African Journal of Microbiology Research Vol. 5(20), pp. 3157-3161, 30 September, 2011
Available online http://www.academicjournals.org/ajmr
DOI: 10.5897/AJMR11.056
ISSN 1996-0808 ©2011 Academic Journals

Full Length Research Paper

A surveillance study of antimicrobial susceptibility in 11 hospitals in Kurdistan Province

Ahsan B.[1], Beiranvand S.[2], Abdulmaleki N.[3] and Mohamadi H.[4], Kalantar E.[5*]

[1]Deputy of Treatment, Kurdistan University of Medical Sciences, Sanandja, Iran.
[2]Deputy of Food and Druh, Kurdistan University of Medical Sciences, Sanandja, Iran.
[3]Reference Laboratory, Kurdistan University of Medical Sciences, Sanandja, Iran.
[4]Mohammadi H, Evaluation Unit, Deputy of Treatment, Kurdistan University of Medical Sciences, Sanandja, Iran.
[5]Department of Microbiology, School of Medicine, Kurdistan University of Medical Sciences, Sanandja, Iran.

Accepted 30 July, 2011

Antimicrobial resistance has become a serious public health concern all over the world. The objective of this study was to determine susceptibility patterns of microorganisms to antibiotics in 11 hospital laboratories in Kurdistan province. During one month period (February, 2010), all the clinical specimens which were received from the laboratories were processed for isolation and identification of bacteria to the species level by standard methods. Testing procedures were validated following the Kirby-Bauer disc diffusion technique using Muller Hinton agar. Susceptibility testing was performed on Mueller–Hinton agar. A total of 4395 clinical specimens were obtained from 4301 patients among them, 1062 (24.7%) were male and 3239 (75.3%) were female, giving on overall male to female ratio of 0.32. Their mean age was 31.3 years (range: 4 to 74 years). Based on data 310 pathogens were isolated and *Escherichia coli* 183 (59.3%), followed *Klebsiella pneumoniae* 40 (01.29%) and *Staphylococcus aureus* 39 (1.25%) were the predominant isolated bacteria. The most resistant antibiotics tested against isolated bacteria were penicillin, ampicillin, and amoxicillin. Lastly, these resistance rates leave imipenem and ciprofoxcacin as the reliable agent for the empirical treatment in this province. The present study has shown that the urinary tract infection (UTI) patients have a higher rate of infection. The risk of antibiotic resistance in isolated bacteria, particularly *E. coli*, emphasizes the importance of hospital control measures and rational prescribing policies. Lastly, these resistance rates leave ciprofloxcacin and imipenem as the reliable agent for the empirical treatment in this province.

Key words: Antimicrobial resistance, *Escherichia coli,* ciprofloxacin and imipenem.

INTRODUCTION

Bacterial infections continue to be important causes of morbidity and mortality in developing countries (Mendes and Turner, 2001). Antimicrobial resistance among pathogens causing various infections constitutes a serious problem throughout the world, which must be dealt with constantly (Okesola and Oni, 2009). The increase of drug resistance among these organisms has made therapy of various infections difficult and has led to greater use of expensive broad spectrum antibiotics such as third generation of cephalosporin.

Systematic monitoring of such resistance at local, national and international levels is recognized as an integral part of the control strategy by most national and international organizations including WHO (Ahmed et al., 2011; WHO, 1997; Diane et al., 2004).

Surveillance programs are valuable tools and offer important information on bacterial resistance trends, by geographical location and by disease type in community and hospital settings. Several multicentre surveys conducted all over the world over the last 10 years (Diekema et al., 2000; Filiz et al., 1999; Vatopoulos et al.,

*Corresponding address. E-mail: kalantar_enayat@yahoo.com. Tel: 0098 – 871 6131409. Fax: 0098 – 871 6664654.

