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Surveillance of Nosocomial Infections in General Surgery Unit: Data of Ten Years Period

Genel Cerrahi Kliniğinde Gelişen Hastane Enfeksiyonlarının Sürveyansı: On Yıllık Verilerin Değerlendirilmesi

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SUMMARY

Aim: The aim of this study is to evaluate the epidemiologic data of nosocomial infection (NI) occurring in the General Surgery Unit (GSU).

Method: This study was performed between January 1997 and December 2006. The surveillance method was active, prospective, and based on laboratory and patient. NIs were defined according to Centers for Diseases Control and Prevention criteria (CDC).

Results: During the ten-year period, 305 NI episodes were detected in 290 patients. The overall incidence rates and incidence densities of NIs were 2.0% and 2.3/1,000 patient-day respectively. The most common NIs by primary site were surgical site infections, urinary tract infections, and pneumonia. The most prevalent microorganisms were Escherichia coli (36.8%), Staphylococcus aureus (17.7%) and Pseudomonas aeruginosa (10.5%). Meticillin resistance among S. aureus isolates was 76%. Meropenem and amikacin were the most effective agents against to Gram-negative bacteria.

Conclusion: In order to detect of the variation and trends of NIs, the data of surveillance activities must be evaluated decisively and regularly with collaboration among infection control team, Infectious Disease clinic, and GSU.

Key words: Nosocomial infections, epidemiology, surveillance, general surgery unit.

ÖZET

Amaç: Bu çalışmada, genel cerrahi kliniğinde gelişen hastane enfeksiyonlarının epidemiyolojisi değerlendirilmiştir.

Yöntem: Bu çalışma, Ocak 1997-Aralık 2006 tarihleri arasında; hastaya ve laboratuvara dayalı, aktif, ileriye dönük sürveyans metodu kullanılarak yapıldı. Hastane enfeksiyonu tanısı Centers for Diseases Control and Prevention (CDC) kriterlerine göre yapıldı.

Bulgular: Genel Cerrahi kliniğinde, 10 yıllık sürede 290 hastada 305 hastane enfeksiyonu saptandı. Ortalama hastane enfeksiyonu hızı ve insidans dansitesi sırasıyla %2,0 ve 2,3/1000 hasta günü bulundu. En sık görülen hastane enfeksiyonu; cerrahi alan enfeksiyonu, üriner sistem enfeksiyonu ve pnömoni idi. En sık izole edilen patojen mikroorganizmalar Escherichia coli (%36,8), Staphylococcus aureus (%17,7) ve Pseudomonas aeruginosa (%10,5) idi. S. aureus suşlarının %76'sı metisiline dirençli bulundu. Meropenem ve amikasin Gram negatif bakterilere en etkili antibiyotiklerdi.

Sonuç: Enfeksiyon kontrol komitesi, Enfeksiyon Hastalıkları ve Genel Cerrahi Kliniği arasında işbirliği yapılarak sürveyans verilerinin düzenli aralıklarla kararlı bir şekilde değerlendirilmesi, Hastane enfeksiyonlarının sürveyansında gelişecek değişikliklerin saptanması için gereklidir.

Anahtar Kelimeler: Hastane enfeksiyonları, epidemiyoloji, sürveyans, genel cerrahi kliniği.

INTRODUCTION

NIs are an important problem in the hospitals, and associated with high morbidity, mortality, and healthcare costs. The control of NIs requires a continual surveillance and effective infection control programs. The effective infection control programs provide the advanced quality of healthcare and reduce costs (1,2). Surveillance provides the useful data for detecting patients with infection, determine the site infections, and identify the contributing factors (3-5). Patients undergoing surgery may have increased risk of NIs. If NIs are well documented, it will enable us to take appropriate intervention measures and evaluate their efficacy for General Surgery Unit (GSU).

There are few studies about surveillance of NIs especially in patients undergoing surgery in developing countries. This is the first long term study

to involve ten years surveillance data of NIs in GSU. The aim of this study is to evaluate the epidemiology of NIs occurring in GSU.

