



Nosocomial Infections in Tbilisi, Georgia: A Retrospective Study of Microbiological Data from 4 Major Tertiary Care Hospitals

[George Kandelaki](#), *Emory University*

[Maia Butsashvili](#), *National Center for Disease Control and Public Health*

[M. Geleishvili](#), *Centers for Disease Control and Prevention*

[N. Avaliani](#), *National Center for Disease Control and Public Health*

[N. Macharashvili](#), *Infectious Diseases, AIDS & Clinical Immunology Research Center*

[M. Topuridze](#), *National Center for Disease Control and Public Health*

[Carlos Del Rio](#), *Emory University*

[Henry Michael Blumberg](#), *Emory University*

[T. Tsertsvadze](#), *Infectious Diseases, AIDS & Clinical Immunology Research Center*

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Nosocomial Infections in Georgia; a retrospective study of microbiological data from four major tertiary care hospitals in Tbilisi, capital of Georgia

G. Kandelaki¹, M. Butsashvili¹, M. Geleishvili², N. Avaliani¹, N. Macharashvili³, M. Topuridze¹, C. Del Rio⁴, H.M. Blumberg⁴, and T. Tsertsvadze³

¹National Center for Disease Control and Public Health (NCDC) of Georgia; M. Asatiani st. N9, Tbilisi 0177, Georgia, Tel. : (995 32) 39 89 46, Fax : (995 32) 31 14 85, maiabutsashvili@gmail.com

²US CDC-Georgia Country Office

³Infectious Diseases, AIDS & Clinical Immunology Research Center, Tbilisi, Georgia

⁴Emory University School of Medicine, Atlanta, GA, USA

Abstract

The study aimed to evaluate epidemiology of nosocomial pathogens and their resistance patterns at four major tertiary care centers in Tbilisi, Georgia. Out of 3452 samples included in the study 1607 positive culture results were documented (46.6%). Study showed considerable burden of nosocomial infections on Georgian health care system.

BACKGROUND

Health care associated infections (HAI) are important and ever-increasing public health problems worldwide. These infections are associated with increased morbidity, length of stay, mortality and costs.^{1–3} More than a million and a half HAIs occur in US annually causing nearly one hundred thousand deaths per year.²

The problem is somewhat under-recognized in Georgia. Hospital house staff often lacks appropriate knowledge about prevention, identification and management of HAIs.⁴ Utilization of antibiotics is frequently inappropriate and uncontrolled. Many hospitals do not have formal infection control system. There are relatively scarce statistical data available regarding the epidemiology of nosocomial infections or prevalence of multidrug resistant organisms (MDROs) in the region. During the last decade several small scale studies have tried to address the problem and fill the gap.^{5–8} The results of these studies clearly show a significant burden of HAIs and high prevalence of MDROs in Georgia.

The goal of our study was to evaluate the epidemiology of nosocomial pathogens and their resistance patterns at four major tertiary care centers in Tbilisi, Georgia.

METHODS

A three year (August 2007–December 2010) retrospective descriptive analysis of the microbiological data from four major tertiary health care centers in Tbilisi, Georgia was performed. The samples for investigation included: blood, intravascular catheter tips, lower

respiratory samples, urine, stool, body fluids, abscesses and tissues. All samples were gram-stained and cultured. Identification of the pathogens was performed by automated system for identification and susceptibility tests – VITEK. The sensitivities to different antibiotics were determined by disk diffusion method or VITEK. Stool samples for *Clostridium difficile* were assessed by ELISA for A&B toxin. Ethics committee approval was obtained for the study.

RESULTS

Total of 3452 available samples were included in the study. 1607 positive culture results were documented (46.6%). The most commonly isolated microorganisms (10 isolates or more) are given in the order of frequency of their occurrence in the table 1. The sensitivity pattern of gram negative rods (GNR) to most common antibiotics is shown in table 2.

Out of 95 isolates of GNRs tested for the presence of extended-spectrum beta-lactamase (ESBL) 33.7% was found to be ESBL carriers (*K. pneumonia* –24, *E. coli* – 4, *K. oxytoca* – 2, *P. mirabilis* – 1, *C. freundii* –1). The vast majority of GNRs were sensitive to colistin, but we have identified eight colistin resistant strains: *Pseudomonas aeruginosa* – 1, *E. coli* – 2, *K. oxytoca* – 1, *K. pneumonia* – 1, *P. mirabilis* – 2, *K. terrigena* – 1. The most common gram positive cocci (GPC) were *S. aureus*, *S. epidermidis* and *E. faecalis*. 33.3% of *S. aureus* and 36.1% of *S. epidermidis* were Methicillin resistant. All of the GPC isolates were vancomycin sensitive.

