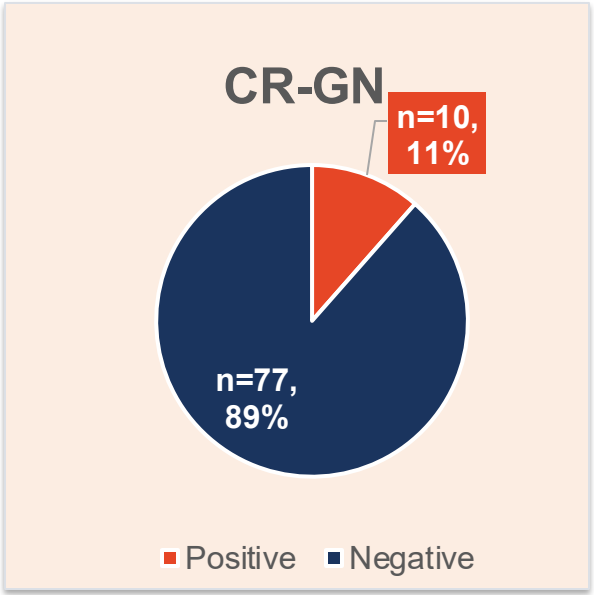
When?

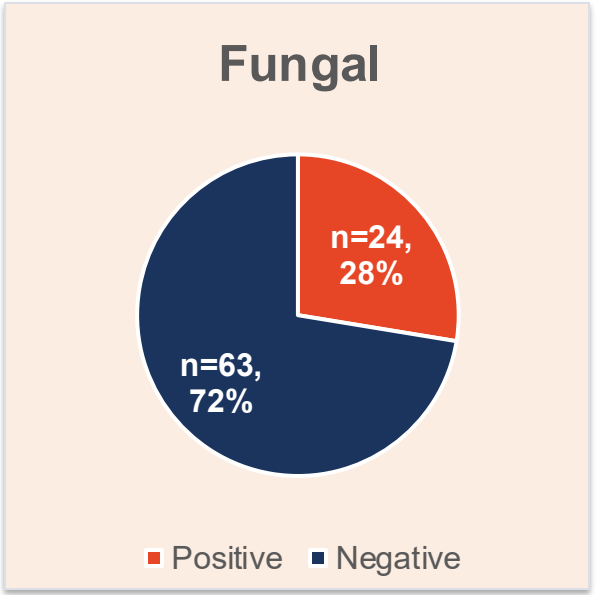
August 2025 – November 2025 with 6 month follow up period

Results: Maternal colonisation

78% (68/87) mothers were colonised with at least 1 multidrug-resistant bacteria or fungi at delivery

