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Original Research Article

Antibiotic susceptibility profile of acinetobacter isolates from various clinical specimens at a tertiary care hospital in South Karnataka

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ABSTRACT

Introduction: *Acinetobacter* is one of the most common pathogens causing Hospital acquired infections (HAIs) and has taken more and more imperative place as an opportunistic, difficult-to-treat pathogen. Development of drug resistance among them during recent years has made treatment of these infections difficult.

Objective: 1) To estimate the prevalence of *Acinetobacter* isolates among various clinical samples in the study setting. 2) To determine the antimicrobial susceptibility pattern among isolated *Acinetobacter* species.

Materials and Methods: A descriptive study was conducted over a period of one year from November 2012 to October 2013 in the Department of Microbiology, Mysore Medical College and Research Institute, Mysore among 110 *Acinetobacter* species isolated from various clinical specimens and antibiotic susceptibility testing was performed using Kirby-Bauer disc diffusion technique. Statistical analysis was done using Microsoft office excel 2010.

Results: Majority of the *Acinetobacter* species were isolated from patients younger than 1 year, male patients especially inpatients and that too among those admitted to Intensive care units (ICU) and majority were from pus samples. Antimicrobial susceptibility testing showed maximum resistance 93 (84.54%) to cephalosporin and maximum sensitivity 101(91.81%) to Colistin.

Conclusion: This study highlights the need for the surveillance to detect multidrug resistance *Acinetobacter* species, judicious use of antibiotics and implementation of appropriate infection control measures to control the spread of these strains in the hospital.

1. Introduction

Acinetobacter is a complex genus and historically, there has been confusion about the existence of multiple species.[1] Worldwide in the past two or three decades, especially since 2005-2006 members of the genus *Acinetobacter* have emerged from organisms of questionable pathogenicity to pan resistant nosocomial pathogens.[2] *Acinetobacter* species are gram negative, strictly aerobic, non-fastidious, non-fermenting encapsulated coccobacilli with more than 30 genomic types.[2,3] It's most important representative is *Acinetobacter baumanni*.

Acinetobacter species are opportunistic pathogens predominantly found in immunocompromised patients. They are widespread in nature, and regarded as commensal microbes of human skin and respiratory tract, however, they may cause serious infections, such as endocarditis, urinary tract infections, pneumonia, wound infections, meningitis, and septicemia, especially in individuals with impaired host defenses. The increased risk of infection is associated with the severity of patient's illness, length of exposure to invasive devices and procedures, increased risk of patient contact with health care personnel and length of stay in ICU. In addition to infection among hospitalized patients, community acquired *Acinetobacter* infection is increasingly reported in recent years.[3]

The genus Acinetobacter has taken more and more imperative place as an opportunistic, difficult-to-treat pathogen and is accredited as one of the six intricate pathogens "ESKAPE" (Enterococcus faecium,

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Staphylococcus aureus, Klebsiella pneumoniae, Acinetobacter baumanni, Pseudomonas aeruginosa, and *Enterobacter species)* to emphasise that they escape the lethal action of antibiotics.[4]

Acinetobacter species have become resistant to nearly all routinely prescribed antimicrobial agents like aminoglycosides, fluoroquinolones, broad-spectrum β-lactams and also against cephalosporins and carbapenems.[3] The appearance of resistant species is attributed to both inappropriate use of antimicrobials and health care associated transmission of drug-resistant strains among patients and have posed significant challenges for clinicians in their treatment.[4] With this background, the present study was undertaken to study antimicrobial susceptibility pattern among *Acinetobacter* species in the study setting.

2. Aims and Objectives

1. To estimate the prevalence of *Acinetobacter* isolates among various clinical samples in the study setting.
2. To determine the antimicrobial susceptibility pattern among isolated *Acinetobacter* species.

3. Materials and Methods

A descriptive study was conducted over a period of one year from November 2012 to October 2013 in the Department of Microbiology, Mysore Medical College and Research Institute, Mysore among 110 *Acinetobacter* species isolated from various clinical samples from patients. Ethical clearance was taken from the Ethical clearance committee. Permission was taken from the head of the institution.

