A Study on Rare Cases and Bacterial Infections in Children

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ABSTRACT
The present was a short-term study and conducted for a period of five months in order to study the incident rate of bacterial infections that occur commonly and rarely in children. A total of 50 clinical samples like blood, urine, pus, stool, nasal secretions, sputum etc. were collected from children suffering with various types of diseases like urinary tract, gastro intestinal, skin, ear, upper and lower respiratory tract infections caused by bacteria. Positive growth was identified in 31 samples and the bacterial infections represented by Streptococcus pneumoniae (2 samples), Methicillin resistant Staphylococcus aureus (MRSA) (5), Staphylococcus aureus (3), Escherichia coli (3), Klebsiella species (2), Pseudomonas aeruginosa (5), Citrobacter species (1), Enterococcus species (2), Coagulase negative staphylococci (5), Enterobacter species (1), Methicillin sensitive coagulase negative Staphylococcus aureus (2). Staphylococcus aureus was found to be the major pathogen isolated from the majority of clinical samples. The organism Staphylococcus aureus was also isolated from 5 years old boy suffering with Beta thalassemia Major and diagnosed with severe respiratory tract infections characterized by fever, cold, cough, and bronchiolitis. The antibiotic susceptibility pattern of the organisms was studied using Kirby-Bauer method.

Key words: Infections, Microorganisms, Antibiotic sensitivity, Beta thalassemia.

INTRODUCTION
In the present days the children were continuously posed to several types of microbial infections. This may be due to poor sanitary conditions, environmental pollution problems, eating unhealthy foods, malnutrition, prolonged illness, sedentary life style etc. leads to decrease in the immune resistant power. The commonest respiratory infections are localized in the oropharynx, nasopharynx and nasal cavity causing sore throat, nasal discharge, and often fever but the throat pathogens may also spread to infect the larynx, causing hoarseness; the middle ear causing otitis media with earache; a paranasal sinus, causing sinusitis with pain in the face or head; and the eye causing conjunctivitis or keratitis. The most common bacterial pathogens causes RTI are Pneumococcus, Haemophilus influenzae, Staphylococcus aureus and Streptococcus pyogenes [1]. The most common lower respiratory tract infections include acute tracheo bronchitis, acute exacerbations of chronic bronchitis and the
pneumonias. In majority of cases, primary infection is caused by a virus but the secondary bacterial infections are caused by bacterial pathogens from the nasopharynx most commonly pneumococcus or Haemophilus influenzae, Staphylococcus aureus, Pseudomonas aeruginosa etc. [2]. Lung infections are commonly associated with bacteremia and it may be possible to culture from the blood a delicate pathogen whose growth is suppressed in the cultures of sputum contaminated with the salivary organisms. Acute otitis media is usually caused by Mycoplasma Pneumoniae, Pneumococcus, Moraxella catarrhalis, Haemophilus influenzae and Streptococcus pyogenes. Antibiotic therapy is urgently required to prevent a possible bacterial infection damaging the hearing mechanism and amoxicillin or erythromycin may be used when the causal organism is unknown [3]. Chronic inflammation of the skin of the external meatus with irritation and discharge may be caused by bacteria particularly Pseudomonas aeruginosa, Staphylococcus aureus, coliform bacteria etc. Infection of soft tissues is generally associated with the production of pus and the bacteria involved are said to be pyogenic. Staphylococcus aureus was isolated from pustules, boils, carbuncles, stitch abscesses and wound infections [4]. The commonest pyogenic bacteria Staphylococcus aureus, Streptococcus pyogenes, Pneumococcus, E.coli, Proteus, Pseudomonas aeruginosa etc. cause wound infections. For gastrointestinal infections the common specimen examined was faeces from patient with diarrhea, with or without abdominal pain or vomiting. The commonest infectious causes of diarrhoea in children over 2-3 years age are infections with Campylobacter Species, Enterobacteriaceae members, Clostridium perfringens, Vibrio parahaemolyticus, Bacillus cereus etc. [5]. In urinary tract infections the most common symptoms are urgency and frequency of micturition, with associated discomfort or pain. The commonest condition is cystitis due to infection of the bladder with uropathogenic bacterium, which most frequently is E.coli but sometimes Staphylococcus saprophyticus, Klebsiella, Proteus, Pseudomonas aeruginosa, Enterococcus. Mid-stream urine is collected from bacteriuria patient [6]. Beta thalassaemia syndromes are the blood disorders recognized by reduced or absent beta globin chain synthesis, leads to reduced haemoglobin in red blood cells, decreased RBC production and anaemia. The infant who are affected with thalassaemia major become progressively pale. The affected infant may get diarrhoea, irritability, fever, spleen and liver enlargement, growth retardation, pallor, jaundice, poor musculature, leg ulcers, hepato splenomegaly etc. The regular blood transfusions by maintaining haemoglobin levels 9.5 to 10.5g/dl cause the normal growth development till 10-12 years. However iron overload is the major problem in transfused patients leads to growth retardation and delayed sexual maturation. Iron chelation therapy help in reducing the complications in affected children [7]. Chung et al. isolated Klebsiella from transfusion dependent thalassaemia patient. Nonetheless, limited data are available with regard to the incidence of infection and spectrum of clinical presentation [8]. The incidence of infections among patients with thalassaemia and the role of risk factors for infection are uncertain [9]. Staphylococcus aureus was the major pathogen mainly related to infection, associated with iron chelation therapy. Many studies have showed that infection is common in thalassaemia patients and caused by Klebsiella pneumoniae, E.coli, Streptococcus pneumoniae, Staphylococcus aureus, Salmonella typhi etc. [8],[10],[11],[12],[13]. The objective of the present study was to determine the rate and spectrum of infections occur among the children.

