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FREQUENCY OF ISOLATED MICROORGANISM AND THEIR ANTIBIOTIC RESISTANCE PATTERN IN PEDIATRIC INTENSIVE CARE UNIT

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ABSTRACT

Objective: This study was conducted to assess the frequency of different microbial isolates and their antibiotic resistance pattern in patients admitted to Pediatric Intensive Care Units of Jinnah Hospital Lahore. Methods: In this descriptive cross-sectional study, samples drawn from 253 pediatric patients of Intensive Care Units were included. Data was taken from records of the Pathology Department of the concerned hospitals, from September 2018 to July 2019. Data was collected about the types of specimens, culture positive microbes, and the antibiotic sensitivity of the bacterial isolates. Results: Amongst the cultures included, 64.8% showed no growth while 32% showed bacterial growth and 3.2% showed fungal growth. Most frequently isolated organism was Escherichia Coli (22.7%) followed by Klebsiella pneumonie (18.8%), Acinetobacter baumannii (16.8%), Staphylococcus Aureus (10.9%), Pseudomonas (9.9%), Candida (7.9%). The most common pathogen isolated from the respiratory tract was Klebsiella (38.7%); from urinary tract, E.coli (63.2%); from blood, Staphylococcus Aureus (30%). Antibiotic sensitivity showed that the isolated pathogens were most susceptible to Meropenem. It was however less effective against Acinetobacter. Vancomycin was also effective against majority of microbes isolated except for Klebsiella. Fosfomycin showed mixed results. **Conclusion:** In Paediatric ICU most commonly isolated pathogens are E.coli, Klebsiella, Acinetobacter and S.aureus. Meropenam and Vancomycin combination is the best guess empiric antibiotic keeping in mind antibiotic sensitivity pattern of these microorganisms.

KEYWORDS: Microbial Isolates, Intensive Care Unit, Antibiotic Sensitivity.

INTRODUCTION

Patients of pediatric age group with serious conditions are dealt with in the Pediatric Intensive Care Units (PICU). Infections are an important cause of substantial morbidity, mortality and prolonged hospital stay in PICU. Duration of hospital stay was found to be 22.5 days in patients with infection in contrast to 9 days in patients without infection, in a study done in Barcelona in 2000.[1] The severity of infection depends on various factors, including virulence of the infectious organism, available treatment modalities, and the immune response of the infected host. The pattern of infections and their causative microbes in PICU may differ from that seen in adult ICU.[2] A research conducted in India concluded that of all the children admitted into PICU, 20.7% were diagnosed with a certain disease of infectious etiology.[3] Similarly, a study conducted in Brazil concluded that at 54.8%, gram negative bacteria were the most common causative agent of infection isolated from patients admitted in the PICU with a disease of infectious etiology.[4] Treatment of bacterial infections, especially in intensive care settings, is empiric and based on epidemiologic and experimental data.[5] Also, there is a lower threshold to prescribe antibiotics in these settings, in comparison to patients elsewhere.[6] Patients admitted into PICU at Jinnah Hospital Lahore, suffer from a wide array of infections, however, there is no organized database at the hospital concerning the frequency of microbial agents responsible for these infections.

Clinical outcome of patients in ICU settings can be drastically improved by application of the principles and practice of Clinical Microbiology.[7] The immunological immaturity of the patients combined with non-specific clinical symptoms of infection has resulted in the frequent overuse of antibiotics in intensive care units.[8] This research will help in determining the frequency of different microorganisms isolated from PICU and their antibiotic sensitivity in the local setting, and thus lead to the development of a more efficient and targeted approach towards combating infectious diseases.

MATERIALS AND METHODS

This descriptive cross-sectional study was initiated after taking approval from the concerned authorities and study was carried out in Pathology Department of Jinnah Hospital Lahore. From records (September 2018 to July 2019) of Pathology Department, data of PICU patients

having any infection was included. Anticipated population proportion is 0.207.[3] Keeping the level of confidence 95% and absolute precision 0.05%, minimally required sample size calculated through WHO sample size calculator was 253. All the 253 patients from the records were included using simple random sampling technique. A structured pro-forma was designed to collect data regarding the site from where the sample was taken, types of specimens, culture results and the antibiotic sensitivity of the bacterial isolates, extracted from records, was noted. Statistical Package of Social Sciences (Version-22) was used for the entry and analysis. Multiple types of bacteria in one specimen were entered separately. Descriptive statistics like percentages, frequencies, means and standard deviations were calculated, and cross tabulations were used for comparisons.

RESULTS

Table I: Cross Tabulation of Pathogens and Their Site of Isolation.

Pathogen * Specimen Cross-tabulation								
Pathogens	**Specimen**						**Total**	**Percentage**
	Respiratory Secretion	**Blood**	**Urine**	**CSF**	**Peritoneal fluid**	**Others**		
Klebsiella	12	4	2	0	0	1	19	21.5
Acinetobacter	6	4	0	0	0	1	11	12.5
Pseudomonas	2	6	0	1	0	0	9	10.3
E.coli	7	0	12	0	1	1	21	23.5
Staphylococcus Aureus	0	9	0	0	0	1	10	11.3
MRSA	2	3	0	0	0	0	5	5
Candida	2	1	4	0	0	1	8	9
Salmonella	0	2	0	0	0	2	4	4.5
Enterococcus	0	0	1	0	0	0	1	1.2
Streptococcus Pyogenes	0	1	0	0	0	0	1	1.2
Total	31	30	19	1	1	7	89	100

Table II: Cross tabulation of Pathogens with their Resistance Patterns.

