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Full Length Research Paper

Nosocomial pulmonary infections at Peltier Hospital, Djibouti

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Nosocomial pulmonary infections are a major public health problem. The retrospective study was carried out on medical records of 140 patients aged 59.4±32.2, 0.29 (mean ± sd, SEM) years, admitted at Peltier hospital, Djibouti, between May 5, 2018 and April 30, 2020, and who developed nosocomial pulmonary infections after 48 h of admission. The objective was to establish incidence of nosocomial pulmonary infections, identify the causative agents, and establish appropriate antimicrobial regimens to improve case management. Tracheobronchial secretions were cultured on appropriate culture media and antimicrobial susceptibility testing done on bacteria isolates. About 9(6.4%) cultures were sterile, 21(15%) and 110(78.6%) had *Candida albicans* and polymicrobial infection respectively. The study established that 80.9% of nosocomial pneumonia during the study period was due to gram negative bacilli, while 14.6% was due to *Staphylococcus aureus*. Cefotaxime and Colistin were the drugs of choice for *P. aeruginosa* and *A. baumannii* respectively.

Key words: Nosocomial pulmonary infections, protected specimen brush, prevalence, bacterial resistance, hospital, Djibouti.

INTRODUCTION

Nosocomial infections are acquired infections during hospital stay that were neither present nor in incubation at the time of patient admission (Pan American Health Organization, 2018). The frequency, cost of diagnosis and treatment are a major public health concern worldwide (Pooja et al., 2016; Saravanan et al., 2018). Causative agents are often resistant to available antibiotics and their prognosis is grave (Haroon et al., 2020; Hassuna et al., 2020). Infections caused by multidrug resistant gram negative bacteria are a major public health problem in developing countries (Adesola et al., 2020; Ali et al., 2020; Aworh et al., 2019; Horsefall et al., 2017). Several studies have been carried out to take stock of healthcare-related infections in many countries (Amulioto et al., 2020; Oli et al., 2017; Schuts et al., 2016).

In general, the prevalence of nosocomial infections varied according to the clinical picture and management. Antibiotic resistance is one of the three most important issues facing human health (Pan American Health Organization, 2018). The objective of the retrospective study was to establish incidence of nosocomial pulmonary infections, identify the causative agents, and establish appropriate antimicrobial regimens to improve case management at Peltier hospital, Djibouti.

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Table 1. Rate resistance isolates to nosocomial pulmonary infections.

Antibiotic	*E. coli*	*P. aeruginosa*	*S. aureus*	*K. pneumoniae*	*A. baumannii*	*E. cloacae*	*P. mirabilis*	*S. pneumoniae*	*K. oxytoca*
Amoxicillin	100	100	-	-	100	100	100	-	-
Augmentin	80	100	-	80	100	70	60	-	50
Ticarcillin	100	100	-	-	100	90	-	-	-
Cefoxitin	30	80	40	20	100	100	20	50	30
Ceftazidime	70	70	-	40	100	70	50	-	50
Meropenem	40	50	-	30	80	30	10	-	15
Imipenem	10	40	-	20	60	20	5	-	5
Gentamicin	60	80	25	60	80	80	60	50	50
Amikacin	10	60	-	25	60	60	40	-	30
Ciprofloxacin	30	60	20	60	100	50	50	40	50
Fosfomycin	10	50	10	20	100	60	40	25	30
Tetracycline	-	90	20	100	100	-	-	40	100
Ceftriaxone	60	60	-	40	100	50	40	-	30
Nalidixic acid	90	80	-	50	100	80	60	-	50
Norfloxacin	60	70	30	60	-	80	60	60	50
Nitrofuran	60	-	30	80	-	90	70	50	70
Ampicillin+Salbactam	90	-	-	-	-	60	60	-	-
Piperacillin	40	90	-	90	100	-	70	-	60
Piperacillin+Tazobactam	10	50	-	40	100	-	30	-	50
Cefotaxime	30	25	-	60	100	60	50	-	50
Cefixime	70	100	-	60	100	60	60	-	50
Ofloxacin	40	90	10	80	100	80	60	40	60
Cefepime	70	100	-	90	100	100	-	-	-
Colistin	0	40	-	0	0	-	-	-	0

Antibiotic susceptibility outcomes were demonstrated using the Kirby-Bauer method and Clinical Laboratory Standards Institute (CLSI) guidelines (CLSI, 2013). The frequency and economic challenges of nosocomial infections motivated the undertaking of this study.

