wjpmr, 2023,9(5), 186-188

SJIF Impact Factor: 5.922

WORLD JOURNAL OF PHARMACEUTICAL AND MEDICAL RESEARCH

www.wjpmr.com

Research Article

ISSN 2455-3301

WJPMR

EMERGING PATTERN OF CARBAPENEM RESISTANT E.COLI AND KLEBSIELLA SPECIES IN HOSPITAL AND COMMUNITY ACQUIRED INFECTIONS FROM A RURAL SETUP

Dr. Payal Dutta*[1], Dr. Bhawna Sharma[2] and Dr. Dipender Kaur Najotra[3]

[1]M.D Microbiology Assistant Professor, Department of Microbiology. Government Medical College Jammu, J & K 180001.
[2]Assistant Professor, Department of Microbiology. Aadesh Medical College, Ambala, Haryana 132001.
[3]Professor, Department of Microbiology, ASCOMS Hospital.

***Corresponding Author: Dr. Payal Dutta**

M.D Microbiology Assistant Professor, Department of Microbiology. Government Medical College Jammu, J & K 180001.

Article Received on 08/03/2023 **Article Revised on 28/03/2023** **Article Accepted on 18/04/2023**

ABSTRACT

Antimicrobial resistance is a global problem that needs urgent action. Development of antimicrobial resistance is a phenomenon inevitably related to microbial evolution and antibiotic use. Carbapenem resistance (CR) producing enterobacteriacaeae has become a growing therapeutic concern worldwide.Aim of this study was to evaluate CR producing Escherichia coli and Klebsiella from all clinical isolates of hospital and community acquired infection.A total of 100 clinical isolates of carbapenem resistant strains of E.coli and Klebsiella species from all clinical samples were cultured and antibiotic sensitivity was done as per standard laboratory routine procedures.Among total (n=100) carbapenem resistant strains, 78% and 22% were HAI and CAI respectively. In HAI, CR strains of Klebsiella and E.coli were 86% and 60% while in CAI it was 14% and 40% correspondingly.Thus concluding that carbapenem resistance was more of focus in nosocomial infections because of repeated administration of antibiotics with prolonged stay makes bacteria resistant but contrary to this fact; above study results have indicated the presence of carbapenem resistance in the community as well due to the readily availability of antibiotics without prescription leading to their misuse. Henceforth serious measures should be brought up in the community for the awareness about multidrug resistance and antibiotic abuse.

KEYWORDS: Carbapenem resistance, Hospital acquired infections, Community acquired infections, E.coli, Klebsiella.

1. INTRODUCTION

Enterobacteriaceae have become one of the most important causes of nosocomial and community acquired infections. Hospitals have always been a hub of infections. Repeated administration of antibiotics given on daily basis makes the microbes resistant thus surviving in a hostile environment. Now a day's carbapenem resistance is growing worldwide and is the key source of HAI in the patients with prolonged stay. UTI is considered to be one of the most common HAI. In uropathogens, a novel form of carbapenem resistant bacteria has evolved However CAI are also on a hike in India due to the readily available antibiotics without prescription leading to their misuse. Throughout the world, including India, Hospital-acquired pneumonia (HAP) is associated with significant morbidity and mortality. Wound infections comprise third most common form of HAI, accounting for increased treatment cost. Prolonged stay in hospital environment and exposure to ubiquitous diagnostic procedures, therapies and micro flora increase the rate of wound infections. Carbapenems are commonly used to treat infections which are caused by multidrug resistant Enterobacteriaceae. Antibiotic resistant E.coli and Klebsiella spp. have been a noteworthy nosocomial pathogen for over 4 decade. The principal pathogen for Hospital outbreaks often caused by new types of strains, the so-called carbapenem resistant Klebsiella strains.

