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CONTENTS

Editorial

- Formalin in Food - An Emerging Public Health Problem 2
Prof. Dr. Md. Azfarul Habib

Information for authors

3

Original Articles

- Comparative Study of Standard Culture Technique and Simple Non-culture Methods for Rapid Laboratory Diagnosis of Urinary Tract Infections in A Tertiary Care Hospital 5
Khan A H, Zaman M K, Hossain M S, Rahman M A, Samad M A.
- Identification of Enterotoxigenic Escherichia Coli (ETEC) and Their Genes: Est, Heat-stable Toxin and Eit, Heat-labile Toxin Using Multiplex PCR Technology in A Tertiary Care Hospital 9
Kabir M R, Hossain M A, Alam M M, Paul S K, Begum Z, Yesmin T.
- Klebsiella Spp. Infection: An Emerging Health Issue 14
Yasmin T, Khan A H, Mowla G, Siddiqui M Z R, Kabir M R, Haque N, Maua J.
- Association of Serum Magnesium Level and Development of Arrhythmias in Acute Myocardial Infarction 19
Islam M K, Islam M M, Ahsan R, Mamun M A A R.
- Prevalence of Ciprofloxacin Resistance among Gram-negative Bacilli Isolated from Urinary Tract Infection Specimens at A Specialized Hospital in Riyadh, Saudi Arabia 25
Hossain M A, Mohal S.
- Frequency of Silent Ischemic Heart Disease in Type 2 Diabetic Patients 30
Islam M K, Islam M M, Ahsan R, Montasir A A, Mahmud M A A R.
- A Study of Head Injury by Railway Accident in Bogra District 33
Islam K M S, Habib M A.

Case Reports

- Primary Inoculation Tuberculosis following Pricking Injury Presenting as Cold Abscess : Report of 4 Cases. 36
Mazid M A, Rahim M M, Sultana N, Habib M A, Methela A T.
- General Anaesthesia for Patey's Mastectomy with Moderate Heart Failure and Bradycardia – A Case Report. 40
Jahan N, Rahman M A, Mollah M A W, Mondol C K.
- Fetal Cardiac Rhabdomyoma - A Rare Case Report 42
Mondal S R, Sarkar S K, Pervin F.

ORIGINAL ARTICLE

KLEBSIELLA SPP. INFECTION: AN EMERGING HEALTH ISSUE

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ABSTRACT

Background: Bacteria belonging to the genus *Klebsiella* frequently causes human nosocomial infections, poses a new problem to health care professionals worldwide, which complicates and limits therapeutic options. Local knowledge of antimicrobial susceptibilities of these organisms is important for implementation of effective hospital anti-biotic policies. **Objective:** This study was undertaken to see frequency of *Klebsiella* spp among Hospital and Community acquired infection and their sensitivity pattern. **Methodology:** This cross sectional study was carried out in the department of Microbiology at Mymensingh Medical College from January 2011 to June 2011 for a period of 6 months. Specimens were processed and bacteria were isolated and identified according to standard procedure. Antibigram profile of these isolates was determined by Kirby-Bauer's disc diffusion method on Muller Hinton agar media. **Result:** A total of 300 gram negative isolates were taken. Among them urine were 216 (72%), wound swab 45 (15 %), pus 39 (13%). Of the 45(15%) *Klebsiella* spp. hospital and community acquired isolates were 17 (37.77%) and 28 (62.22%) respectively. All the isolates were sensitive to imipenem and nitrofurantoin followed by amikacin 70%. A relatively higher rate of resistance to gentamicin, co-trimoxazole, azithromycin and quinolones were also observed. **Conclusion:** This study helps to suggested that *Klebsiella* spp were not only common in Hospital acquired infection but also in community, this study reveals that *Klebsiella* spp isolated were multidrug resistant in this area.

Key words: *Klebsiella* spp, antibiotic resistance.

