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Full Length Research Paper

Antibiogram types of *Klebsiella aerogenes* isolated from urinary tract infection (UTI)

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Thirty three (33) strains of *Klebsiella aerogenes* isolated from 197 in-and out-patients with symptoms of urinary tract infection (UTI) at University of Benin Teaching Hospital (UBTH), Benin City were used for this study. Twenty-one antibiotics were used for the antibiogram typing. Organisms were isolated from 65 positive samples, with the most prevalent being *Staphylococcus aureus* (40.0%), others were *Escherichia coli* (26.2%), *Pseudomonas aeruginosa* (12.3%), *Klebsiella* spp (9.2%), *Proteus* spp (6.2%), *Acinetobacter* spp (4.6%) and *Providencia* spp (1.5%). Majority of the isolates were highly sensitive to the quinolones (47.3%) and less sensitive to the penicillins (7.2%). Isolates of *Pseudomonas aeruginosa* were most sensitive to ofloxacin (50.0%), rifampicin (50.0%) and even gentamycin (50.0%), and less sensitive to tetracycline and chloramphenicol (12.5%) respectively. This study is of great concern to public health; it is suggested that suitable antimicrobial intervention should be administered to reduce the risk of multidrug-resistant (MDR) pathogens.

Key words: Antibiotics, multidrug-resistant, uropathogens, public health.

INTRODUCTION

Urinary Tract Infection (UTI) is the widespread of all bacterial infections affecting humans throughout their life. It is an infection which implies the microbial colonization of the urethra and invasion of the lower or upper urinary tract. Urinary tract infection could be defined as the presence of 10^5 or more organisms in one millilitre of midstream sample of urine (Kassim and Oluwanya, 1996). The most common organisms associated with infections are members of the family Enterobacteriacea among which are: *Eschericha coli, Klebsiella aerogenes*. Gram-positive organisms like *Staphylococcus aureus*, *Staphylococcus saprophyticus* and *Streptococus faecalis* do occur to a lesser extent (Orhue, 2004). Apart from age, sex, and cultures, other factors that could predispose individuals to UTI include obstruction of the tract, method of toilet wiping, use of irritant soap, vagina deodorant and contraceptives.

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The common symptoms of UTI include burning feeling during urination, frequent or intense urges to urinate, even when one passes little urine, backaches or pains at the lower abdomen, cloudy, dark, bloody, or unusual-smelling urine, fever or chills (NKUDIC, 2005). The diagnosis of UTI is based on clinical and laboratory investigations. These are the cultural and microscope examination of freshly voided urine sample and culture (Cheesbrough, 2002). In the treatment of UTI, it is important to be guided by the antibiotic susceptibility pattern of the bacterial isolate. Monitoring of the sensitivity of the isolate is important as organism can acquire resistance by several means. A technical way of monitoring the susceptibility of isolate and their epidemiologic implication is to determine their antibiogram types. Other typing methods like plasmid profile analysis, stereotyping and phage typing could also be employed. They could be more reliable but more expensive and cumbersome. Antibiogram typing method is a good way of presenting the sensitivity profiles of isolate as it does not only indicate susceptibility pattern but is a relatively cheap and readily available methods for determination of

Table 1. Sensitivity and antibiogram of *Klebsiella aerogenes*.

Bacterial isolates	Ampicillin	Amoxicillin	Cloxacillin	Flucoloxcillin	Amoxyclave	Ampi-Subactam	Genticin	Tobramycin	Streptomycin	Chloramphnical	Tetracycline	Co-trimoxzole	Metronidazole	Nitrofurantion	Erthromycin	Ofloxacin	Ciproxin	Reflacine	Cephalexin	Cefotaxime	Cefroxime	Types
Conc./disk (µg)	10	10	5	10	30	10	10	10	30	10	10	30	10	10	10	10	100	10	10	10	10	
K. aerogenes	1	2	4	1	2	4	1	2	4	1	2	4	1	2	4	1	2	4	1	2	4	
1	-	-	-	-	-	-	+	+	+	+	-	-	-	+	-	+	+	+	-	+	+	0071376
2	-	-	-	-	+	-	+	+	-	-	-	-	-	+	-	+	+	+	-	+	+	0210076
3	-	+	-	-	-	-	+	-	-	-	-	-	+	+		-	+	+	-	+	+	2010376
4	-	-	-	-	+	+	-	+	-	+	+	-	-	+	-	+	+	+	-	-	+	0637374
5	-	-	-	-	+	+	+	+	-	+	+	+	-	+	-	+	+	+	-	+	+	0637276
6	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	+	+	+	+	+	-	0060073
7	-	+	-	+	-		+	-	-	+	-	-	-	-	-	+	+	+	-	+	+	2111076
8	-	-	-	-	-	-	-	+	-	+	+	-	-	+	-	+	+	+	-	-	+	0023274
9	-	-	-	-	-	-	+	-	-	-	-	-	+	-	-	+	+	+	-	-	-	0011176
10	+	+	-		+	-	+	-	-	+	+	+	+	-	+	+	+	+	-	+	+	1275766
11	-	-	-	-	-	-	-	+	-	-	-	-	-	+	-	+	+	+	+	+	+	0020277
12	-	-	-	-	+	+	+	+	-	+	-	-	+	-	-	-	+	+	-	+	+	0631066
13	-	-	-	-	-	-	-	+	-	+	+	+	-	+	-	+	+	+	+	+	+	0027276
14	-	-	-	-	-	-	+	-	-	+	-	-	+	+	-	+	+	+	-	+	+	0013376
15	-	-	-	-	-	-	+	-	-	+	+	-	-	+	-	+	+	+	-	+	+	0013276
16	-	-	-	-	+	+	+	-	-	+	+	-	-	+	-	+	+	+	-	-	-	0613270
17	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	+	+	+	-	+	+	0010076
18	-	-	-	-	+	-	+	+	-	-	-	-	-	+	-	-	-	+	-	+	+	2230246
19	-	+	-	-	-	-	-	+	-	+	+	-	-	+	-	+	+	+	-	-	+	0027276
20	-	-	-	-	-	-	-	-	-	+	-	-	+	+	-	+	+	+	+	+	+	0001377
21	+	-	-	-	-	-	+	+	-	+	+	-	+	+	-	+	+	+	-	+	+	1013376
22	-	-	+	+	+	+	+	+	-	+	-	-	-	-	-	+	+	+	-	+	+	4331076
23	-	-	+	+	-	-	-	+	-	+	-	-	-	+	-	-	-	+	-	+	+	4121246
24	-	+	-	-	-	-	+	-	-	-	-	-	-	-	-	+	+	+	-	-	+	2310074
25	-	-	-	-	-	+	+	+	-	-	-	-	-	-	-	+	+	+	-	+	+	0630076
26	-	-	-	-	+	-	+	+	-	-	-	-	+	+	+	+	+	+	-	+	+	6230776
27	-	-	-	-	-	-	+	-	-	-	-	-	-	+	-	+	+	+	-	-	+	0010274
28	-	-	-	-	-	-	+	+	-	+	-	-	+	+	-	+	+	+	-	+	+	0031376
29	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	+	-	+	+	0010076