MATERIAL and METHOD

Dicle University Hospital (DUH) is a tertiary referral center in the Southeast of Turkey, with 1050 beds, of which 95 are assigned to the GSU. The surveillance method was active, prospective, and based on laboratory and patient. This study was performed between January 1997 and December 2006. Active surveillance of NIs was performed by infection control team, using the criteria proposed by the CDC and National Nosocomial Infections Surveillance System (NNIS) methodology (6,7). The team included an infection control doctor and two nurses. This team visited the GSU for three times at week. All cases with NI were recorded by using a standard data collection form. The form included the patients' name, age, sex, underlying conditions, risk factors for NIs, interventions at the hospital, reason for hospitalization, and treatment for all patients. Medical and nursing notes, microbiology reports, temperature charts, and antibiotic treatment charts of patients with NI were reviewed. The infection control team filled out a worksheet for every patient. Because of the limited resources, it was not possible to carry out a post-discharge follow up.

NIs were classified as surgical site infections (SSIs), urinary tract infections (UTIs), pneumonia, catheter related bloodstream infections (CRBIs), catheter related local infections (CRLIs), bloodstream infection (BSI), sepsis, and the others (intraperitoneal infections, abscess, empyema, gastrointestinal system infections, and prosthesis infections).

Everyday, the data of nosocomial microorganisms were collected from Hospital Core Laboratory and Infection Diseases Department Laboratory. Incidence rate was defined as the number of NIs per 100 patients discharged during the period of surveillance. The incidence density of NI was calculated on the basis of 1,000 days of stay.

RESULTS

During the ten-year period, 305 NI episodes were detected in 290 patients out of 149,987 inpatients. The mean age of the patient population was 44.1 years (range 15–85) with 119 female and 171 male. The mean length of stay in the hospital was 35.3 days (range 3–74). The overall incidence rates (NI/100) and incidence densities (NI/1000 days of stay) of NIs were 2.0% (range 0.7-2.9/1000) and 2.3/1,000 patient-day (range 1.0-3.8/1000), respectively (Table 1). The most common NIs resulted from primary site was SSI. The distribution of superficial incisional, deep incisional, and organ-space SSI were 86 (50.3%), 51 (29.8%), 34 (19.9%), respectively. More detailed information about the distribution of NIs by the body site was shown in Table 2. The most prevalent microorganisms were Escherichia coli, Staphylococcus aureus and Pseudomonas aeruginosa (Figure 1). Amikacin and meropenem were the most effective agents against Gram-negative bacteria (Figure 2). The meticillin resistance among S. aureus isolates was 76% and all were sensitive to vancomycin (Figure 3).

Table 1. Incidence rates and incidence densities of NIs for 1997-2006 in GSU.

Year	No. of hospitalized patients	No. of hospitalized days	No. of NIs	Incidence rates of NIs	Incidence densities of NIs
1997	1073	11320	32	3.0	2.8
1998	1328	15916	28	2.1	1.6
1999	1564	19593	52	3.3	0.8
2000	1233	14814	30	2.4	1.9
2001	1028	12496	39	3.8	2.9
2002	1199	13929	22	1.8	1.6
2003	1150	14147	20	1.7	1.2
2004	1170	13436	12	1.0	0.7
2005	1302	12576	26	2.0	2.1
2006	2309	21760	44	1.9	2.0
Total	**13356**	**149987**	**305**	**2.3**	**2.0**

Table 2. NIs in GSU: site-specific incidence rates and incidence densities.

Type of NI	Number of infections	Percent of total infections	Incidence rates	Incidence densities
Surgery site infection	171	56.1	1.3	1.1
Urinary tract infection	25	8.2	0.2	0.2
Pneumonia	23	7.5	0.2	0.2
CRBI*	22	7.2	0.2	0.2
CRLI**	22	7.2	0.2	0.2
Bloodstream infection	21	6.9	0.2	0.1
Sepsis	12	3.9	0.1	0.1
Others***	9	3.0	0.1	0.1
Total	**305**	**100.0**	**2.3**	**2.0**

*CRBI: catheter related bloodstream infection; **CRLI: catheter related local infection
***intraperitoneal infections, abscess, empyema, gastrointestinal system infections and prosthesis infections)