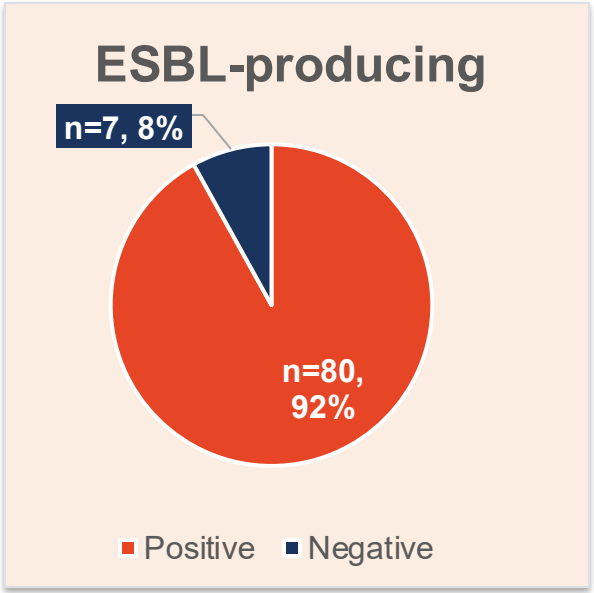


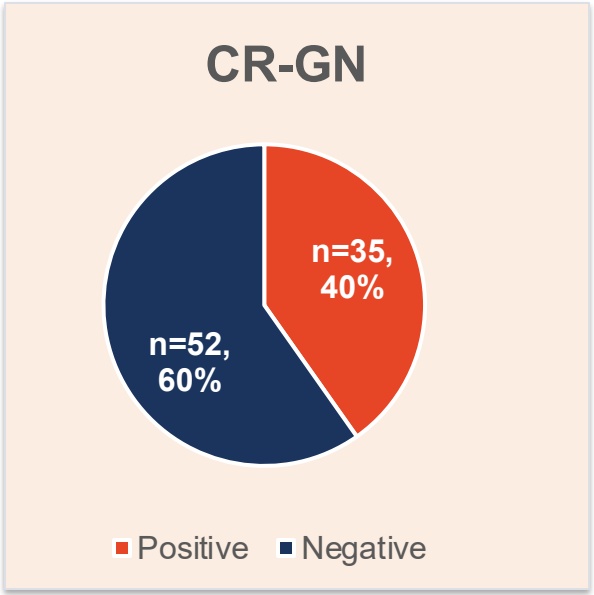


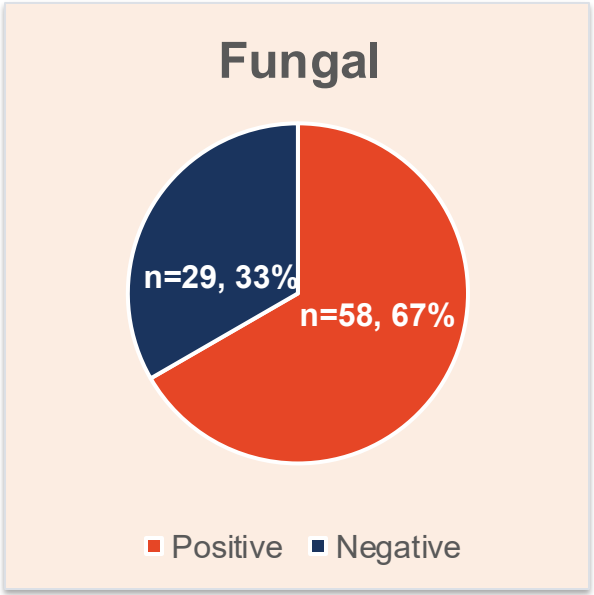


Results: Neonatal colonisation

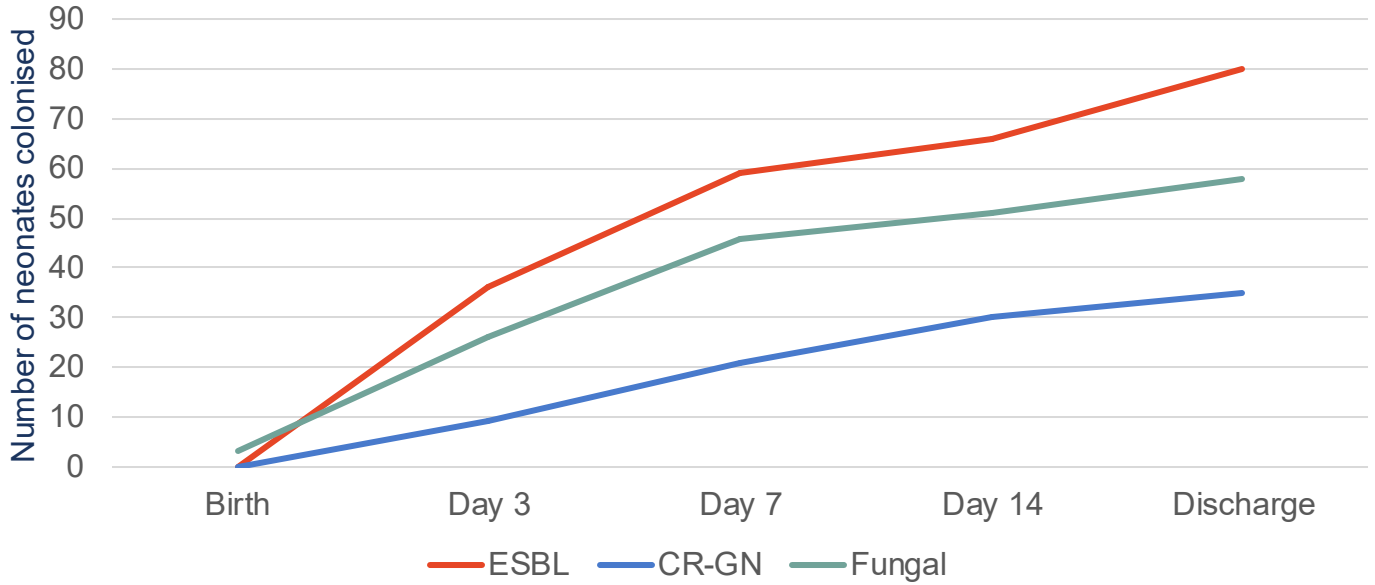
96% (84/87) of neonates were colonised at least 1 multidrug-resistant bacteria or fungi







