



## Detection of common types of Bacterial Respiratory Infections in Children of Ramadi city/Iraq.

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### Abstract

**Background and Aim:** Respiratory Infections are a major global health and financial burden, so among cause the five most common and deadly for respiratory illnesses is acute lower respiratory tract infections (RTIs), these infections claim over 4 million lives annually, making them the leading cause of death in children under 5 years. The current study aims to "Investigate the potential and identification of most common cause for respiratory infections in Ramadi city children". **Methodology:** The study included collect of 300 samples with respiratory infection from both sex with range ages (1-12) years. The samples were collected from general and private hospitals in Ramadi city, Iraq then detection of isolates type that cause of bacterial infection by Vitek Com.2 devise as a final identification. **Results and Conclusion:** The result of sputum culture indicate that 100 of suspected samples were positive culturing while other demonstrate a negative growth. The results of samples distribution according to type of bacterial isolate infection indicate that Gram-Negative bacteria infection more than Gram-Positive with frequency of microbial distribution show that 40 sample belong to *Klebsiella pneumoniae* and 20 sample to *Acinobacter baumannii*, 19 samples of *Streptococcus pneumoniae*, 9 samples to *Enterobacter aerogens*, 8 samples to *Enterococcus faecium* and 4 samples belong to *Pseudomonas putida*. Results showed that male children were more affected (64.3%) with bacterial respiratory infections compared to female (35.7%).

**KEYWORDS:** Lower Respiratory Infections, *Klebsiella pneumoniae*, Bacterial Infection.

## 1. Introduction:

One of the most common infections in children is a respiratory infection in which virus and bacteria are the most ordinary causes. The most conventional symptoms are nasal congestion, sore throat, cough, breathing difficulties, runny nose. Respiratory diseases constitute major health and financial burdens worldwide [1]. Respiratory tract infections are a serious threat to global health, causing significant illness [2] [3], these infections responsible for over 4 million deaths each year, with children under 5 years being the most vulnerable [1]. Bacterial infections consider second common cause of respiratory illnesses, and they can be more serious especially with infection of *Corynebacterium diphtheriae*, *Haemophilus influenzae*, *Acinetobacter baumannii*, *Mycoplasma pneumoniae*, *Streptococcus pneumoniae*, *Pseudomonas aeruginosa* and *Klebsiella pneumoniae* [3].

Pulmonary bacterial, viral, and fungal infections are major causes of infectious death in all age groups and are a key risk factor for Acute Lung Injury (ALI)/Acute Respiratory Distress Syndrome (ARDS), for which there are currently no therapies available [4]. The innate immune response is consequential in effective host defense against and clearance of invading pathogens, lung epithelial cells are the first to encounter the pathogen in the lung during pneumonia and other lung infections, which is followed by an influx of neutrophils and macrophages to clear the pathogen, this is initiated in the mammalian immune system by pattern recognition receptors (PRR) that sense pathogen-associated molecular patterns (PAMPs) in order to produce pro-inflammatory responses [5] [6].

Upper respiratory infection ( URI) occurs when a virus or bacteria enter the body, usually through the mouth or nose, the infection may pass to another person through touch or a sneeze or cough [7]. The treatment is usually simple unless a person also has a chronic respiratory condition, such as asthma. Adults tend to get between two and three URIs per year, while children, especially young children, may have more of these infections, because their immune systems are still developing, also children who spend lots of time around other kids may be more prone to these infections, because children are less likely than adults to wash their hands after sneezing or wipe their noses when they need [8] [3].

A lower respiratory tract infection (RTI) occurs when there is an infection of the lungs, specifically in the lower airways, this infection is usually caused by a virus, and bacteria. The lower respiratory tract is not sterile, and it always is exposed to environmental pathogens which invasion and propagation of the bacteria into lung parenchyma at the alveolar level causes bacterial pneumonia, so the body's inflammatory response against it causes the clinical syndrome of pneumonia [9].

