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Orignal Article

Culture and Sensitivity Patterns of Various Bacteriological Agents among Children Admitted in Pediatric Department

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ABSTRACT

The Culture of numerous contaminated fluids of the body is commonly used to determine the etiology of infection and to help medicine specialists and pediatricians to select the suitable antimicrobial treatment. **Objective:** To govern the culture and sensitivity patterns to bacteriological agents' grownup in children. **Methods:** This descriptive cross-sectional study was conducted at the Pediatric Medicine department of Abbasi Shaheed Hospital Karachi, for one-year duration from November 2020 to November 2021. All ≤15-year-old children who met the criteria for sepsis and systemic inflammatory response syndrome were included in the study. Any body fluids or blood were cultivated in the suitable medium as specified. The sensitivity pattern and profile of the cultured microorganisms were recorded and documented in a pre-designed data sheet. SPSS v.22 was applied for data analysis. **Results:** A total of 300 patients were enrolled, 51 (17%) developed multiple organisms in culture and these have been described in more detail. Out of these 51 patients with positive culture, 47.1% were male with a M:F ratio of 1.3: 1, 21(41.2%) were less than one- year old, and 14 (27.5%) were one to five years old, 9 (17.6%) were between 5 and 10 years age and 7 (13.7%) were 10 to 15 years of age, 23 (45.1%) showed an increase in microorganisms in the blood smear. Throat swab, tracheal secretions and sputum cultures were positive in 11 patients (21.6%), CSF cultures were positive in 13 (25.5%), and urine cultures in 10 (19.6%), Swabs (ear and skin) cultures were positive in 7 (13.7%) and 3 (5.9%) had positive pleural fluid cultures. The most frequently isolated microorganism is *Salmonella spp.* (17.6%), *Klebsiella spp.* (15.7%), *Escherichia coli* (11.8%), Acinetobacter (9.8%), *Staphylococcus aureus* (7.8%), Pseudomonas aeruginosa (13.7%), *Streptococcus pyogenes* (7.8%), *Stenotrophomonas maltophilia* (3.9%) and *Enterobacter spp.* (7.23%). **Conclusion:** The most frequently isolated microorganisms were *Salmonella spp., Staphylococcus aureus, Klebsiella spp., E coli and Streptococcus pyogenes*. The antibiotics resistance in various cultures is a warning in contradiction of overuse of antibiotics.

INTRODUCTION

Systemic inflammatory response syndrome (SIRS) is a sequence of inflammatory responses manifested by a response of the host to a non-infectious or infectious trigger [1-2]. This is prompted when the defense system of the host is unable to properly recognize or remove the triggering event. Sepsis is a predominantly bacterial insemination resulting from a systemic inflammatory response to infection, resulting in bacteremia and appearance of clinical signs and resulting in augmented mortality and morbidity among children [3-4]. In children; Sepsis may exhibit with tachycardia, fever> 38.5 ° C, malaise, dyspnea, decreased appetite, lethargy or rejection to feed and is considered a medical emergency requiring immediate attention [5-6]. Any postponement in management of this life-endangering situation will be lethal and rapid antibacterial therapy is specified. The gold-standard in the diagnosis of sepsis is the bacterial agent's isolation from body fluids and blood cultures. Though, antibiotic susceptibility and bacteriological cultures testing require numerous days, and therefore rapid empiric antibiotic therapy is recommended [7-8]. The major

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dilemma associated with empiric antibiotic therapy is the advancement of antibiotics resistance. The most possible cause for this is the widespread and reckless use of unsuitable antibiotics, a grave issue that could bring the universe back to the pre-antibiotic age. Episodic investigation of the sensitivity and patterns of the isolated organisms is essential, and the any resistance of the antibiotics should be printed in the conscience of a responsible doctor of medicine to facilitate better medical care [[9-10]. Knowledge of the common causative agents of sepsis and their patterns of antimicrobial sensitivity to antibiotics will lead to suitable empiric therapy of antibiotics and have an important role in decreasing the danger of resistance to antibiotics [11]. Several infected secretions of the body and blood cultures are the easiest and most frequently used tests to identify the aetiological mediator of an infection. Accurate bacterial identification, early diagnosis, and sensitivity to infectious antimicrobial agents provide clinicians with the information they need to initiate appropriate antimicrobial therapy [12-13]. The objective of this analysis is to govern the culture and sensitivity patterns to bacteriological agents' grownup in children.