MATERIALS AND METHODS

Medical records of 140 in-patients whom within the study period developed pulmonary infections, demonstrated by recent onset of purulent tracheal secretions, recent fever, leukocytosis, dyspnea and positive cultures for respiratory infections, in the absence of other causes after 48 h of admission were reviewed and considered for the retrospective study. Tracheal aspirate specimens collected using protected specimen brush (PSB) following a clinical diagnosis of pneumonia and prior to initiation of antimicrobial therapy, had been collected and cultured on Blood agar, Chocolate agar, MacConkey and Sabouraud media incubated overnight at 37°C and room temperature overnight respectively.

Standard antibacterial susceptibility testing was assessed on Muller-Hinton agar according to the Kirby-Bauer method using standardized inoculum of isolated bacteria colonies. The antibacterial susceptibility test interpretive criteria and quality control performance standards for antimicrobial testing was used to bacterial isolates either as, susceptible, intermediate or resistant (CLSI, 2013). Resistance percentage was calculated where isolates for susceptibility to specific antibiotics was ≥ 30 and tabulated in Table 1.

Streptococcus faecalis ATCC 29212 control strain was used against Cotrimoxazole disk for batch-to-batch validation of Muller-Hinton agar during the study period. Batch-to-batch validation of new susceptibility disks was tested against *Staphylococcus aureus* ATCC 25922, *Escherichia coli* ATCC 25922 and *Pseudomonas aeruginosa*

ATCC 27853 and the zones of inhibitions were compared with the quality control limits on Muller-Hinton agar for monitoring antibiotic susceptibility testing.

RESULTS AND DISCUSSION

The retrospective study was carried out on medical records of 140 patients aged 59.4±32.2, 0.29 (mean ± sd, SEM) years, admitted at Peltier hospital, Djibouti, between May 5, 2018 and April 30, 2020, who developed nosocomial pulmonary infections after 48 h of admission. Bacterial percentage resistances responsible for nosocomial pulmonary infections are tabulated in Table 1. From the study, 9(6.4%) cultures were sterile, 21(15%) and 110(78.6%) had *Candida albicans* and polymicrobial infection respectively. Also, 80.9% of nosocomial pneumonia during the study period was due to gram negative bacilli, while 14.6% was due to methicillin resistant *Staphylococcus aureus*. The microbiological examination revealed 9 organisms responsible for nosocomial infection in infected patients: *Escherichia coli, P. aeruginosa, S. aureus, Klebsiella pneumoniae, Acinetobacter baumannii, Enterobacter cloacae, Proteus mirabilis, Streptococcus pneumoniae* and *Klebsiella oxytoca.*

The phenotypes of the gram negative bacilli were categorized into: Carbapenem-resistant *E. coli* (19%), Carbapenem-resistant *K. pneumoniae* (13%) and Carbapenem-non-susceptible *P. aeruginosa* (15.5%). Cefotaxime and Colistin were the drugs of choice for managing nosocomial pulmonary infections at Peltier hospital. The study recommended antimicrobial stewardship through establishment of an infection control committee to reduce microbial resistance and decrease the spread of infection caused by multidrug resistant organisms. Infections caused by multidrug resistant gram negative bacteria are a major public health problem in developing countries (Djoman et al., 2020; Falgenhauer et al., 2019; Founou et al., 2018). Several studies have been carried out to take stock of healthcare-related infections in many countries (Bekoe et al., 2020; Herawati et al., 2017; Karanika et al., 2016).

Conclusion

Cefotaxime and Colistin are the drugs of choice for managing nosocomial pulmonary infections at Peltier hospital. Antimicrobial stewardship is necessary to safeguard the effectiveness of the drugs of choice. There is a need for perspective study on nosocomial infections in the hospital to identify the general and upcoming antimicrobial resistant phenotypes and to continually monitor antimicrobial resistance.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

REFERENCES

Adesola O, Onwugamba F, Iwalokun B, Mellmann A, Becker K, Schaumburg F (2020). High proportion of carbapenemase-producing *Escherichia coli* and *Klebsiella pneumoniae* among extended-spectrum β-lactamase-producers in Nigerian hospitals. Journal of Global Antimicrobial Resistance 21:8-12.

Ali MA, Okojokwu OJ, Augustine UA, Achenbach C, AjeAnejo-Okopi J, MankoLar P, Imade G, Sagay AS (2020). Prevalence and drug-resistance profile of plasmid-borne extended spectrum beta-lactamase (ESBLs) resistance genes in multidrug resistant *Escherichia coli* from HIV-1 positive individuals in Jos, Nigeria. African Journal of Microbiology Research 14(10):564-571.

Amulioto J, Muturi MW, Mathenge S, Gideon M, Mutua GM (2020). Antibiotic susceptibility patterns of bacteria isolates from post-operative wound infections among patients attending Mama Lucy Kibaki Hospital, Kenya. African Journal of Microbiology Research 14(8):420-425.

