ISSN: 2309-3234

TMSS MEDICAL COLLEGE JOURNAL

Volume 02, No. 2, January 2014

AN OFFICIAL PUBLICATION OF TMSS MEDICAL COLLEGE, BOGRA

TMSS MEDICAL COLLEGE JOURNAL
JANUARY 2014

AN OFFICAL PUBLICATION
OF
TMSS MEDICAL COLLEGE, BOGRA

TMSS Medical College Journal

Vol. 2, No. 2, January 2014

AN OFFICAL PUBLICATION OF TMSS MEDICAL COLLEGE, BOGRA, BANGLADESH

Published by

Prof. Dr. Azfarul Habib
on behalf of the TMSS Medical College

Printed at

the graphic point
Uttara Market, Chalkjadu Road, Bogra
Phone : 051-64219

Address of Correspondence

Executive Editor, TMSS Medical College Journal,
TMSS Medical College, Rangpur Road,
Thengamara, Bogra, Bangladesh.
Phone : 051-61830, Fax : : 051-61830
Web : www.tmssmedicalcollege.com
e-mail : raghibraj@gmail.com

FREQUENCY AND ANTIMICROBIAL SENSITIVITY PATTERN OF GNB AMONG HOSPITAL AND COMMUNITY ACQUIRED INFECTION AT MYMENSINGH REGION IN BANGLADESH

YASMIN T[1], HOSSAIN M A[2], PAUL S K[3], MOWLA G[4], SULTANA S[5], MONDAL S R[6], BHUIYAN M K[7].

1. Dr. Taslima Yesmin, Assistant Professor, Dept. of Microbiology, TMSS Medical College, Bogra
2. Prof. Dr. Md. Akram Hossain, Professor of Microbiology, Mymensingh Medical College, Mymensingh
3. Dr. Shyamol Kumar Paul, Dept. of Microbiology, Mymensingh Medical College, Mymensingh
4. Dr. Golam Mowla, Assistant Registar, Dept. of Neonatology, Mymensingh Medical College, Mymensingh
5. Dr. Safia Sultana, Assistant Professor, Dept. of Microbiology, Syed Nazrul Islam Medical College, Kishorjong
6. Dr. Swapna Rani Mondal, Asstt. Professor, Dept. of Radiology and Imaging, TMSS Medical College and RCH, Bogra.
7. Mohammed Kamrujjaman Bhuiyan, Associate Professor, Dept. of Statistics Bangladesh Agricultural University.

ABSTRACT

Background: Gram negative bacteria are notorious bacteria both in nosocomial and community acquired infection and they are resistant to many antibiotics. **Objective:** This study was undertaken to see frequency of GNB among Hospital and Community acquired infection and their sensitivity pattern. **Methodology:** This cross sectional study was carried out in the department of Microbiology at Mymensingh Medical College from January 2011 to June 2011 for a period of 6 months. Specimens were processed and bacteria were isolated and identified according to standard procedure. The susceptibility test was determined by Kirby Bauer method on Muller Hinton agar media. **Result:** A total of 300 gram negative isolates were taken. Among them urine were 216 (72%), wound swab 45 (15 %), pus 39 (13%). Among them most prevalent organisms isolated from Hospital and community were Proteus spp. 54.5% and Klebsiella spp. (62%) respectively. All the isolates were sensitive to imipenem and nitrofurantoin followed by amikacin 70%. A relatively higher rate of resistance to gentamicin, co-trimoxazole, azithromycin and quinolones were also observed. **Conclusion:** This study helps to suggested that GNB were not only common in Hospital acquired infection but also in community and give an antibiotic policy for the physicians to treat patients.

INTRODUCTION

Humans have been plagued with the threat of bacterial infection since before the dawn of recorded history, and have thus always had a keen interest in finding a suitable treatment for these agents[1]. The development of extended spectrum cephalosporins in the early 1980 s was regarded as a major addition to our therapeutic armamentarium in the fight against beta-lactamase mediated bacterial resistance[2]. The bacteria were subdivided according to whether the infection was nosocomial or community acquired, Gram negative bacteria are the major pathogens in hospitalized patients with weakened host defenses, due to malignancy, malnutrition, debilitation, trauma, a prolonged antibiotic use and surgery[3]. The most frequently bacteria are E. coli, Klebsiella pneumoniae, Pseudomonas aeruginosa, Enterobacter and Acinetobacter baumanii, hence these organisms are established as the source of the infection, they are aggressively treated with antimicrobial drugs[4]. The majority of hospitalized patients receive antibiotics for therapy or prophylaxis during their inpatient treatment same as community patients[5]. Over prescribing not only increases the costs of health care, but may result in super infection due to antibiotic-resistant bacteria, as well as opportunistic fungi, and may increase the likelihood of an adverse drug reaction[6]. These organisms are also isolated with increasing frequency from patients in extended-care facilities and recently from those with community-onset disease[7]. So, the present study was undertaken to see the frequency of nososcomial and hospital acquired GNB (Gram negative bacilli) with their antibiotic sensitivity pattern, with the aim to reduce health care coast, decrease drug resistance bacteria and formulate an antibiotic policy.