Neonatal colonisation timepoints

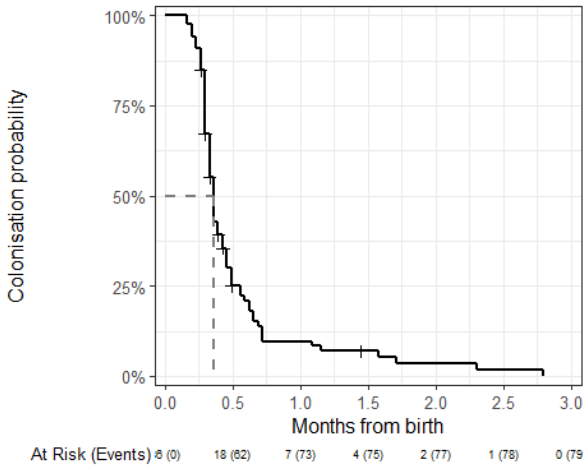


	ESBL	CR-GN	Fungal
Birth	0/87 (0%)	0/87 (0%)	3/87 (3%)
Day 3	36/87 (41%)	9/87 (10%)	26/87 (30%)
Day 7	59/87 (68%)	21/87 (24%)	46/87 (52%)
Day 14	66/87 (76%)	30/87 (35%)	51/87 (59%)
Discharge	80/87 (92%)	35/87 (40%)	58/87 (67%)

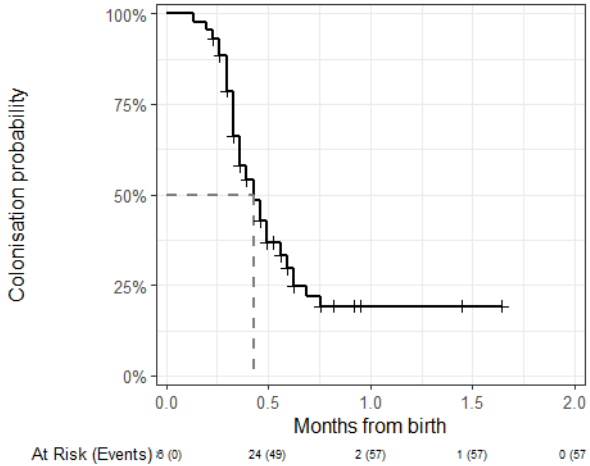
Mean hospital admission length of 18 days (SD: 14)

