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Study of Emergence, Prevalence and Sensitivity Pattern of Acinectobacter Spp. in Tertiery Care Hospital Jamnagar, Gujarat, India

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Abstract: Acinetobacter has emerged as significant hospital pathogen involved in outbreaks of hospital infections, notoriously known to acquire antibiotic resistance to most of the commonly prescribed antimicrobials. Many risk factors are associated with Acinetobacter infections, especially in patients in intensive care unit (ICU). Acinetobacter species tend to be resistant to a variety of antibiotics and thus the infections are difficult to treat. This study aims to isolate Acinetobacter from various clinical samples and to determine its antimicrobial sensitivity pattern. The objectives of the present study were; 1) To isolate Acinetobacter species from various clinical samples. 2) To study their Antibiogram pattern of the Isolated Organisms**.** A total of 93 Acinetobacter species were isolated from various clinical samples. Identification of Acinetobacter was done on the basis of hemolysis on blood agar, growth at 42ºC, and oxidation fermentation test. Antibiotic susceptibility testing was done as per standard CLSI guidelines (2017). Maximum isolation of Acinetobacter species were from pus or wound swabs 57 (61.29%) followed by sputum and tracheal secretions 21 (22.58%) and urine 15 (16.12%) samples. Most of the strains were sensitive to imipenem (97%), piperacillin-tazobactam (91.39%), and getifloxacin (86%) whereas, maximum resistance was observed to co-trimoxazole (10.75%) and gentamicin (9.67%). Acinetobacter spp. has emerged as a major nosocomial pathogen. Broad-spectrum antibiotics should be used with caution and only after antibiotic susceptibility testing. Early identification and continued surveillance of prevalent organism will help prevent the spread of Acinetobacter in hospital environment. Empirical antibiotic policy should be determined for each hospital according to the resistance rates of that hospital setting.
Keywords: Acinetobacter spp., frequency, antibiotics, resistance, nosocomial pathogen.

INTRODUCTION

Acinetobacter baumannii, non-fermenting Gram-negative baciili has become an emerging pathogen especially in the hospitals owing to its ability to survive in adverse environmental conditions [1]. Acinetobacter species is associated with health care associated infections especially in patients on respiratory therapy equipment and indwelling catheters. The infections caused by this pathogen include pneumonia, septicemia, wound sepsis, urinary tract infection, endocarditis, and meningitis. A. baumannii is the most common species [2]. Antibiotic resistance and the ability of the organism to survive in the moist environment has contributed to the survival and spread of this pathogen in hospital settings [3]. The risk factors associated with Acinetobacter infections include presence of prosthesis, endotracheal intubation, intravenous catheters and prior antibiotic therapy, length of intensive care unit (ICU) and hospital stay, recent surgery, and invasive procedures [4]. The rate of antimicrobial resistance in this organism is very high, and thus the infections are difficult to treat. With the increase in the use of carbapenems to treat the resistant strains, there is a surge in the rates of carbapenem resistance. Use of polymyxin, colistin, and tigecycline is considered to treat the carbapenem resistant strains [5]. The knowledge of the prevalence and pattern of antimicrobial susceptibility pattern of Acinetobacter spp. is important [5, 6].

MATERIALS & METHODOLOGY

A total of 4127 samples includes 2318 pus samples, 616 sputum and tracheal secretions, 902 urine samples and 291 blood culture received from various wards & ICUs at microbiology laboratory during the period from January to July 2018 were included. Isolation, identification and antibiogram of Acinetobacter species were included in the study. Processing of other bacterial isolates was excluded. Non-fermenters were initially separated and further identified as Acinetobacter spp. In Gram stain of direct smears Acinetobacter appeared as tiny, Gram-negative coccobacillary cells often appearing as diplococci (Fig-1) [7]. All specimens were inoculated on 10% sheep blood agar (Fig-2) and MacConkey agar (Fig 3 & 4) and incubated at 37°C for 18-24 [8]. Colonies on blood agar were 0.5-2 mm diameter, translucent to opaque, convex and entire. On MacConkey agar a faint pink tint were produced [7]. Gram stain, catalase, oxidase and motility tests were performed. Acinetobacter are Gram-negative Coccobacilli, non-motile, strictly aerobic, catalase positive and oxidase negative. Formation of acid in 10% lactose seen in A.baumannii but not in A lwofii (Fig-5). Rapid utilization of 10% glucose was seen with O-F medium. The antibiotic susceptibility testing was done by Kirby-Bauer disk diffusion method & zones were interpreted as per CLSI 2017 (Fig-6).

