Tripolitana Medical Journal; 2019, Vol.8, No. I, pp. 28 - 31

Short Communication

ISSN 2077-5628

Multi-Drug Resistant Organisms in Medical Intensive Care Unit, Tripoli University Hospital

Abubaker Elmaryul[@1] and Zakaria Ben-issa[2]

[1]Department of Medicine, Faculty of Medicine, University of Tripoli- Libya
[2]Department Of Medicine, Medical Intensive Care Unit, Tripoli University Hospital

Received 7 January April 2019/Accepted 10 March 2019

ABSTRACT

Resistance of nosocomial and community acquired pathogens to antimicrobial agents is a serious problem with significant clinical consequences. A study of multi-drug resistant microorganisms, in medical intensive care unit (MICU) in Tripoli University Hospital, to identify the multidrug organisms in MICU among a period of time and also to identify the effective antibiotics from those not effective. For epidemiologic purposes, MDROs are defined as microorganisms, predominantly bacteria, that are resistant to one or more classes of antimicrobial agents. Although the names of certain MDROs describe resistance to only one agent (e.g., MRSA, VRE), these pathogens are frequently resistant to the most available antimicrobial agents. These highly resistant organisms deserve special attention in healthcare facilities. In addition to MRSA and VRE, certain GNB, including those producing extended spectrum beta-lactamases (ESBLs) and others, that are resistant to multiple classes of antimicrobial agents, are of particular concern. Cross sectional study including all patients admitted in MICU, from the 1st of January 2014 to the 31st of December 2014, a total of (797 cases), for about 501 samples, (277 blood and 224 sputum), the variability was the gender, age from (20 to 90 years), use of broad spectrum antibiotic, admission and intubation for 2 weeks or more, the samples were blood and sputum, cultured for a week in blood and chocolate agar in our microbiology lab. In this study, a total 797 cases in 2014 were admitted in our medical ICU, 45 cases were isolated as a MDR cases (5.64%) and the pathological organisms were 20 cases (2.5%) *Acinetobacter baumanii*, 19 cases (2.38%) *Klebsiella ESBL*, 7 cases (0.8%) *Pseudomonas aeruginosa* a common risk factor between all the patients were previous use of broad spectrum antibiotic and intubation for more than a week also from the MDR cases actually there were 8 cases from 20 of *Acinenobacter* resistant to all (EDR) even for Carbapenems and Amikacin and the mortality rate reaches 90% for all the cases, and to minimize the development of resistance, antimicrobials must be administered judiciously, and infection control practices must be instituted and followed.

Keywords- *Antimicrobial agents; Multi drugs résistance; Medical intensive care unit; Bacteria; ESBL; Mortality; Healthcare.*

INTRODUCTION

For epidemiologic purposes, MDROs are defined as microorganisms, predominantly bacteria, that are resistant to one or more classes of antimicrobial agents. Although the names of certain MDROs describe resistance to only one agent (e.g., MRSA, VRE), these pathogens are frequently resistant to most available antimicrobial agents, therefore, these highly resistant organisms deserve special attention in healthcare facilities. In addition to MRSA and VRE, certain GNB, including those producing extended spectrum beta-lactamases (ESBLs) and others, that are resistant to multiple classes of antimicrobial agents, are of particular concern.

In addition to *Escherichia coli* and *Klebsiella pneumoniae*, these include strains of *Acinetobacter baumannii* resistant to all antimicrobial agents, or all except Imipenem, and organisms such that are intrinsically resistant to the broadest-spectrum antimicrobial agents. It is important to control multidrug-resistant *S. pneumoniae* (MDRSP), that are resistant to penicillin and other broad-spectrum agents, such as Macrolides,Fluroquinolones and Strains of *S. aureus* that have intermediate susceptibility are resistant to Vancomycin (i.e., Vancomycin-intermediate *S. aureus* [VISA], Vancomycin-resistant *S. aureus* [VRSA]) have affected specific populations, such as hemodialysis patients.