Antibiotics	**Pathogen**								
	Klebsiella	**Acinetobacter**	**Pseudomonas**	**E.coli**	**S. Aureus**	**MRSA**	**Salmonella**	**Enterococcus**	**Streptococcus pyogenes**
Augmentin	14/16 87%	10/10 100%	1/1 100%	19/20 95%	-	2/2 100%	1/2 50%	1/1 100%	-
Methicillin	-	-	-	1/2 50%	-	1/1 100%	-	-	-
Aztreonam	9/10 90%	6/6 100%	5/8 62.5%	13/14 92.8%	1/1 100%	-	0/1 0%	1/1 100%	-
Amikacin	9/12 75%	10/14 71.4%	2/6 33.33%	6/9 66.67	-	-	-	-	-
Gentamicin	2/4 50%	0/1 0%	-	3/5 60%	4/8 50%	0/1 0%	-	-	-
Meropenem	1/14 7%	5/7 7 1.4%	0/7 0%	5/17 35.7	4/6 66.67	0/4 0%	0/1 0%	-	0/1 0%
Ceftriaxone	16/16 100%	15/16 93.75%	6/7 85.71%	22/23 95.65	0/1 0%	-	1/2 50%	-	-
Vancomycin	2/3 66.67%	0/3 0%	-	0/1 0%	0/10 0%	1/5 20%	-	0/1 0%	0/1 0%
Ciprofloxacin	9/16 56.25%	10/15 66.67%	1/8 14.28%	14/19 73.38%	4/5 80%	1/1 100%	1/2 50%	1/1 100%	1/1 100%
Tazocin	8/18 44.4%	8/11 66.67	1/9 12.5	10/21 47.61	-	-	0/1 0%	1/1 100%	-
Fosfomycin	1/5 20%	0/1 0%	0/1 0%	0/13 0%	7/8 87.5%	4/4 100%	-	1/1 100%	-
Ceftizoxime	6/6 100%	3/3 100%	2/2 100%	6/7 85.7%	0/1 0%	-	1/1 100%	-	-

A total of 253 pediatric ICU patients whose culture and sensitivity were requested from July 2018 to September 2019 were included in this study. Out of these, the cultures of 164 (64.8%) showed no growth while 81 (32%) showed bacterial growth and 8 (3.2%) showed fungal growth. 45 out of 130 specimens (34.6%) showed bacterial growth, 36 out of 123 specimens (29.2%) showed bacterial growth. Most frequently isolated

organism was E.coli (22.7%) followed by Klebsiella (18.8%), Acinetobacter (16.8%), Staphylococcus Aureus (10.9%), Pseudomonas (9.9%), Candida (7.9%), Methicillin Resistant Staphylococcus Aureus (MRSA) (5.0%), Salmonella (4.0%), Shigella (2.0%) while Enterococcus and Streptococcus pyogenes accounted for 1.0% each, elaborated in Table I.

When patients were categorized according to the Hospital, the most common pathogens isolated from Hospital were found to be Staphylococcus Aureus (20.8%) followed by E.coli (18.7 %) and Klebsiella (16.7%), while the most common pathogens isolated were E.coli (29.3%) and Klebsiella (26.8%). According to the type of specimens collected, the maximum number of bacterial growths were found in respiratory secretions, followed by blood as shown in Table I. The predominant pathogens isolated according to the site of specimens were; Klebsiella (38.7%) from Respiratory tract, E.coli from urinary tract (63.2%) while from blood, the predominant pathogen was Staphylococcus aureus (30%).

Antibiotic sensitivity of the isolated microbes showed that most were susceptible to antibiotics like Meropenem, which showed good results against all microbes except for Acinetobacter. Vancomycin also showed good results across all the pathogens except against Klebsiella. Fosfomycin showed mixed results, while drugs like Ceftriaxone and Ciprofloxacin showed increasing resistance (Table-II).

DISCUSSION

All around the world, patients admitted in Intensive Care Unit settings have faced an increasing emergence and spread of antibiotic resistant pathogens.[9] This leads to prolonged stay in the hospital. The mortality rate of infected patients was more than twice as compared to that of non-infected patients in ICU settings.[10] Keeping in mind all these factors, periodic evaluation of drug utilization in the ICU, longitudinal surveillance of drug use and obtaining information on the sensitivity patterns of microorganisms over a period of time are important.[11]

