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Original Research Article

Prevalence and Emergence of Acinetobacter Spp. in a Tertiary Care Hospital

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Abstract:

Background: Acinetobacter are aerobic, non-fermentative gram-negative coccobacilli, non-capsulated, nonmotile and non-sporing and oxidase negative organism. It belongs to the family of Moraxellaceae. There is a development of antimicrobial resistance (AMR) and there is an emergence and spread of extended-spectrum beta-lactamases (ESBLs). This study aimed to determine the prevalence and isolate Acinetobacter in all clinical samples and to determine their susceptibility to antimicrobial agents and resistance for ESBL.

Materials and Methods: Prospective study was done for 1 year. With ethics committee approval and informed consent, clinical samples from 1-70 years from different IPDs and OPDs were included. Samples with incomplete information and contaminants were excluded. Isolation and identification of Acinetobacter spp were performed according to standard techniques.

Results: Among the 384 suspected samples received at the laboratory, A. baumannii accounted for 262 (68.22%) and it is the most common species followed by A.lwoffii 82 (21.35%) and others 40 (10.41%). The maximum numbers of Acinetobacter isolates were from Sputum 152 (39.58%). Antibiotic susceptibility pattern in Acinetobacter spp showed highly resistant to ampicillin (74%) and low resistant patterns to imipenem (4%), meropenem (5%), and piperacillin/tazobactam (7%). Among 384 isolates screened for ESBL production, 148 (38.54%) isolates were found to be ESBL producers.

Conclusions: This study estimated prevalence of Acinetobacter spp, their susceptibility pattern in our hospital setup, which will aid in development of an antibiotic policy for the hospital and coordinated effort to curtail inappropriate use of antibiotics as well as limit the spread of multidrug resistant bacteria.

Keywords: Acinetobacter baumannii, Prevalence, Multidrug Resistance; ESBL.

Introduction

Acinetobacter is a leading cause of nosocomial infections that severely threaten public health. They are aerobic, gram negative coccobacilli, non-fermentative, non-capsulated, nonmotile, non-sporing and oxidase negative organism. It belongs to the family of Moraxellaceae. [1] These organisms are not usually considered as normal human flora, the relatively high prevalence of Acinetobacter species in hospitals frequently results in colonization and infection in patients.[2] The vast majority of A. baumannii isolates arise in medical institutions and are closely associated with nosocomial infections, particularly in patients receiving intensive care and in immunocompromised individuals.[3] It causes a wide range of clinical complications such as pneumonia, septicaemia, urinary tract infections, skin and soft tissue infections, wound infections and meningitis especially in immunocompromised patients. [4] Acinetobacter spp have been reported to cause high mortality rate of 32-52% in blood stream infections. Similarly, mortality rates upto 70% have been reported in ICU acquired pneumonias. [5,6] Hence the identification of Acinetobacter spp. from clinical specimens is very essential.

The emergence of multidrug resistant isolates of Acinetobacter species causing nosocomial infections are of great concern worldwide In addition, once nosocomial outbreaks, it is difficult to thoroughly eradicate from the environment due to its remarkable resistance to disinfectants and its capacity to rapidly develop tolerance to these

antibacterial agents, contributing to prolonged colonisation and transmission.[7]

Hence in-vitro antimicrobial susceptibility pattern and identification of resistance pattern is important before treating Acinetobacter infections. Therefore, the present study was undertaken to assess the prevalence of Acinetobacter and antibiotic sensitivity pattern. This study will provide the necessary information to formulate a hospital antibiotic policy and also to prevent the spread of multidrug resistance strains in the community.

Objectives

1. To isolate, identify and speciate Acinetobacter isolates from various clinical specimens.
2. To determine antimicrobial susceptibility test pattern of these isolates and to detect extended spectrum beta lactamases (ESBL).

Materials and Methods

Source of data: The laboratory based study was conducted on Three hundred eighty four patient's samples over a period of one year from the inpatients and out patients visiting Vijayanagar Institute of Medical Sciences and Medical college Hospital, Ballari.

Ethical consideration:

The study was initiated after obtaining the Institutional ethics committee approval (**IEC NO. 62/2021**) and after written Informed consent from patients. All the patients satisfying the Eligibility criteria were included.

Eligibility criteria: The clinical samples of patients between age group 1-70 years, received for culture and sensitivity from different IPDs & OPDs to Microbiology Central Diagnostic laboratory of Vijayanagar Institute of Medical Sciences and Medical college Hospital, Ballari.