INTRODUCTION

Klebsiella spp, a common intestinal microflora has been associated with diverse disease syndromes ranging from Urinary tract infection (UTI), pneumonia, blood stream infections, wound or surgical site infections and meningitis¹. *Klebsiella* spp. is a Gram-negative, non-motile, encapsulated, lactose fermenting, facultative anaerobic, rod shaped bacterium, citrate positive, some are Indole positive found in the normal flora of the mouth, skin, and intestines that can cause different types of health care infection². *Klebsiella* was named after the German bacteriologist Edwin Klebs (1834-1913) in 1884. It naturally occurs in the soil³. *Klebsiella* spp. is an opportunistic pathogen frequently implicated in respiratory and urinary tract infections of hospitalized patients, particularly in chronic alcoholics and diabetic

mellitus⁴. Members of the *Klebsiella* genus typically express 2 types of antigens on their cell surface. The first, O antigen is a component of the lipopolysaccharide (LPS), of which 9 varieties exist. The second is K antigen, a capsular polysaccharide with more than 80 varieties⁵. *Klebsiella* bacteria have become highly resistant to antibiotics. When bacteria such as *Klebsiella pneumoniae* produce an enzyme known as a carbapenemase (referred to as KPC-producing organisms), then the class of antibiotics called carbapenems will not work to kill the bacteria and treat the infection, like β -lactamases (β lactam drug will not act). There are many factors for this resistance, firstly the presence of cell wall receptors enables *Klebsiella* spp. to attach to the host cell, thereby altering the bacterial surface so that phagocytosis by polymorphonuclear leukocytes and macrophages is

impaired and invasion of the non-phagocytic host cell is facilitated^{6,7}. Second, *K. pneumoniae* produces an endotoxin that appears to be independent of factors that determine receptors and capsular characteristics². Third, *Klebsiella* spp. also have adhesive properties⁸. So, the present study was undertaken to see the frequency of *Klebsiella* infection and there antibiogram, to make an antibiotic policy for the phycision.

MATERIAL AND METHODS

This cross sectional study was conducted in the laboratory of the Department of Microbiology at Mymensingh Medical College, Mymensingh. Mymensingh is situated around 60 km from Dhaka city of Bangladesh. This study was carried out from January 2011 to June 2011 for a period of 6 months. All the patients at any age with both sexes presented with UTI and skin wound infection who were attended at the OPD as well as the patients who were admitted in the IPD were taken as study population. Specimens were collected aseptically. Specimens were processed and bacteria were isolated and identified according to standard procedure⁹. All samples were routinely cultured on MacConkey's agar media and blood agar plates at 37...C aerobically for 18 hours. Thereafter, Gram negative isolates were further identified by microscopy and standard biochemical tests (Citrate utilization test, Motility test, Test for indole production, Triple sugar iron agar)⁹. The susceptibility test was determined by Kirby Bauer method on Muller Hinton agar media according to Clinical Laboratory Standard Institute (CLSI 2010)¹⁰.

RESULTS

During the 6 months study period a total of 300 various bacterial isolates were yielded. The specimens were urine 216 (72%), wound swab 45 (15 %), pus 39 (13%). Out of 300 Gram negative isolates in this study majority were *Esch. coli* 156 (52%), followed by *Proteus* spp. 55 (18.3%), *Klebsiella* spp. 45 (15%), *Pseudomonas* spp. 9 (3%) and others (*Enterobacter* spp., *Citrobacter* spp.) 35 (11.7%).

Table- I : Table showed *Klebsiella* spp distribution in different specimen both from community and hospital:

<i>Klebsiella</i> spp		Urine (%)	Pus (%)	Wound Swab (%)
	Community	27 (96.4)	01 (3.5)	00 (00)
	Hospital	9 (52.9)	03 (17.6)	05 (29.4)
Grand total		45		

Table -II Table showed antibiotic resistance pattern of *Klebsiella* spp. isolated from hospital and community by disc diffusion method

Antimicrobials	<i>Klebsiella</i> spp.	
	Hospital isolates n=17	Community isolates n=28
Aztreonam	17 (100)	28 (100)
Piperacillin	15 (88.3)	27 (96.4)
Amoxicleve	16 (94.1)	26 (92.8)
Ampicillin	16 (94.1)	25 (89.2)
Ceftriaxone	15 (88.2)	23 (82.1)
Ciprofloxacin	15 (88.2)	22 (78.5)
Cefotaxime	14 (82.3)	22 (78.5)
Ceftazidime	14 (82.3)	22 (78.5)
Azethromicine	14 (82.3)	16 (57.1)
Gentamicin	11 (64.7)	17 (60.7)
Amikacin	3 (17.6)	6 (21.4)
Nitrofurantoin	1 (5.8)	1 (3.6)
Imipenem	0 (0)	0 (0)

