Infection Control & Hospital Epidemiology (2018), **39**, 1381–1383
doi:10.1017/ice.2018.213

Concise Communication

High prevalence of ESBL-positive bacteria in an obstetrics emergency hospital and neonatal care unit—Haiti, 2016

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Abstract

A point-prevalence survey of mothers and neonates admitted to an obstetrics emergency hospital in Port-au-Prince, Haiti, revealed that 13 of 127 gram-negative bacteria isolates (10%) from rectal swabs were ESBL-positive in women and 30 of 59 gram-negative bacteria isolates (51%) from rectal swabs were ESBL-positive in neonates. Length of hospital stay and antibiotic consumption were risk factors for ESBL colonization.

(Received 26 March 2018; accepted 1 August 2018; electronically published August 30, 2018)

Patient colonization with extended-spectrum β-lactamase–producing gram-negative bacteria (ESBL-GNB) could serve as a potential reservoir for transmission of multidrug-resistant (MDR) bacteria in a hospital setting. Individuals colonized with ESBL-Enterobacteriaceae are also known to be at a higher risk of ESBL-GNB infection following their colonization.[1] We encountered an outbreak of MDR *Klebsiella pneumoniae* in the neonatal care unit (NCU) of the Médecins Sans Frontiéres (MSF) obstetric emergency hospital in Port au Prince (CRUO), Haiti, between 2014 and 2015.[2] As part of ongoing surveillance activities for MDR bacteria and in an effort to better target infection, prevention, and control (IPC) measures throughout the hospital, we conducted a point-prevalence survey to estimate the prevalence of colonization with ESBL-GNB and to identify risk factors for colonization with ESBL-GNB in women and neonates admitted to this hospital.

Methods

We collected single rectal swabs from all women waiting for admission and admitted mothers and neonates in CRUO between July 11 and July 22, 2016. The number of swabs per day was limited due to the daily processing capacity of the microbiological laboratory.

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Cite this article: Chaintarli K. *et al.* (2018). High prevalence of ESBL-positive bacteria in an obstetrics emergency hospital and neonatal care unit—Haiti, 2016. *Infection Control & Hospital Epidemiology* 2018, 39, 1381–1383. doi: 10.1017/ice.2018.213

Rectal bacteriology transport swabs with Amies agar gel (Copan Diagnostics, Murrieta, CA) were collected at ambient temperature and stored in sterile containers 4°C and were transported to the processing laboratory daily. The methods used for testing have been described previously.[2] The choice of antibiotics was based on the Clinical and Laboratory Standard Institute (CLSI) guidelines (M100-S25),[3] and ESBL confirmation was based on the methods outlined in the guidelines of the Microbiological Association of France (CASFM 2013).[4]

The medical director of MSF-OCA approved the survey; it formed part of the routine monitoring and evaluation of antimicrobial resistance in the hospital. The Haitian Ethics Review Committee approved the implementation of this survey. All women and caretakers of neonates provided written informed consent for participation.

We calculated the prevalence of colonization by estimating the proportions of ESBL-GNB of the total number of GNB isolates per admission room. We calculated the proportions of susceptibility of ESBL-GNB for each antibiotic. Finally, we used multivariable exact Poisson regression to account for the small sample size to calculate adjusted prevalence ratios (aPRs) and to identify risk factors for colonization with ESBL-GNB. All analyses were conducted using Stata version 14.1 software (StataCorp, College Station, TX).

Results

In total, 112 women and 64 neonates participated in the survey; 2 women refused to participate (99% response). The mean age of the women was 29.1 years (standard deviation [SD], 6.8 years), and they had spent a median of 2 days in the hospital. Among

women, 26 (23%) took antibiotics in the 2 weeks prior to their admission to the hospital and 40 (45%) received antibiotics during their current hospital stay. Neonates were a median of 5 days old at the time of sampling (mean, 7.1 days; SD, 12.7 days) and 43 (69%) had received antibiotics since their birth at the hospital. We isolated 127 GNB from women and 59 from neonates, for a total of 186 GNB isolates. We detected >1 isolate in samples from 24 patients (16 women and 8 neonates), and samples from 15 patients showed no growth (2 women and 13 neonates).

