

HOSPITAL-BASED DELIVERIES DRIVE ANTIMICROBIAL RESISTANCE IN BANGLADESH

BACKGROUND

- Antimicrobial resistance (AMR) is a worldwide threat that disproportionately affects low- and middle-income countries.¹
- Neonates are a key risk group with up to a third of sepsis deaths being caused by multi-drug resistant organisms.²
- In Bangladesh, the majority of neonatal infections are caused by gram negative organisms, 75-100% of which are resistant to third generation cephalosporins.^{3,4}

OBJECTIVES

- What are the risk factors for community acquired AMR?
 - How do hospitals contribute to AMR colonization?
 - What is driving AMR colonization in newborns?
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METHODS

- Participants recruited from pregnant women presenting for delivery to Faridpur Medical College Hospital in Faridpur, Bangladesh
- Enrollment during February-August 2020 (excluding April-July)
- Cohort study design
- Interviews regarding community exposures
- Maternal vaginal and rectal swabs on presentation for delivery
- Medical record review
- Swabs from hospital environment
- Maternal vaginal and rectal swabs on discharge
- Neonatal rectal swabs on discharge
- Swabs plated on agars selective for extended-spectrum beta-lactamase (ESBL) producing organisms and carbapenem-resistant organisms (CRO)

Table

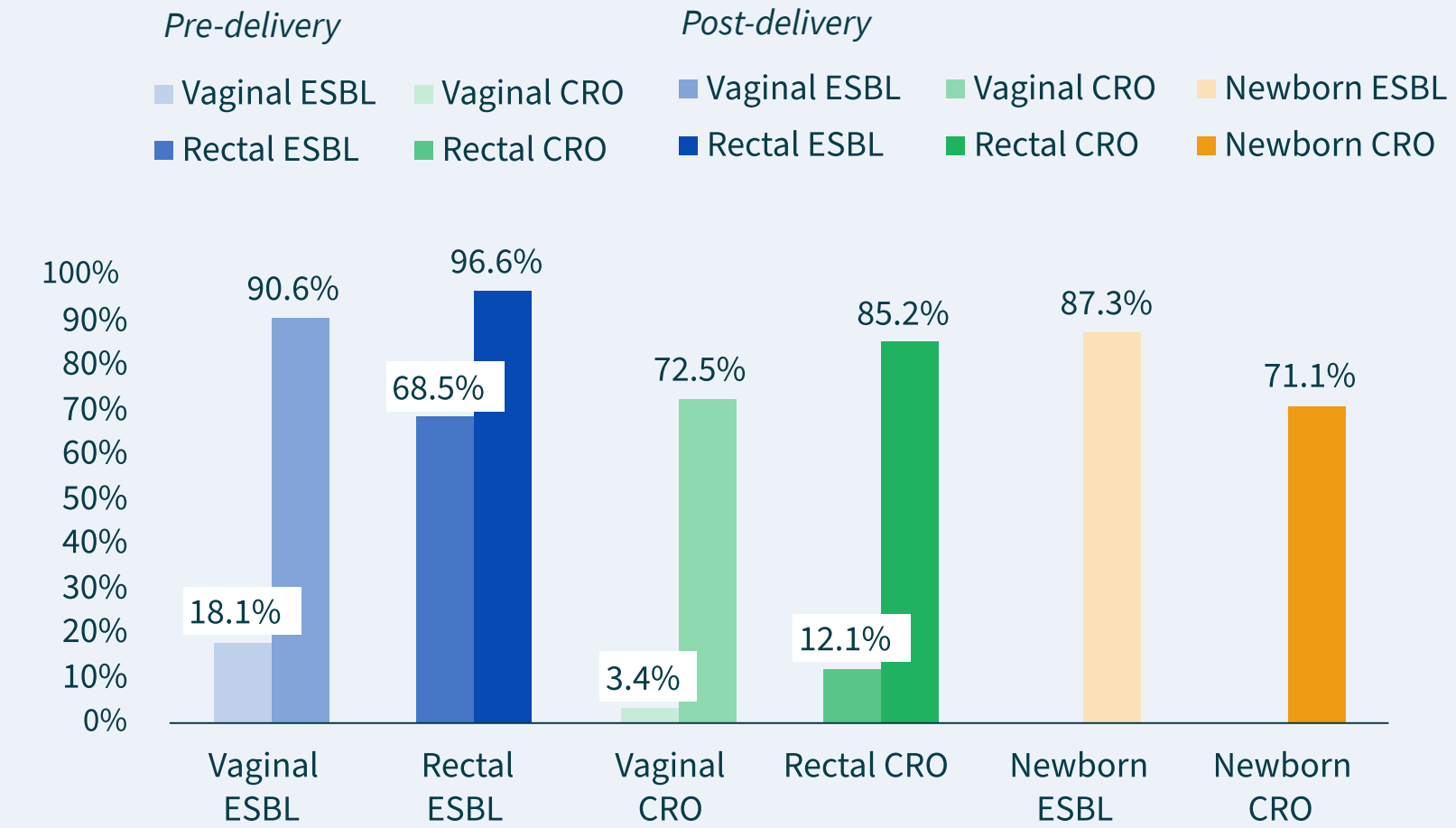
Of the participants in the study, the majority delivered by cesarean section. The most frequent antibiotic regimen given to mothers was a combination of a 3rd generation cephalosporin, flucloxacillin, and metronidazole or an aminoglycoside.