Note: Figures in parentheses represent percentage



Fig. 1 : MacConkey agar media showing klebsiella pneumoniae

DISCUSSION

In the present study, a total of 300 Gram negative strains were isolated from various clinical specimens of which majority of the organisms were isolated from urine 72% (216/300) followed by wound swab 15% (45/300), pus 13% (39/300). Among the isolated organisms *Esch. coli* was the most prevalent 52% (156/300), followed by *Proteus* spp. 18.3% (55/300), *Klebsiella* spp. 15% (45/300) and *Pseudomonas* spp. 3% (9/300). Irrespective of specimens among the identified bacteria *Klebsiella* spp. 62% (28/45) was the leading bacteria from the community acquired isolates, followed by *Esch. coli* 57% (89/156), *Proteus* spp. 45.5% (25/55) and *Pseudomonas* spp. 44.4% (4/9). In (table I) *Klebsiella* spp. now also found in community acquired isolates more than hospital which indicates that hospital strains circulate in the community. In the present study isolation of *Klebsiella* spp was 80% and 20% from both urine and pus respectively, (Table - I) which are dissimilarities findings done by Haque et al. (2009) and Parveen et al. (2009) in the same institute, which indicate that *Klebsiella* spp are now common in community and it is common not only for community acquired pneumonia but also for UTI^{11,12}.

In Bangladesh, it has been reported that 65-92% of commensal Enterobacteriaceae and other organisms isolated from urine is resistant to commonly used antibiotics like ampicillin, tetracycline, co-trimoxazole etc¹³. Now a day's organism encoding multiple antibiotic resistance genes are becoming increasingly prevalent¹⁴. In this study aztreonam, ampicillin, amoxyclovaue were found 95-100% resistant (Table -II), this is in agreement with other studies^{1,15}. Cephalosporins especially third generation have been used for Gram negative bacterial treatment¹⁶. *Klebsiella* spp. were found resistant to ceftriaxone, ceftazidime and cefotaxime in 88.2%, 82.3%, and 82.3% in hospital acquired isolates and 82.3%, 78.5%, 75.5% in community acquired isolates respectively (Table -II). It correlates with the study done by Sasirekha et al. (2010) and Singh and Goyal (2003) in India where they found 84% resistance to cefotaxime and 75%, 85% resistant for ceftriaxone and ceftazidime respectively^{15,17}. Hospital acquired isolates were more resistant than the community acquired isolates, it may be due to lack of antibiotic policy, irrational use of 3GCs mainly ceftriaxone in the hospital¹⁸ and the emergence of antibiotic-resistant organisms in hospitals in concert with the use of high levels of antibiotics use caused the emergence of resistant organisms and they might be inherently more virulent than the organisms are sensitive (CDC 2002). It was also noted that *Klebsiella* spp were more resistant which may be due to *Klebsiella* spp. have some virulence factor like hyperviscosity, polysaccharide capsule and production of endotoxine, carbapenemases, which make it more resistant^{6,7}. Thomson and associates found *Klebsiella* spp. was more resistance to cefotaxime and ceftazidime¹⁹. This indicate over use and irrational use of 3GCs give the world brand new resistant bacteria that can produce many other drug resistance enzymes.

In this study observed resistance to ciprofloxacin was 88%. (Table-II). These findings were in accordance with the study by Haque and Salam (2010) from Bangladesh and it was 90.9%²⁰. Another study by Sasirekha from India where they found 68% resistant to ciprofloxacin¹⁵.

Aminoglycosides have good activity against clinically important gram negative bacilli²¹. In the present study 82.1% isolates were susceptible to amikacin, followed by 41.8% to gentamicin, it was similar to Sasirekha et al. (2010)¹⁵. Several studies showed that amikacin was more sensitive than gentamicin but if it is over used than it may also become resistant. In 2010 gentamicin was 59% resistant in India and 55.5% in Bangladesh^{1,15,20}. These variations may be due to increased use of gentamicin, caused by selection pressure of aminoglycosides in different region²². Carbapenems are the drugs of choice for many infections caused by Gram positive and Gram negative bacteria¹. In this study imipenem was 100% sensitive (Table -II). These findings were similar to study done by Haque and Salam in (2010)²⁰ but one study showed 3.1% resistant to imipenem in Bangladesh²³. Amikacin was the second most common sensitive drug after imipenem. So, these drug resistance organisms have limited therapeutic options and necessitated the increased use of carbapenems. But very recently new beta lactamases are developed e.g., K. pneumoniae carbapenemase (KPC) which is resistant to imipenem and has been spread world wide²⁴. So there is very limited options to treat imipenem resistant strains and colistin may be the drug of choice²⁵, though it has many side effect. Our findings emphasize the urgent need for efforts for the prevention of Klebsiella spp infection and antibiotic should given after proper sensitivity test and patients coast effective.

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