3.1. Isolation of acinetobacter species

A total of 2750 culture positive clinical samples such as pus, urine, blood, sputum, CSF, endo tracheal aspirate, sputum and other body fluids were inoculated on 5% sheep blood agar and macconkey agar and incubated overnight aerobically at 37° C. All isolates obtained were further processed and identified by routine microbiological and biochemical tests. In case of urine samples, the isolates were subjected to biochemical tests only if the colony count was significant ($>10^5$ CFU/ml). Genus *Acinetobacter* was identified by characteristic colonies (Non Lactose-fermenting, glistening, small mucoid colonies), Gram staining pattern as Gram negative coccobacilli, motility as non-motile, and standard biochemical reactions (catalase, oxidase, oxidation-fermentation test, indole production, citrate utilization, urease activity, reaction in triple sugar iron medium.[5]

3.2. Antibiotic susceptibility testing

Antibiotic susceptibility testing was performed for each isolate by the Kirby-Bauer disc diffusion method. The antimicrobial agents used were- gentamicin (10μg), ciprofloxacin (5μg), cotrimoxazole (25μg), ceftazidime (30μg), ceftriaxone (30 μg), cefo-taxime (30μg), cefoperazone+sulbactam (75 μg /30 μg), amikacin (30μg), Tigecycline (15 μg), aztreonam (30 μg), piperacillin-tazobactam (100mg/10mg), imipenem (10mg), chloramphenicol (30μg), colistin (10μg). Antibiotic susceptibility results were interpreted by measuring the zone diameters produced and correlating them with the CLSI (Clinical and Laboratory Standard Institute) standards.[6]

3.3. Data collection

A pretested and semi structured proforma was used to collect data like name, age, sex, clinical presentation, predisposing factors, history of treatment as well as results of antibiotic susceptibility testing for all *Acinetobacter* isolates.

3.4. Statistical analysis

Statistical analysis was performed using Microsoft Excel 2010.

4. Results

1. Out of 2750 culture positive samples in the present study, 110 were found to be positive for *Acinetobacter* species thereby making a prevalence of 4%.
2. Table 1 illustrates distribution of *Acinetobacter* isolates according to some variables.
   i. Out of 110 isolates studied, maximum number i.e. 29 (26.36%) of isolates were from infants, followed by 19 (17.27%) in 20 - 29 year age group and 18 (16.36 %) in 40 - 49 years. Also 14 (12.72%) samples were among elderly aged >60 years as seen in the table.
   ii. Majority i.e. 60 (54.54%) of A*cinetobacter* species were found among males and the male: female ratio was 1.2:1.
   iii. Majority i.e.103 (93.60%) were inpatients.
   iv. Maximum number of the specimens i.e. 67(60.90%) were recovered from various wards (Medical, Surgical, ENT, OBG, Pediatrics wards etc) and nearly one third i.e. 36 (32.72%) from Intensive Care Units.
3. Table 2 demonstrate distribution of various clinical samples positive for *Acinetobacter* species. Pus with 51 (46.36%) samples and blood with 42 (38.18%) of samples accounted for significant contributors to *Acinetobacter* species in the present study.
4. Table 3 shows antibiotic susceptibility pattern of *Acinetobacter* species. In the present study among 110 *Acinetobacter* isolates, highest resistance i.e. 93 (84.54%) was seen against 3rd generation cephalosporins followed by chloramphenicol 89 (80.90%), cotrimoxazole 80 (72.72%), ciprofloxacin 76 (69.09%) and gentamicin 72 (65.45%).

Table 1: Distribution of *Acinetobacter* isolates according to variables (n = 110)

Variable	Classification	Number of isolates	Percentage (%)
Age in years	<1	29	26.36
	1-9	4	3.63
	10-19	8	7.27
	20-29	19	17.27
	30-39	12	10.9
	40-49	18	16.36
	50-59	6	5.45
	≥ 60	14	12.72
Gender	Male	60	54.54
	Female	50	45.45
Department	Inpatients	103	93.6
	Outpatients	7	6.4
Wards	General	67	60.9
	NICU	19	17.27
	ICU	17	15.45
	OPD	7	6.36

Table 2: Distribution of *Acinetobacter* isolates according to clinical samples (n = 110)

Specimen	No. of isolates	Percentage (%)
Pus	51	46.36
Blood	42	38.18
Urine	08	7.27
Endotracheal aspirate	6	5.45
Sputum	3	2.72
Total	110	100

5. Discussion

The prevalence of *Acinetobacter* isolates in the present study was 4% which is comparable with other studies.[3,14,16–20] On the contrary, many other studies[8,11,13,21–23] however have reported higher prevalence rates.[4] This variation could be due to differences in study settings, study design, method of isolation, sampling technique as well as differences in the profile of patients.