Multidrug-resistant organisms (MDROs), including *Methicillin-resistant Staphylococcus aureus* (MRSA), *Vancomycin-resistant enterococci* (VRE) and certain gram-negative bacilli (GNB) have important infection control implications that either have not been addressed or received only limited consideration in previous isolation guidelines. Thus, increasing experience with these organisms is improving understanding of the routes of transmission and effective preventive measures. Although transmission of MDROs is the most frequently documented in acute care facilities, all healthcare settings are affected by the emergence and transmission of antimicrobial-resistant microbes. The severity and extent of disease caused by these pathogens vary by the

@ Author to whom correspondence should be addressed: Dr Abubaker Elmaryul;
Tel: 00218 913297255; E-mail: elmaryul@hotmail.com

population affected and by the institution in which they are found. Institutions, in turn, vary widely in physical and functional characteristics, ranging from long-term care facilities (LTCF) to specialty units (e.g., intensive care units [ICU]) in tertiary care facilities.

Study objectives: The aim of this study is to identify the multidrug organisms in the medical intensive care unit among a period of time, and also, to identify the effective antibiotics from those not effective.

MATERIALS AND METHODS

A cross sectional study including all patients admitted in the medical intensive care unit from the 1stof January 2014 to the 31stof December 2014, a total of (797 cases), and for about 501 samples, (277 blood and 224 sputum), the variability was the gender, age from (20 to 90 years), use of broad spectrum antibiotic, admission and intubation for 2 weeks or more, the samples were blood and sputum, cultured for a week in blood and chocolate agar in our microbiology lab.

RESULTS

In this study, a total of 797 cases in 2014 were admitted in the medical intensive care unit in our hospital, 45 cases were isolated as MDR cases (5.64%),and the pathological organisms were 20 cases (2.5%) *Acinetobacter baumanii* (Figure 1). The sensitivity was (25% to Septrin, 15% to Topramycin, 5% to Ciprofloxacin, Fortum, Levofloxacin and Tazocin.

19 cases (2.38%) *Klebsiellapneumonia* (Figure 2) ESBL. The sensitivity was (42% for Septrin, 21% for Amikacin, 100% for Imipenem, 5% Meropenem, 0% for Rocephine, Tazocin, Ciprofloxacin, Fortum and Levofloxacin).

Seven cases (0.8%) *Pseudomonas aeruginosa* (Figure 3). The sensitivity was for Topramycin and Gentamycin (42%), for Ciprofloxacin (40%) and Septrin (0%). A common risk factor between all the patients was the previous use of broad-spectrum antibiotic and intubation for more than a week, also, from the MDR cases actually there were 8 from the 20 of *Acinenobacter resistant* to all (EDR), even for Carbapenems and Amikacin and the mortality rate reaches 90% for all the cases.

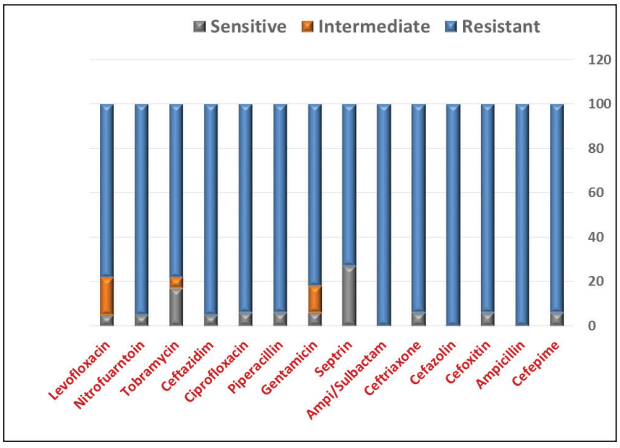

Figure 1: Shows the drug sensitivity and resistant to *Acinetobacter baumannii* organism.