Exclusion criteria:

The Patients with colonization of Acinetobacter with no apparent clinical illness and isolate of repeated samples from the same patient were excluded. The samples with incomplete information and contaminants were also excluded.

Methods:

In this study a total of 384 clinically significant, consecutive, nonduplicate isolates of Acinetobacter spp. were enrolled. With universal safety precautions, the samples were collected from various clinical specimens and were subjected for gram stain and culture by standard conventional methods.[9,10] The bacterial isolates were biochemically identified. Genus Acinetobacter was identified by Gram staining, cell and colony morphology, TSI, Indole, mannitol motility media, urease, positive catalase test, negative oxidase test and absence of motility [11]

Speciation of Acinetobacter was performed on the basis of glucose oxidation, citrate utilization, beta haemolysis, growth at 37°C and 42°C, Arginine hydrolysis and susceptibility to chloramphenicol. [12-15]

After the identification of Acinetobacter species, the Kirby-Bauer disk diffusion method used to determine the drug resistance phenotype in compliance with the CLSI guidelines [16].

ESBL Detection by CLSI Phenotypic Confirmatory Method: In this method a lawn culture of test isolate was made as for disc diffusion procedure. Ceftazidime clavulanic acid disc (30µg/10µg) (Himedia) and ceftazidime disc 30µg (Himedia) were placed on the surface of the plate. The test isolate was considered to produce ESBL, if the zone size around the β lactamase inhibitor combination disc was increased by ≥5mm. The test was performed with appropriate controls. [17,18]

Results

Table 1 shows gender wise distribution of patients. There was a male predominance (61.7%) among the isolates obtained from the patients. Table 2 shows Distribution of Acinetobacter spp obtained from sample sources of Inpatients and outpatients. Table 3 gives Demographic distribution of Acinetobacter species isolates. The maximum numbers of patients were seen between 41-60 years of age. Table 4 Depicts clinical sample wise distribution of Acinetobacter species isolates. The maximum numbers of Acinetobacter isolates were from Sputum 152 (39.58%). Table 5 shows distribution of Acinetobacter isolates in various clinical specimens from different wards. Most of the isolates were from the department of Medicine 76 (19.79%), followed by the department of surgery 64(16.67%). Table 6 shows Types of species of Acinetobacter isolated. A.baumannii accounted for 262 (68.22%) and it is the most common species followed by A.lwoffii 82 (21.35%) and others 40 (10.41%). Table 7 shows Antibiotic susceptibility pattern in Acinetobacter species. It shows highly resistant to ampicillin (74%) and low resistant patterns to imipenem (4%), meropenem (5%), and piperacillin/tazobactam (7%). Table 8 shows detection of Extended Spectrum Beta Lactamase in Acinetobacter species. Among 384 isolates screened for ESBL production, 148(38.54%) isolates were found to be ESBL producers.

Table 1: Gender wise distribution of patients

Sex	No. of patients	Percentage%
Male	237	61.7 %
Female	147	38.3 %
Total	384	

Table 2: Distribution of Acinetobacter spp obtained from sample sources of Inpatients and Outpatients

S. No	Samples from hospital	Number of isolates (Total = 384)
1	Inpatients	246 (64%)
2	Outpatients	138 (36%)

Table 3: Demographic distribution of Acinetobacter species isolates

S. No	Age group (years)	Males 237(61.7%)	Females 147(38.3 %)	Total n=384
1	1 -10	2	00	2 (0.52%)
2	11-20	28	18	46(11.98%)
3	21-40	68	30	98(25.5%)
4	41-60	98	75	173(45.05%)
5	61-80	41	24	65(16.93%)
Total		**237**	**147**	**384**

Table 4: Clinical Sample wise distribution of Acinetobacter species isolates

Acinetobacter species isolates obtained from different clinical Samples	Numbers of Isolates	Percentage
Pus/ wound	99	25.78%
urine	88	22.92%
sputum	152	39.58%
Blood	22	5.73%
Body fluids	8	2.08%
others	15	3.90%
Total	384	

Table 5: Distribution of Acinetobacter isolates in various clinical specimens from different wards