Majority i.e. 29 (26.36%) of isolates were from infants similar to the findings of study done by Madhu Sharma et. al.[24] and contrary to few other studies.[12,13,25] The male: female ratio was 1.2:1 which corroborates with other studies.[12,26] *Acinetobacter* isolates were more 103 (93.60%) from inpatients in confirmation with other studies[13,22,23] Similarly, maximum isolates were from wards 67 (60.90%) in line with another study.[3] This could be probably due to invasive diagnostic procedures; greater quantity of broad spectrum antimicrobials used and prolonged duration of stay in hospital among inpatients. Majority i.e. 51 (46.36%) of *Acinetobacter* species were isolated from pus samples, which is in agreement with the results reported previously in other studies.[8,10,11,18,27]

However, several other studies have stated higher isolation rates from clinical samples like urine,[3,4,16,23,28] blood[13,29–31] and respiratory secretions.[29–32]

In the present study, *Acinetobacter* species were found to be resistant to most commonly used antibiotics. The highest resistance was seen in third generation cephalosporins 93(84.54%) which was similar to the findings of other studies.[3,33] Resistance to Imipenem recorded was 57(51.81%) whereas lower resistance was reported by other studies. The result of the present

Table 3: Distribution of *Acinetobacter* isolates according to their antibiotic susceptibility pattern (n=110)

Antibiotic	Antibiotic susceptibility	
	Sensitive No. (%)	Resistant No. (%)
Ceftazidime	17(15.45)	93 (84.54)
Ceftriaxone	17 (15.45)	93(84.54)
Cefotaxime	17(15.45)	93(84.54)
Chloramphenicol	21(19.09)	89(80.90)
Cotrimoxazole	30(27.27)	80(72.72)
Ciprofloxacin	34(30.9)	76(69.09)
Gentamicin	38(34.54)	72(65.45)
Piperacillin+Tazobactam	40(36.36)	70(63.63)
Cefoperazone+Sulbactam	51(46.36)	59(53.63)
Imipenem	53(48.18)	57(51.81)
Aztreonam	56(50.9)	54(49.09)
Amikacin	64(58.18)	46(41.81)
Tigecycline	85(77.27)	25(22.72)
Colistin	101(91.81)	9(8.18)

Table 4: Comparison of antibiotic sensitivity of various studies with the present study

Study series	Antibiotic Sensitivity (%)													
	G	CF	CE	CA	CI	CO	AK	PT	CFS	TGC	I	AO	CL	C
Lone R, et al.[7]	13.70	30.80	34.20	-	38.20	-	-	-	88.50	-	98.5	-	-	-
Mindol I PB et. al.[8]	43.50	22.00	–	51.00	–	–	56.50	83.00	–	–	84.5	–	–	09
Parandekar PK et al.[9]	9.00	18.1	–	22.7	–	00	27.20	–	–	–	86,3	–	–	–
Tripath I PC et al[10]	13.00	15.00	00	00	–	13.00	55.14	13.18	–	–	57.0	–	–	-
Oberoi A et al.[11]	–	–	15.00	10.00	–	–	64.70	–	94.0	–	82.3	–	–	–
Maryam A et al.[12]	8.5	0.8	—	—-	— -	0.8	14.6	–	–	–	2.30	–	–	0.8
Single P, et al.[13]	31.33	32.60	11.00	3.33	8.66	19.66	43.33	31.66	-	-	63.0	–	100	-
Rit K, et al.[14]	29.87	–	–	25.9	–	–	85.71	81.80	–	–	94.8	–	–	12
Shareek PS, et al.[15]	–	28.00	12.20	28.00	10.50	22.80	24.50	21.00	33.33	61.40	24.5	14.00	–	–
Present study	**29.09**	**27.27**	**10.90**	**10.90**	**10.90**	**20.90**	**54.54**	**27.27**	**41.81**	**68.18**	**40.0**	**45.45**	**91.81**	**19.09**

study showed an increased prevalence of resistance of the *Acinetobacter* species against piperacillin/tazobactam combination with only 40(36.36%) isolates being sensitive. This is in accordance with studies done both within and outside India.[4,30,34] Similarly, *Acinetobacter* isolates showed maximum sensitivity to colistin 101(91.81%) in corroboration with other studies[3,4,13,15,19,30,32,34,35] and sensitivity to tigecycline was 75 (68.18%) which corroborates with other studies.[4,15,34]

6. Conclusion

The present study shows that the significance of *Acinetobacter* has increased as a nosocomial pathogen in various wards of the hospital because of high potential of this genus to develop multidrug resistance and highlights the need for its surveillance, judicious use of antibiotics andimplementation of appropriate infection control the spread of these strains in the hospital.

7. Source of funding

None.

8. Conflict of interest

None.

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