METHODS

This descriptive cross-sectional study was conducted at the Pediatric Medicine department of Abbasi Shaheed Hospital Karachi, for one-year duration from November 2020 to November 2021. All ≤15-year-old children who met the criteria for sepsis and SIRS were included in the study. The SIRS criteria comprised 2 of the 4 parameters, one of which is an abnormal white blood cell count or abnormal temperature. > 38.5 ° C (101.3 ° F) Core temperature or < 36°C (96.8°F) (bladder, rectal, central catheter or oral). Tachycardia; mean elevation of greater than two standard deviations above standard for age or 0.5 to 4 hours persistent elevation or two standard deviations above standard for age in the absenteeism of chronic medications, external stimuli or pain stimuli or < 1-year old child, constant 0.5-hour persistent bradycardia (< 10th percentile mean heart rate for age in the absenteeism of congenital heart disease, vagal stimuli or β-blocker drugs). Children in a severe necessity for mechanical ventilation unrelated to general anesthesia or neuromuscular disease or RR of >2 SD. High or low white blood cell count (not after chemotherapy) or occurrence of> 10% immature neutrophils. Pediatric sepsis is definite when a patient meets the criteria of SIRS with proven or suspected infection. Patients who received antibiotics for more than five-days were omitted from the analysis. Various body fluids and blood from various sites were cultured as clinically indicated, counting cerebrospinal fluid, urine, sputum, pleural fluid, tracheal secretions, throat swabs, skin and ear swab. Bacteriological microorganisms have been isolated and the sensitivity of the microorganisms to various drugs has been determined. Amongst the positive reports of culture and sensitivity, the sensitivity and bacteriological profile to antimicrobials were studied. Consent was obtained from the hospital review committee. The data was saved in a previously designed data sheet. Statistical analysis was performed with the SPSS 22.0 software, percentages were considered and articulated in the form of tables and graphs.

RESULTS

Out of 300 patients enrolled, 51 (17%) developed multiple organisms in culture and these have been described in more detail. From these 51 patients with positive culture, 47.1% were male with a M:F ratio of 1.3: 1. Of the 51 patients, 21 (41.2%) were less than one- year old, and 14 (27.5%) were one to five years old, 9 (17.6%) was between 5 and 10 years old and 7 (13.7%) were 10 to 15 years of age. 23 patients (45.1%) showed an increase in microorganisms in the blood smear. Throat swab, tracheal secretions and sputum cultures were positive in 11 patients (21.6%), CSF cultures were positive in 13 (25.5%), and urine cultures in 10 (19.6%), Swabs (ear and skin) cultures were positive in 7 (13.7%) and 3 (5.9%) had positive pleural fluid cultures (Figure 1).

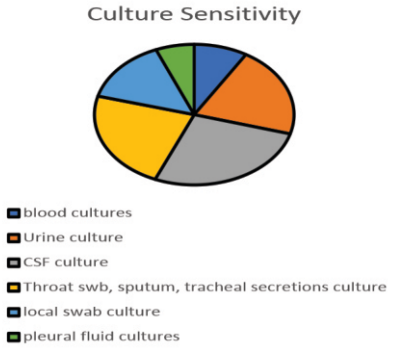

Figure 1: Frequency of sites of cultural isolation (n=51)

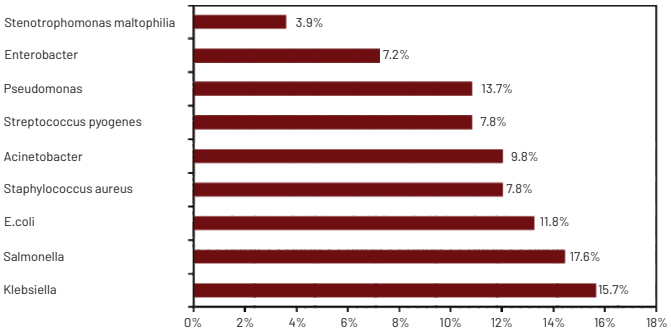

Figure 2: The bacteriological organism's profile from different cultures

The most frequently isolated microorganism is Salmonella spp. (17.6%), Klebsiella spp. (15.7%), Escherichia coli

