Frequency of Occurrence and Antimicrobial Susceptibility Profile of Pathogens causing the Bloodstream Infections in Pediatric Patients from Latin America: Report of the SENTRY Antimicrobial Surveillance Program (1997-2002)

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ABSTRACT

Objective. We attempted to verify if the frequency of occurrence (FO) and the antimicrobial susceptibility profile (ASP) of bacterial isolates responsible for bloodstream infections (BSI) in pediatric patients varied among the years and age categories.
Methods. A total of 2450 isolates were collected from pediatric patients hospitalized in Latin American hospitals through the SENTRY Program between 1997 and 2002. The ASP to numerous antimicrobials was determined by the NCCLS broth microdilution method. The FO and ASP were studied according to age categories (AC): ≤ 1 y-o, 2-5 y-o, and 6-12 y-o.
Results. Overall, *S. aureus* (SA) was the most frequently isolated pathogen among children ≤ 1 y-o (18.3%) and 6-12 y-o (26.8%) followed by coagulase-negative staphylococci (CoNS). Among children ≤ 1 y-o and 2-5 y-o, *S. pneumoniae* (SPN) ranked among the top five pathogens. In contrast, it has caused only 5.1% of BSI among children 6-12 y-o. Interestingly, in this age group, *Salmonella* spp. (7.1%) and *Acinetobacter* spp./*P. aeruginosa* (5.8%) assumed the fifth and sixth position in the rank order of frequency, respectively. Among SA, the oxacillin resistance (OR) rate was lower in the 6-12 y-o AC (17.2%; p ≤ 0.05) than in the ≤ 1 y-o (27.3%) or 2-5 y-o (25.0%) AC. In contrast, among the CoNS, elevated rates of OR were noticed in all AC (≤ 1 y-o, 82.1%; 2-5 y-o, 81.2%; 6-12 y-o, 78.3% - p > 0.05). ESBL-producing *K. pneumoniae* were more frequently detected in the ≤ 1 y-o AC (66.8% of the *K. pneumoniae* isolates) and 2-5 y-o (64.1%) than 6-12 y-o AC (52.0%). On the opposite, ESBL-producing *E. coli* isolates were less frequently encountered among children ≤ 1 y-o (9.4%) than among children 2-5 y-o (25.0%). However, these differences did not reach statistical significance (p > 0.05). SPN isolates showing reduced susceptibility to penicillin were detected more frequently in the AC of ≤ 1 y-o (39.2%) and 2-5 y-o (32.7%) than in 6-12 y-o (15.0%; p ≤ 0.05).
Conclusions. Although only slight differences in the FO of BSI pathogens were noticed along the years and AC, important differences were observed on the ASP of the BSI pathogens according to the age categories, especially for SPN and SA isolates.

INTRODUCTION

The concept that pediatric infections differ from those in adults has been well established. Although the frequency of wound infections, nosocomial pneumonias (ventilator-associated), and urinary tract infections are lower in children than in adults, children have a higher prevalence of viral respiratory and gastrointestinal infections, bacteremias, and cutaneous infections. Multiple factors contribute to these differences, including host factors, sources of infection, routes of transmission, and distribution of pathogens.

Bloodstream infections (BSI) represent a major cause of hospital-acquired infections in pediatric patients. However, pediatric patients represent a heterogeneous population of children of varying age, diagnosis, and underlying illness, ranging from infants with congenital anomalies to adolescents with multiple traumas.

The objective of this study was to verify if the frequency of occurrence and antimicrobial susceptibility profile of bacterial isolates responsible for causing BSI in pediatric patients varied along the years and age categories among the Latin American medical centers participants of the SENTRY Antimicrobial Surveillance Program (1997-2002).