Neonatal time-to-colonisation

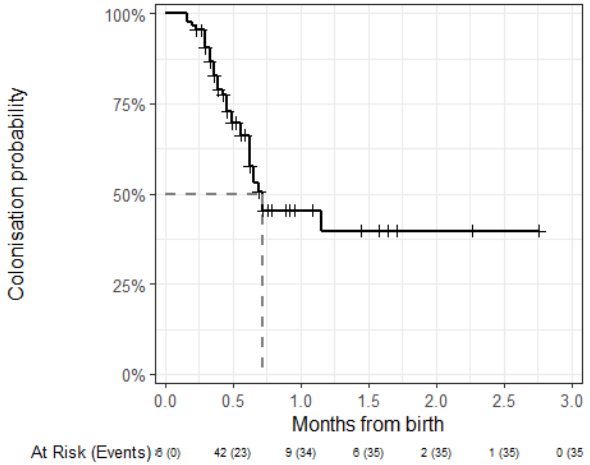
ESBL: Median time **2.5 days**



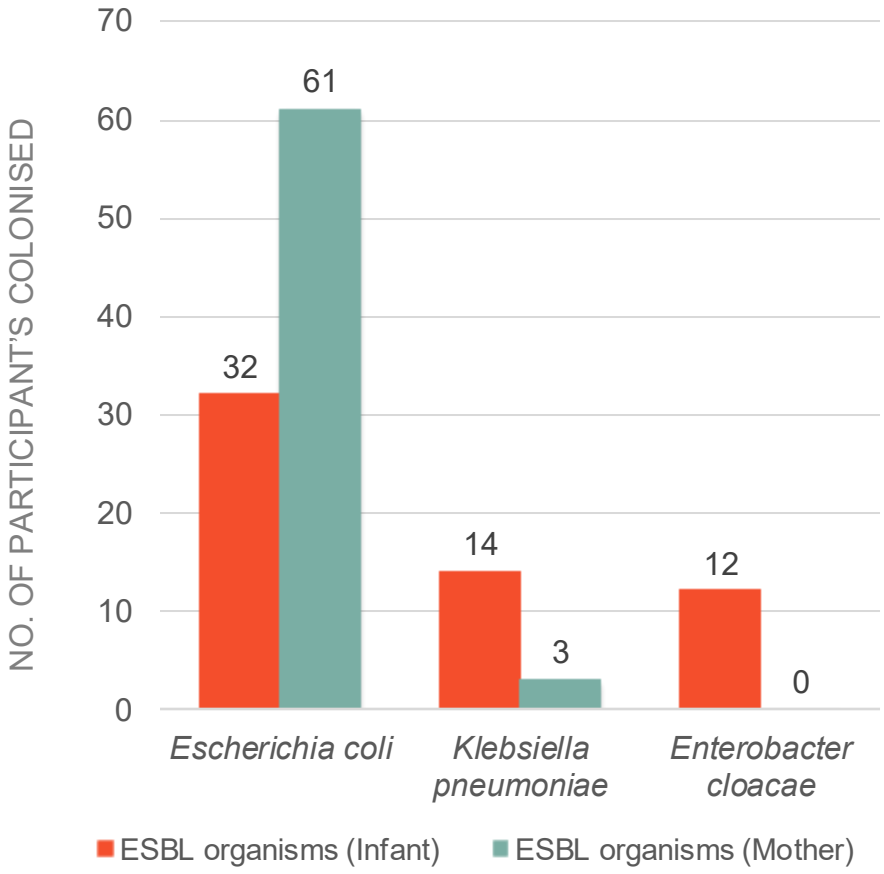
Fungal: Median time **3.0 days**

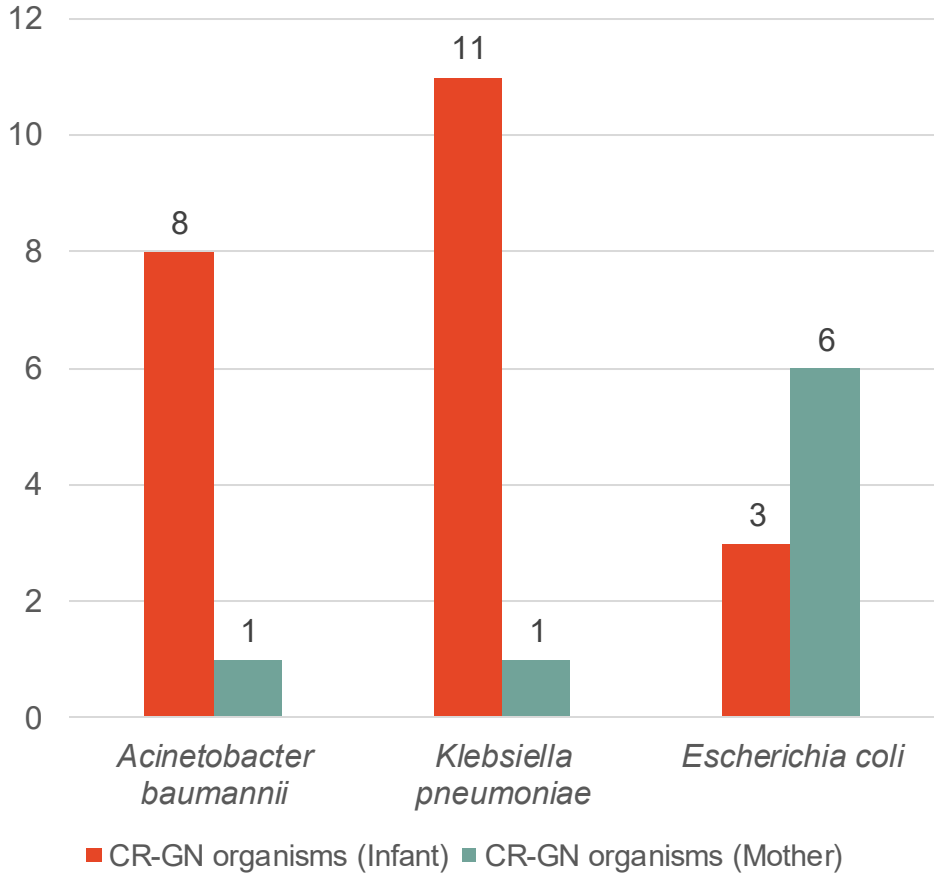


CR-GNB: Median time **5.0 days**

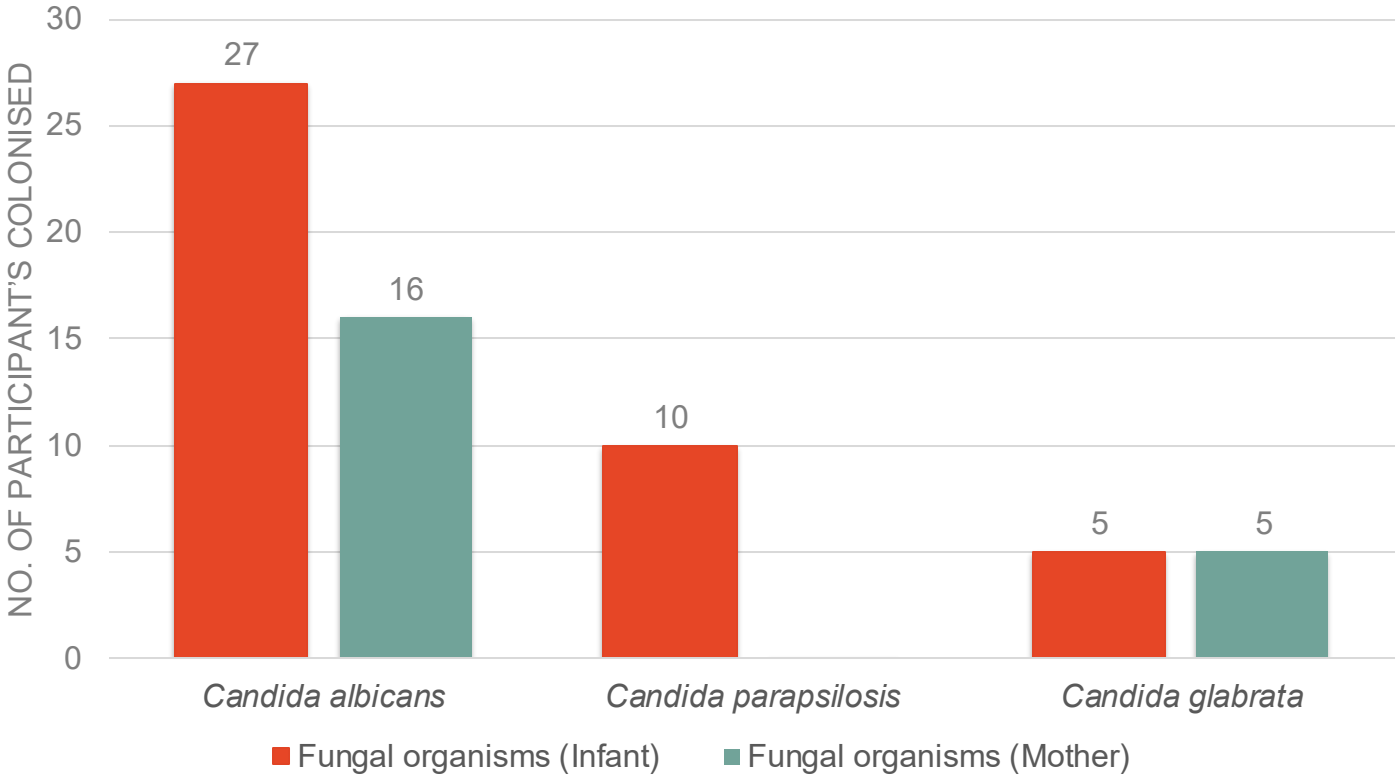


Most common first MDR bacteria isolated

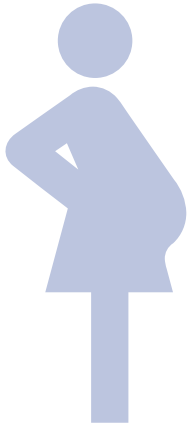




Most common first fungi isolated



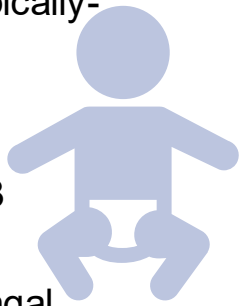
Maternal, neonatal & environmental species concordance



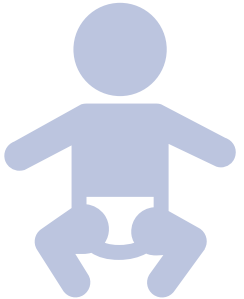
58% of ESBL-producing GNB colonised mothers (38/66) → Neonate colonised with phenotypically-matched ESBL producing GNB

0% of CR-GNB colonised mothers (0/10) → Neonate colonised with phenotypically-matched CR-GNB

54% of fungal colonised mothers (13/24) → Neonate colonised with same fungal species



Burkholderia cepacia isolated each week from NICU sink drain (10/10) → 5/87 neonates colonised with phenotypically matched organism (all NICU admitted)



High colonisation rate & low sepsis rate

70% Of neonates were admitted to NICU (60/87)

