

Prevalence of Non Fermenting Gram Negative Bacilli Infections in a Tertiary Care Hospital

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Abstract

Background and Objective: Non fermenting Gram Negative bacilli (NFGNB) are saprophytic in nature and have emerged as important healthcare associated pathogens. NFGNB group which are known to cause infections are *Pseudomonas aeruginosa*, *Acinetobacter baumannii*, *Burkholderia cepacia complex* and *Stenotrophomonas maltophilia*. This study was undertaken to identify the various non fermenters isolated from patients admitted to our hospital, to assess their clinical significance and type of healthcare associated infections they caused and to know their antimicrobial sensitivity pattern. **Methodology:** A total of 200 non fermenter isolates from various clinical specimens received in department of Microbiology, Adichunchanagiri Institute of Medical Sciences, B.G. Nagara formed the study group. Samples were inoculated on blood agar, MacConkey agar, chocolate agar and incubated at 37°C for 18-24 hours. The clinical isolates were identified using the conventional methods and susceptibility testing was done by Kirby-Bauer disc diffusion method as per CLSI guidelines. **Results:** 200 NFGNB were isolated from various clinical specimens. *Pseudomonas aeruginosa* was the most common isolate accounting for 140 (70%) followed by *Acinetobacter baumannii* 32 (16%) and other nonfermenters 28 (14%). *P.aeruginosa* showed sensitivity to imipenem (94.2%), ceftazidime (70.7%), amikacin (69.2%), tobramycin and ticarcillin (62.8%). *A.baumannii* showed 100% sensitivity to imipenem and 53.1% sensitivity to amikacin and gentamicin. **Conclusion:** *P.aeruginosa* and *A.baumannii* were the common NFGNB isolated in our study from patients of urinary tract infections, surgical site infections, bacteremia and ventilator associated pneumonia. Thus NFGNB are emerging as important opportunistic pathogens and are resistant to commonly used antimicrobials. Therefore early diagnosis and institution of empirical therapy based on antibiotic sensitivity data of the institute would decrease mortality and improve patient management.

Keywords: Non Fermenting Gram Negative Bacilli (NFGNB); *Pseudomonas*; *Acinetobacter*.

Introduction

Non Fermenting Gram Negative Bacilli (NFGNB) are a group of aerobic, non-sporing, bacilli/coccobacilli which are either incapable of utilizing carbohydrates as a source of energy or degrade them via oxidative, rather than fermentative pathway. This group includes numerous organisms

but the ones which are known to cause nosocomial infections are *Pseudomonas aeruginosa*, *Acinetobacter baumannii*, *Burkholderia cepacia complex* (BCC) and *Stenotrophomonas maltophilia* [1-5]. NFGNB are known to account for about 15% of all bacterial isolates from a clinical microbiology laboratory [6]. They can be recovered from hospital environment and are often resistant to disinfectants and have the potential to spread from patient to patient

via fomites or the hands of medical personnel. In recent years, due to the liberal and empirical use of antibiotics, NFGNB have emerged as important healthcare-associated pathogens. They have been incriminated in infections such as septicemia, meningitis, pneumonia, urinary tract infections (UTI) and surgical site infections (SSI) [7]. NFGNB are innately resistant to many antibiotics and are known to produce extended spectrum β -lactamases and metallo β -lactamases. The antimicrobial resistance exhibited by the NFGNB facilitates colonization and super infection in antibiotic treated patients [2-7].

The aim of the present study was to isolate and identify various non fermenters isolates from patients admitted to our hospital and to assess their antimicrobial susceptibility pattern.