Aworh MK, Kwaga J, Okolocha E, Mba N, Thakur S (2019). Prevalence and risk factors for multi-drug resistant *Escherichia coli* among poultry workers in the Federal Capital Territory, Abuja, Nigeria. PLoS ONE 14(11):e0225379.

Bekoe A, Azorliade R, Ablordey A, Addo MG (2020). Antibiotic resistance and genotypic detection of extended spectrum beta-lactamase producing pathogens in catheter associated urinary tract infection at a teaching facility in Kumasi, Ghana. African Journal of Microbiology Research 14(8):395-401.

Clinical Laboratory Standard Institute (CLSI) (2013). Performance Standard for Antimicrobial Disk and Dilution Susceptibility Test for Bacteria Isolated from Animals; Approved Standard - Third edition. CLSI document M31-3A, Wayne, PA: C L SI 24 p.

Djoman CS, Akpa EE, Goualié BG, Samagassi L, N'Guessan DY (2020). Prevalence and Antibiotic resistance profile of Avian Pathogenic *Escherichia coli* (APEC) strains isolated from poultry feeds in Abidjan District, Côte d'Ivoire. African Journal of Microbiology Research 14(10):587-593.

Falgenhauer L, Imirzalioglu C, Oppong K, Akenten CW, Hogan B, Krumkamp R, Poppert S, Levermann V, Schwengers O, Sarpong N, Owusu-Dabo E, May J, Eibach D (2019). Detection and Characterization of ESBL-Producing *Escherichia coli* from Humans and Poultry in Ghana. Frontiers in Microbiology 9:3358.

Founou LL, Founou RC, Allam M, Ismail A, Djoko CF, Essack SY (2018). Genome Sequencing of Extended-Spectrum β-Lactamase (ESBL)-Producing *Klebsiella pneumoniae* Isolated from Pigs and Abattoir Workers in Cameroon. Frontiers in Microbiology 9:188-199.

Haroon RM, Rahman MM, Sultana H, Islam MK, Al Rakib MMN, Abul Kalam M, Efa SS (2020). Antibacterial resistance patterns of bacteria isolated from clinical specimens at Uttara IbnSina Diagnostic Centre, Dhaka. African Journal of Microbiology Research 14(5):175-181.

Hassuna NA, Khairalla AS, Farahat EM, Hammad AM, Abdel-Fattah M (2020). Molecular characterization of Extended-spectrum β lactamase- producing *E. coli* recovered from community-acquired urinary tract infections in Upper Egypt. Scientific Report 10:2772.

Herawati F, Hartono ID, Pranajaya D, Narindra IPH (2017). Antibiotic use at primary healthcare centers in Surabaya: a surveillance study. International Journal of Pharmacy and Pharmaceutical Sciences 9(7):41-44.

Horsefall SJ, Abbey SD, Nwokah E, Okonko IO (2017). Prevalence of Extended-Spectrum Beta-lactamases (ESBLs) and Plasmid status of *Escherichia coli* and *Klebsiella pneumoniae* isolates from clinical sources in UPTH, Port-Harcourt, Nigeria. New York Scientific Journal 10(3):29-39.

Karanika S, Paudel S, Grigoras C, Kalbasi A, Mylonakis E (2016). Clinical and economic outcomes from the implementation of hospital-based antimicrobial stewardship programs: a systematic review and meta-analysis. Antimicrobial Agents and Chemotherapy 60(8):4840-4852.

Oli AN, Eze DE, Gugu TH, Ezeobi I, Maduagwu UN, Ihekwereme CP (2017). Multi-antibiotic resistant extended-spectrum beta-lactamase producing bacteria pose a challenge to the effective treatment of wound and skin infections. Pan African Medical Journal 27:66-77.

Pan American Health Organization (2018). Prevention and control of

healthcare – associated infections. Basic Recommendations. Washington, D.C.: PAHO.
Pooja MB, Sweta SR, Sheela KD, Dileep KV (2016). Characterization of carbapenem resistant *Acinetobacter baumannii* isolated in a tertiary care hospital: epidemiology and treatment outcome. International Journal of Pharmacy and Pharmaceutical Sciences 8(7):277-281.
Saravanan M, Ramachandran B, Barabadi H (2018). The prevalence and drug resistance pattern of extended spectrum β-lactamases (ESBLs) producing Enterobacteriaceae in Africa. Microbial Pathogenesis 114:180-192.
Schuts EC, Hulscher MEJL, Mouton JW, Verduin CM, Cohen Stuart JWT, Overdiek HWPM, van der Linden PD, Natsch S, Hertogh CMPM, Wolfs TFW, Schouten JA, Kullberg BJ, Prins JM (2016). Current evidence on hospital antimicrobial stewardship objectives: a systematic review and meta-analysis. Lancet Infectious Diseases 16(7):847-856.