MATERIAL AND METHODS

Bacterial strains. A total of 2,450 bacterial isolates were collected from pediatric patients hospitalized in Latin American medical centers between 1997 and 2002. All isolates were identified at the participating institution by the routine methodology in use at each laboratory. Upon receipt at the monitoring laboratory, isolates were subcultured onto blood agar to ensure viability and purity. Confirmation of species identification was performed with the Vitek (bioMérieux Vitek, St Louis, MO) or conventional methods as required.

Medical centers. The participant medical centers included twelve cities in seven countries: São Paulo (1997 - 2002), Rio de Janeiro (1997 - 98), Florianópolis (1997 - 2002), Brasília (2001-2002), and Porto Alegre (1999 - 2002) in Brazil; Buenos Aires and San Isidro in Argentina (1997 - 2002); Santiago in Chile (two sites; 1997 - 2002); Montevideo in Uruguay (1997); Medelin in Colombia (1997 - 2000); Mexico City in Mexico (three different sites; 1997 - 2002); and Caracas in Venezuela (1998 - 2002).

Susceptibility testing. Antimicrobial susceptibility testing was performed and interpreted following the guidelines for reference broth microdilution method as described by the NCCLS. The antimicrobial agents were obtained from the respective manufacturers or purchased from Sigma (St. Louis, MO). Validated dry-form microdilutiuon panels and broth for inoculation were manufactured by Trek Inc. (Westlake, OH, USA). Quality control of test procedures and reagents was monitored throughout routine testing using the following ATCC strains: *Escherichia coli* ATCC 25922 and 35218, *Staphylococcus aureus* ATCC 29213, *Pseudomonas aeruginosa* ATCC 27853, *Enterococcus faecalis* ATCC 29212, *Haemophilus influenzae* ATCC 49247 and 49766, and *Streptococcus pneumoniae* ATCC 49619

Statistical analysis. Statistical analysis was performed using SPSS Version 9.0 and values of p <0.05 were considered statistically significant.

RESULTS

- The Chilean medical centers contributed the most pediatric BSI isolates (39.8%) followed by the Brazilian (33.9%) and Argentinean (12.7%) medical centers (Table 1).

- The highest number of BSI isolates were collected from patients ≤ 1 year-old (65.5%) and between the years 1999 and 2002 (76.5%).

- Overall *S. aureus* was the most frequently isolated pathogen in the ≤ 1 y-o (18.3%) and 6-12 y-o (26.8%) age categories, followed by CoNS (17.4% and 11.6%, respectively). On the other hand, CoNS (17.8%) was the most frequent pathogen in the 2-5 y-o age category, followed by *S. aureus*: (14.3%).

- Among children ≤ 1 y-o and 2-5 y-o, *S. pneumoniae* ranked among the top five pathogens (7.5 and 8.7% of infections, respectively. Interestingly, *Salmonella* spp. (7.1%) was the fourth most frequently isolated pathogen among children 6 -12 y-o. *Acinetobacter* spp. and *P. aeruginosa* also showed high prevalence (5.8% for both) in their age category.

- The resistance rates to clindamycin, erythromycin, and rifampin were higher among oxacillin-resistant *S. aureus* isolates collected from children in the 6-12 y-o age category than among those collected from children ≤ 1 y-o and 2-5 y-o. These rates were comparable to those observed among patients >12 y-o.

- Macrolide resistance among penicillin-susceptible *S. pneumoniae* was more noticable in children ≤ 1 y-o and 2-5 y-o than in children 6-12 y-o and patients >12 y-o.

- *E. coli* and *K. pneumoniae* resistance rates to the fluoroquinolones were lower among isolates from children of any age category compared to isolates from patients >12 y-o.

- Among *S. aureus*, the oxacillin resistance rates were lower in the 6-12 y-o age category (17.2%; p ≤ 0.05) than in the ≤ 1 y-o (27.3%) or 2-5 y-o (25.0%) age categories. In contrast, among the CoNS, elevated rates of oxacillin resistance were noticed in all age categories (≤ 1 y-o, 82.1%; 2-5 y-o, 81.2%; 6-12 y-o, 78.3%).

