Original Article

ANTIBIOTIC SENSITIVITY PATTERNS OF ENTEROBACTERIACEAE ISOLATED AT KING FAISAL HOSPITAL, KIGALI - A THREE YEARS STUDY.

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ABSTRACT

Introduction: A great concern exists about the emergence of antibiotic resistant organisms. The goal of this study is to delineate antibiotic sensitivity patterns at King Faisal Hospital.
Methods : A three years study, from Jan 2009 to Dec 2011 was conducted in the Microbiology unit, department of Laboratory, King Faisal hospital, Rwanda. All the specimens and antibiotic sensitivity were processed according to the standard guidelines. Microorganisms and their sensitivity data were reviewed and compiled by using hospital information system.
Results: Over the 3-year period, several Enterobacteriaceae pathogens declined in susceptibility to various antimicrobial agents. A total of 2153 Enterobacteriaceae were isolated. Most common isolate was E. coli (1413) followed by Klebsiella species (550), Enterobacter species (110), Proteus species (165), Citrobacter Species (79), Shigella species (110) and other species.
Most notable were the decreased sensitivities to cefuroxime: E. coli (84% to 72%) Klebsiella (78% to 33%), Enterobacter (50% to 41%) Proteus (67% to 59%) and Shigella to ciprofloxacin (100% to 96%). And also decreased sensitivities to Imipenem: E. coli (100% to 98%) and Klebsiella species (100% to 94%).
Conclusion: These decreased antibiotic sensitivities reflect increased bacterial selection pressure as a result of widespread antibiotic use. A combined approach involving infection-control specialists, infectious disease physicians, and hospital administrators is necessary to address this increasingly difficult problem.

Keywords: Antibiotic sensitivity, Enterobacteriaceae, E. coli, Klebsiella, Enterobacter

RESUME

Introduction: Une grande préoccupation existe au sujet de l'urgence des organismes résistant aux antibiotiques. Le but de cette étude est de tracer les modèles d'antibiotiques sensibles à l'Hôpital Roi Fayçal.
Méthodes: La période d'étude était de trois ans, de Janvier 2009 jusqu'à Décembre 2011. Le lieu d'étude était l'unité de microbiologie du département de laboratoire de l' Hôpital Roi Fayçal, Rwanda. Tous les échantillons et les antibiogrammes ont été traités selon les directives standard.
Résultats: Au cours de la période de trois ans, plusieurs agents pathogènes d'entérobactériaceae ont augmenté la résistance aux certains antibiotiques. Dans 2153 des entérobactériaceae isolées. Le plus isolé était l'Escherichia coli (1413) suivi de Klebsiella (550), Entérobacter (110), Proteus (165), Citrobacter (79), Shigella (110) et autres espèces.
L'étude note la diminution de la sensibilité au cefuroxime : Escherichia coli (84% à 72%) Klebsiella (78% à 33%), Entérobacter (50% à 41%) Proteus (67% à 59%) et Shigella au ciprofloxacin (100% à 96%). Et également la diminution de la sensibilité à l'Imipenem: Escherichia coli (100% à 98%) et Klebsiella (100% à 94%).

Conclusion:Cette diminution de la sensibilité aux antibiotiques reflète l'augmentation de la sélection de la pression bactérienne en raison de l'utilisation de nombreux antibiotiques. Une approche combinée faisant participer divers spécialistes, les infectiologues et l'administration de l'hôpital est nécessaire pour aborder ce problème de plus en plus difficile.