	No.	% (range)
Number of women enrolled	149	
Number of babies enrolled	151	
Mode of delivery		
Spontaneous vaginal delivery	12	8.1%
Assisted vaginal delivery	15	10.1%
Elective cesarean	18	12.1%
Emergency cesarean	104	69.8%
Mother received antibiotics	146	98%
Average duration of antibiotics (days)	9.6	(3-15)
Indication for antibiotics		
Prevention	146	100%
Treatment	1	0.7%
Baby received antibiotics	9	6.0%
Indication for antibiotics		
Prevention	1	11.1%
Treatment	9	100%

Baseline Characteristics

Figure 1

Colonization rates with ESBL and CRO bacteria was much higher at discharge than on admission. Neonates were frequently colonized with resistant organisms at levels similar to mothers on discharge.



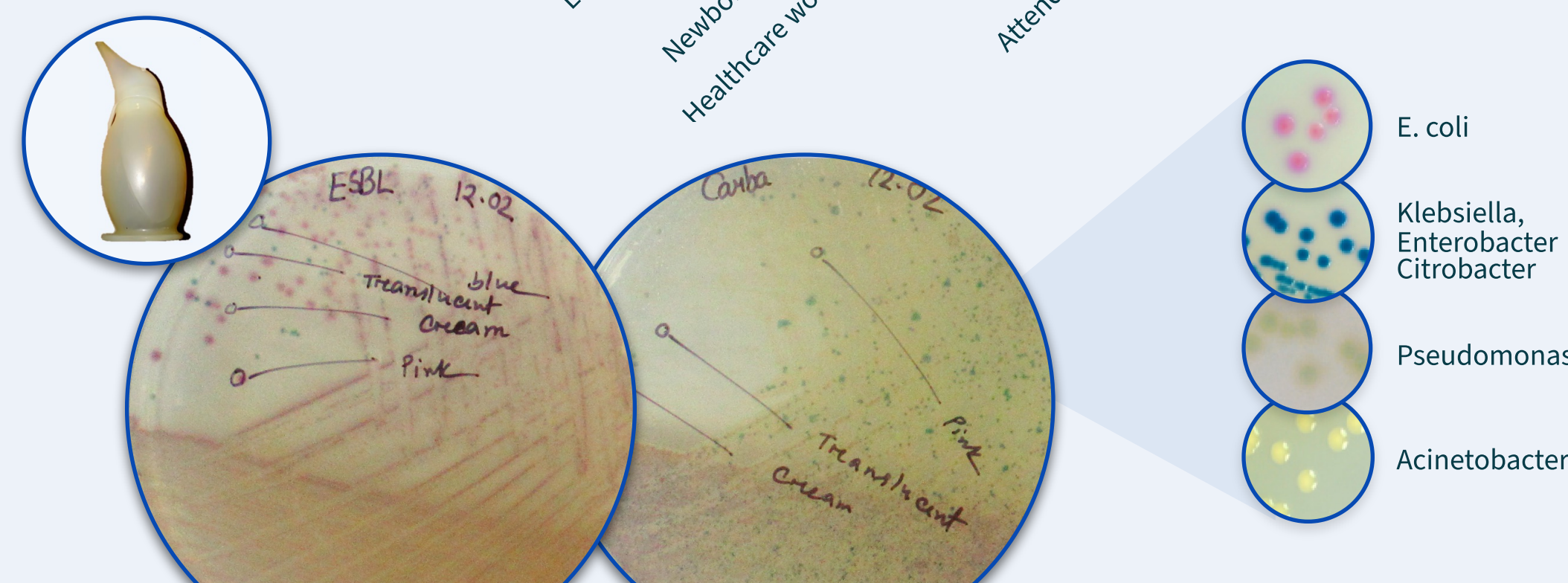
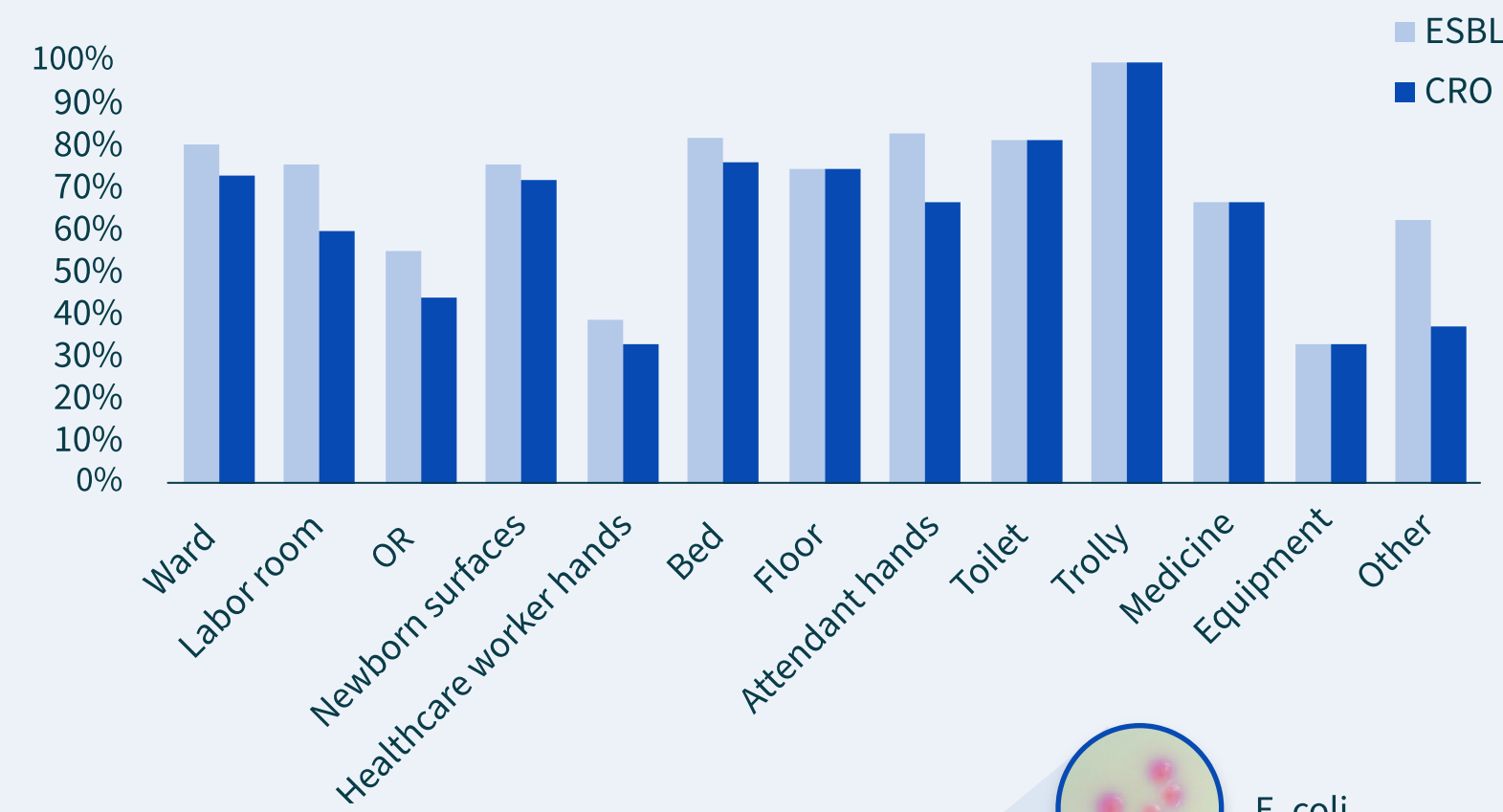
AMR Colonization

RESULTS

Environmental Contamination

Figure 2

All environmental surfaces were contaminated with both ESBL and CRO bacteria (right), though certain surfaces such as the neonatal suction bulb appeared to be more heavily contaminated with a wide variety of resistant flora (below).