Key words: Gram negative bacilli, Esch.coli. Klebsiella spp,.

MATERIAL AND METHODS

This cross sectional study was conducted in the laboratory of the Department of Microbiology at Mymensingh Medical College, Mymensingh. Mymensingh is situated around 60 km from Dhaka city of Bangladesh. This study was carried out from January 2011 to June 2011 for a period of 6 months. All the patients at any age with both sexes presented with UTI and skin wound infection who were attended at the OPD as well as the patients who were admitted in the IPD were taken as study population. Specimens were collected aseptically. Thereafter, specimens were processed and bacteria were isolated and identified according to standard procedure[8]. All samples were routinely cultured on MacConkey's agar media and blood agar plates at 37…C aerobically for 18 hours. Gram negative isolates were further identified by standard biochemical tests8. The susceptibility test was determined by Kirby Bauer method on Muller Hinton agar media according to Clinical Laboratory Standerd Institute (CLSI 2010)[9].

RESULTS

During the 6 months period, a total of 300 Gram negative isolates from various clinical specimens were included in the study. The specimens were urine 216 (72%), wound swab 45 (15 %), pus 39 (13%). Out of 300 Gram negative isolates in this study majority were Esch. coli 156 (52%), followed by Proteus spp. 55 (18.3%), Klebsiella spp. 45 (15%), Pseudomonas spp. 9 (3%) and others (Enterobacter spp., Citrobacter spp.) 35 (11.7%) Figure 1. Klebsiella spp. (62%), was found to be the most prevalent organisms isolated from the community followed by, Esch. coli 57% Proteus spp. 45%, Pseudomonas spp 44.4%. On the other hand Proteus spp. 54.5% was found to be the most prevalent organisms isolated from the community followed by Esch. coli 42.9%, Klebsiella spp. 37.7%, Pseudomonas spp (5/9, 55.5%) (Table -I). Aztreonam, Ampicillin, Amoxyclave and Piperacillin were more resistant. Among them in Klebsiella spp. was more resistant than Esch. coli. The entire isolated organisms in this study were 100% sensitive to Imepenem and 98% sensitive to Nitrofurantoin (Table II).

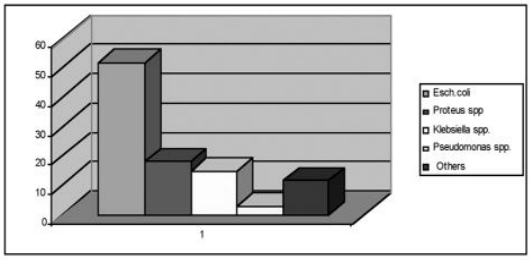

Figure 1 : Detection rate of different isolates in the study population.

Table-I Showed pattern of organisms isolated from the community and hospital. Klebsiella spp. (62%), was found to be the most prevalent organisms isolated from the community followed by, Esch. coli 57% Proteus spp. 45%, Pseudomonas spp 44.4%. On the other hand Proteus spp. 54.5% was found to be the most prevalent organisms isolated from the community followed by Esch. coli 42.9%, Klebsiella spp. 37.7%, Pseudomonas spp (5/9, 55.5%).

Table- I : Pattern of organisms isolated from the community and hospital

Name of the organisms	No. of total isolates	No. of clinical isolated from community	No. of clinical isolated from hospital
Esch. coli	156 (52)	89 (57)	67 (42.9)
Klebsiella spp	45 (15)	28 (62)	17 (37.7)
Proteus	55 (18.3)	25 (45.4)	30 (54.5)
Pseudomonas spp	9 (3.0)	4 (44.4)	5 (55.5)
*Others	35 (11.7)	22 (62.85)	13 (37.1)
	300 (100)	168 (56)	132 (44)

Note: Figures in parentheses represent percentage

* Others - Enterobacter spp., Citrobacter spp

Table II Showed antimicrobial resistance pattern of both hospital and community acquired isolates. Aztreonam, Ampicillin, Amoxyclave and Piperacillin were more

resistant. Among them in Klebsiella spp. were more resistant than Esch. coli. All the isolated organism in this study were 100% sensitive to Imepenem and 98% sensitive to Nitrofurantoin.