Table 1. ESBL-Positive Isolates by Admission Room for Women and Neonates, CRUO – Haiti, July 2016[a]

	Women			Neonates		
	GNB Isolates	ESBL-GNB Isolates		GNB Isolates	ESBL-GNB Isolates	
Admission Room	No.	No.	(%)	No.	No.	(%)
Triage	6	0	(0)	NA	…	…
Antenatal	13	1	(8)	NA	…	…
Delivery room	6	0	(0)	1	0	(0)
Postpartum	69	6	(9)	21	12	(57)
Intensive care unit	8	2	(25)	NA	…	…
Kangaroo mother care ward	17	2	(12)	12	5	(50)
Cholera	8	2	(25)	NA	…	…
Pediatric isolation	NA	…	…	7	4	(57)
Pediatric ward	NA	…	…	18	8	(44)

Note. NA, not available. Kangaroo Mother Care refers to a ward where mothers and their newborn premature newborns are encouraged to have skin-on-skin contact to reduce mortality and improve clinical outcomes in these infants.
[a]Total GNB isolates in women, n = 127 and in neonates, n = 59.

From women, *Escherichia coli* was isolated from 102 of 112 rectal swabs (91%) and *K. pneumoniae* was isolated from 15 of 112 rectal swabs (13%). *Klebsiella oxytoca* (n = 2), *Enterobacter cloacae* (n = 3), *Acinetobacter baumannii* (n = 2), *Morganella morganii* (n = 1), *Enterobacter* spp (n = 1), and *Serratia* spp (n = 1) were also identified in samples from women. From neonates, 31 of 64 samples (48%) yielded *E. coli*, and 17 of 64 samples (27%) yielded *K. pneumonia*. *Klebsiella oxytoca* (n = 4), *E. cloacae* (n = 1), *Klebsiella* spp (n = 1), and *Pseudomonas aeruginosa* (n = 1) were also isolated from neonatal samples.

Among women, 13 of 127 isolates (10%) were ESBL-GNB: *K. pneumonia*, 4 of 15; *K. oxytoca,* 1 of 2; and *E. coli*, 8 of 99. Overall, the proportion of ESBL-GNB isolates was highest in the intensive care unit (2 of 8, 25%) and the cholera ward (2 of 8, 25%), while no ESBL-GNB were isolated in triage or in the delivery room (Table 1). Among neonates, 29 of 59 isolates (49%) were ESBL-GNB: *K. pneumonia* (10 of 17), *K. oxytoca* (4 of 4), and *E. coli* (14 of 30). ESBL-GNB were isolated in all wards housing neonates except for the delivery room (ie, soon after birth).

Susceptibilities to amikacin and imipenem in ESBL-GNB from neonates and women were ≥90% (Fig. 1). Cefoxitin and piperacillin/tazobactam susceptibilities in all samples were ~70% (Fig. 1). Susceptibilities to amoxicillin/clavulanic, cefotaxim, gentamicin, and trimethoprim/sulfamethoxazole were <40% for all ESBL-GNB isolates (Fig. 1). Susceptibility to ciprofloxacin was significantly higher in neonatal isolates (90%) than in isolates from women (31%; $P < .0001$).

We adjusted the multivariable exact Poisson regression for patient type (women vs neonates), antibiotic consumption prior to hospital admission or while admitted, shared room between women or neonates, and length of hospital stay. Colonization with ESBL-GNB was associated with being a neonate (aPR, 4.5; 95% confidence interval [CI], 1.8–12.6), with having consumed

