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A STUDY OF ANTIBIOTIC SUSCEPTIBILITY PATTERN OF BACTERIOLOGICAL ISOLATES ON PEDIATRIC PATIENTS WITH INFECTIOUS DISEASES

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ABSTRACT

Antibiotics are one of the most often prescribed drugs for children's infectious diseases. This study is aimed to determine and analyze the antibiotic susceptibility pattern of bacterial isolates using microdilution method and to identify the effective antibiotics prescribed by antibiotic sensitivity pattern on pediatric patients from a private hospital for one year period. We reviewed the 612 case records from the pediatric ward, who fulfilled the inclusion criteria were studied. Antibiotic susceptibility pattern were performed and each case records, blood culture reports were recorded. Among the (n=612) blood culture reports, the total positive blood culture reports monitored was 33% (n=202) with the bacteriological organisms *Staphylococcus aureus, Streptococcus pneumonia, Escherchia coli, Klebsiella pneumonia* and *Meningo coccus*. The most frequent bacterial organisms isolated were *Staphylococcus aureus, Streptococcus pneumonia, Escherchia coli, Klebsiella pneumonia* and *Meningo coccus* respectively. *S. pneumoniae* was found to be most sensitive towards amoxicillin, followed by cloxacillin, chloramphenicol, ciprofloxacin, ampicillin, and least sensitive towards gentamycin, and penicillin. *M. coccus* was shown to be highly sensitive towards penicillin, ciprofloxacin, and least sensitivity towards ampicillin, cloxacillin, amoxicillin, gentamycin, and chloramphenicol. *Staphylococcus aureus* was sensitive against chloramphenicol and *Klebsiella pneumoniae* was found to be sensitive against chloramphenicol. *S. pneumoniea* and E. coli were sensitive to amoxicillin. Micrococcus was found to be sensitive with penicillin, ciprofloxacin followed by ampicillin. The study is concluded with most of antibiotics were not sensitive against all bacteria. Hence the antibiotics can be considered and prescribed to the infected pediatrics only after the antibiotic sensitivity pattern tests.

INTRODUCTION

Antibiotics are one of the most often prescribed drugs for children's infectious diseases. Their use has become so common that not much thought is given to their need for use, their side effects and precautions to be observed during the treatment [1-3]. Children are more vulnerable to bacterial illness than are adults, and this vulnerability is reflected in their higher disease rates [4].

In the year 2009, more than 60 kinds of antibiotics were available for use in pediatric population. Many more are in the process of being developed as research continues. Today, bacterial infections usually can be treated easily and successfully in children with access to good medical care [5-7]. Although the key role played by antibiotics in the treatment of infectious diseases in developing countries should be acknowledged, there are reports of irrational use of antibiotics which may even lead to infections that are worse than those caused originally

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[8,9]. The rational and correct use of antibiotics requires understanding of common pathogens and their drug sensitivity pattern in the regions. Due to constant evolving antimicrobial resistant patterns, there is a need of constant antimicrobial sensitivity surveillance. This will help clinicians to provide safe and effective empirical therapies, develop rational prescription programs and make policy decisions and finally assess the effectiveness [10-12].

Bacterial infections are thought to be the second most important cause worldwide, accounting for 26% of the deaths. But in countries with the highest neonatal mortality rates, infection may account for a greater proportion [13-15].

A review of 14 studies of the bacterial etiology of young infant sepsis noted that the setting influences the pattern of causative agents and antimicrobial susceptibility [16].

One important study of community-acquired young infant sepsis was by World Health Organization (WHO) Young Infant Study, carried out in 1990-1993 in 4 countries (Papua New Guinea, Philippines, Gambia and Ethiopia) [17,18]. Among infants with proven bacterial infection, Gram positive organisms were more common than Gram negative but this study had only 31 isolates from the first week of life. A retrospective study of 801 isolates from 784 neonates in a tertiary referral hospital in Malawi also found that gram positive organisms were predominant [19].

