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PREVALENCE OF RESPIRATORY TRACT INFECTIONS IN PAEDIATRIC POPULATION AND COMPARE THE INCIDENCE OF URTI AND LRTI AT A TERTIARY CARE HOSPITAL IN SOUTH INDIA

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ABSTRACT

Respiratory tract infections (RTIs) are among the most common illnesses reported by paediatric population in monsoon season. Hospitalizations are much more common in children less than 2 years of age and immunocompromised individuals' weak immune system.[2] High-risk groups such as infants, small children, the elderly and subjects with chronic and chronic tracheobronchial or pulmonary disease are at elevated risk of growing severe clinical consequences. And it is sometimes life- threatening for children if not treated or not given a potential treatment. This prospective observational study was performed to study the prevalence of RTI's in paediatric population and compare the incidence of Upper Respiratory Tract (Common Cold, Sinusitis, tonsillitis, Otitis externa, Otitis media, Pharyngitis, Epiglottitis and Laryngotracheitis) and Lower Respiratory Tract Infections (Bronchitis, Bronchiolitis and Pneumonia in children. A total of 589 patients satisfied the inclusion and exclusion criteria of the study. All guardians of the patients were informed regarding the study and patient's consents were taken. The prevalence of these Respiratory Tract Infections was analysed by evaluating the sample collection, gender distribution, age distribution, locality and incidence of different types of URTI, LRTI and URTI and LRTI. The required information was collected from the patient case sheet and the patient. Data regarding RTIs and related to pulmonary infections were recorded throughout the study period i.e. 4 months till the end of the monsoon in south India. It was found that the rate of infection of respiratory tract in males was 32% and females was 68%. From the overall population, the proportion of LRTI (81%)

was higher than URTI (12%). Rate of comorbidity of LRTI along with URTI was way lesser than the individual infections within the study population. The age of 1 -10 months infants recorded excessive amount of exposure to the respiratory infections than other age groups. Here we conclude that there is a high incidence of LRTI in contrast to URTI in the particular area of study. The incidence is underestimated mainly because the majority of infections are mild and not debilitated. But respiratory infections are more common in the monsoon when indoor crowding facilitates transmission, as the epidemiological studies and mortality rate say that there is a huge risk from these infections. And the all the people and guardians of the children should be aware of the potential life-threatening risk of respiratory tract infections maintain the preventive measures before it converts in to a complication that is proved in many clinical practices around the globe.

KEYWORDS: Respiratory tract infections, LRTI, URTI, Paediatric population, Compare the incidence of RTIs, Prevalence of RTIs, Monsoon season, South India.

INTRODUCTION

Respiratory tract infections (RTI) remain the major cause of morbidity from acute illness and most likely represent the single most common reason patients seek medical attention.

Infections of the respiratory tract are grouped according to their symptomatology and anatomic involvement. Upper respiratory tract infections (URTI) include the common cold, pharyngitis, epiglottitis, and laryngotracheitis. These infections are usually benign, transitory and self-limited, although epiglottitis and laryngotracheitis can be serious diseases in children and young infants. Etiologic agents associated with URTI include viruses, bacteria, mycoplasma and fungi. Respiratory infections are more common in the monsoon when indoor crowding facilitates transmission.

Infections of the lower respiratory tract include bronchitis, bronchiolitis and pneumonia. These syndromes, especially pneumonia, can be severe or fatal. Although *viruses*, *mycoplasma*, *rickettsia* and *fungi* can all cause lower respiratory tract infections (LRTI), *bacteria* are the dominant pathogens, accounting for a much higher percentage of lower than of URTI's.[1]

Upper respiratory tract infections

Sinusitis

Sinusitis is an acute inflammatory condition of one or more of the paranasal sinuses. Infection plays an important role in this affliction. Sinusitis often results from infections of other sites of the respiratory tract since the paranasal sinuses are contiguous to, and communicate with, the upper respiratory tract.