Mots-clés: Antibiogramme - Enterobacteriaceae - Escherichia coli - Klebsiella - Enterobacter

INTRODUCTION

The emergence of antibiotic-resistant organisms is of great concern in the medical community [1]. Antibiotic resistance among bacteria is becoming more and more serious problem throughout the world. It is said that evolution of bacteria towards resistance to antimicrobial drugs, including multidrug resistance, is unavoidable because it represents a particular aspect of the general evolution of bacteria that is un-stoppable [2]. The hospital antibiogram is a periodic summary of antimicrobial susceptibilities of local bacterial isolates submitted to the hospital's clinical microbiology laboratory. Antibiograms are often used by clinicians to assess local susceptibility rates, as an aid in selecting empiric antibiotic therapy, and in monitoring resistance trends over time within an institution. Antibiograms can also used to compare susceptibility rates across institutions and track resistance trends [3]. Enterobacteriaceae is a large and heterogeneous family of gram-negative, facultative anaerobic, enteric bacilli whose normal place is in gastrointestinal tract of human and animals. Drug resistance in enteric bacilli is largely attributed to the vast transfer of resistance plasmids among different genera of Enterobacteriaceae. Use of drugs in animal foods leads to faster growth of animals, however, this is associated with an increase in drug-resistant intestinal organisms in fecal flora of farm workers [4]. The goal of this study was

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to delineate antibiotic sensitivity patterns at King Faisal Hospital.

aim

The present study is to know the current status of antibiotic sensitivity pattern of common Enterobacteriaceae bacterial isolates at King Faisal Hospital, Kigali

METHODS

A three years study, from Jan 2009 to Dec 2011 was conducted in Microbiology unit, department of Laboratory, King Faisal hospital, Kigali. Antimicrobial susceptibility testing was performed by Kirby-Bauer disk diffusion method according to the guidelines of the Clinical and Laboratory Standards Institute [5].

The following antibiotic disks were used: Ampicillin (10 µg), Amoxycillin/clavulanic acid(30 µg), Cefuroxime(30 µg), Chloramphenicol (30 µg), Norfloxacin(10 µg), Cefotaxime(30 µg) Ceftriaxone(30 µg), Gentamicin(10 µg), Piperacillin (100 µg), Cotrimoxazole(25 µg), Nalidixic acid(30 µg), Ciprofloxacin(5 µg) and Nitrofurantoin (30 µg). All the isolates were tested for antibacterial susceptibility based on Kirby-Bauer disc diffusion method and processed according to CLSI(5). All antibiotic sensitivity data were entry into the hospital information system and were analyzed.

RESULTS

Over the 3-year period, several Enterobacteriaceae pathogens declined in susceptibility to various antimicrobial agents. A total of 2327 Enterobacteriaceae were isolated and antibiotic sensitivity were shown in the table: 1

Most common isolate was E. coli (1313) followed by Klebsiella species (550), Enterobacter species (110), Proteus species (165), Citrobacter Species (79), Shigella species (110) and other species.

Most notable were the decreased sensitivities to cefuroxime: E. coli (84% to 72%) Klebsiella (78% to 33%), Enterobacter (50% to 41%) Proteus (67% to 59%) and Shigella to ciprofloxacin (100% to 96%). And also decreased sensitivities to Imipenem: E. coli (100% to 98%) and Klebsiella species (100% to 94%). Klebsiella sensitivity was decreased to 3rd generation cephalosporins. An overall 99% of E.coli and 97% of Klebsiella were sensitive to imipenem. Only 37% of E.coli and 16% of Proteus were sensitive to Ampicillin. 75% of Citrobacter was sensitive to Norfloxacin. Shigella was sensitive to ciprofloxacin by 99% and 100% sensitivity towards 3rd generation Cephalosporins. Resistance is not remarkable observed towards aminoglycoside.

DISCUSSION

Hospital antibiograms are commonly used to help guide empiric antimicrobial treatment and are an important component of detecting and monitoring trends in antimicrobial resistance. To serve these purposes, antibiograms must be constructed using standardized methods that allow inter- and intrahospital comparisons [6].

In this study, the most prevalent bacteria in Enterobacteriaceae family were E. coli and Klebsiella spp. The Enterobacteriaceae family with E. coli on the top has been known as the most prevalent agent of urinary tract infection (UTI), bacteremia, and sepsis and it is also among the prevalent agents of intra-abdominal and genital region infections. The Enterobacteriaceae species play a major role in most community-acquired infections with origins from urogenital system, lungs, gastrointestinal tract, bed sores, surgical wounds, and venous catheters [7, 8].