Overall 66 stool samples from 53 patients with diarrhea, which had developed during their hospitalization were evaluated for *Clostridium difficile* A and B toxins. 25 (37.8%) samples from 20 (37.7%) patients were found to be positive for *Clostridium difficile*.

DISCUSSION

To the best of our knowledge this is the first attempt of comprehensive review of the epidemiology of microbial organisms causing health care associated infections in Georgia. The study results clearly show that there is a considerable burden of nosocomial infections on health care system of the country.

There is a dramatic surge of antibiotic resistance. Gram negative organisms are increasingly becoming resistant to nearly all available antibiotics. In one third of the tested GNRs ESBL production was revealed. The situation is further complicated by the decreasing trend of susceptibility to carbapenem. This is especially true for *Pseudomonas aeruginosa* and *Acinetobacter baumannii*, the isolates of which are sensitive to carbapenems in 29% and 11.9%, respectively. Colistin still remains as an effective, last resort agent in vast majority of cases but the appearance of colistin resistant strains is extremely alarming. The isolated outbreaks of colistin resistance have been described^{9,10} but if widespread polymyxin resistance occurs we may be left with very limited treatment options.

One third of *S. aureus* isolates were methicillin resistant which should be considered during the choice of initial empiric antibiotics. 37% of the evaluated patients were proven to have *Clostridium difficile* associated disease, which clearly reflects its burden as a nosocomial pathogen.

Limitations

The study has several limitations. Since the patients' medical records were not available the differentiations between infection, colonization and contamination cannot be made and associations between the pathogens, severity of infections and outcomes cannot be

established. Due to the fact that only tertiary care centers from the capital of Georgia – Tbilisi were evaluated, the generalizability of the results may not be universal throughout the country.

Future needs

There is an urgent need to establish comprehensive surveillance system for nosocomial infections in Georgia to have a better understanding of HAI epidemiology in the country in order to effectively plan robust public health interventions to improve infection control in health care facilities of Georgia.

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TABLE 1

List of the most commonly isolated microorganisms at four major tertiary care centers in Tbilisi, Georgia, 2011.

ORGANISMS	No	(%)
<i>Klebsiella pneumoniae</i>	375	26.5
<i>Pseudomonas aeruginosa</i>	216	15.2
<i>Candida albicans</i>	174	12.3
<i>Staphylococcus aureus</i>	128	9.0
<i>Escherichia coli</i>	108	7.6
<i>Acinetobacter baumannii</i>	72	5.1
<i>Enterobacter aerogenes</i>	64	4.5
<i>Yeast (unspecified)</i>	51	3.6
<i>Staphylococcus epidermidis</i>	36	2.5
<i>Proteus mirabilis</i>	29	2.0
<i>Klebsiella oxytoca</i>	28	2.0
<i>Enterobacter cloacae</i>	22	1.6
<i>Streptococcus group C</i>	14	1.0
<i>Enterococcus</i>	10	0.7

TABLE 2

The sensitivity of microorganisms to antibiotics, Georgia, 2011.

Organism	Sensitive to antibiotics (%)									
	AMK ¹	CEPH-3 ²	CFT ³	CFP ⁴	CIP ⁵	PIP/TAZ ⁶	IMP ⁷	FOSPH ⁸		
<i>Klebsiella pneumoniae</i>	45.1	60.7	57.2	59.1	69.1	60.7	76.8	57.0		
<i>Pseudomonas aeruginosa</i>	20.4	0	13.1	12.5	22.6	20.0	29.0	31.5		
<i>Escherichia coli</i>	59.0	50.0	53.4	52.5	40.4	44.9	89.4	63.4		
<i>Acinetobacter baumannii</i>	10.1	0	1.8	7.0	4.8	13.7	11.9	23.3		
<i>Enterobacter aerogenes</i>	39.1	4.2	19.4	20.6	21.0	20.3	39.1	49.1		
<i>Proteus mirabilis</i>	46.4	42.9	48.3	42.9	48.3	53.8	51.7	61.1		
<i>Klebsiella oxytoca</i>	39.3	55.6	69.6	60.7	64.3	57.1	100.0	64.0		
<i>Enterobacter cloacae</i>	54.5	42.9	36.4	42.9	59.1	55.0	71.4	66.7		

¹ AMK- Amikacin;

² CEPH-3 – 3rd generation cephalosporin;

³ CFT- Ceftazidime;

⁴ CFP- Cefepime;

⁵ CIP- Ciprofloxacin;

⁶ PIP/TAZ- Piperacillin/Tazobactam;

⁷ IMP- Imipenem;

⁸ FOSPH- Fosfomycin.