The risk of bacterial infection is higher for infants and children, and treatment options are more limited, for several reasons such as, their undeveloped immune systems, exposure of more disease-causing bacteria through day-today activities, less approved therapeutic medications for use in children and metabolic differences between children and adults which may certain drugs are unsafe for children [20,21]. Although careful use of antibiotics can result in the emergence of antibiotic-resistant bacteria and inappropriate use greatly accelerates this process [22]. The more often bacteria get exposed to antibiotics, the more resistant they become. Because bacteria reproduce rapidly, these antibiotic-resistant bacteria can spread efficiently. Hence it has been necessary to study about bacteriological isolates and antibiotic sensitivity pattern. Determination of antibiotic sensitivity patterns in periodic intervals is mandatory in each patient for choosing appropriate antibiotic therapy [23,24]. The purpose of this study was to determine and analyze the antibiotic susceptibility pattern of bacterial isolates in the blood and to identify the effective antibiotics prescribed by antibiotic sensitivity pattern of bacterial isolates on data on bacteremia in pediatric patients.

MATERIALS AND METHODS

This study was a hospital based prospective study. The study was effectively conducted in hillside hospital (private), Bangalore, India for one year period. Both the gender, highly prevalent towards the bacterial infections from in-patient pediatric department was included in this study. Due to the changes in the susceptibility test patterns of different bacteriological species, there was a necessary continuous monitoring of susceptibility patterns and effective treatment for the infectious diseases. The isolates were identified by antibiotic susceptibility testing, which was determined by microdilution method, where the interpretation of results was recorded after 24 and 48 hours of test.

Inclusion and exclusion criteria

We reviewed the 612 cases from the pediatric ward for analyzing the bacteriological results, profiles and relevant data. Pediatric patient's age ranging between 1 to 14 years were included for this study, whereas neonates and preterm babies were excluded. We enrolled patients with pneumonia, ear infections, skin infections, diarrhea, meningitis, joint infections, and other febrile clinical presentations.

Statistical Analysis

The Statistical analysis was done by one way ANOVA (analysis of variance) using SPSS version 16.0. The value of $p<0.05$ was considered as statistically significant.

RESULTS AND DISCUSSION

We reviewed the 612 case records from the pediatric ward, who fulfilled the inclusion criteria were studied. Antibiotic susceptibility pattern were performed and each case records, blood culture reports were recorded. Among the (n=612) blood culture reports, the total positive blood culture reports monitored was 33% (n=202) with various bacteriological organisms such *Staphylococcus aureus, Streptococcus pneumonia, Escherchia coli, Klebsiella pneumonia, Meningo coccus.* The gender distributions among 202 cases were 132 (65.4%) male and 70 (34.6%) female pediatric patients.

The most frequent bacterial organisms isolated were 74.2% *Staphylococcus aureus* (n=150), 14.3% *Escherchia coli (n=29),* 5% *Klebsiella pneumonia (n=10),* 5% *Streptococcus pneumonia* (n=10) and 1.5% *Meningo coccus (n=3)* is given below in the Table.1.

The selected 202 pediatric patient's age groups with positive bacterial infections were shown in Table 2.

The diagnosis such as ear infections, skin infections, chest infections, diarrohea, flu, sinus infections were found. The technique used in the microbiology laboratory was microdilution for bacterial isolates. The culture rate was high, and the microbiological techniques were reliable. The most common organisms isolated on blood culture were: *Escherichia coli, Staphylococcus aureus, Streptococcus pneumoniae, Klebsiella*

pneumoniae, Streptococcus pneumoniae, Micrococcus. The isolated organism and antibiotic sensitivity were shown in the Table 3.