- ESBL-producing *K. pneumoniae* isolates were more frequently detected in children ≤ 1 y-o (66.8%) and 2-5 y-o (64.1%) than in children 6-12 y-o (52.0%). Conversely, *E. coli* isolates with ESBL-producing phenotypes were less frequently encountered among children ≤ 1 y-o (9.4%) than among children 2-5 y-o (25.0%). However, these differences did not reach statistical significance (p > 0.05).

- *S. pneumoniae* isolates showing reduced susceptibility to penicillin were detected more frequently in children ≤ 1 y-o (39.2%) and 2-5 y-o (32.7%) than in children 6-12 y-o (15.0%; p ≤ 0.05).

- The main differences in the antimicrobial susceptibility patterns between isolates from children (≤ 12 y-o) and isolates from patients >12 y-o were: 1) oxacillin resistance rates were lower in *S. aureus* isolated from children (p< 0.05); 2) penicillin resistance rates were higher in pediatric (≤ 12 y-o) patients, especially in children ≤1 y-o (p< 0.05); 3) the ESBL-producing phenotype was more frequently detected among *K. pneumoniae* and *E. coli* isolates collected from children (≤ 12 y-o) than from patients >12 y-o (p< 0.05).

Table 1. Distribution of 2,450 pediatric BSI isolates listed by the Latin American medical center and year of isolation (SENTRY Antimicrobial Surveillance Program, 1997-2002).

Nation/medical center no. (no. tested)	1997	1998	1999	2000	2001	2002
Argentina (310)						
39 (63)	10	20	7	10	11	5
40 (247)	29	37	54	40	36	51
Brazil (830)						
41 (75)	31	44	-a	-	-	-
46 (126)	16	41	23	13	13	20
48 (324)	47	48	58	58	57	56
57 (203)	-	-	42	50	55	56
101 (102)	-	-	-	-	35	67
Chile (974)						
42 (778)	9	67	196	155	190	161
43 (196)	42	36	34	23	35	26
Colombia (224)						
44 (224)	31	63	77	53	-	-
México (68)						
45 (3)	2	1	-	-	-	-
92 (65)	-	-	-	53	12	0
Uruguay (3)						
47 (3)	3	-	-	-	-	-
Venezuela (41)						
49 (41)	-	-	12	11	8	10

a. - = the medical center did not participate in the study that year.

Table 2. Occurrence of the top 10 BSI pathogens isolated from pediatric patients hospitalized in Latin American medical centers listed by age category (SENTRY Antimicrobial Surveillance Program, 1997-2002).

Rank order	Occurrence (%)		
	1 y-o (n=1,605)	2-5 y-o (n=449)	6 -12 y-o (n=396)
1	*S. aureus* (18.3%)	CoNS (17.8%)	*S. aureus* (26.8%)
2	CoNS (17.4%)	*S. aureus* (14.3%)	CoNS (11.6%)
3	*K. pneumoniae* (11.7%)	*S. pneumoniae* (12.2%)	*E. coli* (10.6%)
4	*E. coli* (11.3%)	*K. pneumoniae* (8.7%)	*Salmonella* spp. (7.1%)
5	*S. pneumoniae* (7.5%)	*E. coli* (8.0%)	*K. pneumoniae* (6.3%)
6	*Enterobacter* spp. (6.4%)	*P. aeruginosa* (5.8%)	*Acinetobacter* spp. (5.8%)
7	ß-haemolytic strept. (5.7%)	*Enterobacter* spp. (5.3%)	*P. aeruginosa* (5.8%)
8	*P. aeruginosa* (4.7%)	*Salmonella* spp. (5.1%)	*Enterobacter* spp. (5.1%)
9	*Acinetobacter* spp. (2.3%)	*Acinetobacter* spp. (3.1%)	*S. pneumoniae* (5.1%)
10	*Serratia* spp. (2.2%)	ß-haemolytic strept. (2.4%)	*Enterococcus* spp. (2.0%)

Table 3. Antimicrobial susceptibility of Gram-positive cocci according to age category (SENTRY Program, 1997-2002).