In recent years, many studies have reported the increasing resistance of Enterobacteriaceae to ampicillin, cotrimoxazole and first-generation cephalosporins. The resistance to third-generation cephalosporins has also been increasing, though less than the first-generation, in many countries. Currently, among the beta-lactam antibiotics, carbapenems are the most effective drugs [9]. This may be due to routine and extensive use of third-generation cephalosporins in treating the infections.

In a study by Khanfar in Saudi Arabia in 2009, all isolated types of E. coli and Klebsiella were sensitive to imipenem, however, the highest resistance was observed against ciprofloxacin and aminoglycosides (10). According to the previous reports from different hospitals in Iran, ESBL producing Enterobacteriaceae have been common in the last decade [5]. Indeed, resistance to carbapenems has been uncommon. Only 58.4% of Klebsiella pneumoniae isolates were sensitive to imipenem and 19.5% in Seyyed Hamid Hashemi et al study In Iran [5, 11]. In the present study, resistance to imipenem was 1% in E.coli and 3% in Klebsiella which showed that the resistance to carbapenems is less than in European countries and in Iran and that the uncontrolled use of this antibiotic warns about further resistance in near future. In the United States, carbapenem-resistant Enterobacteriaceae have been reported more commonly over the last years. The emergence of carbapenemase has contributed to an increased prevalence of carbapenem-resistant Enterobacteriaceae [5, 12]. Studies performed in some Asian, African, and South American countries also have shown the global increase in Multi drug resistance Enterobacteriaceae [13, 14, 15].