Prevention and Treatment

Symptomatic treatment with analgesics and moist heat over the affected sinus pain and a decongestant to promote sinus drainage may suffice. For antimicrobial therapy, a beta-lactamase resistant antibiotic such as amoxicillin-clavulanate or a cephalosporin may be used. For chronic sinusitis, when conservative treatment does not lead to a cure, irrigation of the affected sinus may be necessary. Culture from an Antral puncture of the maxillary sinus can be performed to identify the causative organism for selecting antimicrobial therapy. Specific preventive procedures are not available. Proper care of infectious and/or allergic rhinitis, surgical correction to relieve or avoid obstruction of the sinusal ostia is important. Root abscesses of the upper teeth should receive proper dental care to avoid secondary infection of the maxillary sinuses.[7]

Otitis media

Acute Otitis media occurs most commonly in young children. The initial complaint usually is persistent severe earache (crying in the infant) accompanied by fever, and, and vomiting. Otologic examination reveals a bulging, erythematous tympanic membrane with loss of light reflex and landmarks. If perforation of the tympanic membrane occurs, serosanguinous or purulent discharge may be present. In the event of an obstruction of the Eustachian tube, accumulation of a usually sterile effusion in the middle ear results in serous Otitis media.

Prevention and Treatment

Use of polyvalent pneumococcal vaccines has been evaluated for the prevention of otitis media in children. However, children under two years of age do not respond satisfactorily to polysaccharide antigens; further, no significant reduction in the number of middle ear infections was demonstrable. Newer vaccines composed of pneumococcal capsular polysaccharides conjugated to proteins may increase the immunogenicity and are currently under clinical investigation for efficacy and safety.[6]

Pharyngitis

Etiology

Group A beta-haemolytic streptococcus or *Streptococcus pyogenes* is the most important bacterial agent associated with acute pharyngitis and tonsillitis. *Corynebacterium diphtheriae* causes occasional cases of acute pharyngitis, as do mixed anaerobic infections (Vincent's angina), *Corynebacterium haemolyticum, Neisseria gonorrhoeae,* and *Chlamydia trachomatis*. Outbreaks of *Chlamydia pneumoniae* (TWAR agent) causing pharyngitis or pneumonitis have occurred in military recruits. *Mycoplasma pneumoniae* and *Mycoplasma hominis* have been associated with acute pharyngitis. *Candida albicans*, which causes oral candidiasis or thrush, can involve the pharynx, leading to inflammation and pain.

Prevention and Treatment

Symptomatic treatment is recommended for viral pharyngitis. The exception is herpes simplex virus infection, which can be treated with acyclovir if clinically warranted or if diagnosed in immunocompromised patients. The specific antibacterial agents will depend on the causative organism, but penicillin G is the therapy of choice for streptococcal pharyngitis. Mycoplasma and chlamydial infections respond to erythromycin, tetracyclines and the new macrolides.[8]

Epiglottitis and Laryngotracheitis Etiology

Inflammation of the upper airway is classified as epiglottitis or laryngotracheitis (croup) on the basis of the location, clinical manifestations, and pathogens of the infection. *Haemophilus influenzae* type b is the most common cause of epiglottitis, particularly in children age 2 to 5 years. Epiglottitis is less common in adults. Some cases of epiglottitis in adults may be of viral origin. Most cases of laryngotracheitis are due to viruses. More serious bacterial infections have been associated with *H influenzae* type b, group A beta-haemolytic streptococcus and *C diphtheriae*. Parainfluenza viruses are most common but respiratory syncytial virus, adenoviruses, influenza viruses, enteroviruses and Mycoplasma pneumoniae have been implicated.

Prevention and Treatment

Epiglottitis is a medical emergency, especially in children. All children with this diagnosis should be observed carefully and be intubated to maintain an open airway as soon as the first sign of respiratory distress is detected. Antibacterial therapy should be

directed at *H influenzae*. Patients with croup are usually successfully managed with close observation and supportive care, such as fluid, humidified air, and racemic epinephrine. For prevention, *Haemophilus influenzae* type b conjugated vaccine is recommended for all paediatric patients, as is immunization againstdiphtheria.[9]

Lower Respiratory Infections

Bronchitis and Bronchiolitis

Etiology

Bronchitis and bronchiolitis involve inflammation of the bronchial tree. Bronchitis is usually preceded by an upper respiratory tract infection or forms part of a clinical syndrome in diseases such as influenza, rubeola, rubella, pertussis, scarlet fever and typhoid fever. Chronic bronchitis with a persistent cough and sputum production appears to be caused by a combination of environmental factors, such as smoking, and bacterial infection with pathogens such as *H influenzae* and *S pneumoniae*. Bronchiolitis is a viral respiratory disease of infants and is caused primarily by respiratory syncytial virus. Other viruses, including parainfluenza viruses, influenza viruses and adenoviruses (as well as occasionally *M pneumoniae*) are also known to cause bronchiolitis.