MATERIALS AND METHODS
In the present study 50 clinical samples namely Blood, Pus, Sputum, Stool, Nasal secretions, Throat swab, and Ear swab for bacteriological investigation were collected in sterile containers. Among them one sample was collected from 5 years old boy diagnosed with acute upper respiratory tract infection and suffered with Beta thalassaemia major characterized by severe spleno
hepatomegaly, haemolytic anaemia. The haemoglobin levels were 4g/dl and the CRP levels were 145 mg/l and considered positive. Haemoglobin variant analysis is suggestive of a diagnosis homozygous Beta thalassaemia. The boy was detected with Thalassaemia at the age of 9 months. However blood intended primarily for blood culture was inoculated into a blood culture bottle. Swabs were used for taking specimens of exudate from the throat, nostril, skin, wound and other lesions. For urine samples the examinations made were the microscopy examination of a wet film to determine whether polymorphs or pus cells were present in numbers indicative of urinary tract infection. The clinical samples were now inoculated into a suitable enrichment, differential and selective media like Mannitol salt agar, Mac Conkey agar, Blood agar, EMB agar, Chocolate agar, Loeffler’s serum slope, TCBS agar, XLD agar, Deoxycholate citrate agar. The plates were incubated for 24h and later identified for the presence of bacterial growth. A Gram staining was performed to identify the morphological features of the isolates and biochemical tests like Catalase, Coagulase, IMViC, Urease test, Oxidase test, O/F test, Nitrate reduction test, TSI agar test, CAMP test, PYRase test, Bile solubility test, Sugar fermentation tests etc. were used for the organism confirmation. Mueller Hinton agar was used to perform Antibiotic susceptibility pattern of microorganisms using Kirby Bauer method. Standard Hi-grade antibiotics (Hi Media Laboratories) were used for the test [14].

RESULTS AND DISCUSSION
Among 50 pediatric samples screened for the presence of bacterial growth 31 samples show positive. The isolated organisms were Streptococcus pneumoniae, Methicillin resistant Staphylococcus aureus, Pseudomonas aeruginosa, Staphylococcus aureus, Klebsiella pneumoniae, Citrobacter, Escherichia coli, Enterococcus, Enterobacter, Coagulase negative Staphylococci, Methicillin sensitive coagulase negative Staphylococcus aureus (Table 1). Alteret al. reported that bacterial pneumonia was common in younger children and accounts for 13% of all infection illnesses in infants younger than 2 years of age [15]. The organisms most commonly cause E.coli, Streptococcus pneumoniae, Klebsiella pneumoniae. In the present study four pneumonia cases were identified and the organisms Streptococcus pneumoniae and Klebsiella pneumoniae were highly susceptible to Linezolid, Ciprofloxacin, Tetracycline and Gentamycin, Amikacin, Ertapenem, Methicillin, Ciprofloxacin (Table 2). However Staphylococcus aureus (coagulase positive, MRSA and Coagulase negative) were the predominant organisms isolated. The organism was also isolated from the Beta thalassaemia patient suffered with severe respiratory tract infection. The results were similar while comparing with the previous studies [8],[10],[11],[12],[13]. The organism was sensitive to antibiotics like Cefuroxime, Tetracycline, Linezolid, Vancomycin, Ceftriaxone and Gentamycin (Table 2). Methicillin resistant Staphylococcus aureus was identified in 5 cases of skin infections like Carbuncles, furuncles and Impetigo. MRSA was the common pathogen isolated from the soft tissues [15],[16]. The organism Pseudomonas aeruginosa was screened from children suffering with wound infections, skin infections and respiratory tract infections. The organism was highly sensitive to Ceftazidine, Ciprofloxacin, and Amikacin. Algun et al. showed that 136 strains of Pseudomonas exhibit high and medium susceptibility to antibiotic ciprofloxacin [17]. Urinary tract infection seen in 5% of febrile infants and 2% of febrile children more than 5 years of age and reoccurs again in 50% of school-aged girls within 6-12 years. Male children were more prone to UTI when compared to females [18]. Escherichia coli, Proteus are seen in more number of cases. In the present study along with E.coli the other organismCitrobacter was cultured from urine. The organism showed high sensitivity to Ceftriaxone, Ampicillin/Salbactum (Table 2) (Figure 1). By examining the stool cultures, three organism were identified which cause gastrointestinal infections were Enterococcus,
Enterobacter and E.coli. 75% of children experience at least one episode of otitis media within 3 years of age. The causal organisms were Streptococcus pyogenes and Staphylococcus sensitive to antibiotic like Amoxicillin, Cefuroxime, Ceftriaxone, Cefpodoxime etc. [18]. The current findings showed that Methicillin sensitive Staphylococcus aureus and coagulase negative Staphylococci were isolated from ear swabs. The coagulase negative Staphylococci have become the commonest pathogens in neonatal intensive care units and present special problems both of diagnosis and management.