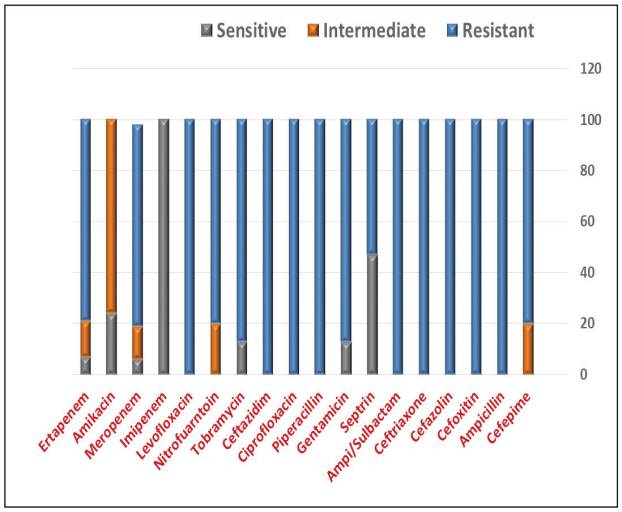

Figure 2: Shows the drug sensitivity and resistant to *Klebseilla pneumonia* ESBL

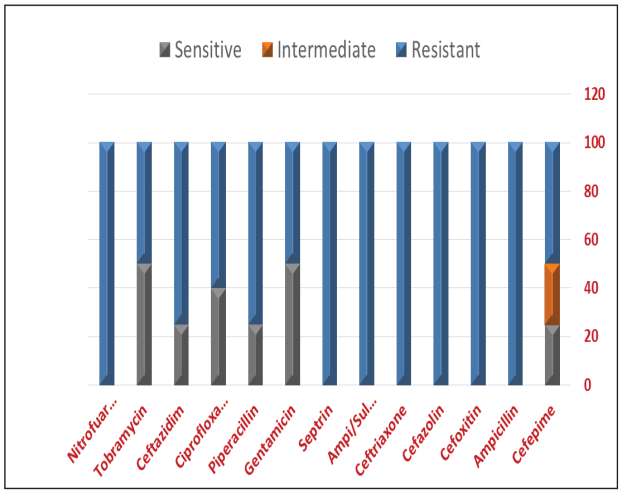

Figure 3: Shows the drug sensitivity and resistant to *Pseudomonas aeruginosa*.

DISCUSSION

From the results of the 3 organisms, regarding the *Acinetobacter baumanii,* comparing with other studies, it shows that, in a surveillance study of the antibiotic susceptibility patterns of the isolates from the ICUs of five European countries in 1999, the prevalence of resistance in *Acinetobacter* spp. to Gentamicin was 0-81%, Amikacin 10-51%, Ciprofloxacin 19-81%, Ceftazidime 0- 81%, Piperacillin-Tazobactam 36-75%, and Imipenem 5-19%.[1] The MYSTIC (Meropenem Yearly Susceptibility Test Information Collection) program reported the antimicrobial susceptibility of 490 *A. Baumannii* strains, collected from 37 centers in 11 European countries between 1997 - 2000.[2] Imipenem and Meropenem were found as the most active agents against *A. baumannii*, with resistance rates of 16 and 18%, respectively. However, susceptibility testing with Ampicillin/Sulbactamand Colistin were not performed. Subsequent data from 40 centers in 12 countries participating in the MYSTIC program in (2006) revealed a substantial increase in resistance rates for Meropenem (43.4%), and Imipenem (42.5%).[3]

Data of the antibiotic susceptibilities of Acinetobacter from different geographical regions revealed that the resistance of *Acinetobacter* spp. to Imipenem was in the range of no resistance to 40% between (2000- 2004).[4] In a report from a Teaching Hospital in Spain (2002), the prevalence of Imipenem-resistant *Acinetobacter* spp. had increased from no resistance in 1991 to 50% in 2001.[5] Among *Acinetobacter* spp. derived from 30 European centers from the worldwide collection of SENTRY between 2001-2004, the proportion of strains resistant to Imipenem, Meropenem, Ampicillin/Sulbactam, and Polymyxin B was: 26.3, 29.6, 51.6, and 2.7%, respectively.[3,6] Gladstone et al. from Vellore, India (2005), reported a prevalence of 14% *Carbapenem-resistant Acinetobacter* spp., isolated from tracheal aspirates (n= 56).[7] In Delhi, India (2006), the prevalence of Carbapenem resistance in *Acinetobacter* spp. isolated from different clinical samples was found to be almost 35%.[8] In Greece, the proportion of Imipenem-resistant *A. baumannii* isolates from patients hospitalized between 1996 and 2007, in tertiary care hospitals, in several regions of the country rose from no resistance to 85% (ICUs), 60% (medical wards), and 59% (surgical wards) [Greek System for Surveillance of Antimicrobial Resistance (GSSAR), blood stream isolates from the same data set exhibited even higher resistance rates. The prevalence of Imipenem resistance in *Acinetobacter baumannii* isolated from a burns unit of USA was found to be as high as 87% (2007).[9] The above-mentioned data suggests that an antibiotic therapy should always be guided by *in vitro* susceptibility profile of the organism.