	≤ 1 y-o			2-5 y-o			6-12 y-o			> 12 y-o		
	MIC (mg/L)			MIC (mg/L)			MIC (mg/L)			MIC (mg/L)		
Antimicrobial agent	50%	90%	% sª	50%	90%	% sª	50%	90%	% sª	50%	90%	% sª
Oxac.-susc. *S. aureus*	n=213			n=48			n=87			n=1,270		
Clindamycin	0.12	0.25	96.2	0.12	0.25	97.9	0.12	0.25	98.9	0.12	0.25	98.3
Erythromycin	0.5	>8	76.1	0.5	>8	81.3	0.5	0.5	82.8	0.5	>8	77.4
Gentamicin	≤1	2	93.9	≤1	2	95.8	≤1	2	98.9	≤2	2	95.0
Rifampin	0.25	0.25	98.6	0.25	0.25	95.8	0.25	0.25	100.0	0.25	0.25	97.7
TMP/SMXᵇ	<0.5	<0.5	94.8	<0.5	<0.5	97.9	<0.5	<0.5	97.7	<0.5	<0.5	98.3
Ciprofloxacin	0.25	0.5	97.7	0.25	0.5	100.0	0.25	0.5	98.9	0.25	0.5	96.1
Gatifloxacin	0.06	0.12	99.1	0.06	0.12	100.0	0.06	0.12	100.0	0.06	0.12	99.6
Linezolid	2	2	100.0	2	2	100.0	2	2	100.0	2	4	100.0
Quin/Dalfᶜ	0.25	0.5	99.5	0.25	0.5	97.9	0.25	0.5	100.0	0.25	0.5	99.8
Teicoplanin	0.5	2	99.5	0.5	2	100.0	0.5	1	100.0	0.5	1	99.9
Vancomycin	1	1	100.0	1	1	100.0	1	1	100.0	1	1	100.0
Oxac.-res. *S. aureus*	n=80			n=16			n=18			n=657		
Ciprofloxacin	>2	>2	45.0	>2	>2	31.3	>2	>2	16.7	>2	>2	8.4
Gatifloxacin	1	4	88.8	2	4	75.0	2	4	61.1	2	4	70.3
Clindamycin	>8	>8	48.8	>8	>8	37.5	>8	>8	11.1	>8	>8	11.3
Erythromycin	>8	>8	22.5	>8	>8	31.3	>8	>8	11.1	>8	>8	7.2
Gentamicin	>8	>8	13.8	>8	>8	6.3	>8	>8	16.7	>8	>8	7.5
Rifampin	0.25	>2	72.5	0.25	>2	68.8	2	>2	44.8	2	>2	39.2
TMP/SMXᵇ	<0.5	>2	64.9	<0.5	<0.5	93.8	<0.5	>2	50.0	>2	>2	38.1
Linezolid	2	2	100.0	2	4.0	100.0	2	2	100.0	2	4	100.0
Quin/Dalfᶜ	0.25	1	100.0	0.5	1	100.0	0.5	1	100.0	0.5	1	99.5
Teicoplanin	1	8	96.3	1	2	100.0	1	4	100.0	1	2	99.2
Vancomycin	1	2	100.0	1	2	100.0	1	2	100.0	1	2	100.0
Oxac.-susc. CoNS	n=50			n=15			n=10			n=283		
Ciprofloxacin	0.25	0.25	98.0	0.25	0.25	100.0	0.25	0.25	100.0	0.25	0.5	95.8
Gatifloxacin	0.12	0.12	98.0	0.12	0.12	100.0	0.12	0.12	100.0	0.12	0.12	99.3
Clindamycin	0.12	0.25	98.0	0.12	0.25	93.3	0.12	0.25	100.0	0.12	0.25	92.9