Table -II Antibiotic resistance pattern of Esch.coli and Klebsiella spp. isolated from community hospital and community by disc diffusion method.

Antimicrobials	Esch. coli		Klebsiella spp.	
	Hospital isolates n=67	Hospital isolates n=89	Community isolates n=17	Community isolates n=28
Aztreonam	67 (100)	89 (100)	17 (100)	28 (100)
Piperacillin	62 (92.5)	85 (95.5)	15 (88.3)	27 (96.4)
Amoxiclave	63 (94.0)	83 (93.2)	16 (94.1)	26 (92.8)
Ampicillin	64 (95.5)	80 (89.8)	16 (94.1)	25 (89.2)
Ceftriaxone	57 (85.0)	70 (78.6)	15 (88.2)	23 (82.1)
Ciprofloxacin	56 (83.5)	64 (71.9)	15 (88.2)	22 (78.5)
Cefotaxime	53 (79.1)	63 (70.7)	14 (82.3)	22 (78.5)
Ceftazidime	41 (61.1)	63 (70.7)	14 (82.3)	22 (78.5)
Azithromicine	54 (80.5)	52 (58.4)	14 (82.3)	16 (57.1)
Gentamicin	39 (58.2)	42 (47.1)	11 (64.7)	17 (60.7)
Amikacin	12 (17.9)	11 (16.4)	3 (17.6)	6 (21.4)
Nitrofurantoin	2 (2.9)	3 (3.3)	1 (5.8)	1 (3.6)
Imipenem	0 (0)	0 (0)	0 (0)	0 (0)

Note: Figures in parentheses represent percentage

DISCUSSION

Now a days antibiotics have been used extensively and newer antibiotics are continuously being added for the treatment of various infections. An extensive use of β-lactam antibiotics in hospital and community has created a major problem leading to increased morbidity, mortality and health care costs. Proper use of antibiotics is very important for various reasons. Development of bacterial resistance against newer antibiotics makes the main focus of research.

In the present study, among the 300 isolated organisms Esch. coli was the most prevalent 52% (156/300), followed by Proteus spp. 18.3% (55/300), Klebsiella spp. 15% (45/300) and Pseudomonas spp. 3% (9/300) Figure 1. Irrespective of specimens among the identified bacteria Klebsiella spp. 62% (28/45) was the leading bacteria from the community acquired isolates, followed by Esch.coli 57% (89/156), Proteus spp. 45.5% (25/55) and Pseudomonas spp. 44.4% (4/9) (Table -I). In (table I) Klebsiella spp. now also found in community acquired isolates more than hospital which indicates that hospital strains circulate in the community. In the present study isolation of Esch.coli was 55.6% and 61.2% from both urine and pus respectively, which were in aggrement with findings done by Haque et al. (2009) and Parveen et al. (2009) in the same institute 10,11. In India (2005) Marcus and associates found the same figure[12].

Now a day's organism encoding multiple antibiotic resistance genes are becoming increasingly prevalent 13 . In this study aztreonam, ampicillin, amoxyclauve were found 95-100% resistant (Table -II), this is in agreement with other studies[14,15]. Cephalosporins especially third generation have been used for Gram negative bacterial treatment 16 . In the present study ceftriaxone, ceftazidime and cefotaxime were found 85%, 61%, 79% from hospital acquired and 78.6%, 70.7%, 70.7% resistant among community acquired E.coli respectively (Table II). It correlates with the study done by Sasirekha et al. (2010) and Singh and Goyal (2003) in India where they found 84% resistance to cefotaxime and 75%, 85% resistant for ceftriaxone and ceftazidime respectively 14,17. Klebsiella spp. were found resistant to ceftriaxone, ceftazidime and cefotaxime in 88.2%, 82.3%, and 82.3% in hospital acquired isolates and 82.3%, 78.5%, 75.5% in community acquired isolates respectively (Table -I). Hospital acquired isolates were more resistant than the community acquired isolates, it may be due to lack of antibiotic policy, irrational use of 3GCs mainly ceftriaxone in the hospital (Shova 2007) and the emergence of antibiotic-resistant organisms in hospitals in concert with the use of high levels of antibiotics use caused the emergence of resistant organisms and they might be inherently more virulent than the organisms are sensitive (CDC 2002)[18]. It was also

noted that Klebsiella spp were more resistant than Esch. coli which may be due to Klebsiella spp. have some virulence factor like hyperviscosity, polysaccharide capsule and production of endotoxine, carbapenemases, which make it more resistant[19]. This indicate over use and irrational use of 3GCs give the world brand new resistant bacteria that can produce many other drug resistance enzymes.