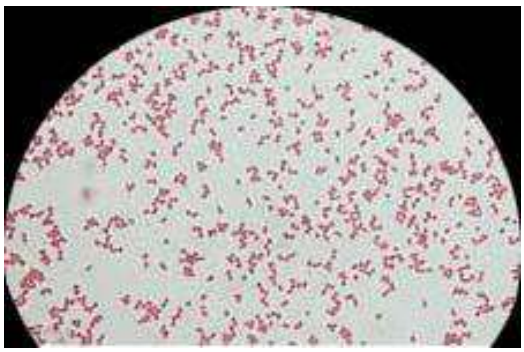

Fig-1: Gram stain from growth

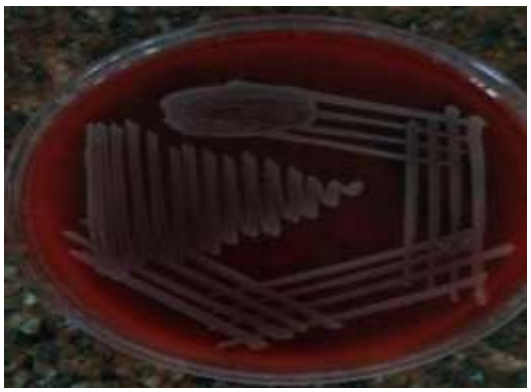

Fig-2: Acinetobacter growth on Blood agar

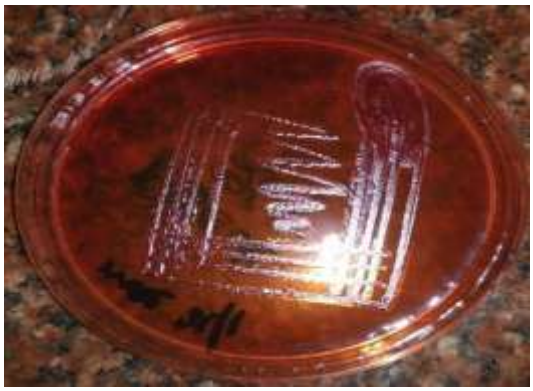

Fig-3: A. baumannii on MacConkey agar

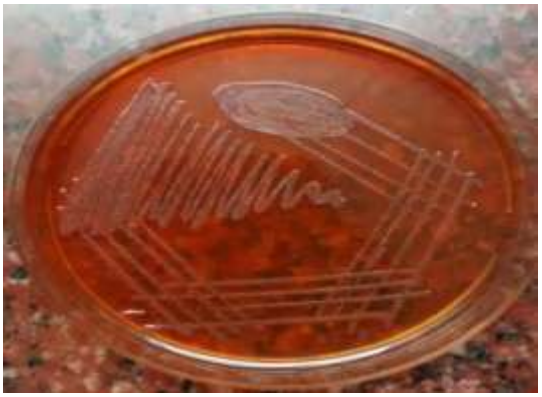

Fig-4: A. lwoffii on MacConkey agar

Fig-5: Utilization of 10% lactose

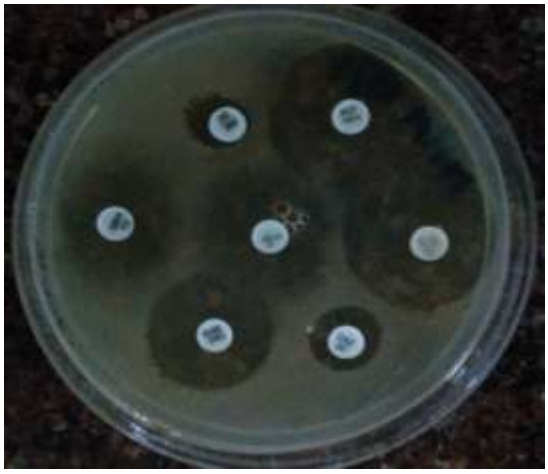

Fig-6: Antibiotic susceptibility testing A. baumannii (+Ve) & A. lwoffii (-Ve)

RESULTS

Out of 4127 clinical samples, 1110 (27%) yielded significant growth, out of them 93 (8.37%) Acinetobacter isolated. Maximum isolation of Acinetobacter species was from pus or wound swabs 57 (61.29%) followed by sputum and tracheal secretions 21 (22.58%) and urine 15 (16.12%) samples.

Out of 93 isolates 90 (96.77%) Acinetobacter baumannii were isolated and 3 (3.22%) were Acinetobacter lwoffii. Out of them 60 (64.51%) were males and 33 (35.48%) were female. Middle age and elderly age group were commonly affected in our study, associated with comorbidities, and long hospital stay.

Most of the strains were sensitive to imipenem (97%), piperacillin-tazobactam (91.39%), and getifloxacin (86%) whereas, maximum resistance was observed to co-trimoxazole (10.75%) and gentamicin (9.67%). In general wards and in ICU, A. baumannii was more resistant to commonly used antimicrobials.