Erythromycin	>8	>8	72.0	0.5	>8	60.0	0.5	>8	60.0	0.25	>8	72.4
Gentamicin	1	2	92.0	1	8	86.7	1	1	90.0	1	4	91.8
Rifampin	0.25	0.25	98.0	0.25	>2	71.9	0.25	>2	69.4	0.25	>2	97.2
TMP/SMXᵇ	<0.5	>2	86.0	<0.5	>2	80.0	<0.5	>2	80.0	<0.5	>2	85.8
Linezolid	1	2	100.0	1	2	100.0	2	2	100.0	1	2	100.0
Quin/Dalfᶜ	0.25	0.5	100.0	0.25	0.25	100.0	0.25	0.25	100.0	0.25	0.25	100.0
Teicoplanin	2	4	98.0	0.5	8	100.0	4	4	100.0	1	8	96.5
Vancomycin	1	2	100.0	1	2	100.0	2	2	100.0	2	2	100.0
Oxac.-res. CoNS	n=229			n=65			n=36			n=832		
Ciprofloxacin	0.25	>2	61.6	0.25	>2	64.6	0.25	>2	63.9	>2	>2	37.1
Gatifloxacin	0.12	2	93.9	0.12	2	95.4	0.12	2	100.0	1	2	90.7
Clindamycin	0.25	>8	59.0	>8	>8	58.5	0.5	>8	58.3	>8	>8	38.5
Erythromycin	>8	>8	26.2	>8	>8	38.5	>8	>8	33.3	>8	>8	38.5
Gentamicin	>8	>8	27.2	>8	>8	38.5	>8	>8	38.9	>8	>8	32.0
Rifampin	0.25	>2	73.4	0.25	>2	71.9	0.25	>2	69.4	0.25	>2	63.5
TMP/SMXᵇ	>2	>2	47.6	>2	>2	46.9	>2	>2	44.5	>2	>2	41.3
Linezolid	1	2	100.0	2	4	100.0	1	2	100.0	1	2	100.0
Quin/Dalfᶜ	0.25	0.25	99.6	0.5	1	100.0	0.25	1	100.0	0.25	0.5	100.0
Teicoplanin	2	8	91.3	2	16	82.6	2	16	88.9	2	8	90.3
Vancomycin	2	2	100.0	2	2	100.0	2	2	100.0	2	4	100.0
Pen.-susc *S. pneumoniae*	n=73			n=37			n=17			n=177		
Chloramphenicol	2	4	100.0	2	4	100.0	2	4	100.0	2	4	98.9
Gatifloxacin	0.25	0.5	100.0	0.25	0.25	100.0	0.25	0.25	100.0	0.25	0.5	100.0
Clindamycin	≤0.06	≤0.06	100.0	≤0.06	0.12	91.9	≤0.06	≤0.06	94.1	≤0.06	≤0.06	98.9
Erythromycin	≤0.06	8	84.9	≤0.06	8	78.4	≤0.06	2	88.2	≤0.06	0.25	96.6
Rifampin	≤0.25	≤0.25	100.0	≤0.25	≤0.25	100.0	≤0.25	≤0.25	100.0	≤0.25	≤0.25	100.0
TMP/SMXᵇ	<0.5	>2	79.5	<0.5	>2	80.6	<0.5	>2	82.4	<0.5	>2	77.6
Linezolid	1	1	100.0	1	1	100.0	1	1	100.0	1	1	100.0
Quin/Dalfᶜ	0.5	0.5	100.0	0.5	0.5	100.0	0.5	0.5	100.0	0.25	0.5	100.0
Vancomycin	≤0.25	0.5	100.0	≤0.25	0.5	100.0	≤0.25	0.5	100.0	≤0.25	0.5	100.0