Table 1. Contd.

30	-	-	-	-	-	-	-	+	-	+	+	-	-	-	-	+	+	+	-	+	+	0023076
31	+	-	-	+	+	-	-	-	-	+	+	-	+	+	+	+	+	+	-	+	+	1103776
32	-	-	-	+	+	+	+	+	-	+	-	-	-	+	-	+	+	+	-	+	+	0611276
33	-	-	+	-	-	+	+	-	-	+	-	+	+	+	-	+	+	+	-	+	+	0011376
Cum. Frequency	3	5	2	5	11	7	23	19	1	21	11	4	11	22	3	29	31	33	4	26	30	
Group Cum. Frequency	9.1	15.2	6.1	15.2	33.3	21.2	69.7	57.6	3.0	63.6	33.3	12.1	33.3	66.7	9.0	87.9	93.4	1.00	12.1	78.9	90.9	
		10.1			23.2			43.4			36.3			36.3			93.8			60.3		

+ = Sensitive; - = Resistant.

emergent nosocomial strains. In this study, the Ajumali methods" of pneumonic coding (Joshi et al., 1984) was adopted for the determination of antibiogram types and strain discrimination and delineation between bacteria isolate (Orhue, 2004)

MATERIALS AND METHODS

Thirty three (33) strains of *Klebsiella aerogenes* isolated from 197 in-and out-patients presenting with symptoms of UTI at University of Benin Teaching Hospital (UBTH), Benin City during July to December 1999 were used for this study. The isolates were provisionally identified at the medical microbiology laboratory of UBTH and confirmatory identification and analysis were carried out at the microbiology laboratory of the Faculty of Natural Sciences, Ambrose Alli University, and Ekpoma. Identification and susceptibility testing was done as previously described (Cruickshank et al., 1975). Twenty-one antibiotics were used for the antibiogram typing. Antibiotics were placed in seven groups of three each according to their mode of action, chemical composition or the medical uses in the community. They were arranged in ascending order of molecular weights. Susceptibility was scored as positive (+) for sensitive and negative (-) for resistant. In each group of 3 antibiotics, antibiotics were assigned an arbitrary value of 1, 2 and 4 respectively. The arbitrary value for each group was calculated, that is, 7 for a perfect sensitivity to the 3 antibiotics (that is to say, 1+2+4 = 7and zero that is, (0+0+0 = 0), for perfect resistance to three antibiotic.

RESULTS AND DISCUSSION

Urinary tract infection (UTI) is the most prevalent nosocomial infection (Nester et al., 2001; Momoh et al., 2009). Klebsiella pathogens are fairly common causes of UTI. However, the main importance of Klebsiella as human pathogens in causing infections in hospital patients has been alarming; the strains responsible are nearly biochemical member of K. pneumoniae and K. aerogenes (Momoh et al., 2009). The role of antibiogram typing for strain discrimination and delineation using the present scheme has been further under-scored by the study. Strain numbers 13 and 19 were of the same types (0027276). Strain numbers 17 and 29 were also of the same type (0010076) as shown in Table 1. The other 29 isolates were of different antibiogram types and this could be an indication of the diverse locations of the origin of the strains, especially as UBTH is a catchment reference medical centre for very wide geographical locations. The stains were more susceptible to the quinolones and more resistant to the penicillin as evident by the penicillin group cumulative frequency, of 15.2% (highest recorded group cumulative frequency) compared to the quinolones 93.4% (group cumulative frequency) (Table 1). Also worrisome is the fact that the stains were basically resistant to common over the counter antibiotics like amoxicillin, ampicillin, and cloxacillin. The antibiogram method employed in this study, clearly distinguished all the isolated strains of *K. aerogenes.*

Conclusion

As previously mentioned antibiogram typing is relevantly cheap and an easily acquired method for strains discrimination and delineation. Although, the specificity and stability of this method is low, the same process applied for routine susceptible testing could at the same time be used for acquisition of antibiogram typing data. An inherent advantage of this method can be seen in the reduction of susceptibility result to numerical values (types) enabling one to easily identify the differences in susceptibility patterns.

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