In this study, we found out that most frequently isolated organism was E.coli (22.7%) followed by Klebsiella (18.8%) illustrated in Table 1. The proportion of Methicillin-resistant Staphylococcus Aureus (MRSA) to all Staphylococcus Aureus was 31.25%. In another study conducted, the most common isolate was found to be Pseudomonas aeruginosa followed by E.coli and proportion of MRSA to all Staphylococcus Aureus was 65.2%.[12] A study conducted in Adult ICU in Saudi Arabia found Acinetobacter to be the most common pathogen showing that the spectrum of pathogens isolated in Adult ICU and Pediatric ICU is different.[13]

E.coli was the most common microbe isolated in our study, maximum isolates were from Urine cultures followed by respiratory secretions. E.coli showed great sensitivity to Meropenem, Fosfomycin and Vancomycin. Also, the sensitivity of E.coli for Amikacin has dropped from 80.95% to 33%.[14] E.coli has also shown high resistance against antibiotics like Augmentin, ceftriaxone and ceftizoxime. Klebsiella constituted the highest number of microbes isolated from Respiratory secretions. It showed great sensitivity to Meropenem and also to Fosfomycin and Tazocin while its Amikacin sensitivity has significantly dropped from 100% to 25%.[14] Also, Klebsiella was found to be 100% resistant against Ceftriaxone in our study.

Acinetobacter was third most common microbe isolated in our study. A study done in Saudia Arabia done between 2004 to 2009 showed Acinetobacter developing increasing resistance to Meropenom, Ciprofloxacin and Amikacin. Similarly results were replicated in our data which showed resistance against these antibiotics at 71.4%, 66.67% and 71.4% respectively.[13] Another significant finding in our study was the decline in sensitivity of Vancomycin against MRSA from 100 to 80 percent compared to a study conducted in Pakistan during 2013.[14]

CONCLUSION

The most commonly isolated pathogens were E.coli, Klebsiella, Acinetobacter and Staphylococcus Aureus and the most effective antibiotics were Vancomycin and Meropenem, although Klebsiella showed high resistance against the former while Actinobacter against the latter. In order to provide effective treatment, the overall trend of sensitivity should be kept in mind.

REFERENCES

1. Urea M, Pons M, Serra M, Laborer C, Palenque A. Prospective incidence study of nosocomial infections in a pediatric intensive care unit. Pediatr Infect Dis J, 2003; 22(6): 490-4.
2. Richards MJ, Edwards JR, Culver DH, Gayness RP. Nosocomial Infections in Pediatric Intensive Care Units in the United States. PEDIATRICS, 1999; 103(4): 39.
3. Shoo B, Pataki S, Mishra R, Jain MK. Morbidity pattern and outcome of children admitted to a paediatric intensive care unit of Eastern India. Int J Contempt Pediatr, 2017; 4: 486-9.
4. Abramczyk, ML, Carvalho WB, Carvalho ES; Medeiros EAS. Nosocomial infection in a pediatric intensive care unit in a developing country. Bras J Infect Dis., 2003; 7(6): 375-80.
5. Esfahan BN, Baser R, Mirhosseini SMM, Moghim S, Dolatkhah S. Nosocomial Infections in Intensive Care Unit: Pattern of Antibiotic-resistance in Iranian Community. Adv Biomed Res, 2017; 6: 54.
6. Abbas Q, Ulf-Haq A, Kumar R, Ali SA, Hussain K, Shako or S. Evaluation of antibiotic use in pediatric intensive care unit of a developing country. Indian J Crist Care Med, 2016; 20(5): 291-4.

7. Bhattacharya S, Mondale AS. Clinical microbiology in the intensive care unit: Strategic and operational characteristics. Indian J Med Microbial, 2010; 28(1): 5- 10.
8. Van den Anker JN. How to optimize the evaluation and use of antibiotics in neonates. Early Hum Dev., 2014; 90 Suppl 1: S10-12.
9. Radii M, Faustian S, Aribinuko N. Antibiotic sensitivity pattern of bacterial pathogens in the intensive care unit of Fatmawati hospital. Indonesia Asian Pac J Trop Biomed, 2011; 1(1): 39-42.
10. Vincent JL, Rollo J, Marshall J, Silva E, Ansett A, Martin CD, et al. International study of the prevalence and outcomes of infection in intensive care units. JAMA, 2009; 302: 2323- 9.
11. Shankar PR, Parthia P, Dubai AK, Mishra P, Deshpande VY. Intensive care unit drug utilization in a teaching Hospital in Nepal. Kathmandu Uni Med J (KUMJ), 2005; 3: 130-7.
12. Lee CY, Chen PY, Huang FL, Lin CF. Microbiologic spectrum and susceptibility pattern of clinical isolates from the pediatric intensive care unit in a single medical center 6 years' experience. J Microbial Imanol Infect, 2009; 42(2): 160- 5.
13. Al Johana SM, Akhter J, Balky H, El-Saeed A, You nan M, Me mish Z. Prevalence of antimicrobial resistance among gram-negative isolates in an adult intensive care unit at a tertiary care center in Saudi Arabia. Ann Saudi Med, 2010; 30: 364-9.
14. Khurram M, Umar M, Tayyaba SA, Bushra HT, Raheem M. Frequently isolated bacteria and their culture and sensitivity pattern in a medical ICU. J Coll Physicians Surg Pak, 2013; 23(9): 681-2.