a. Percentage of susceptibility interpreted using NCCLS breakpoints.
b. TMP/SMX, trimethoprim/sulfamethoxazole.
c. Quin/Dalf, quinupristin/dalfopristin.

Table 4. Antimicrobial susceptibility of Gram-negative bacilli according to age category (SENTRY Program, 1997-2002).

	≤1 y-o			2-5 y-o			6-12 y-o			> 12 y-o		
	MIC (mg/L)			MIC (mg/L)			MIC (mg/L)			MIC (mg/L)		
Antimicrobial agent	50%	90%	% sª	50%	90%	% sª	50%	90%	% sª	50%	90%	% sª
Escherichia coli	n=42			n=36			n=181			n=1816		
Aztreonam	≤0.12	0.25	92.3	≤0.12	>16	77.8	≤0.12	16	88.1	0.12	0.25	95.2
Cefoxitina	4	8	95.6	4	8	97.2	4	8	97.6	4	8	90.9
Ceftriaxone	≤0.25	≤0.25	92.2	≤0.25	>32	75.0	≤0.25	32	88.1	≤0.25	0.25	94.8
Ceftazidime	≤1	2	92.8	≤1	>16	80.6	≤1	>16	88.1	≤1	≤1	95.9
Cefepime	≤0.12	0.5	97.2	≤0.12	16	86.1	≤0.12	4	97.6	≤0.12	0.25	96.6
Imipenem	0.12	0.25	100.0	0.12	0.25	100.0	0.12	0.25	100.0	0.12	0.25	100.0
Meropenem	≤0.06	≤0.06	100.0	≤0.06	0.06	100.0	≤0.06	≤0.06	100.0	≤0.06	≤0.06	100.0
Pip/Tazᵇ	2	8	91.2	2	32	88.9	2	32	88.1	2	8	92.5
Amikacin	2	32	89.5	2	16	91.7	2	4	90.5	2	4	98.1
Gentamicin	2	16	80.1	1	8	86.1	2	>8	83.3	1	4	90.7
Ciprofloxacin	0.03	0.25	99.4	0.25	0.25	97.2	0.03	0.25	92.9	0.03	4	81.5
Gatifloxacin	≤0.03	0.06	99.4	≤0.03	0.12	97.2	≤0.03	0.5	92.9	≤0.03	>4	82.4
Levofloxacin	≤0.03	0.5	99.4	≤0.03	0.5	97.2	≤0.03	0.5	99.4	0.06	>4	82.1
Klebsiella pneumoniae	n=181			n=36			n=42			n=1816		
Aztreonam	16	>16	46.0	16	>16	48.7	0.25	>16	64.0	0.12	>16	66.1
Cefoxitina	4	16	89.3	4	>32	79.5	4	>32	85.4	4	16	84.8
Ceftriaxone	16	>32	44.9	32	>32	46.5	2	>32	72.0	0.25	>32	66.0
Ceftazidime	8	>16	60.4	8	>16	51.3	2	>16	68.0	≤1	>16	68.9
Cefepime	2	>16	65.2	4	>16	69.2	0.25	>16	88.0	0.12	>16	78.6
Imipenem	0.12	0.5	100.0	0.25	0.5	100.0	0.25	1	100.0	0.12	0.5	99.9
Meropenem	0.06	0.06	100.0	0.06	0.06	100.0	0.06	0.06	100.0	0.06	0.12	99.7
Pip/Tazᵇ	8	>64	62.0	16	>64	51.3	4	64	68.0	4	>64	68.1
Amikacin	8	>32	66.8	16	>32	64.1	2	>32	72.0	2	32	63.6
Gentamicin	>16	>16	39.6	2	>16	61.5	1	>16	68.0	2	>16	69.7
Ciprofloxacin	0.25	0.25	98.8	0.25	0.25	94.9	0.25	1	92.0	0.12	4	85.4
Gatifloxacin	0.06	0.25	99.5	0.06	0.5	97.4	0.06	1	100.0	0.06	4	88.8
Levofloxacin	0.06	0.25	98.9	0.06	0.5	97.4	0.06	1	100.0	0.06	4	87.9
***Salmonella* spp.**	n=28			n=23			n=28			n=150		
Ampicilin	≤2	8	92.9	≤2	2	100.0	≤2	2	92.9	1	4	91.3
Amox/Clavᶜ	≤2	8	92.9	≤2	2	100.0	≤2	2	92.9	≤2	≤2	94.0
Aztreonam	≤0.12	≤0.12	100.0	≤0.12	≤0.12	100.0	≤0.12	≤0.12	96.4	≤0.12	≤0.12	98.7
Ceftriaxone	≤0.25	≤0.25	100.0	≤0.25	≤0.25	100.0	≤0.25	≤0.25	100.0	≤0.25	≤0.25	99.3
Ceftazidime	≤1	2	100.0	≤1	2	100.0	≤1	2	96.4	≤1	≤1	99.3
Cefepime	≤0.12	≤0.12	100.0	≤0.12	≤0.12	100.0	≤0.12	≤0.12	96.4	≤0.12	≤0.12	99.3
Imipenem	0.25	0.25	100.0	0.12	0.25	100.0	0.12	0.5	100.0	0.25	0.5	100.0
Meropenem	≤0.06	≤0.06	100.0	≤0.06	≤0.06	100.0	≤0.06	≤0.06	100.0	≤0.06	≤0.06	100.0
Pip/Tazᵇ	2	4	100.0	2	4	100.0	2	8	100.0	2	4	98.7
Ciprofloxacin	0.12	0.25	100.0	0.03	0.25	100.0	0.03	0.25	100.0	0.03	0.25	100.0
Gatifloxacin	0.03	0.5	100.0	0.03	0.12	100.0	0.03	0.06	100.0	0.06	0.12	100.0
Levofloxacin	0.03	0.5	100.0	0.03	0.5	100.0	0.03	0.25	100.0	0.12	0.5	100.0
TMP/SMXᵈ	<0.5	<0.5	92.9	<0.5	<0.5	100.0	<0.5	<0.5	96.4	<0.5	<0.5	91.3