## **2. Methodology:**

### **2.1 Study Design and Samples Collection:**

The study included collect of 300 samples with respiratory infection from both sex with range ages(1-12) years. The samples were collected from general and private hospitals in Ramadi city, Iraq. At first, patient samples collect according to physicians recommendation as expected of bacterial respiratory infection by used of nasogastric (NG) tube to collect of sputum from baby, also collect of sputum with sterile cup by deep coughing from young children with sterile condition, then detection of isolates type that cause of bacterial infection by Vitek Com.2 devise as a final identification. The period of the study and all required works that are important for the research extended from June 2023 to May 2024.

### **2.2 Bacterial Identification:**

Bacterial identification is a critical step in current study to distinguishes of bacterial respiratory infection from other illness. The samples identified by traditional microbiological methods which includes colonial morphology, Gram staining, biochemical tests and the Vitek 2 Compact system was utilize for final identification of bacterial infection sources, as per the manufacturer's instructions (bioMérieux, France).

### **2.5 Ethical Approval**

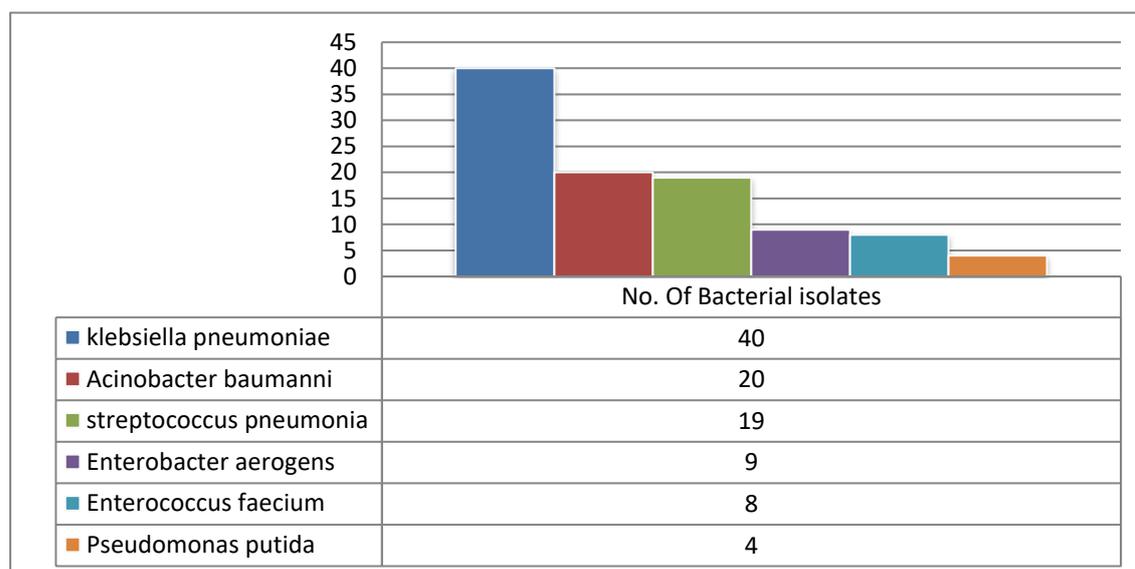
The study was approved by Ethics Committee of the Al Anbar Medical Research University approval number (3<sup>rd</sup> June.2023). All individuals have given consent of their parents to participate in the current study.

### 3. Results and Discussion:

#### 3.1 Bacteria Sampling and Cultivation

For isolation and primary identification of different bacterial genera, all isolates were grown on blood agar and MacConkey's agar, and isolates that were grown on blood agar were re-cultured on Mannitol salt agar. Out of all specimens, the result of microbial culture indicate that 100(33.3%) were positive for culturing while 200(66.6%) negative for any growth. Some negative culture results could be caused by patients receiving antimicrobial chemotherapy before the cultures were taken [10], or may back to another causes of microbial respiratory infection such viruses or fungal.