In this study observed resistance to ciprofloxacin was 78% and 88% for Esch.coli and Klebsiella spp. (Table-II) respectively. These findings were in accordance with the study by Haque and Salam (2010) from Bangladesh and it was 90.9%[20]. Another study by Sasirekha from India where they found 68% resistant to ciprofloxacin[14]. Aminoglycosides have good activity against clinically important gram negative bacilli[21]. In the present study 70% isolates were susceptible to amikacin, followed by 41.8% to gentamicin, it was similar to Sasirekha et al. (2010)[14]. Several studies showed that amikacin was more sensitive than gentamicin but if it is over used than it may also become resistant. In 2010 gentamicin was 59% resistant in India and 55.5% in Bangladesh[14,15]. These variations may be due to increased use of gentamicin, caused by selection pressure of aminoglycosides in different region[22]. Carbapenems are the drugs of choice for many infections caused by Gram positive and Gram negative bacteria[15]. In this study imipenem was 100% sensitive (Table II). These findings were similar to study done by Haque and Salam in (2010) but one study showed 3.1% resistant to imipenem in Bangladesh[20,23]. Amikacin was the second most common sensitive drug after imipenem. So, these drug resistance organisms have limited theraputic options and necessitated the increased use of carbapenems. But very recently new beta lactamases are developed e.g., K. pneumoniae carbapenemase (KPC) which is resistant to imipenem and has been spread world wide[24]. So there is very limited options to treat imipenem resistant strains and colistin may be the drug of choice , though it has many side effect[25].

In the conclusion, GNB are commonly found in both Hospital and community infection with a reduced sensitivity profiles. An indiscriminate use of the higher antibiotics should be restricted as far as possible. The infection control programs should be monitored continuously in hospital.

REFERENCES

1. Bradford, P. A. Extended-spectrum _-lactamases in the 21st century: characterization, epidemiology, and detection of this important resistance threat. Clin. Microbiol. Rev. 2001. 14:933-951.
2. Perez, F, Endimiani, A, Hujer, KM, Bonomo, RA, The continuing challenge of ESBLs. Current Opinion in Pharmacology. 2007: 7 (5); 459-469 .
3. Jarvis, W. R., and W. J. Martone. Predominant pathogens in hospital infections. J. Antimicrob. Chemother. 1992:29; 19-24.
4. Journal of Clinical and Diagnostic Research. 2013: 7(4); 642-645
5. Professional Communications, 2009, ISBN: 978-1-932610-59-8 Printed in the United States of America
6. Rahman, MM, Haque, JA, Hossain, MA, Sultana, R, Islam, F, AHM, Islam, S, Prevalence of extended spectrum beta lactamase-producing Escheria coli and Klebsiella pneumoniae in an urban hospital in Dhaka Bangladesh, International journal of antimicrobial agents, 2004: 24(5) ; 508-510.
7. Rodriguez-Bano, J., M. D. Navarro, L. Romero, L. Martinez-Martinez, M. A. Muniain, E. J. Perea, R. Perez-Cano, and A. Pascual. Epidemiology and clinical features of infections caused by extended-spectrum _-lactamase-producing Escherichia coli in nonhospitalized patients. J. Clin. Microbiol. 2004:42; 1089-1094.
8. Cheessbrough M. District laboratory practice in tropical countries. Microbiology -2, New york,USA : Cambridge university. 2006; 184-186
9. Clinical Laboratory Standards Institute. Performance standards for antimicrobial disc susceptibility testing. 14th informational supplement. 2010
10. Nazia Haque, MA Hossain, L Bilkis, AK Musa, C Mahamud, MS Bari, N Haque, N Muhammad, US Parvin, MT Islam, SI Khan, MA Islam, S Haque, Antibiotic susceptibility pattern of Staphylococcus epidermidis. Mymensingh Med J. 2009: 18(2);142-7.
11. Parveen, US, Hossain, MA, Musa, AK, Mahmud, C, Islam, MT, Haque, N, Muhammad, N, Khan, SI, Mahmud, NU, Pattern of Aerobic Bacteria with Antimicrobial Susceptibility Causing Community Acquired Urinary Tract Infection. 2009: 18(2); 148-153.
12. Marcus, N, Ashkenazi, S, Yaari, A, Samra, Z, Livni, G, Non-Escherichia coli versus Escherichia coli community-

