Healthcare-Associated *Clostridium difficile* Infections in the National Point Prevalence Survey of Healthcare-Associated Infections and Antimicrobial Use in Acute Care Hospitals in Hungary, 2012

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Summary

In May 2012 Hungary participated in the first European point prevalence survey (PPS) of healthcare-associated infections (HAI) and antimicrobial use (AMU) coordinated by the European Centre for Disease Prevention and Control (ECDC). Due to the increasing incidence of healthcare-associated *Clostridium difficile* infection (HA-CDI) in Hungary, we analysed HA-CDI data in the national PPS. The survey included 29 hospitals and 10,180 in-patients. A total of 462 patients with HAI (4.5%, 95% CI: 4.0-5.2%) were recorded. The mean prevalence of HA-CDI was 0.5% (95% CI: 0.3-0.9%). The percentage of HA-CDI among all HAIs was 10.6% (almost 3x higher than in the overall European PPS). Nearly half of HA-CDI (45.3%) were present on admission. Factors associated with increased odds of HA-CDI were increasing age and length of stay (before onset, if HAI), ultimately/rapidly fatal co-morbidity, urinary catheter in place, medical specialty, hospital fluoroquinolone use, number of infection control nurses and secondary/tertiary level of care. The results confirmed that HA-CDI is an important public health problem in Hungary which calls for multifaceted prevention strategy.

Introduction

- The epidemiology of HA-CDI has started to change in Hungary in the second half of the 2000s.
- Notification data showed that the incidence of HA-CDI increased from 1.2 to 2.8 per 10,000 patient-days from 2011 to 2012 in Hungary.
- To complement notification data and better understand risk factors of HA-CDI, we aimed to describe HA-CDI cases, antimicrobials used and associated factors in the first Hungarian point prevalence survey of HAI and antimicrobial use.
- The national survey was conducted in the frame of the first European PPS of HAI and AMU implemented in 29 countries under the coordination of ECDC in 2011-2012.

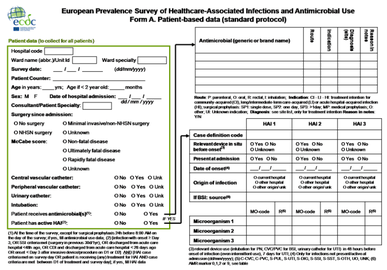
Methods

European PPS of healthcare-associated infections and antimicrobial use, 2011-2012 [1]

- Inclusion crit.: acute care hospitals → all acute care wards → patients present on PPS day at 8 am
- Exclusion crit.: chronic care, day-cases, outpatients
- Case definition of HA-CDI:

The case meets at least 1 of the following criteria: 1) Diarrhoeal stools or toxic megacolon, and a positive laboratory assay for *C. difficile* toxin A and/or B in stools 2) Pseudomembranous colitis revealed by lower gastro-intestinal endoscopy 3) Colonic histopathology characteristic of CDI on a specimen obtained during endoscopy, colectomy, or autopsy AND onset of symptoms was on day 3 after admission or later OR the patient has been admitted or develops symptoms within 2 days with CDI < 28 days from a previous discharge from an acute care hospital

- Standard data collection form:


European Prevalence Survey of Healthcare-Associated Infections and Antimicrobial Use
Form A. Patient-based data (standard protocol)

National PPS of healthcare-associated infections and antimicrobial use in Hungary, May 2012

- Sampling method and sample: systematic sampling according to hospital type and size → 29 acute care hospitals (fig. 1.) and 10,180 inpatients included
- Surveyors: hospitals' infection control staff

Figure 1. Number of participating hospitals by county in the Hungarian PPS, 2012

Data analysis

- Calculation of mean prevalence of HA-CDI, and prevalences by hospital, specialty, age, sex.
- Calculation of adjusted odds ratios for risk factors at patient and hospital level using a multilevel mixed effect logistic regression.

Results

Healthcare-associated infections

- Number of pts in PPS: 10,180 patients (43% male)
- Median age of pts: 61 years
- Total number of HAIs: 498 infections
- Prevalence of pts with HAI: 4.5% (95% CI: 4.0–5.2%)

Healthcare-associated *C. difficile* infections

- Number of pts with HA-CDI: 53 patients (43% male)
- Median age of pts: 75 years
- Prevalence of HA-CDI: 0.5% (95% CI: 0.3–0.9%)
- Prevalence by hospital: 0.0–1.8%
- HA-CDI of all HAIs: 10.6% (53/498)
- HA-CDI present on admission: 45.3% (24/53)

- The percentage of HAI-CDI of all HAIs was the lowest in primary level and highest in secondary level hospitals (fig.1).
- Infectious disease specialty had the highest prevalence of HA-CDI (fig. 2), which were all imported infections.
- Several independent predictors of HA-CDI were found (table).

