SURVEILLANCE OF INTRAHOSPITAL INFECTIONS AT THE CLINIC FOR GYNAECOLOGY AND OBSTETRICS

Amer Čustović [1*], Vesna Zulčić-Nakić[2] , Mensura Aščerić[3], Sadeta Hadžić[1]

[1] Department for Hygienic and Epidemiologic survey, University Clinical Center, Trnovac bb, 75000 Tuzla, Bosnia and Herzegovina

[2] Clinic for Gynaecology and Obstetrics, University Clinical Center, Trnovac bb, 75000 Tuzla, Bosnia and Herzegovina

[3] Department of Pharmacology and Toxicology, Faculty of Medicine, University of Tuzla, Univerzitetska 1, 75000 Tuzla, Bosnia and Herzegovina

[*] Corresponding author

Abstract

Intrahospital infections (IHI) and antibiotics resistance are the problems which exist in virtually all hospitals in the world. The main aim of the present research is establishing of epidemiological surveillance over occurrence of IHI at the Clinic for Gynaecology and Obstetrics at the University Clinical Center Tuzla and thus identifies: types of bacteria which cause IHI, types of infection according to anatomical localization and research resistance organisms causing of IHI on antimicrobial drugs. A study was implemented on all patients admitted to Clinic for Gynaecology and Obstetrics during the period of one year and who subsequently developed infection. Determination of intrahospital infections was done according to criteria defined by the Centres for Disease Control and Prevention from the United States.

The results of our work have shown that both urinary tract infections and surgical site infections are the most frequent. As IHI causers the most found are gram-negative organisms (73,7%), such as *Escherichia coli* (29,8%), right after that *Klebsiella pneumoniae* (24,6%), *Pseudomonas aeruginosa* (14%) and *Proteus mirabilis* (5,3%) ($p<0,05$). Gram-positive organisms as causers of IHI are registered in 26,3% cases. Out of that *Streptococcus species* are isolated in 10,5% cases, *Staphylococcus aureus* (8,8%) and coagulasa negative staphylococci (7%) ($p>0,05$). High percent resistance of bacteria was evident to beta-lactams, aminoglycosids and cephalosporin's of third generation. Gram-positive organisms were 100% sensitive to vancomycin, while gram-negative organisms manifested the high percent of sensibility to imipenem and cefepime.

KEY WORDS: intrahospital infections, antibiotics resistance, surveillance

Introduction

Intrahospital infections (IHI) are a frequent occurrence in modern hospitals. These infections are recognized as a significant public-health problem in the industrial developed countries, as well as in countries in developing. The significance and size of intrahospital infections problem is determined by series of consequences such as, medical, legal, ethical and economic (1). The organisms causing most IHI usually come from the patient's own body (endogenous flora). They also can come from contact with staff (cross-contamination), contaminated instruments and needles, and the environment (exogenous flora) (2). Most IHI are inevitable risks related to treatment. Due to the improvements in the treatments of serious diseases, there are more and more patients whose resistance to infection is severely reduced (3). Simultaneously, modern treatments necessitate the use of intravenous catheters, urinary catheters, respirators, complicated operations and other factors, which depress resistance mechanisms and make patients susceptible to infections (4). Most intrahospital infections are not related to epidemics but occur consistently as sporadic cases (5). Surveillance of IHI is the cornerstone of prevention and control (6). The main aim of the research is establishing of epidemiological surveillance over occurrence of IHI at the Clinic for Gynaecology and Obstetrician at the University Clinical Center (UCC) Tuzla and thus identifies: types of bacteria which cause IHI, types of infection according to anatomical localization and research resistance of organisms causing the IHI on antimicrobial drugs. This study was an attempt to pay more attention on this problem, because in any hospital in Bosnia and Herzegovina there is no active modern epidemiology surveillance of IHI, and also there are no legal regulations that could regulate the duties of health-medical organizations in order to prevent and keep down IHI.

Material and Methods

A prospective study was implemented for all patients admitted to Clinic for Gynaecology and Obstetrician UCC Tuzla during the period January 1, 2006 to December 31, 2006 and who subsequently developed infection. The research has been conducted by usage of application made on the base of recommendations of Health Infection Control Practice Advisory Committee (HICPAC) which exist within the Centres for Disease Control and Prevention (CDC) from the United States. Determination of intrahospital infections was done according to criteria defined by the CDC.

Results and Discussion

Alert organism surveillance is the continuous monitoring of the incidence of specified organisms isolated by the microbiology laboratory. Alert organisms might include methicillin-resistant *Staphylococcus aureus*, glycopeptide-resistant enterococci and gentamicin-resistant coliforms.