Materials and methods

The present study was carried out in the department of Microbiology, Adichunchanagiri Institute of Medical Sciences, B.G.Nagara for a period of one and half years. Ethical committee clearance was taken from the institution. A total of 200 non fermenter isolates were isolated from various clinical samples like urine, pus, blood, sputum, endotracheal aspiration collected from patients. The samples were inoculated on blood agar, MacConkey agar, chocolate agar and incubated at 37°C for 18-24 hours. The organisms isolated were identified using standard procedures. All the organisms that grew on Triple Sugar Iron agar and produced an alkaline reaction were provisionally considered to be NFGNB and identified further by using a standard protocol for identification [1]. The characters assessed are morphology on Gram's

stain, motility, pigment production, oxidase test, OF test (Hugh-Leifson's medium) for glucose, lactose, sucrose, maltose, mannitol and xylose, growth on 10% lactose agar, lysine and arginine decarboxylase test and gelatin liquefaction test.

The antibiotic susceptibility test was performed by Kirby-Bauer disc diffusion method using commercially available discs (Hi-media). The different antimicrobials tested were Imipenem (10 μ g), Meropenem (10 μ g), Piperacillin-Tazobactam (100/10 μ g), Netilmycin (30 μ g), Ticarcillin (75 μ g), Amikacin (30 μ g), Gentamicin (10 μ g), Tobramycin (10 μ g), Ciprofloxacin (5 μ g), Ofloxacin (5 μ g), Levofloxacin (5 μ g), Ceftazidime (30 μ g), Ceftriaxone (30 μ g), Cefepime (30 μ g) and Trimethoprim/sulfamethoxazole. The results were interpreted as per the CLSI guidelines [8]. *E.coli* ATCC 25922 and *P.aeruginosa* ATCC 27853 were used as the control strains.

Results

A total of 200 non fermenting Gram negative bacilli were isolated from various clinical specimens like urine, pus, blood, sputum, endotracheal aspiration and body fluids collected from out-patients and in-patients admitted in the hospital. Of these 200 strains of NFGNB, 120 (60%) were from males and 80 (40%) were from females. Most of them belonged to the age group 41-60 years (65, 32.5%), followed by patients of more than 60 years of age (50, 25%) as shown in Table 1.

Out of 200 clinical samples, majority of the isolates were from pus (117) followed by sputum (24), urine (23), blood (22), endotracheal aspiration (9) and body fluid samples (5). The NFGNB isolated from various clinical samples are shown in table 2

Table 1: Age and Gender Wise Distribution of Clinical Isolates of NFGNB

Age group (years)	Male (no.)	Female (no.)	Total (no.)%
<20	25	20	45 (22.5%)
21-40	20	20	40 (20%)
41-60	35	30	65 (32.5%)
>60	40	10	50 (25%)
Total	120	80	200 (100%)

Table 2: NFGNB isolated from various clinical samples

Organisms	Pus	Sputum	Urine	Blood	ET aspirates	Fluid aspirates
<i>Pseudomonas aeruginosa</i>	75	15	20	18	7	5
<i>Acinetobacter baumannii</i>	24	3	2	1	2	0
Other NFGNB	18	6	1	3	0	0
Total	117(58.5%)	24(12%)	23(11.5%)	22(11%)	9(4.5%)	5(2.5%)

Table 3: NFGNB Isolated

Organisms isolated	Number	Percentage (%)
<i>Pseudomonas aeruginosa</i>	140	70%
<i>Acinetobacter baumannii</i>	32	16%
Other NFGNB	28	14%