Table. Factors associated with increased odds of healthcare-associated *Clostridium difficile* infection in univariate analysis (crude ratios) and in the multilevel logistic regression model (adjusted ratios)

	N of patients	% of total	N of pts with HA-CDI	% of pts with HA-CDI	Crude OR (95%CI)	P-value	Adjusted OR (95%CI)	P-value
All patients	10 180	100.0	53	0.52	-		-	
Age						*<0.001**		*0.038**
<40 y	2 567	25.2	3	0.12	ref.		ref.	
40–59 y	2 347	23.1	6	0.26	2.2 (0.5 - 8.8)	0.268	0.8 (0.2 - 3.5)	0.799
60–74 y	3 024	29.7	17	0.56	4.8 (1.4 - 16.5)	0.012	1.4 (0.4 - 5.1)	0.621
>=75 y	2 242	22.0	27	1.20	10.4 (3.2 - 34.4)	<0.001	2.1 (0.6 - 7.8)	0.267
Length of stay**						*<0.001**		*0.009**
1–3 days	3 683	36.2	8	0.22	ref.		ref.	
4–7 days	3 341	32.8	17	0.51	2.3 (1.0 - 5.5)	0.047	1.8 (0.8 - 4.3)	0.167
8–14 days	2 072	20.4	16	0.77	3.6 (1.5 - 8.4)	0.003	2.4 (1.0 - 5.7)	0.044
>=15 days	1 083	10.6	12	1.11	5.1 (2.1 - 12.6)	<0.001	3.2 (1.3 - 8.1)	0.014
McCabe score								
Non fatal	6 409	63.0	20	0.31	ref.		ref.	
Ultimately/Rapidly fatal	1 311	12.9	20	1.53	2.3 (1.2 - 4.6)	0.012	2.5 (1.3 - 4.9)	0.008
Unknown	2 460	24.2	13	0.53	1.2 (0.6 - 2.5)	0.625	1.1 (0.5 - 2.3)	0.815
Urinary catheter	1 238	12.2	19	1.53	4.1 (2.3 - 7.2)	0.000	2.7 (1.5 - 5.0)	0.002
Medical specialty	4 650	45.7	45	0.97	6.7 (3.2 - 14.3)	0.000	4.4 (2.0 - 10.0)	<0.001
Hospital fluoroquinolone use (% of pts, tertiles)						*0.011**		*0.002**
0–3.49%	3 206	31.5	9	0.28	ref.		ref.	
3.5–4.49%	3 755	36.9	20	0.53	1.9 (0.9 - 4.2)	0.110	2.4 (1.0 - 5.4)	0.045
4.5–7.49%	3 219	31.6	24	0.75	2.7 (1.2 - 5.7)	0.012	3.6 (1.6 - 8.2)	0.002
Infection Control Nurse								
<0.75 ICN/250 beds	6 781	66.6	26	0.38	ref.		ref.	
>=0.75 ICN/250 beds	3 346	32.9	27	0.81	2.1 (1.2 - 3.6)	0.007	2.8 (1.4 - 5.5)	0.004
Hospital type								
Primary	2 432	23.9	4	0.16	ref.		ref.	
Secondary	5 405	53.1	39	0.72	4.4 (1.6 - 12.3)	0.005	4.5 (1.1 - 10.6)	0.029
Tertiary	1 867	18.3	9	0.48	2.9 (0.9 - 9.5)	0.074	3.4 (1.1 - 12.3)	0.041
Specialised	423	4.2	1	0.24	1.4 (0.2 - 12.9)	0.746	1.2 (0.1 - 9.2)	0.99

p for trend ; * length of stay before onset of HAI in patients with HAI; pts: patients

Figure 1. Percentage of healthcare-associated *Clostridium difficile* infection of all healthcare-associated infections, by hospital type

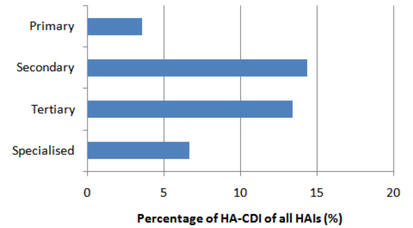
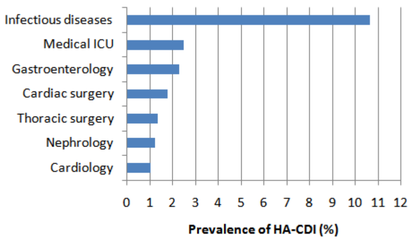
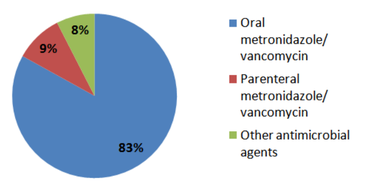


Figure 2. Specialties with at least 1% prevalence of healthcare-associated *Clostridium difficile* infection



Antimicrobials used

Figure 3. Antimicrobials received by patients with HA-CDI on the survey day



- The prevalence of fluoroquinolone use was lower in hospitals with at least 0.75 full-time equivalent infection control (IC) nurse per 250 beds than in those under this ratio:
  - 2.8% and 4.4%, respectively, in all hospitals
  - 3.3% and 4.6%, respectively, in hospitals with HA-CDI

Discussion

- Although the prevalence of patients with HAI observed in the Hungarian PPS (4.5%) was lower than in the European sample (6.0%), the proportion of HA-CDI of all HAIs was considerably higher in Hungary (10.6%) than in Europe (3.6%). [2]
- Imported HA-CDI cases contributed significantly to the burden of HA-CDI. This has importance regarding the risk of secondary transmission, and screening policies.
- Elderly patients with comorbidities were at high risk of HA-CDI. Length of stay and fluoroquinolone use at hospital level were important modifiable risk factors identified.
- Our findings suggest that a higher number of infection control nurses may contribute to better diagnosis of HA-CDI and lower use of fluoroquinolones.

Conclusions

Screening of diarrhoeal patients on hospital admission, increased number of IC staff and decreased fluoroquinolone use may contribute to effective diagnosis and prevention of HA-CDI.

References

1) European Centre for Disease Prevention and Control. Point prevalence survey of healthcare-associated infections and antimicrobial use in European acute care hospitals, protocol version 4.3. Stockholm: ECDC; 2012.
2) European Centre for Disease Prevention and Control. Point prevalence survey of healthcare associated infections and antimicrobial use in European acute care hospitals. Stockholm: ECDC, 2013.

Acknowledgements

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