

## ANTIMICROBIAL SUSCEPTIBILITY PATTERN OF KLEBSIELLA SPECIES FROM EBONYI STATE UNIVERSITY TEACHING HOSPITAL ABAKALIKI, NIGERIA

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### ABSTRACT

*Klebsiella* specie isolated from clinical specimens from Ebonyi State University Teaching Hospital (EBSUTH), Abakaliki were studied to determine the antimicrobial susceptibility pattern. Between January, 2003 and September 2004 a total of 3,600 specimens processed in the routine Medical Microbiology laboratory of EBSUTH, of which 245(6.8%) yielded *Klebsiella* species, with 84 from out – patients and 161 from in – patients The number of isolates from various samples were: Urine 126, Sputum 37 Endocervical swab 13, Aspirates 8, High Vaginal Swab 7, Blood 3, Eye Swab, Ear Swab and Cerebrospinal fluid were 2 samples each. Organisms were identified by conventional methods. Antimicrobial susceptibility was done by the disk diffusion methods. The antimicrobial disk used include: Ceftazidime, Cefuroxime, Cefotaxime, Augmentin, Pefloxacin (30ug), Doxycycline (25ug) Gentamicin (10 ug) Ciprofloxacin and Ofloxacin (5ug) each and Erythromycin (15ug). All were Oxoid products. Results were interpreted according to NCCLS criteria.

*Klebsiella* species were isolated mostly from urine specimens (51.4%) followed by wound swabs (18.4%) Antimicrobial susceptibility to various groups drugs used was generally poor. The most sensitive antimicrobial was Ciprofloxacin with 121(49.4%) isolates susceptible to it, followed by Gentamicin with 95(38.8%) and Ceftazidime with 90(36.7%). Seventeen isolates were multiresistant to all the antimicrobial agents used.

The result of this study will help in the empiric therapy of infection caused by *Klebsiella* species in Ebonyi State University Teaching Hospital, Abakaliki, Nigeria but continuous surveillance of antimicrobial resistance of the organism is very necessary in the formulation of a sound antibiotic policy in the hospital

**Keywords:** *Klebsiella* spp, Antimicrobial susceptibility.

### INTRODUCTION.

The genus *Klebsiella* belongs to the family of Enterobacteriaceae, a large heterogeneous group of gram- negative rods. Eight different species of *Klebsiella* have been described on DNA hybridization studies. They include: *K. Pneumoniae*, *K. oxytoca*, *K. rhinoscleromatis*, *Kozenae*, *.K. planticola*, *K. trevisnii* and *K. terrigena*. *Klebsiella* constitutes a group of non – motile bacteric and the first five species are to be clinically significant<sup>1</sup>.

*Klebsiella pneumoniae* is an important cause of hospital acquired ( noscomial ) infections with potential of causing severe morbidity and mortality<sup>2,3</sup> *Klebsiella* been incriminated in 8% of the noscomial bacterial infection.<sup>4</sup> The National Nosocomial Infection Surveillance System lists *K. Pneumoniae* as the fifth most common agent of nosocomial urinary tract, wound and blood stream infection<sup>5</sup> and lobar pneumonia<sup>6</sup>.

Invasive devices found in hospitalized patients.

particularly urinary catheters, endotracheal tubes and intravenous catheters, markedly increase the disposition to any nosocomial infection, particularly Gram-negative rods<sup>7</sup> Like most gram – negative organisms found in the hospital, environment, *Klebsiella* is characterically resistant to multiple antibiotics. Already naturally resistant to ampicillin and carbenicillin, increasing acquisition of R plasmids is providing drug resistance to cephalosporins and aminoglycosides with increased frequency<sup>8,9</sup> Extended spectrum Beta-Lactamase (ESBL) producing *Klebsiella pneumoniae* have been described in Nigeria<sup>1,2,10</sup> Little or no studies have been done on *klebsiella* species in Ebonyi state. The study was aimed at giving an insight into the antimicrobial susceptibility pattern of *Klebsiella* species in Ebonyi State University Teaching Hospital Abakaliki

### MATERIALS AND METHODS.

#### Samples

Three thousand, six hundred clinical specimens sent into the routine Medical Microbiology Laboratory of Ebonyi State University Teaching Hospital Abakaliki (EBSUTH) between January 2003 and

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September 2004 were studied. The clinical specimens used were: urine, sputum, aspirates, blood, cerebrospinal fluid (CSF), swabs of Wounds, endocervix, eye, ear and vagina. These specimens were processed and identification of isolates was done using conventional methods. *Escherichia coli* ATCC 25922 was included as control strain. MacConkey and blood agar were used for isolation. Inoculated plates were incubated at 18 -24 hours. All lactose – fermenters that were non-motile with mucoid colonies, citrate positive and methyl red negative identified as *Klebsiella*.

#### Antimicrobial agents

The antimicrobial agents used include: Ceftazidime (30ug), Ciprofloxacin (5ug), Ofloxacin (5ug), Cefurxime (30ug) Erythromycin (15ug), Doxyclyne (25ug), Pefloxacin (30ug) Cefotaxime (30ug) Augmenting (30ug), and Gentamicin (10ug). All were Oxoid Products Susceptibility testing

Antimicrobial susceptibility testing was done by the disk diffusion method on Mueller – Hinton agar (Difco – Laboratories, Detroit, Mich) The inoculum turbidity was standardized to 0.5 Mac Farland standard. Inoculum was streaked onto Mueller – Hinton agar using sterile swab sticks, plates incubated for 18 – 24 hours at 37<sup>o</sup>c in air Results were interpreted according to NCCLS criteria<sup>11</sup>

#### RESULTS

Between January, 2003 and September, 2004 a total of 3,600 specimens from different sites including urine ( midstream and catheter specimen), sputum, aspirates, blood, cerebrospinal fluid ( CSF) wound swabs , endocervix, eye , ear and vagina were processed in the routine Medical Microbiology laboratory of EBSUTH, out of which 245 (6.8%) yielded *klebsiella* species with 84 isolates ( 34.3%) from out – patients and 161 ( 65.7%) from in – patients The highest isolation was from urine specimens – 126 (51.4%) followed by wound swabs with 45 (18.4%) them sputum 37 (15.1%) Distribution of isolates in the various clinical specimens is seen in Table 1.