The most common isolated causers of IHI at the Clinic for Gynaecology and obstetrics in 2006 are gram negative bacteria, 42 times or 73,7 %. Out of that *Escherichia coli* was isolated in 29,8% of cases, then *Klebsiella pneumoniae* with frequency of 24,6%, *Pseudomonas aeruginosa* 14 % and *Proteus mirabilis* are identified in 5,3% of cases ($\chi 2=10,07$; $p<0,05$). Gram positive bacteria as causers of IHI are registered 15 times or 26,3%. Out of that bacteria *Strep-*

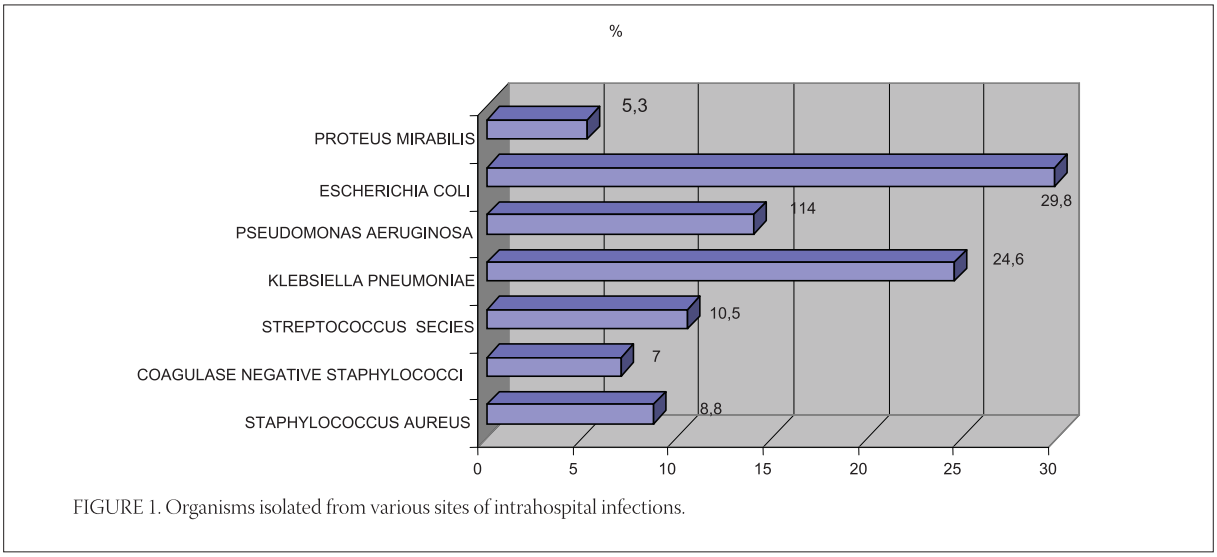

FIGURE 1. Organisms isolated from various sites of intrahospital infections.

tococcus species was isolated in 10,5% of cases, *Staphylococcus aureus* 8,8% and coagulase negative *staphylococci* in 7% of cases ($\chi 2 = 0{,}20$; $p > 0{,}05$) (Figure 1). Intrahospital infections can be defined as those that were neither present nor incubating at the time the patient was admitted. Detailed definitions of specific infections have been published by several organisations, including the World Health Organisation (7), the United States National Nosocomial Infection Surveillance (NNIS) (8), and the Hospital Infection Society (9).

Urinary tract infections (UTI) at the Clinic for Gynaecology and obstetrics in 2006, were mainly caused by *Escherichia coli* and *Klebsiella pneumoniae* 5 times, then *Proteus mirabilis* 2 times, *Streptococcus species* and *Pseudomonas aeruginosa* both once. According to the NNIS study, *Escherichia coli* and *Klebsiella species* accounted for 31,7% and 7,6%, respectively, out of the 13 000 intrahospital urinary tract infections reported in this surveillance study (10). Various organisms may cause wound infections. Those following clean surgery are most often caused by *Staphylococcus aureus*. Gram-negative infections may also occur in this setting (11). At the Clinic for Gynaecology and obstetrics, surgical site infections (SSI) was mainly caused by Pseudomonas aeruginosa (6 times), then *Klebsiella pneumoniae* and *Staphylococcus aureus* both 4 times, then *Streptococcus species* and *Escherichia coli* both one case. Respiratory tract infections (RTI) were caused by *Escherichia coli* 3 times and coagulase negative staphylococci once. Blood infections (BI) were caused by coagulase negative staphylococci in 2 cases, and *Streptococcus species* and *Staphylococcus aureus* both one case. Other infections (OI) were caused by *Streptococcus species* and *Escherichia coli* 2 times, and *Pseudomonas aeruginosa* both once. Within hospitals, the unnecessary use or overuse of antibiotics encourages the selection and proliferation of resistant and multiply resistant strains of bacteria. Once selected, resistant strains are favoured by antibiotic usage and spread by cross-infection. Where resistance is encoded on transmissible plasmids, resistance can also spread between bacterial species. Thus there is a link between antibiotic use (or abuse) and the emergence of antibiotic resistant bacteria causing IHI (12). *Staphylococcus aureus* has shown resistance toward ampicillin, amoxicillin+clavulanic acid and oxacillin in 80% cases, whereas toward cefazolin, gentamicin has shown resistance in 60% of cases. The resistance toward vancomycin, linkomycin and cefotaxim was 0%.

