Antimicrobial resistance in *E. coli* in hospitalised patients in Germany 2009-2011: are there any trends?

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Objectives

The European Antimicrobial Resistance Surveillance Network (EARS-Net) Report 2011 reveals increasing trends of combined resistance to third-generation cephalosporins (3GC), fluoroquinolones (FQ) and aminoglycosides (AG) in invasive *E. coli* isolates from hospitalised patients over the past four years for many European countries but not for Germany. The German Antimicrobial Resistance Surveillance (ARS) System collects data for isolates from all specimen types thus allowing to study trends in isolates from urine and respiratory samples as well.

Materials & Methods

Analysis is based on isolates of *E. coli* collected by eight laboratories covering 191 hospitals with continuous data submission for the period 2009 to 2011. Copy strain elimination is based on first isolate/patient/year for analysis of all specimen and first isolate/patient/specimen type/year for specimen specific analysis. Species identification and antimicrobial susceptibility testing is performed by VITEK 2.

Isolates are classified as non-susceptible to an antibiotic class if they show non-susceptibility to one of its agents:

- 3GC: ceftazidime or cefotaxime or ceftriaxone
- FQ: ciprofloxacin or levofloxacin
- AG: gentamicin or tobramicin or amikacin.

Significance of differences of proportions is evaluated on the basis of 95%-confidence intervals.

Results

antibiotic class	year	specimen type							
		all specimen		blood cultures		urines		respiratory	
		R+I%	95%CI	R+I%	95%CI	R+I%	95%CI	R+I%	95%CI
Aminoglycosides	2009	9,4	9.1 - 9.6	10,2	9.0 - 11.4	9,5	9.2 - 9.9	12,8	11.0 - 14.6
	2010	9,7	9.4 - 9.9	9,8	8.7 - 10.9	9,7	9.3 - 10.0	14,0	12.3 - 15.6
	2011	9,2	9.0 - 9.5	9,1	8.0 - 10.1	9,3	9.0 - 9.7	12,0	10.5 - 13.5
Cephalosporines	2009	8,6	8.3 - 8.9	9,8	8.6 - 11.1	8,5	8.1 - 8.8	13,6	11.8 - 15.4
	2010	9,8	9.6 - 10.1	8,6	7.5 - 9.7	9,5	9.2 - 9.8	16,3	14.5 - 18.0
	2011	10,4	10.1 - 10.6	10,2	9.1 - 11.3	9,9	9.5 - 10.2	15,4	13.7 - 17.1
Fluorchinolones	2009	22,9	22.5 - 23.3	25,4	23.6 - 27.2	24,7	24.2 - 25.2	27,8	25.4 - 30.2
	2010	23,8	23.4 - 24.2	25,4	23.8 - 27.1	25,3	24.9 - 25.8	31,9	29.6 - 34.1
	2011	23,7	23.4 - 24.1	24,8	23.2 - 26.4	24,9	24.4 - 25.4	28,5	26.3 - 30.6
combined non-susceptibility	2009	3,5	3.3 - 3.7	4,7	3.8 - 5.5	3,5	3.3 - 3.8	6,1	4.8 - 7.3
	2010	3,7	3.5 - 3.8	3,9	3.2 - 4.6	3,6	3.4 - 3.8	7,1	5.9 - 8.3
	2011	3,8	3.6 - 3.9	4,7	3.9 - 5.5	3,7	3.5 - 3.9	6,2	5.1 - 7.4
sample sizes: number of isolates tested for all 3 classes by year		2009: 40,354 2010: 46,989 2011: 48,784		2009: 2,295 2010: 2,688 2011: 2,857		2009: 27,257 2010: 31,945 2011: 33,397		2009: 1,338 2010: 1,660 2011: 1,700	

Table 1: Non-susceptibility in *E. coli* isolates from hospitalised patients in Germany 2009-2011: proportions of non-susceptibility (R+I%) against fluoroquinolones, third-generation cephalosporines, aminoglycosides and combined non-susceptibility to these antibiotic classes and confidence intervals (95%CI) stratified by year and specimen type: all specimen, blood cultures, respiratory and urine samples.

Results

Analysis is based on 136,127 non-duplicate *E. coli* isolates from inpatients (blood cultures: 7,840; respiratory samples: 4,698; urine: 95,599). Results are displayed in table 1. Proportions of combined non-susceptibility were highest in respiratory samples followed by blood cultures (6.2% resp. 4.7% in 2011). In respiratory samples combined non-susceptibility increased from 2009 to 2010 and fell to the previous level in 2011, in blood cultures we found an inverse trend whereas in urines and for all specimen (widely dominated by urine) proportions increased continuously on a lower level almost reaching significance.

The same pattern could be seen for third-generation cephalosporins with significant increases in urines and all specimen.

References

ARS-Website: https://ars.rki.de

Antimicrobial resistance surveillance in Europe 2011. Annual report of the European Antimicrobial Resistance Surveillance Network (EARS-Net).

Conclusion

Proportions of non-susceptibility to the main antibiotic classes, distinct and combined, in *E. coli* from blood cultures showed little variation over the period 2009 to 2011. The extended approach of ARS gives insight into other specimen types revealing an increase of non-susceptibility to third-generation cephalosporins in urine and in respiratory samples.

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P 1309