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(11.8%), Acinetobacter (9.8%), Staphylococcus aureus (7.8%), Pseudomonas aeruginosa (13.7%), Streptococcus pyogenes (7.8%), Stenotrophomonas maltophilia (3.9%) and Enterobacter spp. (7.23%) (Fig. 2). Antimicrobial susceptibility showed an increased resistance of most microorganisms to first-line antibiotics. E. coli and Klebsiella spp were resistant to many commonly used antibiotics counting coamoxiclav, penicillin, fluoroquinolones, naladixic acid and cephalosporin, and was sensitive to cefoperazone/ sulbactam, nitrofurantoin and meropenem. Salmonella spp was highly resistant to cephalosporins, fluoroquinolones and Co-amoxiclav. While highly sensitive to meropenem and azithromycin was found, most of the cases were susceptible to co-amoxiclav and ciprofloxacin. Streptococcus pyogenes was sensitive to the most communal antibiotics, while resistance of Staphylococcus to co-amoxiclav and penicillin was noted, it was sensitive to cephalosporin, and very sensitive to vancomycin, linezolid and amikacin. Stenotrophomonas was a rare organism that developed and grown in only 3 patients, but was sensitive to co-amoxiclav, levofloxacin, ceftriaxone, meropenem and sulbactam (Table 1).

Antibiotics	Klebsiella spp (10)	Salmonella sp (9)	E. coli(8)	Acinetobacter (7)	S. aureus (8)	St. Pyogenes (7)	Enterobacter (5)	St. Maltophilia (3)	Pseudomonas (6)
Penicillin			1(12.5%)		7(87.5%)				
Co-amoxiclav	6(60%)	3(33.3%)	5(62.5%)	7(100%)	7(87.5%)		5(100%)	2(66.6%)	6(100%)
Amikacin	5(50%)		4(50%)	5(71.4%)	2(25%)		4(80%)		2(33.3%)
Cefuroxime	9(90%)	6(66.6%)	7(87.5%)	6(85.7%)	6(75%)	6(85.7)	4(80%)	1(33.3%)	4(66.6%)
Ceftriaxone	8(80%)	6(66.6%)	7(87.5%)	5(71.4%)	6(75%)		5(100%)	2(66.6%)	4(66.6%)
Ciprofloxacin	7(70%)	5(55.5%)	3(37.5%)	5(71.4%)			5(100%)	2(66.6%)	3(50%)
Levofloxacin	4(40%)	5(55.5%)	3(37.5%)	4(57.1%)			4(80%)		2(33.3%)
Sulbactam/ cefoperazone	5(50%)	4(44.4%)	6(75%)	5(71.4%)			2(40%)	2(66.6%)	3(50%)
Meropenem	3(30%)	3(33.3%)	5(62.5%)	4(57.1%)			2(40%)	2(66.6%)	3(50%)
Nitrofurantoin	2(20%)								
Nalidixic acid	5(50%)		5(62.5%)						

Table 1: Microorganisms resistant to different antibiotics (n=51)

DISCUSSION

Bacterial pathogens are increasingly resistant to frequently used antibiotics. In spite of the new antibiotic's introduction, the empirical treatment for infections has become a main challenge for clinicians [12-13]. These results are similar to those of Negussie et al. (Male = 54.7% and M: K ratio 1.2: 1). Most of the pathogens isolated in this study are gram-negative bacteria. Similar results were obtained by Ashtiani et al. up to 65% of gram-negative organisms were reported in their studies, Salmonella Spp up to 14% and E. coli 13% [14-15]. The utmost communal gram-positive organism was Streptococcus pyogenes (10.84%), Staphylococcus aureus (12.04%), then enterococci in 7% and E. coli in the remaining 4.7% [16-17]. In one analysis, the most communal isolates of bacteria were gram-positive bacteria, followed by Staphylococcus aureus, then Escherichia coli and Citrobacter [18-19]. Another study also found that gram-positive organisms increased resistance to ampicillin, aminoglycosides and cephalosporins [20]. Many of the negative microorganisms (96%) were multi-resistant. Empirical antibiotic therapy should be reassessed as most of the bacteria isolated show increase resistance to most prescribed drugs, such as coamoxiclav, quinolones and cephalosporins [21-22].

CONCLUSION

The most frequently isolated microorganisms are Klebsiella spp., Salmonella spp. Such as gram-negative pathogens and E coli and common pathogens which are gram-positive were Streptococcus pyogenes and Staphylococcus aureus. Many of these micro-organisms were resistant to commonly used antibiotics. It is suggested that such descriptive studies be performed from time to time to sporadically govern the antimicrobial sensitivity and bacteriological profile. Rational use of antibiotics conferring to the sensitivity and culture should be strict practice to avert further resistance to drugs.

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