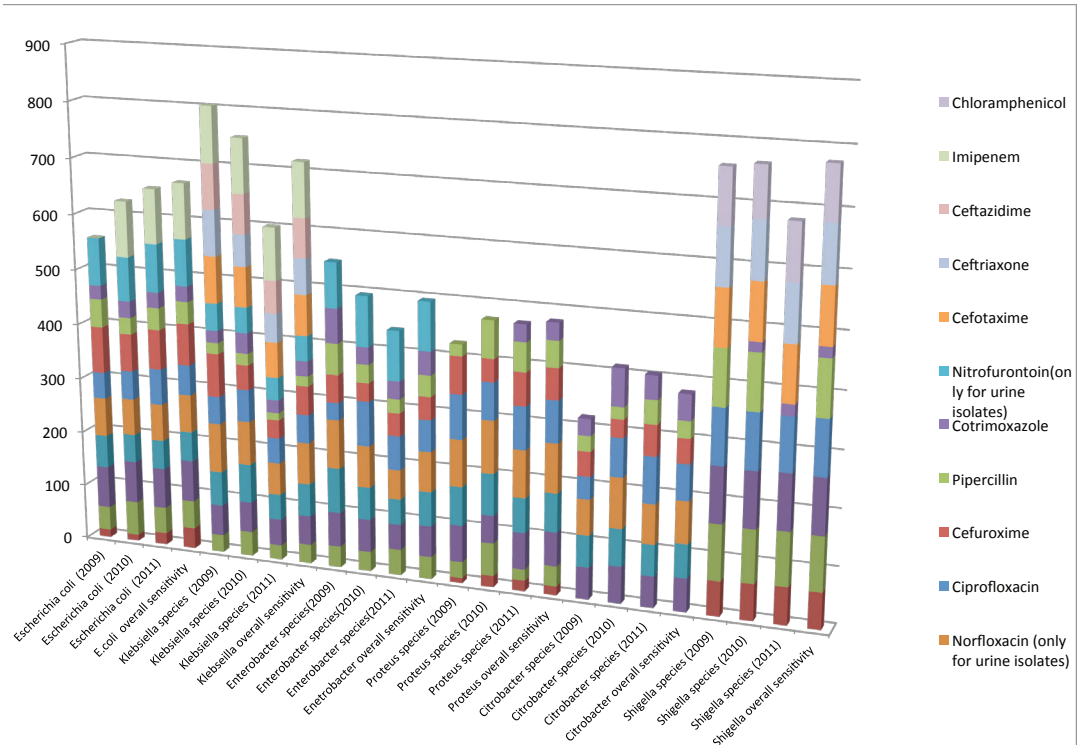
CONCLUSION

Antibiotic resistance has become an important public health issue in the last decade. The hospital antibiogram is a periodic summary of antimicrobial susceptibilities of local bacterial isolates submitted to the hospital's clinical microbiology laboratory. Antibiograms are often used by clinicians to assess local susceptibility rates, as an aid in selecting empiric antibiotic therapy, and in monitoring

resistance trends over time within an institution. To better understand national, regional, and local trends, it is important to critically assess national data on antibiotic consumption. Moreover, given the increasing rates of antibiotic resistance, it is important to be aware of the relationship between antibiotic consumption and emergence of resistance. Since only a very small number of new antibiotics are under development, physicians cannot rely on new drugs alone to treat infections caused by multidrug-resistant bacteria, but must also introduce policies to reduce the emergence and spread of resistant bacteria. And also a combined approach involving infection-control specialists, infectious disease physicians, and hospital administrators is necessary to address this increasingly difficult problem.

Table 1: antibiotic sensitivty percentage of enterobacteriaceae isolates between 2009, 2010 & 2011

ANTIBIOTIC/ORGANISMS	Escherichia coli (2009)	Escherichia coli (2010)	Escherichia coli (2011)	E.coli overall sensitivity	Klebsiella species (2009)	Klebsiella species (2010)	Klebsiella species (2011)	Klebsiella overall sensitivity	Enterobacter species(2009)	Enterobacter species(2010)	Enterobacter species(2011)	Enetrobacter overall sensitivity	Proteus species (2009)	Proteus species (2010)	Proteus species (2011)	Proteus overall sensitivity	Citrobacter species (2009)	Citrobacter species (2010)	Citrobacter species (2011)	Citrobacter overall sensitivity	Shigella species (2009)	Shigella species (2010)	Shigella species (2011)	Shigella overall sensitivity
No of organisms isolated	415	429	469	1313	138	193	219	550	40	32	38	110	62	65	38	165	25	28	26	79	35	46	29	110
Ampicillin	14	11	21	37									9	20	19	16					62	65	67	65
Augmentin	43	62	48	51	31	44	26	34	38	35	46	40	29	59	20	36					100	95	96	97
Gentamicin	76	76	73	75	56	55	48	53	62	59	46	56	66	50	66	61	57	66	56	60	100	100	100	100
Nalidixic acid	59	51	53	54	62	70	46	59	81	59	46	62	70	75	62	69	57	67	56	60				
Norfloxacin (only for urine isolates)	70	66	67	68	89	79	58	75	88	75	53	72	84	94	85	88	64	90	71	75				
Ciprofloxacin	48	52	65	55	50	58	46	51	31	80	61	57	80	67	77	75	40	69	83	64	100	100	96	99
Cefuroxime	84	68	72	75	78	45	33	52	50	33	41	41	67	41	59	56	44	32	55	44				
Pipercillin	51	30	40	40	20	21	13	18	56	33	25	38	21	67	52	47	27	21	42	30	100	100		100
Cotrimoxazole	25	30	28	28	22	37	23	27	62	31	32	42			31	31	30	67	42	46		17	20	19
Nitrofurontoin(only for urine isolates)	86	80	87	84	49	46	41	45	81	90	89	87												
Cefotaxime					84	72	63	73													100	100	100	100
Ceftriaxone					82	57	52	64													100	100	100	100
Ceftazidime					81	71	58	70																
Imipenem	100	100	98	99	100	97	94	97																
Chloramphenicol																					97	89	100	95



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