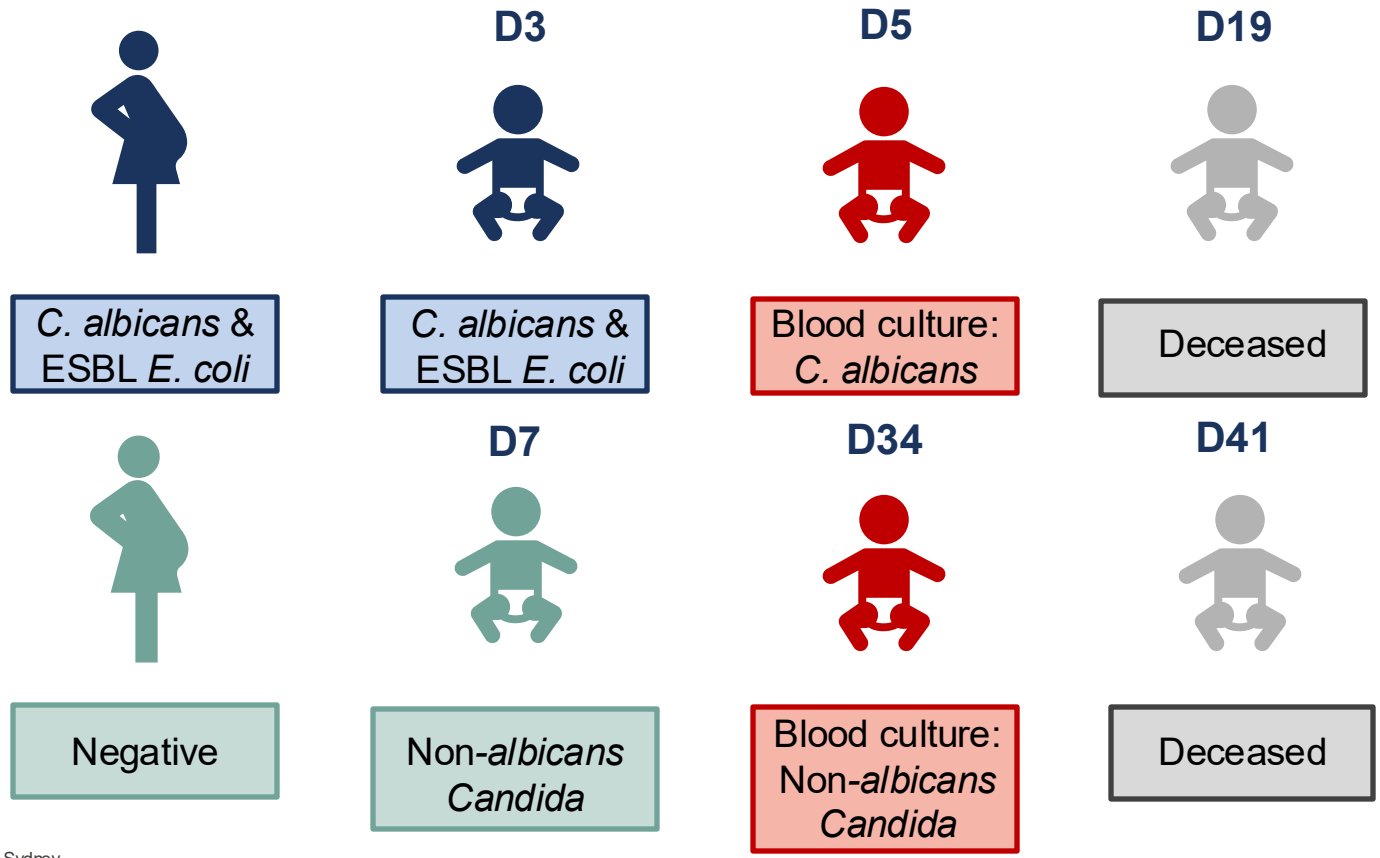
15% Of neonates believed to have had **culture-negative sepsis** (13/87)

