

Study of Bacteriological and Microbial Susceptibility in Critically Ill Children of Karnataka: Retrospective study

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Abstract

Background: Due to indiscriminate usage of antimicrobial agents among critically ill children is extremely imperative to monitor the sensitivity and resistance of antimicrobial agents (AMA). If neglected May cause unsafe treatment exacerbation of adverse drug reactions and increase the length of hospital stay.

Method: Children aged between 2 to 6year of age admitted at ICU were studied out of 92, 69(Sixty Nine) encountered positive. Samples collected for culture and Kirby Bauers Disc diffusion technique. MRSA tested by Oxacillin screening agar method, ESBL were tested for phenotypic confirmation test.

Results: Highest distribution were gram negative pseudomonas aeruginosa 15(21.7%) and least were 1(1.44%) included NFGNB, Moraxella, Enterococci, Coagulase-ve Staphylococci, S. aureus. The highest MDR was 6(54.5%) Acinetobacter.

Conclusion: This pragmatic Bacteriological and microbial findings will be tools for the pediatricians to treat critically ill patients admitted at ICU efficiently.

Keywords: ICU, Kirby Bauer's Disc, MRSA, ESBL, CDC, MDR.

Introduction

Antimicrobial agents are one of the most commonly prescribed drugs to patients in the intensive care units (ICUS). The total antimicrobial consumption is approximately tenfold greater in ICUS than in a general hospital wards⁽¹⁾. The paradox remains where the antibiotics are needed the most (ICU), there resistance is the highest. Since the discovery of very first antibiotics in the 1930's and 1940's these medications have played a revolutionary

role by fighting against various lethal infectious diseases and have saved countless lives⁽²⁾, However still the menace of infectious diseases account for 20% of the death in INDIA and Globally (11 Millions) every yearly⁽³⁾. This is due to the development of Anti-Microbial Resistance (AMR), a threat that was first observed in 1947, when staphylococcus showed resistance against penicillin⁽⁴⁾. The rapidly emerging Drug resistant microbial species make the treatment options very meager and costlier. Although a number

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of factors are thought to contribute to the increasing prevalence of AMR, but a large of studies support the claim that inappropriate use of antibiotics is the main determinant of AMR.⁽⁵⁾ Indiscriminate prescribing of Antimicrobial agents (AMA) leads to unsafe treatment exacerbation of adverse drug reactions and increase the length of stay and health care expenditure.

Prevalent pathogens and microbial resistance pattern may differ amongst various hospitals depending upon the antibiotic pressure in that region. Hence knowledge of common bacterial isolates. Their antibiotic susceptibility pattern facilitates in choosing the most appropriate antibiotic therapy.

Hence antimicrobial agents susceptibility in critically ill-children was evaluated because children have less immunity as compare to adults.

Material and Method

92 (Ninety two) children aged between 2 to 6 years admitted at Siddaganga Medical College and Research Institute, Tumakuru, Karnataka were studied.

- **Inclusive Criteria-** Clinically suspected critically-ill (Children) patients were selected for study.
- **Exclusion Criteria -** The patients who shifted to general ward from ICU. The patients discharged within 24 hours of admission were excluded from study.

Method

After detailed clinical evaluation, microbiological samples were collected from suspected sites of infection. Samples for culture were tested by Kirby Bauer's Disc diffusion technique. Methicillin Resistant *Staphylococcus aureus* (MRSA) samples were tested by oxacillin screening agar methods. Penicillin resistant streptococci were tested by agar dilution method. Out of 92 patient 69 found to be positive and 23 patients samples found to be sterile. ESBL were tested for phenotypic confirmatory test with combination test cases were subsequently classified based on CDC case definitions. Duration of study was Nov 2017 to Apr 2019.

Statistical analysis - Collections of samples from various sites, distribution of different isolates and prevalence of Multi Drug Resistance (MDR) organism were classified with percentage. The statistical analysis was carried out in SPSS Software. The ratio of male and female children was 2:1.