The identification of bacterial species were be done according to colonial morphology and by VITEK Comp.2 system as a final identification, the results of microbial distribution show that 40 samples belong to *Klebsiella pneumoniae* and 20 samples to *Acinobacter baumannii*, 19 samples of *Streptococcus pneumonia*, 9 samples to *Enterobacter aerogens*, 8 samples to *Enterococcus faecium* and 4 samples belong to *Pseudomonas putida* (Fig.1).



**Figure (1): Samples distribution according to type of bacterial isolate infection.**

The results of samples distribution according to type of bacterial isolate infection indicate that Gram-Negative bacteria infection more than Gram-Positive, this may back to presence of outer membrane that acts as a barrier against the immune system and some antibiotics, this membrane can contain toxins like lipopolysaccharides (LPS) which can trigger a strong inflammatory response in the lungs, worsening respiratory infections

[11], and also to adhesion factors: Many Gram-negative bacteria possess fimbriae or pili, which are hair-like structures that help them adhere to host cells in the respiratory tract which this allows them to colonize and establish an infection more easily [12].

There are several reasons that interpretation of sputum is best environment for infection such (a), direct exposure: the constant stream of air we inhale makes the respiratory tract a prime target for airborne pathogens, airway devices like ventilators and nebulizers further expose and potentially bypass natural defenses. (b), weakened defenses: Illness, medications, and intubation can compromise protective barriers like mucus and cilia, leaving the respiratory tract vulnerable to pathogen attachment and growth. (c) the habitat: The warm and humid environment inside the respiratory tract provides the perfect breeding ground for many bacteria and viruses, allowing them to thrive and multiply [13], [14].

The more recurring isolates in gram-negative samples were *K. pneumoniae*, *Acinobacter baumannii*, *Enterobacter aerogens*, *Enterococcus faecium* and *Pseudomonas putida*, while more recurring bacteria in gram-positive samples was *Streptococcus pneumoniae*. It is noted that through the current study that *K. pneumoniae* bacteria dominant of respiratory infection among AL-Ramadi hospital units, and several characteristics of *K. pneumoniae* contribute to its dominance in community and hospital-acquired infections among gram-negative bacteria such as (a) Optimal Habitat: (It readily colonizes human body sites like the respiratory tract, (b) Environmental Toughness: *K. pneumoniae* isn't a fragile creature which can survive on dry surfaces for extended periods, making transmission through contaminated objects (fomites) a real threat. (c) Antibiotic Armor: The emergence of multidrug-resistant *K. pneumoniae* strains (MDR-Kp) poses a major challenge. These "superbugs" are notoriously difficult to treat with conventional antibiotics, allowing them to flourish in healthcare environments [15], [16] In summary, a triple threat in hospitals: *K. pneumoniae* cunning adaptability, potent virulence, and the vulnerability of healthcare settings make it the king of gram-negative nosocomial infections.

### **3.2 Gender Characteristics of Bacterial Respiratory Infections in Children:**

Results presented in Table (1) showed that male children were more affected (64.3%) with Bacterial Respiratory Infections than female (35.7%). Behavioral

differences of boys often engage in more rough and tumble play, which can increase their exposure to germs and respiratory pathogens [17].

**Table (1): Distribution of Bacterial Respiratory Infections according to gender**

Factors		NO (Total =100)	Percentage%
<b>Gender</b>	Male	<b>65</b>	<b>65</b>
	Female	<b>35</b>	<b>35</b>

#### 4. Conclusion:

The study conclude that Gram-negative bacteria infection more than Gram-Positive in respiratory infection of children. The more recurring isolates of respiratory infection of children in gram-negative samples was *K. pneumoniae*

#### 5. Acknowledgements:

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6. **Conflict of interest:** The authors declare no conflict of interest.

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