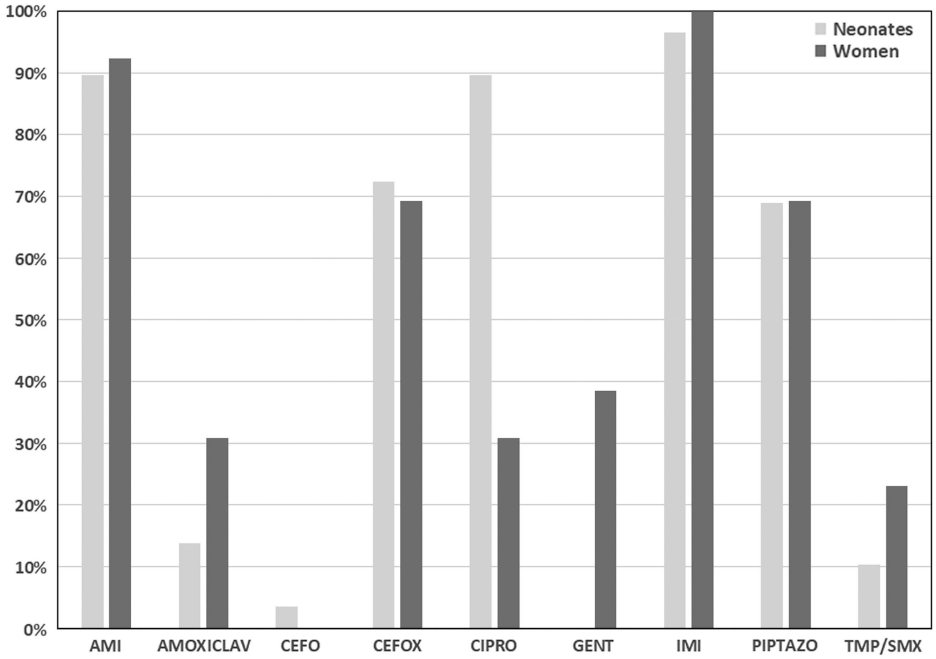

Fig. 1. Antibiotic suspectibility in ESBL-GNB isolates in neonates (n = 29) and women (n = 13) in CRUO, Haiti, 2016. Note. AMI, amikacin; AMOXICLAV, amoxicillin/clavulanic acid; CEFO, cefotaxim; CEFOX, cefoxitine; CIPRO, ciprofloxacine; GENT, gentamycin; IMI, imipenem; PIPTAZO, piperacillin/tazobactam; TMP/SMX, trimethoprone/sulfamexazole.

https://doi.org/10.1017/ice.2018.213 Published online by Cambridge University Press

antibiotics (aPR, 2.7; 95% CI, 1.0–9.3), and with being admitted for >1 day (aPR, 2.9; 95% CI, 0.7–25.7).

Discussion

Our survey shows that prevalence for ESBL-GNB was dramatically higher in neonates than in women admitted to this obstetrics emergency hospital and that antibiotic susceptibility in ESBL-GNB isolated from neonates was lower than in those isolates from women. ESBL-GNB colonization was associated with being a neonate, having stayed longer in the hospital, and having consumed antibiotics in the weeks prior to or during hospital admission. The colonization of ESBL-GNB in women and neonates occurs during their hospital stay, which is also supported by the finding that no ESBL-GNB were found to colonize women in triage or the delivery room. In CRUO, most surveyed neonates were admitted to the NCU (mainly for prematurity or low birthweight) and likely acquired their ESBL-GNB from the hospital environment and breaches of IPC measures. Evidence indicates that in premature neonates, bacterial colonization within 4 weeks after birth was dominated by potentially pathogenic GNB, likely from the hospital environment, rather than commensal bacteria.[5] The finding that antibiotic use was associated with ESBL-GNB colonization in neonates and adults has been reported elsewhere.[6,7] A high proportion of women in the current survey reported having taken antibiotics prior to hospital admission for the delivery, and self-medication with antibiotics (a known risk factor for favoring antibiotic resistance development) is a common practice in Haiti.[8]

This study has several limitations. Several patients (women and neonates) had already taken or were already on antibiotic treatment at the time of sampling, which may have led to the underestimation of the true prevalence of bacterial isolates sensitive to those antibiotics. Rectal sampling in women might have led to the underestimation of colonization due to low sensitivity or incorrect sampling methods. Point-prevalence surveys are also subject to overestimating the burden of disease at the community level because patients with healthcare-associated infections often stay at the hospital for longer and, thus, would have a greater chance to be included in the study.[9]

In conclusion, the current point-prevalence survey provides new and clear insights into the epidemiology of ESBL-GNB in this hospital in Haiti and strengthens the findings from routine surveillance for bloodstream infections and treatment failure. Based on these findings, we recommend that prevalence surveys be carried out annually at CRUO as part of the routine surveillance in the hospital to help identify trends of colonization with ESBL-GNB, to provide evidence pertaining to healthcare-associated infections, and to evaluate the efficacy of existing antibiotic and infection prevention and control strategies.

Acknowledgments. We thank the patients admitted to CRUO, Port-au-Prince, Haiti, during this study for their participation. We also thank Cono Ariti for statistical analysis advice.

Financial support. All field work associated with this study was funded through operational costs of MSF-OCA in Haiti. The funder had no role in the design or interpretation of results from the analysis.

Conflict of interest. All authors report no conflicts of interest relevant to this article.

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https://doi.org/10.1017/ice.2018.213 Published online by Cambridge University Press