Coagulase negative staphylococci has shown the biggest resistance toward ampicillin (100%), then

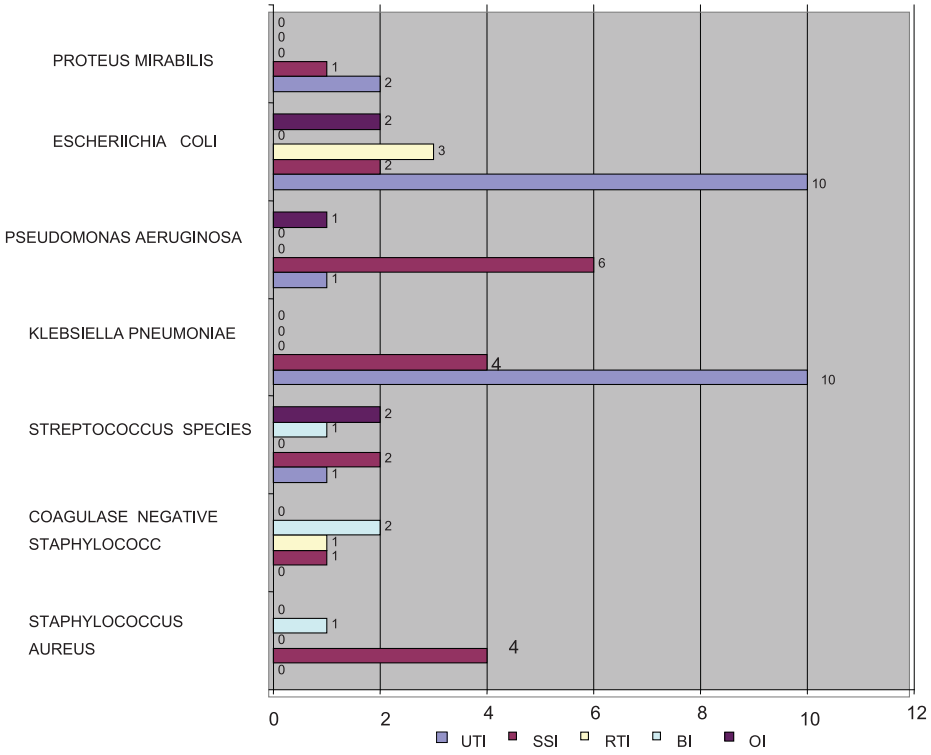

FIGURE 2. Distribution of commonly reported organisms by anatomic localization of intrahospital infection.

Gram-positive isolates / antibiotics	Staphylococcus aureus	Coagulase negative staphylococci	Streptococcus species
ampicillin*	5	4	6
% resistance	**80**	**100**	**66,7**
amoxicillin + clavulanic acid *	5	4	6
% resistance	**80**	**75**	**66,7**
oxacillin*	5	4	0
% resistance	**80**	**75**	**0**
imipenem*	4	3	0
% resistance	**25**	**33,3**	**0**
vancomycin*	5	4	6
% resistance	**0**	**0**	**0**
cefazolin*	5	3	4
% resistance	**60**	**66,7**	**50**
gentamicin*	5	4	6
% resistance	**60**	**50**	**66,7**
sulfamethoxazole+ trimethoprim*	5	3	6
% resistance	**60**	**66,7**	**66,7**
linkomycin*	2	1	0
% resistance	**0**	**0**	**0**
cefotaxim*	2	0	4
% resistance	**0**	**0**	**50**

TABLE 1. Antibiotic sensitivity of Gram-positive isolates

amoxicillin+clavulanic acid and oxacillin in 75% cases, cefazolin and sulfamethoxazole+trimethoprim in 66,7% cases. The resistance toward vancomycin was 0%. *Streptococcus species* in 66,7% cases has shown resistance toward ampicillin, amoxicillin+clavulanic acid, gentamicin and sulfamethoxazole+trimethoprim. All tested bacterias were sensitive to vancomycin (Table 1).