As the bacterial infections in children increases the mortality and morbidity rates in the present scenario might be due to conditions like malnutrition, immune deficiency states, prolonged illness etc. Hence to prevent or reduce the infection rate in children the first key step is the responsibility of the parents to maintain good hygienic conditions of the children, taking appropriate antibiotics, nourished with enriched foods contains high amounts of proteins, vitamins and minerals. This causes the boosting of immune resistant power and the children should be under the continuous supervision of specific physician.

### Table 1: Percentage of organism Isolated in pediatric Infections

| S.No | Name of the organism                      | Positive samples | Percentage |
|------|------------------------------------------|------------------|------------|
| 01   | Streptococcus pneumoniae                 | 2                | 4%         |
| 02   | Methicillin resistant Staphylococcus aureus | 5                | 10%        |
| 03   | Pseudomonas aeruginosa                   | 5                | 10%        |
| 04   | Staphylococcus aureus                    | 3                | 6%         |
| 05   | Klebsiella pneumoniae                    | 2                | 4%         |
| 06   | Citrobacter                              | 1                | 2%         |
| 07   | Escherichia coli                         | 3                | 6%         |
| 08   | Enterococcus                             | 2                | 4%         |
| 09   | Enterobacter                             | 1                | 2%         |
| 10   | Coagulase negative Staphylococci         | 5                | 10%        |
| 11   | Methicillin sensitive coagulase negative Staphylococcus aureus | 2 | 4% |

### Table 2: Antibiotic Sensitivity Pattern of the Isolates

| Name of the organism                      | Sensitive to antibiotics | Resistant to antibiotics |
|------------------------------------------|--------------------------|--------------------------|
| Streptococcus pneumoniae                 | LZD, CIP, TET, GEN       | CXM, AMP, LOM            |
| Methicillin resistant Staphylococcus aureus | CXM, GEN, TET, GEN       | PEN, COT, TET            |
| Pseudomonas aeruginosa                   | CAZ, PIP, TET, GEN       | AMP, TET, COT, A/S, CXM  |
| Staphylococcus aureus                    | CXM, TET, GEN, VAN, CTR, GEN | PEN, ERY              |
| Klebsiella pneumoniae                    | AMK, ETP, TET, CIP       | AMX, CXM, PIP, CPM, CAZ, CTR, CLA, COT, AMP |
| Citrobacter                              | CTR, A/S, IPM, CAZ, CPM, GEN, TET, CIP, CAC | PEN, LOM, AMX, COT, CIT, CXM, AMK, AMP, NOR |
| Escherichia Coli                         | CAC, NIT, AMK, A/S, GEN  | CAZ, ETP, TET, COT, CIT, CXM, AMP, CIP, PEN, LOM, NOR, CTR, AMX |
| Enterococcus                             | CPM, TET, GEN, CTR, VAN, CTX, LZD, ERY | AMP, CIP, PEN |
| Enterobacter                             | NOD, GEN, A/S, IPM       | AMP, CAC, NIT, CAZ, CPM, CIP, CTR |
| Coagulase negative Staphylococci         | A/S, TET, LZD, CIP, VAN  | PEN, ERY, COT, CXM, CTR, GEN, NOR |
| Methicillin sensitive coagulase negative Staphylococcus aureus | PEN, MET, A/S, CXM, TET, CIP, TET, GEN, VAN, LZD | ERY |

**Drugs evaluated:** PEN: Penicillin, CIP: Ciprofloxacin, LZD: Linezolid, A/S: Amoxicillin/Salbactum, TET: Tetracycline, ERY: Erythromycin, GEN: Gentamycin, AMK: Amikacin, CXM: Cefuroxime, AMP: Ampicillin, LOM: Lomefloxacin, CTR: Ceftriaxone, VAN: Vancomycin, CAZ: Ceftazidime, PIP: Pipercillin, ETP: Ertapenem, Met: Methicillin, AMX: Amoxicillin, CLA: Clavulanic acid, COT: Cotrimaxazole, IPM: Imipenem, NIT: Nitrofurantoin, CXM: Cefuroxime, NOR: Norfloxacin, CTX: Cefotaxime, CPM: Cefpiramide, CEC: Cefaclor, CAC: Ceftazidime/Clavulanic acid.

![Fig 1: Antibiotic sensitivity of Citrobacter](image-url)
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