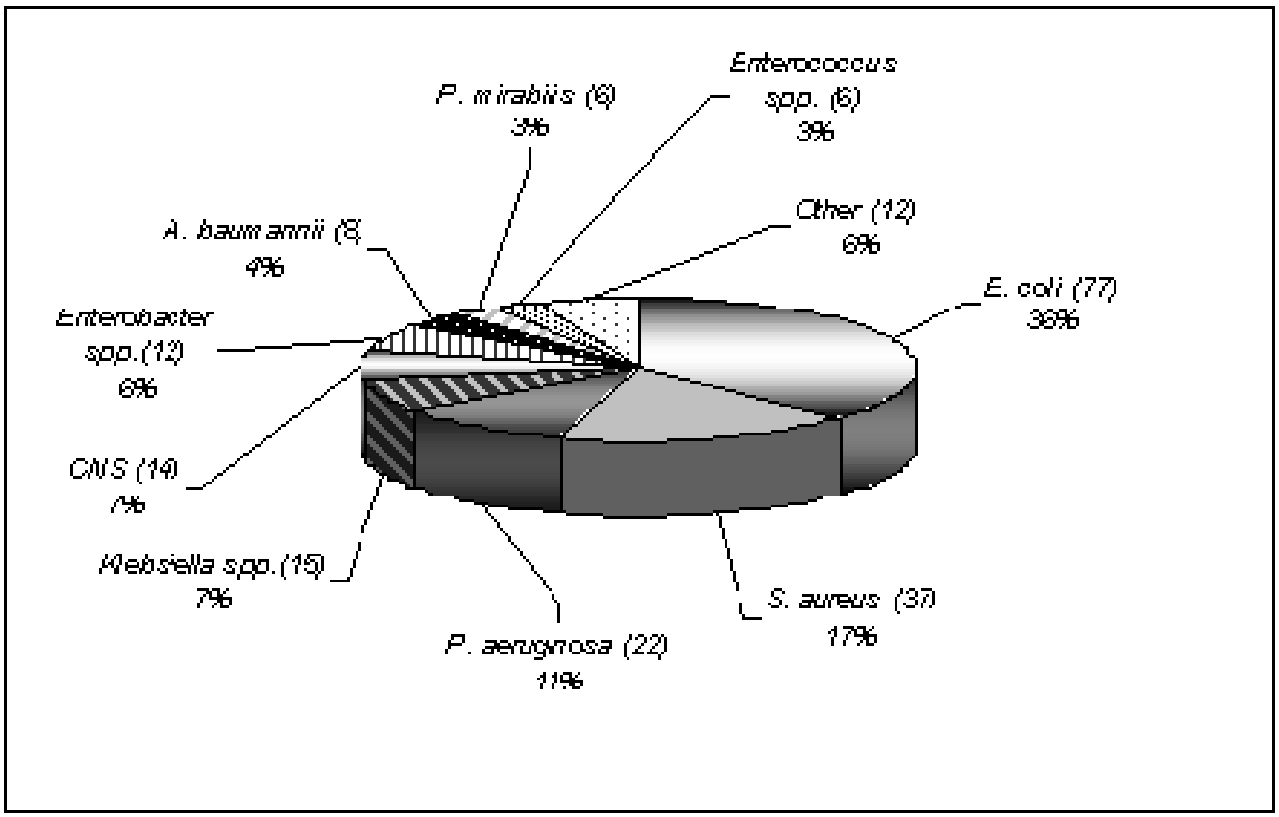
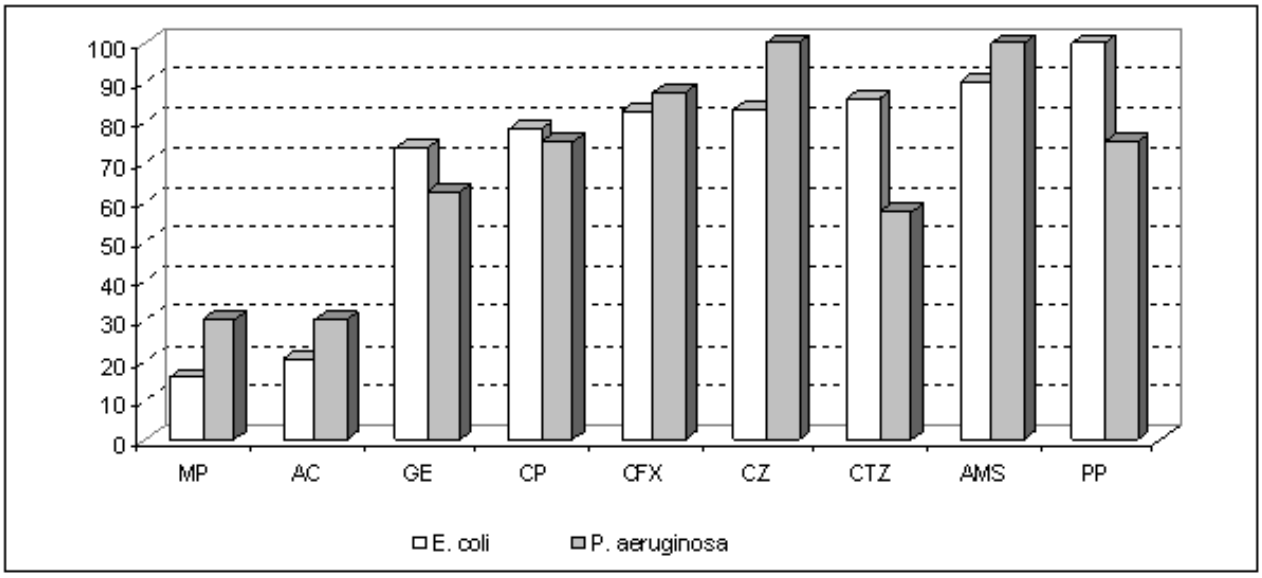