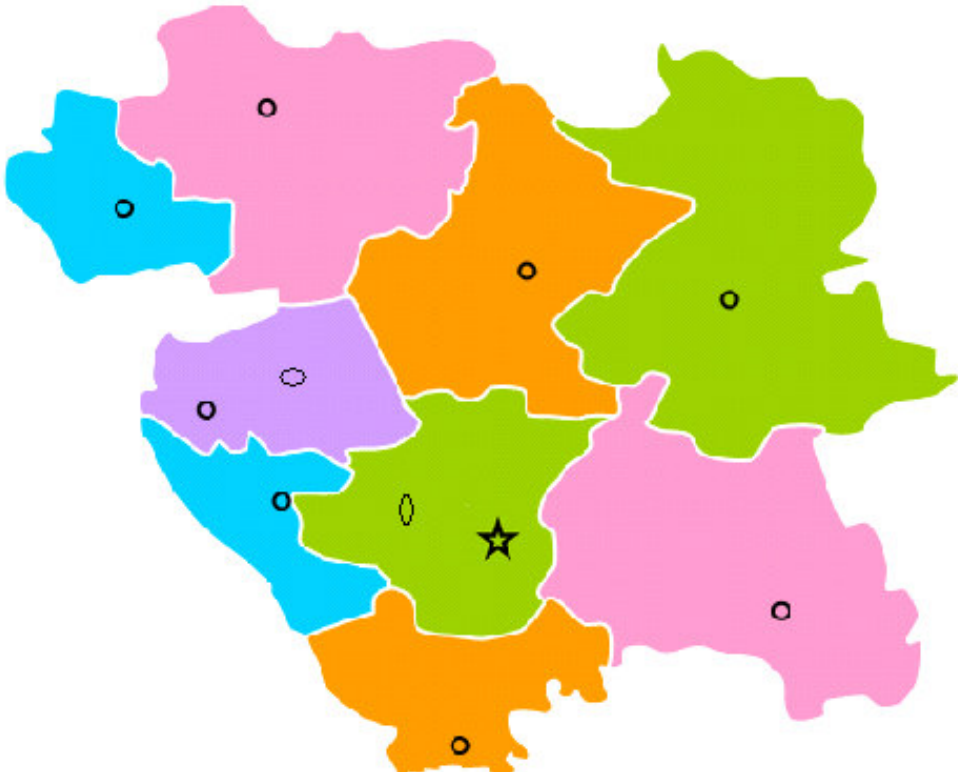

Figure 1. Kurdistan province microbiology laboratories participating in surveillance of antimicrobial resistance.

1999; Arjana et al., 2002; Kalantar et al., 2008) have identified this problem and underlined the need for immediate action.

To satisfy the urgent need for an efficient surveillance system to monitor the possible impact of this policy, and to study the epidemiology of antimicrobial resistance, we launched a project during one month in 2010 (February) to establish a province network for continuous monitoring of such resistance among bacteria isolated from various clinical specimens at 11 hospital laboratories which are affiliated to Kurdistan University of Medical Sciences, Sanandaj, Iran.

MATERIALS AND METHODS

During one month period, February, 2010, 11 hospital microbiology laboratories were participated in the study. The persons in charge of each hospital laboratories were asked to come for a meeting concerning the isolation, identification and antimicrobial susceptibility procedure in order to have the same procedures in all the laboratories. *Escherichia coli* PTCC and *Staphylococcus aureus* PTCC were sent to them as a positive control for antimicrobial susceptibility testing.

Isolation and identification of bacteria

Isolation and identification of bacteria to the species level was performed by standard methods (Patrick et al., 2007).

Antibiotic susceptibility of bacterial isolates

Testing procedures were validated following the Kirby-Bauer disc diffusion technique using Muller Hinton agar (CLSI, 2006). For each isolate, antibiotic susceptibility was determined for 11 different antibiotics: Ampicillin, Amikacin, Tetracycline, Amoxycillin, Chloramphenicol, Co-trimoxazle, Nalidixic acid, Ciprofloxacin, Cefotaxime, Imipenem, and Carbenicillin. Susceptibility testing was performed on Mueller–Hinton agar.

RESULTS

Figure 1 shows locations of the 11 hospital laboratories participated in this study. A total of 4395 clinical specimens were obtained from 4301 patients among them, 1062 (24.7%) were male and 3239 (75.3%) were female, giving on overall male to female ratio of 0.32. Their mean age was 31.3 years (range: 4 to 74 years) (Table 1).

Based on data 310 pathogens were isolated and *E. coli* 183 (59.3%), followed *Klebsiella pneumoniae* 40 (01.29%) and *S. aureus* 39 (1.25%) were the predominant isolated bacteria (Table 2).

The most resistant antibiotics tested against isolated bacteria were penicillin, ampicillin, and amoxicillin (Table 3). Lastly, these resistance rates leave ciprofloxcacin and imipenem as the reliable agent for the empirical treatment

Table 1. Frequency of patients according to age and sex.