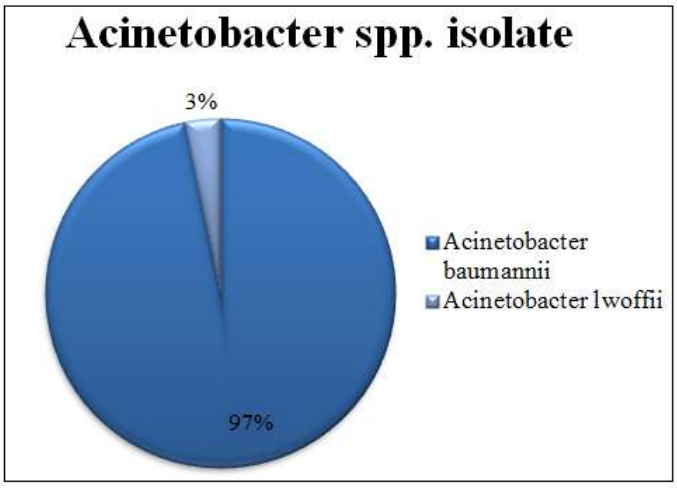

Fig-7: Acinetobacter spp. Isolate

Table-1: Distribution of Acinetobacter different clinical samples

Clinical samples	No. of isolates
Pus/ wound swab swab	57 (61.29%)
Sputum/tracheal secretions	21(22.58%)
Urine	15(16.12%)

Table-2: Age and Gender wise distribution n= 93

Age (Year)	Male	Female
0-20 Year	9	5
21-40 Year	12	7
41-60 Year	29	17
>60 Year	10	4
Total	60	33

Table-3: Antibiotic Sensitivity of Acinetobacter Spp. Isolates by kirby-bauer disc diffusion method

Antibiotics	Sensitivity (%)
Imipenem (IPM)	97%
Piperacillin-Tezobectum (PTZ)	91.39%
Gatifloxacin (GF)	86%
Cefotaxime (CF)	37.63%
Amikacin (AK)	37.63%
Tetracycline (TE)	32.25%
Doxycyclin (DO)	32.25%
Ceftizoxime (CI)	21.5%
Ampicillin-Salbactum (AS)	21.5%
Ofloxacin (ZN)	21.5%
Co-trimoxazole (BA)	10.75%
Gentamicin (GM)	9.67%

DISCUSSION

Acinetobacter Species is widely distributed and has tremendous colonizing potential, hence it became very difficult to explain its significant role in the ICU [9]. Acinetobacter baumanni is now recognized as the species of great clinical importance [10]. In present study that 60 (64.51%) were males and 33 (35.48%) were females which correlates with Smeeta Huidrom *et al.*, [11] (66.1% & 33.9%) and RL Koripella *et al.*, [12] (51.4 % & 48.6%).

Middle and elderly age group were more affected in our study which correlates with Smeeta Huidrom *et al.*, [11] and RL Koripella *et al.*, [12].

In present study 93 (8.37%) were culture positive for Acinetobacter Species from the samples received from various wards and ICU of the hospital. Prevalence rates of 9.6% and 7.8% among hospital isolates were observed by Joshi *et al.*, [14] and RL Koripella *et al.*, [12]. The prevalence rate of this study is less compared to 14% and 12.6% rates among the

hospital isolates reported by Mostofi *et al.*, [13] and Smeeta Huidrom *et al*., [11] respectively, and prevalence rate of this study is higher compare to 4.5% and 3% Rit *et al*., [15] and Dash *et al.*, 16] respectively. There is a significant difference in the behavior and spread of multi-drug resistant Acinetobacter spp. recovered various geographic locations [17].

In present study, maximum isolation of Acinetobacter species was from pus swabs followed by sputum and tracheal secretions. These findings were similar to the study by Dash *et al.*, [16], Suryawanshi N M *et al*., [18] and Chakraborty *et al*., [19].

Out of 93 isolates, 90 (96.77%) A. baumannii were isolated and 3 (3.22%) were Acinetobacter lwoffii. Which were similar to sridevi shridhar *et al*., [20] 191 isolates, 178 (93.2%) A. baumannii were isolated and 8 (4.2%) were Acinetobacter lwoffii.

In present study, majority of the isolates were found to be resistant to commonly used antibiotics such as Co-timoxazole, Gentamicin, Ofloxacine, Ceftizoxime, and Ampicillin-salbactum. Reserve drugs such as imipenem, and piperacillin/tazobactam were found to be more potent antibiotics against this pathogen which were similar to Suryawanshi N M *et al.*, [18].

CONCLUSIONS

Acinetobacter spp. has emerged as a major nosocomial pathogen and antibiotic resistance is on rise. Broad spectrum antibiotics should be used with caution and only after antibiotic susceptibility testing. Empirical antibiotic policy should be determined for each hospital according to the resistance rates of that hospital setting. A combined effort of surveillance and infection control protocols has to be implemented to control the increasing incidence of highly resistance Acinetobacter infections.

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