Often Colistin or Tigecycline are the only available treatments for MDR *A. baumannii* infections. Unfortunately, resistance to Colistin has recently emerged in Europe. The European arm of the SENTRY surveillance program identified 2.7% of Polymyxin B-resistant *A. baumannii* isolates collected during 2001-2004.[6] In a recent surveillance study from Greece, among 100 *A. baumannii* strains derived from ICU patients, 3% were Colistin-resistant, whereas, the minimum inhibitory concentration (MIC) levels of Tigecycline ranged between 0.12 µg/ml and 4 µg/ml.[10] Sporadic cases of infections caused by Colistin-resistant isolates have been increasingly reported from Greece.[11,12] A surveillance study performed in 34 centers across UK, during 2000, reported a 2% resistance rate to Colistin among 443 *A. baumannii* tested, while Tigecycline MICs ranged from < 0.032 µg/ml to 16 µg/ml.[13] Sporadic strains exhibiting Colistin resistance have also been reported in Slovakia.[14]

For *Klebseilla pneumonia* ESBL, the other previous studies, which were conducted at a centralized microbiology laboratory, MGM Hospital Mumbai (from February 2012 to February 2013) for Extended Spectrum -Lactamases (ESBL) producing *Klebsiella pneumonia* of 77 patients, show a sensitivity of 51% to Ceftriaxone, Imipenem 97%, Amikacin 34%, Ciprofloxacin 52%, Nitrofuarntoin 61%.[15]

For *Pseudomonas aeruginosain* comparison to this study a prospective study was undertaken with 525 samples (blood and wound swabs), which were taken from 60 patients who were admitted to Vardhman Mahavir Medical College and Safdarjang Hospital with burn injuries and with 101 samples, which were obtained from environmental sources viz,surgical instruments, dressings, suction devices, sinks, antiseptic solutions. In total, 58(81%) *P. aeruginosa* strains were found to be resistant to aminoglycosides, 41-70%,were resistant to Beta-lactams - Piperacillin, Ceftazidime, and Aztreonam, 34.5% were resistant to Piperacillin-Tazobactam, 12.06% were resistant to ciprofloxacin and 13-19% were resistant to Carbapenems. All strains were sensitive to Colistin. *P. aeruginosa* was resistant to three of the four 'in-use' drugs i.e. Piperacillin+Tazobactam, Imipenem, Ceftazidime, and Gentamicin, which was taken as MDR, which depicted MDR percentage as 36.2.[16]

CONCLUSION

In summary, Gram-negative *Bacilli* among pathogens causing nosocomial infection and an upsurge in threat of antimicrobial resistance in our hospital were the major concern in this study. Thus, Good hand hygiene and strict aseptic procedures remain the most important factors for infection control with appropriate antibiotics, should be reinforced.

RECOMMENDATIONS

We did not find robust evidence for antibiotic treatment of any infection with MDR, that would lead to a firm recommendation for one specific antibiotic over another or for monotherapy over combination therapy. The choice of antibiotic treatment should be based on susceptibility testing balancing the expected clinical success rate against the risk of the development of antibiotic resistance and the risk of the severe side effects.

REFERENCES

1. Hanberger H, Garcia-Rodriguez JA, Gobernado M, Goossens H, Nilsson LE and Struelens MJ. (1999) Antibiotic susceptibility among aerobic gram-negative bacilli in intensive care units in 5 European countries, French and Portuguese ICU Study Groups, *JAMA* **281**, 67-71.