Observation and Results

Table-1 Collections of Various samples from critically ill children - 32(34.7%) Sputum, 23(25%) Blood, 14(15.2%) CSF, 9(9.7%) PUS, 6(6.5%) Wound Swab, 5(5.4%) Urine, 4(4.3%) Pleural fluid.

Table-2 Distribution isolates in different organism in Bacteriological and microbial susceptibility of critically ill-children - 15(21.7%) *pseudomonas aeruginosa*, 12(17.3%) *Klebsiella SPP*, 9(13.04%) *E.coli*, 11(15.9%) *Acinetobacter*, 6(8.69%) *S. aureus*, 3(4.3%) *Candida*, 3(4.3%) *Diphtheroids*, 2(2.89%) *Citrobacter*, 1(1.44%) *Coagulase Negative staphylococci*, 2(2.89%) *Streptococcus SPP*, 2(2.89%) *P.Mirabilis*, 1(1.44%) *Enterobacter*, 1(1.44%) *Enterococci*, 1(1.44%) *Moraxella*, 1(1.44%) *NFGNB*.

Table-3 Prevalence of Multidrug Resistant among common isolates - 3(33.3%) *E.coli*, 5(41.6%) *Klebsiella SPP*, 3(20%) *Pseudomonas*, 6(54.5%) *Acinetobacter*.

Table-4 The present drug resistance profile is 71.8% ESBL rate, 70% MRSA rate, 67% *Fluroquinolones*, 72% 3rd Generation cephalosporins, 10% *Betalactam inhibitor*, 43.3% *Amino glycosides*, 22% *Carbapenems*, 0% *Vancomycin*. These findings are compared with previous workers of INDIA and Abroad.

Discussion

The present study of bacteriological and microbial susceptibility in critically ill- children of Karnataka - Collections of samples from the affected areas - 32(34.7%) Sputum, 23(25%) Blood, 14(15.2%) CSF, 9(9.7%) PUS, 6(6.5%) Wound Swab, 5(5.4%) Urine, 4(4.3%) Pleural Fluid (Table-1) The distribution of different isolates in Bacteriological and microbial susceptibility were 15(21.7%) *pseudomonas aeruginosa*, 12(17.3%) *Klebsiella SPP*, 9(13.4%) *E.Coli*, 11(15.9%) *Acinetobacter*, 6(8.69%) *S.aures*, 3(4.34%) *Candida*, 3(4.3%) *Diphtheroids*, 2(2.89%) *Citrobacter*, 2(2.89%) *Streptococcus SPP*, 2(2.89%) *P.Mirabilis*,

1(1.44%) Coagulase Negative Staphylococci, S aureus, enterobacter, Enterococci, Moraxella and NFGNB (Table-2).

Prevalance of MDR among common isolates were 3(33.3%) E.coli, 5(41.6%) Klebsiella SPP, 3(20%) Pseudomonas, 6(54.5%) Acinetobacter, (Table-3). The drug resistance profile - 71.8% ESBL, 70% MRSA rate, 67% Fluroquinolones, 72% 3rd generation cephalosporins, 10% Beta lactam inhibitor, 43.3% Aminoglycosides, 22% carbapenems and 0% Vancomycin (Table-4). These findings are more or less comparable with previous studies.⁽⁶⁾⁽⁷⁾⁽⁸⁾ Infections continue to play a dominant role in the global mortality and morbidity in developing countries.⁽⁹⁾ The presence of extremely vulnerable patients with diminished host defenses and reduced immune responses, undergoing multiple procedures and use of invasive devices distorting the anatomical integrity and protective barriers of the patients, render the ICUs as a hub for antimicrobial resistance.⁽¹⁰⁾ Hence seriously monitoring the appropriate utilization of antibiotics in ICU's is crucial, preserve the power of almost exhausted antimicrobial armamentarium to fight against fatal infections.