2. MATERIAL AND METHOD

A prospective cross sectional study was conducted on 100 carbapenem (imipenem and meropenem) resistant E.coli and Klebsiella strain from various clinical samples(urine, respiratory tract samples - sputum, BAL, ET aspirate, pus, blood and others - stool, CSF, peritoneal, ascitic fluid, throat swab) in the institutes microbiology laboratory. All isolates were cultured on MacConkeys and blood agar plates & incubated at 37^0C aerobically. After overnight incubation the growth of organisms were identified by putting up a battery of

biochemical test. Antibiotic sensitivity test was done by Kirby Bauer disc diffusion method on Muller Hinton agar according to the National Committee for the clinical Laboratory Standard. Ethical clearance for the study was taken from the ethical committee.

3. RESULTS

Table I: Rate of CR E.coli and Klebsiella species in community- and hospital acquired infections.

Type of Infection	HAI	CAI
Klebsiella(n=70)	60(86)	10(14)
E.coli(n=30)	18(60)	12(40)
Total	78	22

Table II: CR strains in various carbapenem resistant clinical isolates.

Samples	Grand Total	HAI			CAI		
		Klebsiella	E.coli	Total	Klebsiella	E.coli	Total
Urine	44	12(27)	14(33)	26(59)	8(18)	10(22)	18(41)
Pus	19	16(84)	1(5)	17(92)	0	2(11)	2(11)
Respiratory tract samples	25	22(88)	1(4)	23(89)	2(8)	0	2(8)
Blood	7	6(86)	1(14)	7(100)	0	0	0
Miscellaneous	5	4(80)	1(20)	5(100)	0	0	0

Out of 100 CR isolates, majority strains were Klebsiella (70%) while E.coli (30%). As per the distribution was concerned, Klebsiella was 86% and 14% while E.coli was 60% and 40% in HAI and CAI correspondingly. Moreover, Table I also depicts that total number of HAI and CAI were 78% and 22% respectively.

Majority of carbapenem resistant strains were from urine (44%), respiratory samples (25%) and pus (19%). Moreover uropathogens from HAI were 59% and CAI 41%. Out of these, E.coli was 33% & 22% while Klebsiella was 27% & 18% in HAI and CAI individually. However, respiratory tract and pus samples were predominantly 89% and 92% in HAI respectively. Also, Klebsiella was mainly found in respiratory tract 88% and pus samples 84%. (Table II)

DISCUSSION

As present the study comprises HAI (78%) were predominant as compared to CAI (22%). This is supported by Mitali Chatterjee et al.[1] where HAI were 18% and CAI were 4% and Stephen P. Hawser et al.[2] who stated that HAI were three to four times higher than rates for CAI. This may be because in the community there is less exposure to antibiotics while in hospitals microorganisms get exposure to antibiotics everywhere.

While, in current study, out of total HAI, Klebsiella and E.coli were 86% and 60% while in CAI it was 14% and 40% respectively. This is supported by David L. Paterson et al.[3] More than 75% studies have addressed carbapenem resistant infections with Klebsiella, however fewer than 10% of E.coli strains were isolated from HAI. Stephen P. Hawser et al.[2] stated that in India, the CAI rate of E.coli (79.0%) was virtually identical to that of HAI (78.9%) whereas Klebsiella spp. rates for HAI were three to four times higher than rates for CAI. The rate of E.coli was higher in CAI in the present study may be because most of the strains of E.coli were isolated from urine sample which was predominant in CAI. In contrast Klebsiella species was predominant in HAI due to its isolation from the patients of wound infection or HAP. (Table I)

In present study, urine samples (44%) were maximum; and the rate of HAI and CAI were almost same i.e. 59% and 41% respectively. Likewise in the study performed in eastern India by Mitali Chatterjee et al.[1] where urine samples were 17% and 13% HAI and CAI respectively. However another study done in south India by Pai V et al.[4] states that incidence of uropathogen in HAI & CAI was 90% & 10% which shows a vast difference because the results vary from terrain to terrain and are influenced by factors like literacy rate, socio-economic status, personal hygiene and habitat etc.

In current study, HAP accounted for 25% of the total HAI. On the contrary, study conducted by Rajesh Chawla,[5] reported the incidence of HAP as 54%. Reason behind this may be that present study includes only carbapenem resistant pneumonia patients; however the later study included the pneumonia patients who were carbapenem sensitive as well as resistant strains.