The sequence of antibiotic sensitivity towards the bacterial organisms *S. aureus* found to be most sensitive towards chloramphenicol (74.4%) followed by penicillin (66.7%), gentamycin (63.6%), ciprofloxacin (62.3%), cloxacillin (61.3%), amoxicillin (60.1%), ampicillin (56.8%) respectively.

The *E. coli* was shown to be most sensitive towards amoxicillin (53.2%), followed by gentamycin (49.3%), chloramphenicol (41.4%), ampicillin (39.7%) ciprofloxacin (39.3%), cloxacillin (37.9%), where least sensitivity to penicillin (31.2%).

Kleb. pneumoniae given the results sensitivity to the antibiotic chloramphenicol (67.4%) followed by amoxicillin (62.4%), ciprofloxacin (59.7%), and least sensitive towards gentamycin (39.6%), penicillin (33.5%), ampicillin (30.1%), cloxacillin (28.8%).

S. pneumoniae was found to be most sensitive towards amoxicillin (79.3%), cloxacillin (58.9%), chloramphenicol was (51.9%), ciprofloxacin (48.2%), ampicillin (47.6%), and least sensitive towards gentamycin (44.5%), penicillin (42.8%).

M. coccus was shown to be highly sensitive towards penicillin (84.2%), ciprofloxacin (57.2%), and least sensitivity towards ampicillin (51.2%), cloxacillin (47.9%), amoxicillin (47.3%), gentamycin (39.7%), and chloramphenicol (36.6%)

Our study shows that the bacterial isolates such as *Staphylococcus aureus* was sensitive against chloramphenicol (74.4%) and *Klebsiella pneumoniae* was found to be sensitive against chloramphenicol (67.4%), but *S. pneumoniea* and *E. coli* were sensitive to amoxicillin. Micrococcus was found to be sensitive against penicillin (84.2%), ciprofloxacin (57.2%) followed by ampicillin (51.2%).

The ANOVA single factor statistical analysis of different groups of culture and sensitive pattern were shown in the Table 4. The values of $p<0.05$ was considered as statistically significant.

Table 1. Frequency of isolated bacterial organisms.

Common Organisms	No. of cases n=202
Staphylococcus aureus	150 (74.2%)
E-coli	29 (14.3%)
Klebsiella pneumonia	10 (5.0%)
Streptococcus pneumonia	10 (5.0%)
Meningo coccus	3 (1.5%)

Table 2. Frequency of prevalence of positive cases by age

Age group	No of cases Identified (n=202)	Percentage (%)
<6 months	143	70.8%
6-11months	36	17.8%
1-5 years	15	7.4%
6-10 years	8	4.0%
>11 years	9	4.45%

Table 3. The antimicrobial susceptibility pattern of bacterial isolates against various antibiotics

Different Antibiotics Used	*S. aureus*	*E. coli*	*K.pneumonia*	*S. pneumonia*	*M. coccus*
Chloramphenicol	74.4%	41.4%	67.4%	51.9%	36.6%
Ciprofloxacin	62.3%	39.3%	59.7%	48.2%	57.2%
Amoxicillin	60.1%	53.2%	62.4%	79.3%	47.3%
Cloxacillin	61.3%	37.9%	28.8%	58.9%	47.9%
Gentamycin	63.6%	49.3%	39.6%	44.5%	39.7%
Ampicillin	56.8%	39.7%	30.1%	47.6%	51.2%
Penicillin	66.7%	31.2%	33.5%	42.8%	84.2%

Table 4. ANOVA for different groups of culture and sensitive pattern

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	0.177528	4	0.044382	3.022884	0.036622	2.75871
Within Groups	0.367049	25	0.014682			
Total	0.544577	29				

CONCLUSION

Most of the antibiotics commonly recommended for the various bacterial infections were not sensitive enough against the bacteria which to be killed or prevented further growth. Hence the antibiotics should be considered and prescribed to the infected pediatrics only after the antibiotic sensitivity pattern tests. The usage of the antibiotics must be justified for all the pediatric patients.

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