7% Of neonates had **culture-positive sepsis** with either GNB / Fungi

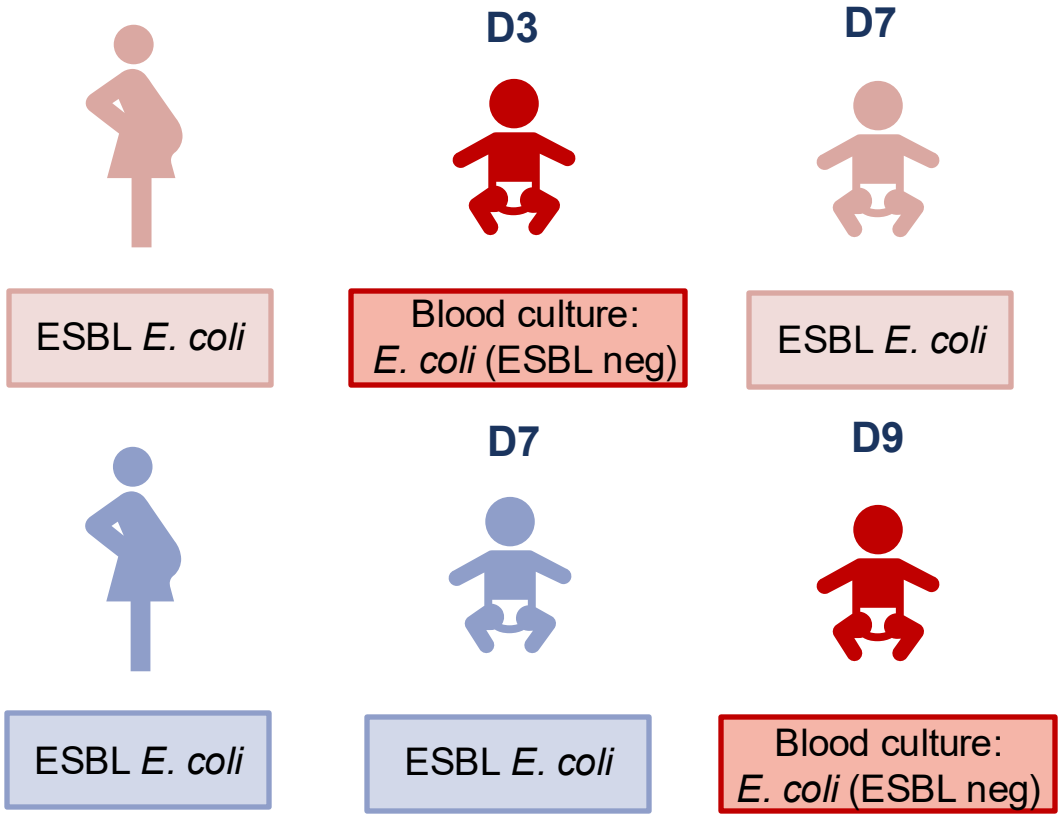
- 1/6 *S. marcescens*
- 1/6 *E. cloacae*
- 2/6 *E. coli*
- 1/6 *C. albicans*
- 1/6 *C. parapsilosis*

Newborns receiving care at study site, credit: Vietnam News agency

Neonatal colonisation & candidaemia



Neonatal colonisation & bacteraemia



Conclusions

High burden of maternal ESBL-GNB colonisation

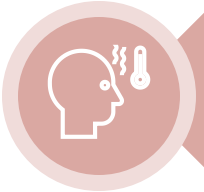
High rates of community carriage

Within 72 hours of NICU admission

High proportion of neonates colonised with multidrug resistant GNB / Fungi

Divergent maternal-neonatal CR-GNB & fungal rates

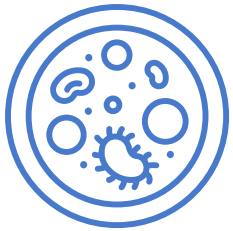
Hospital-based transmission



Low rate of invasive infection despite high colonisation

Other factors at play?

Next Steps



Further species linkage

Further statistical analysis

WGS

Microbiome analysis

Need for **improved strategies** to reduce hospital-based pathogen acquisition in NICU in **LMIC's**

Acknowledgments

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