Risk Factors for AMR Colonization

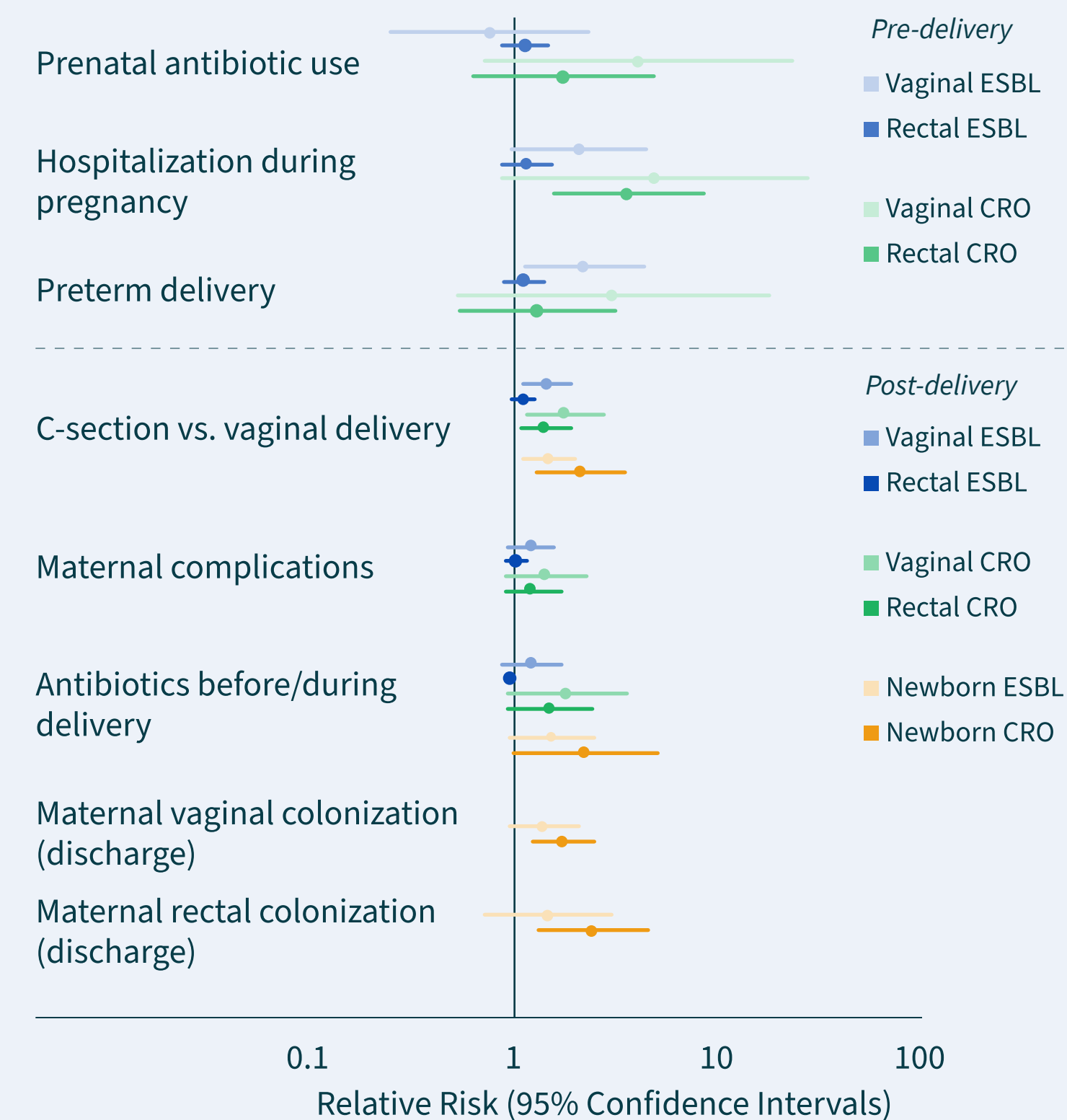


Figure 3

Community exposures, apart from hospitalization during pregnancy and prenatal antibiotic use, did not correspond with colonization patterns. Delivery mode, maternal complications, and antibiotics given before or during delivery predicted colonization with resistant organisms. Neonatal colonization was correlated with maternal colonization on discharge but not admission.

LIMITATIONS

- Direct pathways of transmission of specific AMR organisms have yet to be elucidated.
- Low-abundance AMR organisms present on admission may have not been detected by chromogenic agars.
- Colonization may not accurately predict organisms that lead to neonatal infections.

CONCLUSIONS

- AMR is driven by nosocomial factors in the perinatal setting, and cesarean section and perinatal antibiotic use increase risk of AMR colonization.
- Overuse of antibiotics in the perinatal setting could lead to adverse health effects for newborns, including drug-resistant infections.
- There is urgent need for enhanced antibiotic stewardship and infection prevention and control practices to preserve the benefits of hospital-based deliveries.

FUTURE DIRECTIONS

- Conduct whole genome sequencing of bacterial isolates from participant and environmental samples.
- Deduce transmission events based on phylogenetic analysis.
- Carry out follow-up sampling to assess persistence of colonization patterns after hospital discharge.
- Obtain samples from home births to compare colonization patterns with hospital-based samples.

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References

¹O'Neill, J. Review on Antimicrobial Resistance. May 2016; ²Laxminarayan R, et al. Lancet 2016; 387:168-75; ³Begum S, et al. J Bangladesh Coll Phys Surg 2012; 30: 66-70; ⁴Begum S, Fatema K. J Clin Neonatol 2016;5:254-8.