2. Turner PJ and Greenhalgh JM (2003) MYSTIC Study Group (Europe) The activity of Meropenem and Comparators against *Acinetobacter* strains isolated from European hospitals, 1997-2000, *Clin Microbiol Infect*. **9**, 563-567.

3. Turner PJ. (2008) Meropenem activity against European isolates: report on the MYSTIC (Meropenem yearly susceptibility test information collection) 2006 results, *Diagn Microbiol Infect Dis*. **60**, 185-192.

4. Perez F, Hujer AM, Hujer KM, Decker BK, Rather PN and Bonomo RA. (2007) Global challenge of multidrug-resistant *Acinetobacterbaumannii*, *Antimicrob Agents Chemother*. **51**, 3471-384.

5. Cisneros JM and Rodríguez-Baño J. (2002*) Nosocomial bacteremia* due to *Acineto bacterbaumannii*: epidemiology, clinical features and treatment, *ClinMicrobiol Infect*. **11**, 687-693.

6. Gales AC, Jones RN and Sader HS. (2006) Global assessment of the antimicrobial activity of polymyxin B against 54 731

clinical isolates of Gram-negative *Bacilli*: report from the SENTRY antimicrobial surveillance programme (2001-2004), *Clin Microbiol Infect*. **12**, 315-321.

7. Gladstone P, Rajendran P and Brahmadathan KN. (2005) Incidence of Carbapenem resistant nonfermenting gram negative *Bacilli* from patients with respiratory infections in the intensive care units, *Indian J Med Microbiol.* **23**, 189-191.

8. Sinha M, Srinivasa H and Macaden R. (2007) Antibiotic resistance profile and extended spectrum beta-lactamase (ESBL) production in *Acinetobacter* species, *Indian J Med Res*. **126**, 63-67.

9. Trottier V, Segura PG, Namias N, King D, Pizano LR, Schulman CI. (2007) Outcomes of *Acinetobacter baumannii* infection in critically ill burned patients, *J Burn Care Res*. **28**, 248-253.

10.Souli M, Kontopidou FV, Koratzanis E, Antoniadou A, Giannitsioti E, Evangelopoulou P, et al. (2006) In vitro activity of Tigecycline against multiple-drug-resistant, including pan-resistant, gram-negative and gram-positive clinical isolates from Greek hospitals, *Antimicrob Agents Chemother*. **50**, 3166-3169.

11.Matthaiou DK, Michalopoulos A, Rafailidis PI, Karageorgopoulos DE, Papaioannou V, Ntani G, et al. (2008) Risk factors associated with the isolation of Colistin-resistant gram-negative bacteria: a matched case-control study, *Crit Care Med*. **36**, 807-811.

12.Falagas ME, Rafailidis PI, Matthaiou DK, Virtzili S, Nikita D and Michalopoulos A. (2008) Pandrug-resistant *Klebsiellapneumoniae*, *Pseudomonas aeruginosa* and *Acinetobacter baumannii* infections: characteristics and outcome in a series of 28 patients, *Int J Antimicrob Agents*. **32**, 450-454.

13.Henwood CJ, Gatward T, Warner M, James D, Stockdale MW, Spence RP, et al. (2002) Antibiotic resistance among clinical isolates of *Acinetobacter* in the UK, and in vitro evaluation of Tigecycline (GAR-936), *J AntimicrobChemother*. **49**, 479-487.

14.Beno P, Krcmery V and Demitrovicova A. (2006) Bacteraemia in cancer patients caused by Colistin-resistant Gram-negative *bacilli* after previous exposure to Ciprofloxacin and/or Colistin, *ClinMicrobiol Infect*. **12**, 496-500.

15. Chaudhary BL., Shailja Srivastava, Brij Nandan Singh and Snehanshu Shukla (2014) Nosocomial Infection due to Multidrug Resistant (MDR) *Escherichia coli* and *Klebsiella pneumonia* in Intensive Care Unit, *Int.J.Curr.Microbiol.App. Sci*. **3**(8), 630-635.

16. Biswal I, Arora BS, Kasana D and Neetushree (2014) Incidence of multidrug resistant *Pseudomonas aeruginosa* isolated from burn patients and environment of teaching institution, *J Clin Diagn Res.* **8**(5), DC26-29.