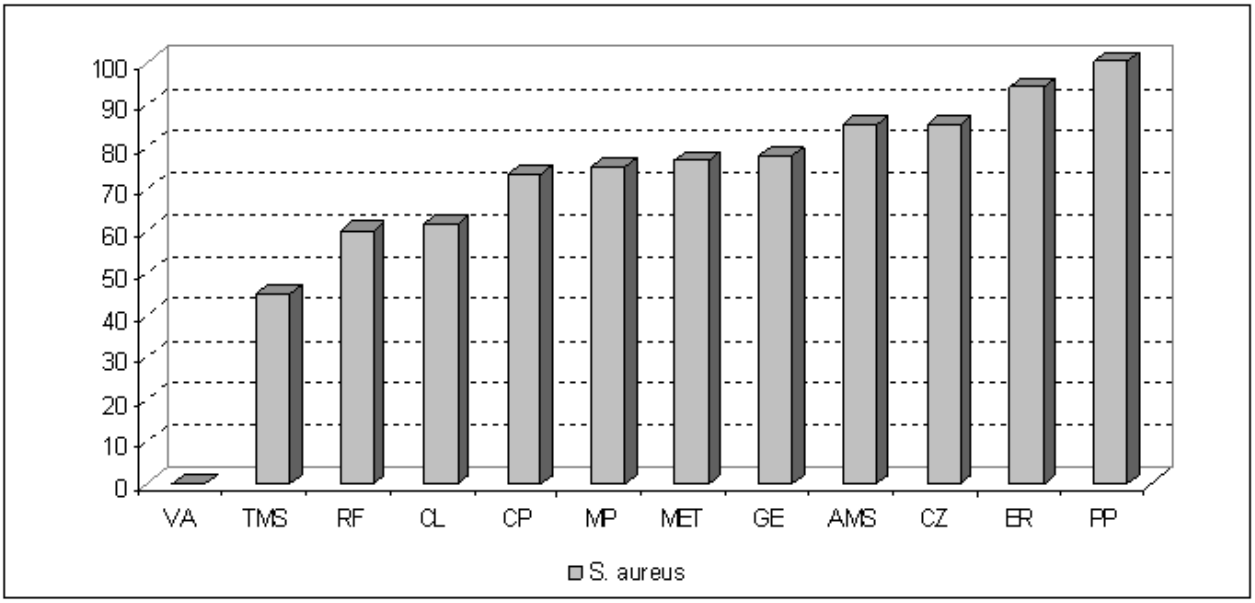