acquired urinary tract infections in children hospitalized in a tertiary center: relative frequency, risk factors, antimicrobial resistance and outcome, Pediatr Infect Dis J. 2005:24(7);581-585.

13. Perez, F, Endimiani, A, Hujer, KM, Bonomo, RA, The continuing challenge of ESBLs. Current Opinion in Pharmacology. 2007:7(5) ;459-469 .
14. Sasirekha, B, Manasa, R, Ramya, P, and Sneha, R, Frequency and Antimicrobial Sensitivity Pattern Of Extended Spectrum _- Lactamases Producing E.coli And Klebsiella Pneumoniae Isolated In A Tertiary Care Hospital, Al Ameen journal Medical science, 2010:3(4) ; 265-271.
15. Ullah, F, Malik, SA, Ahmed, J, Antimicrobial susceptibility pattern and ESBL prevalence in Klebsiella pneumoniae from urinary tract infections in the North -West of Pakistan. African Journal of Microbiology. 2009: 3(11) ;670-680.
16. Samaha-Kfoury, JN, Araj, GF, Recent developments in _ lactamases and extended spectrum _ lactamases, Bairut Medical Journal, vol. 327, no. 22, pp.1209-1213.
17. Singh, NP, Goyal, R, 2003, Changing trends in bacteriology of burns in the burns unit, Delhi, India. Burns. 2003: 29(2); 129-32.
18. Shobha, KL, Gowrish, RS, Sugandhi, R, Sreeja, CK, Prevalence of Extended Spectrum _ Lactamases in Urinary Isolates of Escherichia coli, Klebsiella and Citrobacter Species and their Antimicrobial Susceptibility Pattern in tertiary care hospital. Indian journal for the Practicing Doctor. 2007:3 (6); 01 -02.
19. Lin, Y, Lu, M, Hui-Ling Tang, H, Liu, H, Chen, C, Liu, K, Lin, C, Chiou, C, Chiang, M, Chen, C,Yi-Chyi Lai, Y, Assessment of hypermucoviscosity as a virulence factor for experimental Klebsiella pneumoniae infections: comparative virulence analysis with hypermucoviscosity-negative strain. Bio Med Central Microbiology. 2011: 11(50).
20. Haque, R, Salam, MA, Detection of ESBL producing nosocomial gram negative bacteria from a tertiary care hospital in Bangladesh, Pk J Med Sci . 2010: 26(4); 887-891.
21. Gonzalez, LS, Spencer, JP, Aminoglycosides: a practical review. Am. Fam. Physician. 1998: 58(8) ; 1811-20.
22. Miller, GH, Sabatelli, FJ, The most frequent aminoglycoside resistance mechanisms--changes with time and geographic area: areflection of aminoglycoside usage patterns? Aminoglycoside Resistance Study Groups. Clin. Infect. Dis. 1997: 24(1) 46-62.
23. Rashid, A., Chowdhury, A., Rahman, SH, Begum, SA, and Muazzam, N, Infections by Pseudomonas aeruginosa and Antibiotic Resistance Pattern of the Isolates from Dhaka Medical College Hospital. Bangladesh Journal of Medical Microbiology. 2007: 1(2); 48-51.
24. Rhee, YJ, Park, YK, Lee, MY, Peck, KR, Soo, KK, KPC-Producing Extreme Drug-Resistant Klebsiella pneumoniae Isolated from a patient with Diabetes Mallitus and Chronic Renal Failure on Haemodialysis in South Korea. Antimicrobial Agents and Chemotherapy. 2010: 54(5); 2278-2279.
25. Amaya, E, Caceres, M, Fang, H, Ramirez, AT, Palmgren, AC, Nord, CE, Weintraub,A, Extended spectrum beta lactamase-producing Klebsiella pneumoniae in a neonatal intensive care unit in Leon, Nicaragua. International Journal of Antimicrobial Agents. 2009: 33; 386-7.