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Risk factors of mortality in septic newborns in neonatal intensive care units (NICUs) in Tbilisi, the Republic of Georgia

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Letter to the Editor

Neonatal mortality continues to be a significant public health burden worldwide. Each year 4 million neonates die during the first four weeks of life. Developing countries account for 98% of reported worldwide neonatal deaths [1]. Neonatal infections currently cause about 1.6 million deaths annually in the developing world, and the major cause of newborn mortality is sepsis [2,3]. In the Republic of Georgia, a former Soviet state, little data exists on causes of infant mortality. Newborns up to eight weeks of age with severe acute illness are sent to NICUs from maternity houses (birthing places) and pediatricians' offices. No data from the Republic of Georgia has been published on evaluation of the risk factors associated with neonatal mortality in NICUs.

We recently published the results of our study conducted at the NICUs of two pediatric hospitals in Tbilisi, capital city of Georgia, between 09/2003-09/2004, in an article by Macharashvili et al [4] in *International Journal of Infectious Diseases*. The study evaluated the etiology of neonatal blood stream infections (BSI) in septic neonates, and determined antibiotic

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Conflict of Interest. There was no conflict of interest for all authors. No competing interests to declare.

Ethical approval. The study was approved by Institutional Review Boards (IRB) of the Rehabilitation Center of the Republic of Georgia and State University of New York (SUNY) at Albany, NY.

susceptibility of the isolated organisms. In this study we found a high overall mortality rate of 34% (68 of 200 neonates died).

We conducted analysis of risk factors for mortality in NICU. Data were analyzed using SAS software version 9.1 (SAS Institute, Cary NC). Prevalence ratios with 95% confidence intervals for risk factors of having positive blood culture were estimated with bivariate and multivariate log-binomial regression modeling. Evaluated risk factors and results of bivariate analysis are shown in Table 1. In multivariate analysis independent predictors of neonatal mortality included: age <7 days at NICU admission (PR=1.68; 95% CI 1.07-2.63; p=.02), Apgar score of ≤6 (PR=2.15; 95% CI 1.48-3.13; p<.001), and a positive blood culture (PR=1.98; 95% CI 1.22-3.10; p=.005).

This study demonstrated an important contribution of neonatal bacteremia in high mortality rates among NICU patients in Tbilisi: 76% of newborns who died had positive blood cultures compared to 56% of survived newborns. Age <7 days at NICU admission and an Apgar score of ≤6 as independent predictors of neonatal mortality were likely multifactorial, but beyond the scope of this study.

Effort to reduce the risk of infection is of paramount importance to improved material and newborn care. Improving infection control in birth centres is important to prevent some cases of sepsis as well as reduce the risk of transmission of other infectious organisms.

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Table 1

Demographic and clinical characteristics of died and survived neonates with clinical sepsis and their mothers

Variable		Died (N=68) n (%)	Survived (N=132) n (%)	PR (95% CI)	*P* value
Demographic and clinical characteristics of infants					
Gender					
	Male	35 (51.5)	53 (40.2)	1.35 (0.92-1.98)	.13
	Female	33 (48.5)	79 (59.8)	1.00	
Age at NICU admission					
	< 7 days	51 (75.0)	77 (58.3)	1.69 (1.06-2.69)	**.03**
	≥7 days	17 (25.0)	55 (41.7)	1.00	
Birth weight, grams					
	≤ 2500	15 (22.1)	25 (18.9)	1.13 (0.72-1.79)	.59
	> 2500	53 (77.9)	107 (81.1)	1.00	
Apgar score					
	≤ 6	37 (54.4)	27 (20.5)	2.54 (1.75-3.68)	**<.001**
	> 6	31 (45.6)	105 (79.6)	1.00	
Umbilical Discharge					
	Yes	35 (51.5)	41 (31.1)	1.73 (1.18-2.53)	**.005**
	No	33 (48.5)	91 (68.9)	1.00	
Blood cultures					
	Positive	52 (76.5)	74 (56.1)	1.91 (1.18-3.09)	**.009**
	Negative	16 (23.5)	58 (43.9)	1.00	
Mothers' characteristics					
Mother's Age					
	≤ 18	16 (23.5)	16 (12.1)	1.62 (1.07-2.44)	**.02**
	> 19	52 (76.5)	116 (87.9)	1.00	
Residence					
	Rural	35 (51.5)	49 (37.1)	1.46 (0.99-2.15)	.05
	Urban	33 (48.5)	83 (62.9)	1.00	
Education					
	High school or lower	38 (55.9)	83 (62.9)	0.83 (0.56-1.22)	.33
	College or higher	30 (44.1)	49 (37.1)	1.00	

Variable		Died (N=68) n (%)	Survived (N=132) n (%)	PR (95% CI)	*P* value
Marriage status					
	Not married	6 (8.8)	8 (6.1)	1.29 (0.68-2.43)	.44
	Married	62 (91.2)	124 (93.9)	1.00	
Tobacco use					
	Yes	5 (7.3)	8 (6.1)	1.14 (0.56-2.34)	.72
	No	63 (92.7)	124 (93.9)	1.00	
Syphilis (TP antibody test)					
	Seropositive	5 (7.3)	8 (6.1)	1.14 (0.56-2.34)	.72
	Seronegative	63 (92.7)	124 (93.9)	1.00	
Hepatitis B surface antibodies (anti-HBs)					
	Positive	25 (36.8)	43 (32.6)	1.13 (0.76-1.68)	.55
	Negative	43 (63.2)	89 (67.4)	1.00	
Anti-HCV antibodies (ELISA)					
	Positive	3 (4.4)	7 (5.3)	0.88 (0.33-2.31)	.79
	Negative	65 (95.6)	125 (94.7)	1.00	
Pregnancy and delivery characteristics					
First child					
	Yes	16 (23.5)	25 (18.9)	1.19 (0.77-1.86)	.43
	No	52 (76.5)	107 (81.1)	1.00	
Prenatal Care					
	No	13 (19.1)	11 (8.3)	1.73 (1.13-2.66)	**.01**
	Yes	55 (80.9)	121 (91.7)	1.00	
Premature delivery					
	Yes	15 (22.1)	14 (10.6)	1.67 (1.10-2.53)	**.02**
	No	53 (77.9)	118 (89.4)	1.00	
Premature Membrane Rupture					
	Yes	7 (10.3)	17 (12.9)	0.84 (0.44-1.62)	.61
	No	61 (89.7)	115 (87.1)	1.00	
Type of delivery					
	Caesarean section	12 (17.7)	24 (18.2)	0.98 (0.59-1.62)	.93
	Vaginal	56 (82.3)	108 (81.8)	1.00	