Table 4: Antimicrobial Susceptibility Patterns of various NFGNB

Antibiotic	No / % of sensitive <i>pseudomonas</i> isolates	No / % of sensitive <i>Acinetobacter</i> isolates	No / % of sensitive other NFGNB isolates	Total
Ceftazidime	99 (70.7%)	10 (31.2%)	5 (17.8%)	114
Ceftriaxone	84 (60%)	11 (34.3%)	4 (14.2%)	99
Cefetoxime	82 (58.5%)	11 (34.3%)	2 (7.1%)	95
Cefipime	87 (62.1%)	12 (37.5%)	3 (10.7%)	102
Meropenem	128 (91.4%)	31 (96.8%)	16 (57.1%)	175
Imepenem	132 (94.2%)	32 (100%)	17 (60.7%)	181
Piperacillin\tazobactam	79 (56.4%)	23 (71.8%)	15 (53.5%)	117
Netilmicin	80 (57.1%)	15 (46.8%)	8 (28.5%)	103
Ticarcillin	88 (62.8%)	16 (50%)	5 (17.8%)	109
Ciprofloxacin	62 (44.2%)	14 (43.7%)	6 (21.4%)	82
Ofloxacin	60 (42.8%)	15 (46.8%)	5 (17.8%)	80
Levofloxacin	65 (46.4%)	15 (46.8%)	6 (21.4%)	86
Amikacin	97 (69.2%)	17 (53.1%)	5 (17.8%)	119
Gentamicin	80 (57.1%)	17 (53.1%)	5 (17.8%)	102
Tobramycin	88 (62.8%)	16 (50%)	4 (14.2%)	108
Trimethoprim/Sulfamethoxazole	50 (35.7%)	11 (34.3%)	3 (10.7%)	64

The most common isolate was *Pseudomonas aeruginosa* 140 (70%), followed by *Acinetobacter baumannii* 32 (16%) and other NFGNB 28 (14%). The majority of the non fermenters were isolated from pus and sputum samples. The numbers and percentage of *Pseudomonas aeruginosa*, *Acinetobacter baumannii* and other NFGNB isolated from different specimens are shown in table 3

In the present study, most of the isolates of *P. aeruginosa* were sensitive to imipenem (94.2%), ceftazidime (70.7%), amikacin (69.2%), tobramycin and ticarcillin (62.8%). *A.baumannii* showed 100% sensitivity to imipenem followed by 71.8% to Piperacillin and 53.1% to amikacin and gentamicin. Sensitivity pattern of the NFGNB isolated is shown in table 4

Discussion

NFGNB are emerging as important opportunistic pathogens and are resistant to commonly used antimicrobials. In recent years, a considerable increase in the prevalence of multidrug resistance among non fermenting Gram negative bacilli has been noticed with high morbidity and mortality,

hence performing antibiotic susceptibility testing on a regular as well as a periodic basis is necessary.

In this study, a total of 200 (13.5%) isolates of NFGNB were isolated from various clinical samples received from out-patients and in-patients admitted in the hospital and their antimicrobial susceptibility patterns were determined. Majority of isolates were from male and older age group 41-60 years (65, 32.5%), followed by patients of more than 60 years of age (50,25%). This may be due to decreased immunity, prolonged hospitalization and other associated co-morbidities in these age group.

In the present study, the most common NFGNB isolate was *Pseudomonas aeruginosa* (70%) correlating with the study of Arora et al., (72.83%), Malini et al., (64.4%) and Vijaya D et al., (78.94%) [9-11]. The second commonest isolate was *Acinetobacter baumannii* 32%, which is correlating with the study of Juyal D et al., (29.27%), Malini D et al.,(25.3%) and in contrary Arora D et al., reported 8.4% [9,10,12].

Majority of *Pseudomonas aeruginosa* (64.1%) were isolated from pus specimens, which is comparable with the study conducted by Dipak Bhargava et al., (43.9%), where as Hariom Sharan et al.,reported 26.32%[13,14].

In the present study, *Pseudomonas aeruginosa* was highly sensitive to Imipenem (94.2%), which correlates with the study of Kamalraj et al., (88.4%) and Vikas Jain et al., (78.57%). *Acinetobacter baumannii* showed high sensitivity to imipenem (100%) which is comparable with the study of Vikas Jain et al. [15,16].

Conclusion

In the present study, NFGNB have emerged as an important pathogen and shows resistance to commonly used antimicrobial drugs. To minimize the drug resistance, importance should be given to proper identification of organism and regular antibiotic susceptibility monitoring is essential, which helps and guides the physicians to prescribe the right combinations of anti-microbial drugs for proper management and prevention of the emergence of MDR.

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