Prevention and Treatment

With only a few exceptions, viral infections are treated with supportive measures. Respiratory syncytial virus infections in infants may be treated with ribavirin. Amantadine and rimantadine are available for chemoprophylaxis or treatment of influenza type A viruses. Selected groups of patients with chronic bronchitis may receive benefit from use of corticosteroids, bronchodilators, or prophylactic antibiotics.[10]

Pneumonia

Pneumonia is an inflammation of the lung parenchyma (Fig:4). Consolidation of the lung tissue may be identified by physical examination and chest x-ray. From an anatomical point of view, lobar pneumonia denotes an alveolar process involving an entire lobe of the lung while bronchopneumonia describes an alveolar process occurring in a distribution that is patchy without filling an entire lobe. Numerous factors, including environmental contaminants and autoimmune diseases, as well as infection, may cause pneumonia. The various infectious agents that cause pneumonia are categorized in many ways for purposes of laboratory testing, epidemiologic study and choice of therapy. Pneumonias occurring in usually healthy persons not confined to an institution are

classified as community-acquired pneumonias. Infections arise while a patient is hospitalized or living in an institution such as a nursing home are called hospital-acquired or nosocomial pneumonias. However, many organisms can cause both types of infections.

Pathogenesis and Clinical Manifestations

Infectious agents gain access to the lower respiratory tract by the inhalation of aerosolized material, by aspiration of upper airway flora, or by hematogenous seeding. Pneumonia occurs when lung defense mechanisms are diminished or overwhelmed. The major symptoms or pneumonia are cough, chest pain, fever, shortness of breath and sputum production. Patients are tachycardic. Headache, confusion, abdominal pain, nausea, vomiting and diarrhoea may be present, depending on the age of the patientand the organisms involved.[11]

Prevention and Treatment

The pneumococcal vaccine should be given to patients at high risk for developing pneumococcal infections, including asplenic patients, the elderly and any patients immunocompromised through disease or medical therapy. Yearly influenza vaccinations should also be provided for these particular groups. An enteric-coated vaccine prepared from certain serotypes of adenoviruses is available, but is only used in military recruits. In AIDS patients, trimethoprim/sulfamethoxazole, aerosolized pentamidine or other antimicrobials can be given for prophylaxis of *Pneumocystis carinii* infections.[12]

MATERIAL AND METHODS

This was a hospital based prospective observational study conducted in paediatric department of MGM hospital, Warangal, in 2019 (June – September). IHEC approval was obtained after submission of protocol and IHEC no is MGM/VCOP/PHARMD/ V/2019/ /. Patients were explained about the study & informed consent forms were asked by explaining them in their local language also.

Study population

The patients were enrolled in this study based on the following inclusion and exclusion criteria. All the paediatric patients diagnosed with any of RTIs will be included in this study. The paediatric patients with comorbid diseases (other than variety of RTIs) along with RTIs will be excluded. Adult patients with RTIs are excluded. Patients with severe

dyspnoea in need of urgent treatment are excluded. Patients who were prescribed and using antibiotics for two weeks or more are excluded.

Sample collection

Using the data collection forms, all the required data is obtained by interviewing the patient or patient care takers and their respective case profiles. Data of some parameters (RBC, Hb, Hematocrit, Platelets, WBC, DLC and ESR) to be assessed was collected.

Study Design

A Total of 589 paediatric inpatients having diagnosed with any of the RTI's were included in the study based on the Inclusion and Exclusion criteria. The required parameters for assessment were recorded from patient's case profiles. Through the course of the study, enrolment and patients progress was tracked by regular follow up and counselling was given during their stay in the hospital.