Out of 245 isolates of *Klebsiella* 121 (49. 4%) were susceptible to Ciproftaxacin, 105 (42.9%) to Gentamicin, 95 (38. 8%) to Ofloxacin. The antimicrobial susceptibility pattern is seen in Table 2. Seventeen isolates were multiresistant to various antimicrobial agents used. These were from different clinical specimens as follows: wound swab, 9, urine 3, ear swab 2, while one specimen each was from endocervical swab, aspirate and sputum.

#### DISCUSSION

*Klebsiella* species are important causes of both community and hospital acquired infections.<sup>12</sup> The

**Table 1: Distribution of *Kiebsilla* isolates in the clinical specimens**

Specimen	Number isolated	Percentage
Urine	126	51.4
Sputum	37	15.1
Wound swab	45	18.4
Endocervical swab	13	5.3
Aspirate	8	3.3
High vaginal swab	7	2.9
Eye swab	2	0.8
Ear swab	2	0.8
Blood	3	1.3
Cerebrospinal fluid	2	0.8
Total	245	100

**Table 2. Antimicrobial susceptibility patterns of *Klesiella* isolates at EBSUTH**

Antimicrobial agents	<i>Klebsiella</i> spp n=245 No. susceptible	percentage
Ciprofloxacin	121	49.4
Ceftazidime	90	36.7
Ofloxacin	95	38.8
Ceftriaxone	66	26.9
Gentamicin	105	42.9
Cefurxine	53	21.6
Erythromycin	441.6	1.6
Doxyclyline	6	2.4
Pefloxacin	43	17.6
Cefotaxime	83	33.9
Augmentin	36	14.7

predisposition for nosocomial infection outweighs community acquired disease<sup>6</sup> and from the study about two - thirds (65.7%) of the patients were in patients. Most isolates are found to be associated with infections of the urinary and respiratory tracts.<sup>4</sup> In this study 51.4% of the isolates were from urine samples which is in agreement with earlier findings that *Klebsiella* species are common causes of urinary tract infection.

The susceptibility patterns of the isolates to the third generation cephalosporin notably Ceftazidime (36. 7%), Cefotaxime (33. 9%), Ceftriaxone (26. 9%) and Cefuroxime (21. 6%) showed an increase in resistance to this group of drugs when compared with the result of the work done by Odugbemi<sup>13</sup> in 1995 where 90% of *Klebsiella* species were found to be susceptible to the third generation cephalosporin's.

Over the years, following the over use of the expanded-spectrum cephalosporins, outbreaks caused by Extended-Spectrum Beta-Lactamase (ESBL)-producing gram negative pathogens, particularly *Klebsiella pneumoniae* have been reported<sup>14,15</sup>. Widespread dissemination of such strains within hospitals has been documented with increasing frequency.<sup>16</sup> The ESBLs are able to hydrolyze expanded-spectrum cephalosporins (ceftriaxone, Cefotaxime, Cefotaxime), and other related Oxyimino B-Lactams. In Nigeria, beta lactams are the most frequently prescribed antibiotics in aerobic gram-negative bacilli infections and selective pressure exerted by the extensive use of these beta-lactam drugs may have resulted in strains producing the extended-spectrum beta-lactamase enzyme, thus the difference in susceptibility with earlier work by Odugbemi. Among the quinolones, Ciprofloxacin was the most effective (49.4%) when compared with Ofloxacin (38.8%), and pefloxacin (17.6%), also in a study by Akindele and Rotilu<sup>17</sup>. *Klebsiella* isolates were sensitive to Ciprofloxacin. This sustained susceptibility to the quinolones (especially Ciprofloxacin) implies that this group of drugs should be considered in treatment of infections caused by *Klebsiella* although imipenem, piperacillin or tazobactam have been recommended as the antibiotics of choice in the treatment of ESBL-producing organisms.<sup>18</sup> Susceptibility to gentamicin at 42.9%, was poor. This could probably be due to the fact that over the years, gentamicin has been the drug of choice for many infections caused by Gram-negative organisms and selection pressure could have resulted in development of resistance to this drug. A study done in early 70s<sup>19</sup> showed epidemics of gentamicin-resistance *Klebsiella pneumoniae* infections in hospitals.

Seventeen isolates were multi-resistant to all the antimicrobial agents used. This is not very surprising because there are reports of epidemics caused by strain that have acquired multiple antibiotic resistance and such outbreaks proved difficult to treat and were often accompanied by high mortality<sup>20, 21</sup>. Work needs to be done on ESBL-producing *Klebsiella* isolates in EBSUTH.

Knowledge of the local antimicrobial susceptibility pattern is the empirical treatment of outbreaks of infections caused by *Klebsiella species*. For example, it could be said that Ciprofloxacin followed by Gentamicin and Cefotaxime in that order could be used in the empiric treatment of infections caused by *Klebsiella species* at EBSUTH Abakaliki.

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