Age groups years (%)	Sex	
	Male	Female
	Number (%)	
≥ 10	76 (07.1)	489 (15.0)
10-20	38 (03.5)	350 (10.8)
20-30	227 (21.3)	652 (20.1)
30-40	152 (14.3)	769 (23.7)
40-50	227 (21.3)	536 (16.5)
≤ 60	342 (32.2)	443 (13.6)
Total	1062 (24.7)	3239 (75.3)

Table 2. Prevalence of microorganisms isolated from 11 hospitals.

Microorganism	Number	Percent (%)
E. coli	183	59.3
Streptococcus spp	07	02.3
Citrobacter freundii	07	02.3
Pseudomonas aeruginosa	11	03.6
Klebsiella pneumoniae	40	13.0
Staphylococcus spp	39	12.7
Serratia marcescens	04	01.3
Enterobacter aerogenes	14	04.6
Proteus mirabilis	03	01.0
Total	307	100

Table 3. Antimicrobial resistance pattern of bacteria isolated from different specimens at 11 hospitals (%).

Bacteria	Imp	CTX	P	T	AM	NA	V	CP	C	SXT	AMX
E. coli	36.0	30.0	86.9	90.2	84.7	38.8	ND	11.5	74.9	57.4	90.2
Streptococcus spp	28.5	28.5	71.4	71.4	57.1	42.8	0.0	28.5	0.0	57.1	57.1
C. freundii	28.5	28.5	71.4	100	71.4	100	ND	0.0	0.0	28.5	100
P. aeruginosa	45.4	81.8	100	72.7	100	0.0	ND	0.0	63.7	72.8	90.9
K. pneumoniae	12.5	37.5	100	45.0	85.0	57.5	0.0	30.0	42.5	47.5	90
S. aureus	33.3	28.2	87.1	79.5	43.6	51.3	0.0	25.6	35.6	79.5	51.3
S. marcescens	25.0	25.0	75	75	100	0.0	ND	0.0	25.0	50.0	75.0

Table 3. Contd.

E. aerogenes	35.7	50.0	85.7	78.6	100.0	50.0	ND	14.3	43.0	50	78.6
P. mirabilis	33.3	0.0	100	66.7	66.7	66.6	ND	0.0	66.7	66.7	100.0

P = Penicillin, AM = Ampicillin, T= Tetracycline, AMX = Amoxycillin, C = Chloramphenicol, SXT = Co-trimoxazle, NA = Nalidixic Acid, CP = Ciprofloxacin, CTX = Cefotaxime, IM = Imipenem, and V = vancomycin.

in this province.

DISCUSSION

Antimicrobial resistance often leads to therapeutic failure of empirical therapy; therefore, knowledge of the local prevalence of pathogens and their antimicrobial sensitivity patterns is essential for clinicians in their routine work. Clinicians should also be aware of the sensitivity patterns in both neighboring and distant areas.

This study reveals the antibiotic resistance pattern of 310 bacterial isolates from various clinical specimens in Kurdistan province, Iran, during one month period. Majority of bacteria were obtained from urinary tract infection (69%).This observation is similar to other reports (Filiz et al., 1999; Ava et al., 2010; Anbumani and Malika, 2007). Patients from age group (20 to 30 years) contributed most of the isolates, which is again similar to that reported by others (Kitabayashi et al., 1993; Aziz et al., 2009).

In this study, the distribution of bacterial species showed similarities with other reports: the top three bacterial species were *E. coli*, *K. pneumoniae*, and *Staphylococcus* spp (Decousser et al., 2003; Shalini et al., 2010).

Among *E. coli*, the incidence of resistance to ampicillin, amoxicillin and penicillin was 84.7, 90.2, and 86.9%, respectively which is similar to that observed by Odusanya (2002) and Tenssaie (2001). As opposed to neighboring countries, no vancomycin- resistant were detected (22 to 23). Kurdistan does not seem to have a problem with vancomycin-resistant *Staphylococcus* spp.

Conclusions

It is essential to evaluate prospectively the distribution of bacterial species isolated from various clinical specimens and their susceptibility to the major antimicrobial agents and alternative drugs to adapt antibiotic therapy strategies. The present study has therefore, shown that the UTI patients has a higher rate of infection. The risk of antibiotic resistance in isolated bacteria, particularly *E. coli*, emphasizes the importance of hospital control measures and rational prescribing policies.

Lastly, these resistance rates leave ciprofloxacin and imipenem as the reliable agent for the empirical treatment in this province.

ACKNOWLEDGMENTS

The authors wish to thank the following individuals for their assistance in the execution of this study: Dr. Estifaei F, Rashidi S and Amjadian P. This study was funded by a research grant from Kurdistan University of Medical Sciences, Sanandaj, Iran.

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