Studies done decade back on the prescription of Antimicrobial agents (AMA) in ICU's were penicillin and amino glycosides as the most commonly used AMA but recent studies documented that 3rd generation cephalosporins are frequently prescribed AMA's. The reason for such an extensive use of cephalosporins may be because of their broad spectrum anti-microbial activity against majority of bacteria, better patient tolerability and compliance.

The most common gram positive bacteria identified was S.aureus. which causes most of the bacterial infections like endo-cardiatis, skin and soft tissue infections, septic arthritis, meningitis, pneumonia, empyma, gastro-enteritis and UTI.

Summary and Conclusion

In the present study gram negative organism were the most common organism isolated. Antimicrobial

resistance has always been a reflection of antibiotic use. (High degree of resistance to third generation cephalosporins and aminoglycosides). Based on the results It is recommended that, the prescribing pattern could be improved by adhering to the WHO prescribing indicators moreover an anti-biogram specific to institute, based on the local profile of the prevalent strains of micro organisms needs to be framed and followed to promote the rational use of antimicrobial resistance.

Limitation of Study - Owing to tertiary location of present hospital, small number of patients and lack of latest techniques we have limited findings and

Results

- This research paper is approved by Ethical Committee of Siddaganga Medical College and Research Institute, Tumakuru, Karnataka.
- No conflict of interest.
- No funding.

Table 1: Collections of various samples in Bacteriological and Microbiological Susceptibility in Critically ill-children

Total No. of patients 92			
Sl No.	Name of the sample	No. of Patients	Percentage (%)
1	Sputum	32	34.7
2	Blood	22	23.9
3	CSF	14	15.2
4	PUS	09	9.7
5	Wound swab	06	6.5
6	Urine	05	5.4
7	Pleural fluid	04	4.3

Table 2: Distribution of isolates in different organism in Bacteriological and microbial susceptibility in critically in children **Total No. of patients 69**

SI No.	Name of Organism	No. of Patients	Percentage(%)
1	pseudomonas aeruginosa	15	21.7
2	Klebsiella	12	17.3
3	E.coli SPP	09	13.04
4	Acinetobacter	11	15.9
5	Staphylococcus aureus	6	8.69
6	Candida	3	4.34
7	Diphtheroids	3	4.34
8	Citrobacter	2	2.89
9	Coagulase Negative Staphylococcus aures	1	1.44
10	Streptococcus SPP	2	2.89
11	Proteus Mirabilis	2	2.89
12	Enterobacter	1	1.44
13	Enterococci	1	1.44
14	Moraxella	1	1.44
15	Non-fermenting gram Negative bacilli (NFGNB)	1	1.44

Highest distribution was 15(21.7%) P.aeruginosa and least were 1(1.44%) included NFGNB, Moraxella, Enterococcus and coagulase negative staphyococci.

Table 3: Prevalence of Multi drug Resistant among the common isolates**Total No. of patients 69**

SI No.	Organism	Total No.of patients	No.of MDR	% of MDR
1	E Coli	9	3	33.3
2	Klebsiella SPP	12	5	41.6
3	Pseudomonas	15	3	20
4	Acinetobacter	11	6	54.5

Table 4: Comparison of Present resistant profile with previous workers

Name of the Worker with year	No. of Samples	ESBL rate %	MRSA rate %	Resistance Rate of gram negative organism/S.aureus					
				Fluroquinolones	3 rd generation Cephalosporian	Betalactam inhibitor	Aminoglycosides	Carbapenems	Vancomycin
MamaimAbdissa A 2014	150			24.7%	64.9%		41.6%		
Dewans. etal 2013	2796	78%							
Radjimet al 2011	312			20%	73%	50%	50%	72%	100%
Pattanayak C et al 2013	24.9			56%	64%		15%	24%	
SweSweetal 2010		83%	4.8%						
VeenaKumari HB 2007	489						48.5%		
Present Study 2019	92	71.8%	70%	67%	72%	10%	43.3%	22%	0%

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