Statistical Analysis

Patient's demographic details, diagnosis and the objective findings were collected using predesigned data collection form. The collected data was analysed by using Microsoft excel 2007. The obtained results of the recorded data were assessed and described. The prevalence of these Respiratory Tract Infections was analysed by evaluating the sample collection, gender distribution, age distribution, locality and incidence of different types of URTI, LRTI and URTI+LRTI were explained by following results.

RESULTS

Total of 589 paediatric patients who were diagnosed with Respiratory Tract Infections were enrolled in the study based on inclusion and exclusion criteria and their data was collected in a predesigned data collection form. In total of 589 paediatric patients, 398(68%) of male and 191(32%) of female patients were diagnosed with respiratory tract infections in MGM hospital during our study period.

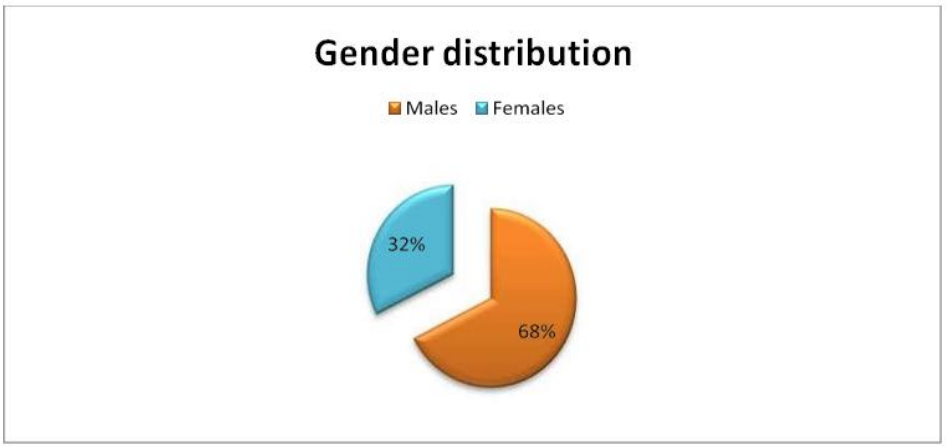

Figure 1: Pie diagram showing gender distribution among patients.

Table 1: Showing age distribution observed among study population.

Age in months	No of patients (n= 589)	Frequency in percentage
1 to 10	180	30.5%
11 to 20	66	11.2%
21 to 30	71	12.3%
31 to 40	17	2.8%
41 to 50	47	7.9%
50 to 60	30	5.09%
60 to 70	20	3.39%
71 to 80	36	6.11%
81 to 91	12	2.03%
91 to 100	30	5.09%
101 to 110	54	9.16%
111 to 120	26	4.41%

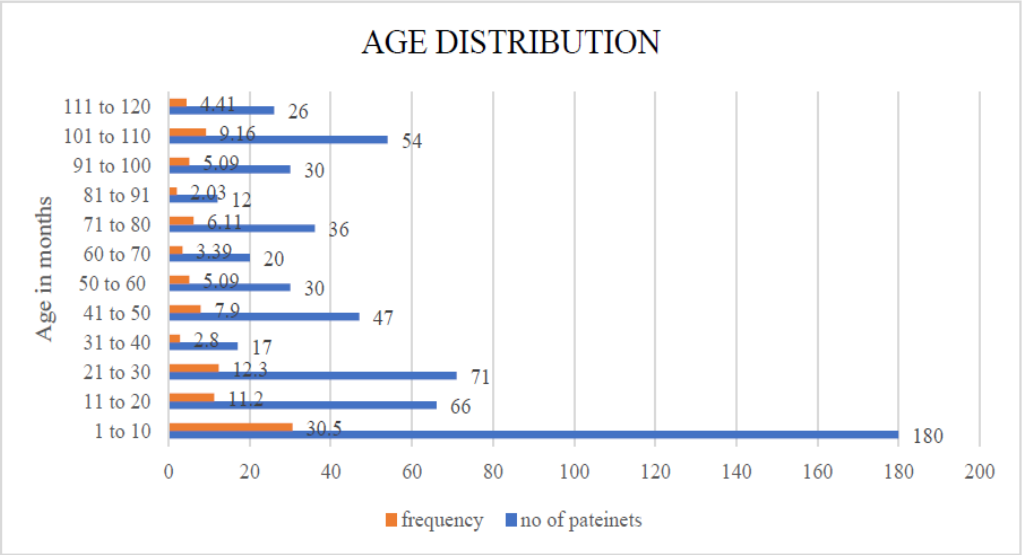

Figure 2: Chart showing age distribution observed among study population.