Despite the complexition of the problem, there are enough reports about jointness of using antibiotics in hospitals with appearances of antibiotics resistance (13,14).

Klebsiella pneumoniae has shown high percentage of resistance toward ampicillin and amoxicillin+clavulanic acid (85,7%). The resistance toward cefalosporins was from 61,5% toward ceftazidim, after that 60% toward ceftriaxon, 53,8% toward cefuroxim, and finally 50% toward cefotaxim, gentamicin and ciprofloxacin. The lowest resistance percentage has shown toward cefepim 7,1% and imipenem 7,7%. Pseudomonas aeruginosa has shown resistance toward ampicillin in 87,5% cases, amoxicillin+clavulanic acid 75%, and toward ciprofloxacin and ceftriaxon 50% resistance. The resistance toward cefotaxim and gentamicin was 42,9%. The lowest resistance was toward imipenemu 25% and cefepimu 16,7%. *Escherichia coli* was highly resistant toward ampicillin (94,1%), then toward amoxicillin+clavulanic acid (80%). The lowest resistance percentage was recorded toward ciprofloxacin and ceftriaxonu with 40%, toward cefuroxim in 38,5% cases. All tested *Escherichia coli* bacterias were sensitive to imipenem. *Proteus mirabilis* has shown 100% resistance toward ampicillin, and 66,7% toward amoxicillin+clavulanic acid, sulfamethoxazole+trimethoprim and ceftazidim. The resistance toward ciprofloxacin, cefuroxim, ceftriaxon and gentamicin was recorded in 33,3 % cases. All tested bacteria were sensitive to imipenem and cefepim (Table 2).

Gram-negative isolates / antibiotics	Klebsiella pneumoniae	Pseudomonas aeruginosa	Escherichia coli	Proteus mirabilis
ampicillin*	14	8	17	3
% resistance	**85,8**	**87,5**	**94,1**	**100**
amoxycillin*	14	8	15	3
% resistance	**85,8**	**75**	**80**	**66,7**
ciprofloxacin*	14	8	15	3
% resistance	**50**	**50**	**40**	**33,3**
imipenem*	13	8	10	3
% resistance	**7,7**	**25**	**0**	**0**
cefuroxim*	13	0	13	3
% resistance	**53,8**	**0**	**38,5**	**33,3**
cefotaxim*	14	7	14	3
% resistance	**50**	**42,9**	**35,7**	**33,3**
ceftazidim*	13	0	10	3
% resistance	**61,5**	**0**	**50**	**66,7**
ceftriaxon*	5	6	5	3
% resistance	**60**	**50**	**40**	**33,3**
cefepime*	14	6	13	3
% resistance	**7,1**	**16,7**	**0**	**0**
gentamicin*	14	7	13	3
% resistance	**50**	**42,9**	**46,2**	**33,3**
sulfamethox.+trimethoprim*	14	7	15	3
% resistance	**50**	**71,4**	**66,7**	**66,7**

TABLE 2. Antibiotic sensitivity of Gram-negative isolates

Conclusion

The epidemiology of intrahospital infections and practice of hospital infection control are dynamic disciplines, undergoing constant evolution.

As IHI causers at the Clinic for Gynaecology and Obstetrics UCC Tuzla, the most found are gram-negative organisms (73,7%) such as *Escherichia coli*, then *Klebsiella pneumoniae*, *Pseudomonas aeruginosa* and *Proteus mirabilis.*

The both urinary tract infections and surgical site infections are the most frequent IHI.

Determining the degree of antibiotic resistance provides an insight into the danger of infections being caused by multiresistant etiological agents.

Tracing the resistance of bacteria on antimicrobial drugs the high percent of resistance was evident to beta-lactams, aminoglycosids and cephalosporin's of third generation. Gram-positive organisms were 100% sensitive to vancomycin, while gram-negative organisms manifested the high percent of sensibility to imipenem and cefepime.

List of Abbreviations

IHI	-	Intrahospital infections
UCC	-	University Clinical Center
HICPAC	-	Health Infection Control Practice Advisory Committee
CDC	-	Centers for Disease Control and Prevention
NNIS	-	National Nosocomial Infection Surveillance
UTI	-	Urinary tract infections
SSI	-	Surgical site infections
RTI	-	Respiratory tract infections
BI	-	Blood infections
OI	-	Other infections

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