Figure 1. The distribution of NIs microorganisms for 1997-2006 in GSU.



* MP: meropenem; AC: amikacin; GE: gentamicin; CP: ciprofloxacin; CFX: cefotaxime; CZ: cefazolin; CTZ: ceftazidime; AMS: ampicillin/sulbactam; PP: piperacillin.

Figure 2. Antibiotic* resistance of major Gram-negative bacteria from NIs.



*VA: vancomycin; TMS: trimethoprim,/sulfamethoxazole; CP: ciprofloxacin; GE: gentamicin; RF: rifampicin; CL: Clindamycin; AC: amikacin; MET: meticillin; AMS: ampicillin/sulbactam; MP: meropenem; CZ: cefazolin; ER: erythromycin; CTX: ceftriaxone; CFX: cefotaxime; PP: piperacillin, AM: ampicillin; CTZ: ceftazidime.

Figure 3. Antibiotic* resistance of major Gram-positive bacteria from NIs.

DISCUSSION

Although the epidemiology of SSI is well established in the literature, there is less information available about NIs in GSU. No previous attempt has been made to evaluate long term surveillance of the other NIs, incidence rates, incidence densities and the antibacterial resistance patterns of NIs in GSU patients. There are wide differences of NIs rates among GSU in the literature. Erdinc et al. (3) reported exceedingly low, less than 1% rates, while Durmaz et al. (8) displayed NIs development of 5% in GSU. In this study, the overall incidence rates and incidence densities of NIs were overall 2.3% and 2.0/1,000 patient-day, respectively. This rate is similar to those reported in Turkish studies and lower than those reported in almost all other studies throughout the world (between 5% and 25%) (3,8-12). This may be explained by several factors such as the type of hospital, severity of the population under study, and the definitions used. Another reason for these low rates may be the result of the education of healthcare staff and the resultant attention given to hand washing, adherence to the recommendations of our hospital's infection control committee, and close co-operation. Although successful infection control programs reduce the rate of NIs, these infections continue to be a problem in GSU.

Types of NIs are varied by operative body site and service. BSIs and pneumonia were most common in cardiovascular surgery, surgical wound infections in the general surgery and orthopedics departments, and urinary tract infections in the urology unit (9-19). SSI, UTI, pneumonia and BSI are the most common NIs in general surgery patients (9-15,19). Few data have been published on specific incidence rate and incidence density of BSI, pneumonia, and UTI especially in GSU. SSI and UTI were two principal types of NIs detected in this study. In a Turkish study (20), the distribution of superficial incisional, deep incisional, and organ-space SSIs were 61.1%, 33.4%, and 5.5%, respectively. In our survey, similar to the published results for other series, SSIs accounted for the majority of NIs in GSU (3,8-13). Our rates of SSI were higher with respect to other NI such as UTI, pneumonia, CRBI, CRLI and BSI. As observed in the present study; other NIs in GSU were UTI followed by pneumonia CRBI, CRLI, BSI, and sepsis. Catheterization into vessels and bladder as well as intubation and anesthesia harm the ability of host defense mechanisms to prevent infection at these sites (21-25). The order of incidence rates and incidence densities of site-specific NIs may differ according to the general surgery patients and settings. We suggest that effective surveillance must be conducted in GSU to readily identify epidemiologic foci of SSI, UTI, CRBI, CRLI, pneumonia and BSI. The prevention of these NIs may be minimized with fastidious wound care. In order to control overcrowding of infection in the GSU, strict hand washing must be applied before and after handling patients, and access to GSU should be restricted.

Clear variations in the spectrum of infecting pathogens and in the level of antimicrobial resistance exist among different hospital. The most common pathogens in surgery patients were E. coli, staphylococci, P. aeruginosa, Klebsiella spp., and Enterobacter spp. (8-19,26). In a German study (10), the most common microorganisms isolated in GSU were E. coli, S. aureus and Enterococcus faecalis. In this study, E. coli was the most common causative agents. S. aureus and P. aeruginosa followed these microorganisms.

This study demonstrated that the antibiotic susceptibility tests for the most commonly used antibiotics revealed resistance problems for E. coli, P aeruginosa, and S. aureus at the GSU. Amikacin and meropenem were the most effective agents against Gram-negative bacteria. Meticillin resistance among S. aureus isolates was 76% and all were sensitive to vancomycin. Efforts for controlling the increase in emerging resistance should be aimed at the control of antimicrobial use and the prevention of nosocomial transmission of resistant bacteria (27-30). Strict adherence to the basic principles of infection control is the key to eradication of MRSA and the other Gram-negative bacteria. An effective infection control program of NIs has to include an accurate analysis of pathogens and their antibiograms in the GSU. In addition, variations and trends in the antimicrobial resistance pattern of these pathogens must be detected.

In conclusion, the present study has determined the epidemiologic features of NIs in GSU. The data of surveillance activities should be evaluated decisively and regularly with collaboration between infection control team, Clinical Microbiology and Infectious Disease Clinic, and GSU. This collaboration may provide to detect the variation and trends of NIs in GSU.

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