a. Percentage of susceptibility interpreted using NCCLS breakpoints.
b. Pip./Taz., piperacillin/tazobactam.
c. Amox/Clav, amoxicilin /clavulanate.
d. TMP/SMX, trimethoprim/sulfamethoxazole.

Table 5. Percentage of determined phenotypes of resistance listed by year of isolation and age category (SENTRY Program, 1997-2002).

Resistance Phenotype	% (N tested)			
	≤1 y-o	2-5 y-o	6-12 y-o	>12 y-o
Oxacillin-resistant *S. aureus*	27.3 (293)ᵇ	25.0 (64)	17.2 (105)ᵇ	34.0 (1927)
Oxacillin-resistant CoNSª	82.0 (279)	81.2 (80)	78.3 (46)	74.6 (1115)
Penicillin-non-susceptible *S. pneumoniae*	39.2 (120)ᵇ	32.7 (55)	15.0 (20)	21.3 (225)
ESBL-producing *E. coli*	9.4 (181)	25.0 (36)ᵇ	19.0 (42)ᵇ	7.4 (1816)
ESBL-producing *K. pneumoniae*	66.8 (187)ᵇ	64.1 (39)ᵇ	52.0 (25)	41.2 (752)

a. CoNS, coagulase-negative staphylococci.
b. p<0.05 comparing with patients >12 y-o.

CONCLUSIONS

- Although only slight differences in the frequency of occurrence of BSI pathogens were noticed along the years and age categories, important differences were observed on the antimicrobial susceptibility profile of the BSI pathogens according to the age categories, especially among *S. pneumoniae* and *S. aureus* isolates.

- The results provided by comprehensive surveillance programs, such as the SENTRY Program, allows the characterization of local patterns of resistance and represent an important tool for guiding empiric antimicrobial therapy.