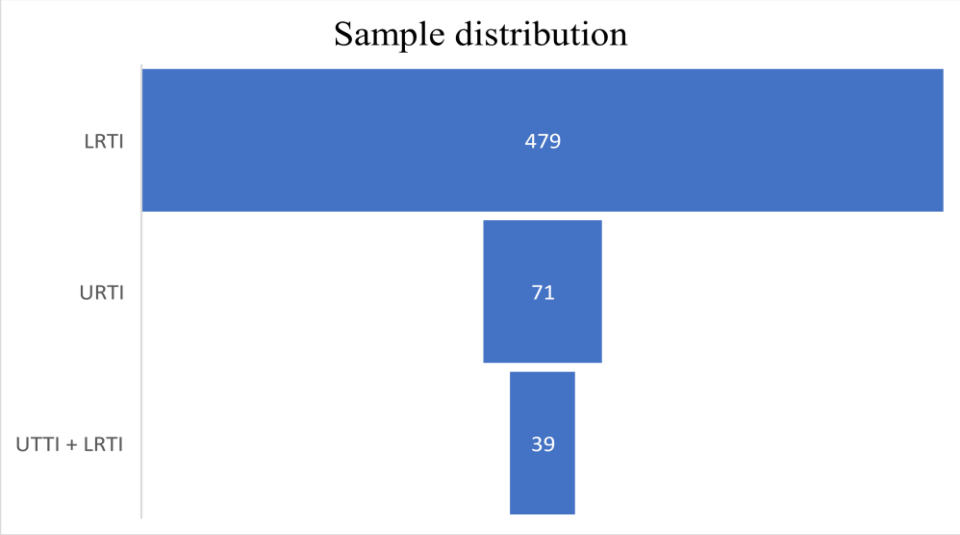

Figure 3: Chart showing sample distribution observed in patients.

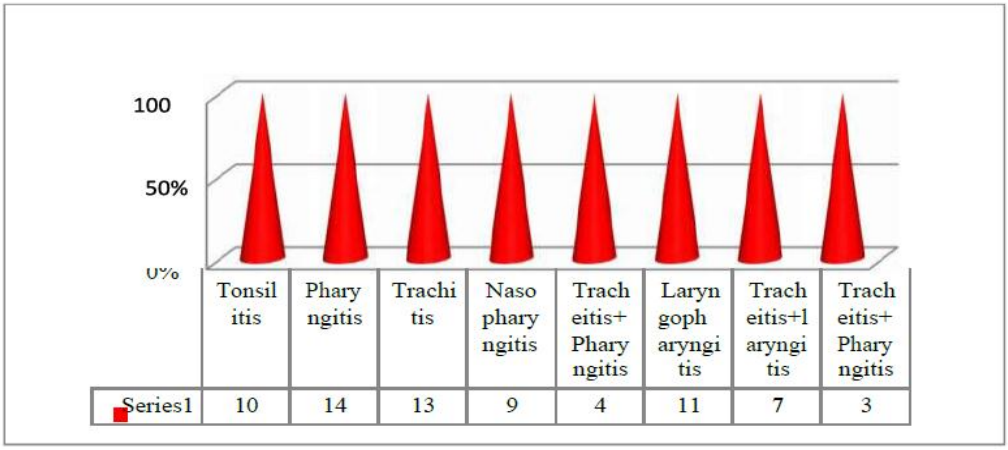

Figure 4: Chart showing incidence of URTI in study population.