S. No	Department	Number of Acinetobacter isolated	Percentage
1	Surgery	64	16.67%
2	Obstetrics and Gynaecology	57	14.84%
3	Orthopaedics	50	13.02%
4	urology	51	13.28%
5	ICU	56	14.58%
6	Medicine	76	19.79%
7	others	30	7.81%
	Total	**384**	100 **%**

Table 6: Types of species of Acinetobacter isolated

Species isolated	Number of isolates (Percentage)
A.baumannii	262 (68.22%)
A.lwoffii	82(21.35 %)
Other Acinetobacter spp	40 (10.41 %)
Total	384

Table 7: Antibiotic susceptibility pattern in Acinetobacter species

Antibiotics	Percentage Sensitivity
Ampicillin	26%
Gentamicin 10µg)	72%
Amikacin (30µg)	76%
Amox-clav	81%
Piperacillin/Tazobactum 100/10µg	93%
Cefepime (30µg)	85%
Cefotaxime (30µg	67%
Ceftriaxone	63%
Ceftazidime(30µg)	75%
Ciprofloxacin (5µg)	54%

Ofloxacin	59%
Imipenem (10µg)	96%
Meropenem 10µg)	95%
Nitrofurantoin	72%
Cotrimoxazole (1.25/23.75µg)	51%

Table 8: Detection of Extended Spectrum Beta Lactamase in Acinetobacter species

ESBL producers	ESBL producers	NON-ESBL producers
	148 (38.54 %)	236 (61.46%)

Discussion

Hospital-acquired infections caused by Acinetobacter baumannii cause a significant threat to health and patient safety worldwide as a result of the continuing decline in treatment options. It has gained importance because of its ability to survive under a wide range of environmental conditions, having numerous intrinsic and acquired drug resistance mechanisms and the emergence of multidrug strains. [19,20] A total of 1407 suspected cases were studied during one year period. Out of these 384 samples were positive for Acinetobacter accounting for prevalence of 27.29 %. The study results are comparable to that of Nisar Ahmad et al.[21]

In the present study, there was a male predominance (61.7%) among the isolates obtained from the patients. The gender ratio (M:F) was 1.61:1, which is compared to study done by Muktikesh Dash et al. [22] where he reported male to female ratio of 1.08:1. The maximum numbers of Acinetobacter isolates were from Sputum 152 (39.58%). This is similar to the study conducted by Apoorva Tripathi et al. [23] where it has accounted for 35.78% of isolates. Whereas study done by Muktikesh Dash et al. [22] has reported that Acinetobacter isolates were common from pus sample 56.9% but in our study pus accounted for 99 (25.78%). Most of the isolates were from the department of Medicine (19.79%), followed by the department of Surgery (16.67%). In the present study, Acinetobacter species were isolated, of which A.baumannii accounted for 262 (68.22%) and it is the most common species followed by A.lwoffii 82 (21.35%) and others 40 (10.41%). This is similar to the study conducted by Muktikesh Dash et al. [22] where they have documented for 79.6% isolates were A. baumannii, 12.4% were A.lwoffii and 8% were other species. Similarly Apoorva Tripathi et al. [23] have reported that 74.50% isolates were A.baumannii and 24.50% were A.lwoffii.

In the present study, most of the Acinetobacter spp. was highly resistant to ampicillin (74%), cotrimaxozole (49%), cefepime (89%), ciprofloxacin (46%), ofloxacin (41%), ampicillin/sulbactam (29%), ceftriaxone (37%), cefotaxime (33%), gentamicin (28%), amikacin (24%). The low resistant patterns of imipenem (4%), meropenem (5%), and piperacillin/tazobactam (7%) indicate that they are effective drugs. Extended spectrum beta lactamases continue to be a major challenge in health care institutions; hence the knowledge about their prevalence is an essential guide towards appropriate antibiotic treatment. In the present study all the 384 isolates were screened for ESBL production. 148(38.54%) isolates were found to be ESBL producers. Whereas study conducted by Sinha et al. have reported 28% of ESBL in Acinetobacter spp. And Vahaboglu et al [24], Yong et al.[25] and Manu Chaudhary et al.[26] have documented ESBL production of 46%, 54.63% and 83.6% respectively.

Conclusion

The prevalence of A. baumannii in all age groups irrespective of gender advocates regular detection of this bacteria and judicious use of antibiotics to which they are still susceptible. Hospital infection control committee of health care institutions should curtail inappropriate use of antibiotics and to have antimicrobial stewardship program in place, be vigilant in detection of resistant Acinetobacters.

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