As per the study conducted by SP Lilani et al.[6] rate of wound infection varies from low 2.5% to as high as 41.9%. In accordance to this, present study indicated the rate of wound infection as 19%. The higher rate in the present study may be because of the rural setup of the hospital where usually patients with complications get admitted.

In present study Uropathogenic E.coli (UPEC) was 33% and 22% while Klebsiella was 27% and 18% in HAI and CAI respectively. This is in accordance with De Anuradha et al,[7] who identified that, commonest

organism isolated in UTIs was E.coli (52.18%), followed by Klebsiella pneumoniae (23.91%) and Madhu Sharma et al.[8] who stated that E.coli accounted for 70-90% of UTI. The ability of UPEC to cause symptomatic UTI is because of numerous virulence factors like adhesins (e.g. Type 1 and P fimbriae) present in the capsule which enhance the adhesion to urathelium of the host and thus rendering virulence against the same and toxins (e.g. Haemolysin).

As per a study conducted by of Behera B et al,[9] out 80% HAI, Klebsiella was predominantly more in respiratory tract infection (42%), pus (18%) and blood (22%).

As in the present study, carbapenem resistant Klebsiella species were 88% out of all pneumonia patients. This may be because of the fact that Klebsiella has two common habitats i.e. mucosal surfaces of nasophayrynx and intestinal tract. Similarly 84% and 86% of carbapenem resistant Klebsiella strains were isolated from all wound infections and septicaemia respectively. This may be due to its ubiquitous nature, being readily available in the environment. (Table II)

CONCLUSION

The early detection of carbapenem resistant isolates by repeated and well-timed sample collection will play an important role in decreasing the mortality rates of patients and will also reduce intrahospital spread. In order to achieve this, a vigilant and combined effort of microbiologists, clinicians and the infection control team is mandatory. Also, in the community, awareness should be brought about the antibiotic resistance and their misuse by quacks.

REFERENCES

1. Chatterjee M,Banerjee IM, Guha IS et al. Study of drug resistance pattern of principal ESBL producing urinary isolates in an urban hospital setting in Eastern India. Sri Lankan J Inf Dis., 2012; 1: 36-41.
2. Hawser SP,Bouchillon SK, Hoban DJ et al. Emergence of high levels of Extended-Spectrum-β-Lactamase-producing Gram negative bacilli in the Asia-Pacific Region: Data from the Study for Monitoring Antimicrobial Resistance Trends (SMART) Program, 2007. Antimicrob Agents Chemother, 2009; 53(8): 3280–4.
3. Paterson DL,Robert A.Bonomo. Extended-Spectrum Beta-Lactamases: a clinical update.Clin Microbiol Rev., 2005; 18(4): 657.
4. Pai V,Nair B. Etiology and sensitivity of uropathogens in outpatients and inpatients with urinary tract infection. Implications on Empiric Therapy, 2012; 5: 181-4.
5. Chawla R. Epidemiology, etiology and diagnosis of hospital- acquired pneumonia and ventilator associated pneumonia in Asian countries. Am. J Inf Control, 2008; 36(4): 93-100.
6. Lilani SP, Jangale N, Chowdhary A et al. Surgical site infection in clean and clean-contaminated cases. Ind J Med Microbial, 2005; 23(4): 249-52.
7. Anuradha De, Deshpande D, Baveja SM et al. Detection of biofilm formation in bacteria from cases of urinary tract infection, specticemia, skin and soft tissue infection and post-operative infection by congo red agar method. J Acad Med Sci., 2012; 2(1): 46-7.
8. Sharma M,Aparna, Sarita Y,Chaudhary U.Biofilm production in uropathogenic *Escherichia coli*. Ind J Path Microbiol, 2009; 52(2): 294.
9. Behera B, Mathur P, Das A, Kapil A. Ertapenem susceptibility of extended spectrum β-lactamase-producing Enterobacteriaceae at a tertiary care centre in India. Singapore Med J, 2009; 50(6): 628.