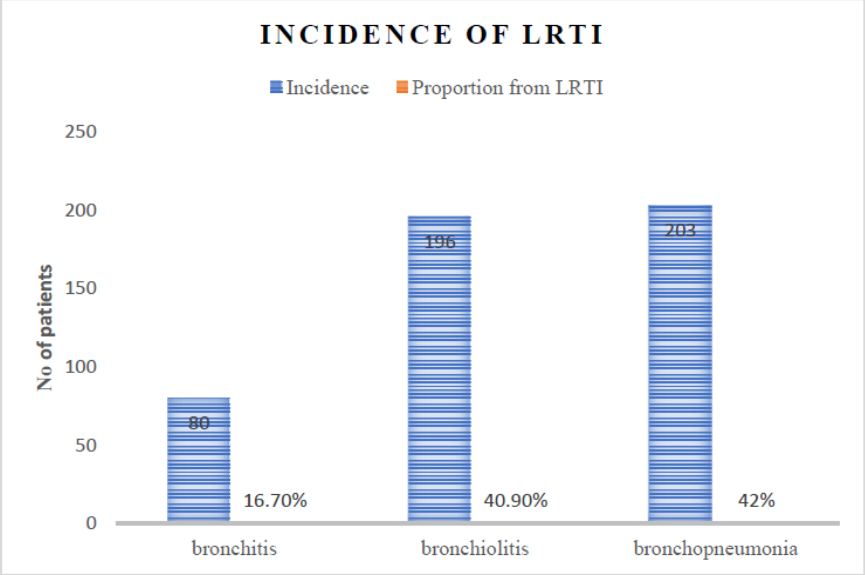

Figure 5: Chart showing incidence of LRTI in patients.

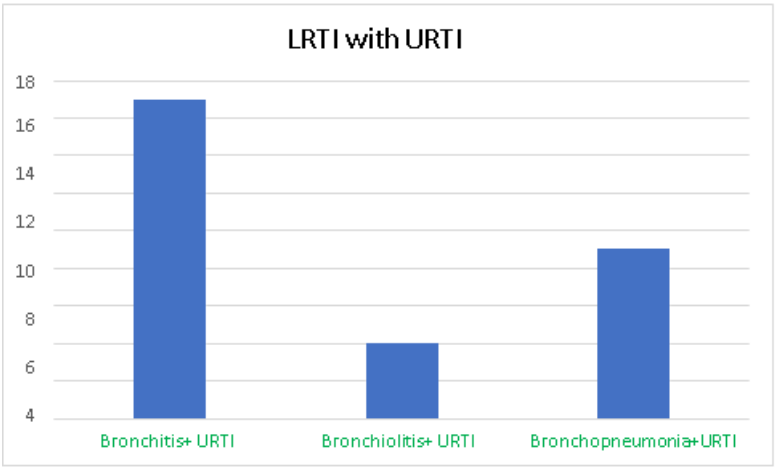

Figure 6: Pie diagram showing incidence of URTI along with LRTI in patients.

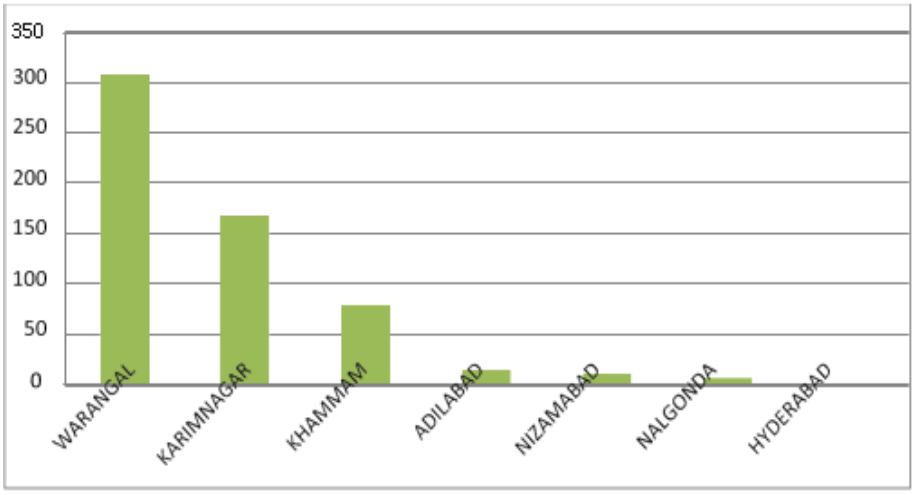

Figure 7: Chart showing Respiratory Tract Infection Patients from Different Districts of Telangana State, India.

DISCUSSION

There is a significant gender difference in the development, course and outcome of RTIs. In a study performed by *Falagas ME, et al*, that is referring to RTIs of both adults and children concluded males develop RTIs more frequently than females, except for sinusitis, otitis externa, and probably tonsillitis. In addition, male sex was frequently found to be a risk factor (and for specific infections like CAP a significant risk factor) for the development of RTIs. The available data in *Falagas ME, et al* study also suggest that the higher prevalence of RTIs in males is more obvious for the devastating and life- threatening infections like pneumonia (CAP, NP, and VAP) and croup. Finally, it seems that the intracranial complications of the URTIs are probably commoner in males than in females. On the other hand, the defected pneumatisation of the mastoid process may explain the more frequent and severe ear infections in male children. There is also evidence that the peripheral airways are

disproportionately narrower during the early years of life in males, which may predispose for lower RTIs.[3] In our study Compared to female, male children seem to suffer more commonly from most types of RTIs (see Fig 1). In addition, such infections take a more severe course in males, leading to higher mortality. Hence, clinicians should be aware of these differences and take them under consideration when managing patients with RTIs.

Demographic and medical characteristics of the study patients. The children aged < 3 years significantly higher number of URTIs and LRTIs[4], as per study conducted by *N. Principi et al*. The overall reported incidence of RTIs is 6-8 episodes during the first 5 years of life, says *FA Ujunwa et al,* In their study The prevalence of RIs are determined individually or collectively by a number of factors, which include age, sex, nutritional status, breastfeeding (type and duration), socio-economic status, overcrowding, indoor pollution, passive smoking, etc.[5] However, in our study projects that, out of the 589 patients (see Fig 2), 224 (38%) were found be in the age range of 1-10 months while 66 (11%) were fell under the age 11-20 months and 71 (12%) patients fell under the age 21-30 months. Less RTI's cases were reported from 31-120 months throughout the study period. We must admit that our study has a small dispute regarding risk factors and that is since we exclusively intended to collect the data of incidence of RTIs.

In our study we (see Fig 3) that the incidence of URTI's in paediatric patients like tonsils. Out of these paediatric populations 71 were diagnosed with URTI, 479 were diagnosed with LRTI, 39 were diagnosed with URTI along with LRTI.

In our study we observed (see Fig 4) that the incidence of URTI's in paediatric patients like tonsils[10], pharyngitis[14], tracheitis[13], nasopharyngitis[9], tracheitis with pharyngitis[4], laryngopharyngitis[11], tracheitis with laryngitis[7] and tracheitis with laryngopharyngitis[3] respectively.

A study driven by *FA Ujunwa et al,* A total of 436 patients were enrolled for the study. The mean age of the population was 18.75(13.38) months and there were 31.6% (138/436) cases of pneumonia 6.9% (30/436) cases of bronchiolitis and 61.5% (268/436) cases of acute upper respiratory tract infections. Children less than 20 months accounted for 60.9% (84/138 cases) of pneumonia, 86.7% (26/30 cases) of bronchiolitis, and 64.5% (173/268 cases) of acute upper respiratory tract infections. Pneumonia was noted in about 75.7% (56/74) of inadequately nourished children compared to 22.6% (82/362) in adequately nourished

children. Nevertheless, the incidence of types of LRTIs (see Fig 5) in our study were found to be (80/589) of bronchitis cases while (196/589) of bronchiolitis and (203/589) of bronchopneumonia cases respectively in overall study population.

During the course of our study, we came across with some children who were diagnosed with URTI and along with a type of LRTI (see Fig 6) interestingly. They were separated and described in the figure.

The Respiratory tract infected patients from various districts of Telangana states who were admitted in inpatient paediatric department, MGM hospital during our study period were as follows: Warangal (307), Karimnagar (165), Khammam (79), Adilabad (15), Nizamabad (11), Nalgonda (7) and Hyderabad (3) (see Fig 7).

CONCLUSION

From the above results drawn we conclude that the prevalence of Respiratory Tract Infections in paediatric population is way more in this monsoon season than we expect. The incidence of LRTIs is greater than URTIs and URTI+LRTIs. Further research must be proposed to gain the accuracy in this research area. Moreover, clinicians should be aware of these differences and take them under consideration while managing and preventing them by using the knowledge of various health professionals such as Clinical pharmacists, counselling personnel etc. present in the field to reduce the risk of getting infected.

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