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## A Study on Antibiotic Prescriptions for Upper Respiratory Tract Infection (Urtis) in Childrens at a Tertiary Care Teaching Hospital.

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### ABSTRACT

Upper respiratory tract infection (URTI) is considered as one of the major public health problems and it is recognized as the leading cause of mortality and morbidity in many developing countries. The greatest problem for developing countries is the mortality from URTI in children less than five year of age. Upper respiratory tract infections account for thousands of visits to teaching hospitals each year in the India. What to do for the child with another upper respiratory tract infection is a common practice dilemma. Unfortunately, upper respiratory tract conditions, especially infections, are commonly mismanaged and a common error is the use of antibiotics for viral disease. To investigate the type and frequency of antibiotic prescription for URTI without apparent bacterial infection in India, based on both visits and facilities. Cross-sectional analysis of the drug utilization study was conducted to evaluate the pattern of antibiotics use in Pediatric Department of a teaching Hospital, Vijayawada, India. From a total of 385 claims, 323 claims (non-bacterial URI, one visit per claim) were analyzed, antibiotics were prescribed in 77% of these visits. Third -generation cephalosporins were the most commonly- prescribed drug class (46%), followed by macrolides (27%) and quinolones (16%). In general, visits to physician offices were more likely to result in an antibiotic prescription than visits to hospital outpatient clinics.

**Keywords:** Antibiotics, Upper respiratory tract infection, Pediatrics, Hospital

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## INTRODUCTION

Upper Respiratory Tract Infections (URTIs) including nose, the paraasal sinuses, adenoids, tonsillitis, nasopharynx, nasopharyngitis, pharyngitis, and otitis media is the most frequently occurring illness of childhood [1]. The vast majority of acute URTIs are caused by viruses [2]. Inappropriate use of drugs in the treatment of upper respiratory tract infections has been previously reported in literature [3,4]. This could result in the development of drug related problems such as adverse drug reactions and drug resistance, in addition to increasing the overall cost for health care [5-8].

Upper respiratory infection accounts for 20-65% of outpatient and 12-35% of inpatient attendance in a General Hospitals. Common cold does not require anti-microbial agent (AMA) unless it is complicated by acute otitis media with effusion, tonsillitis, sinusitis and lower respiratory tract infection [1]. The CDC in collaboration with the American Academy of Paediatrics (AAP) recommends stringent diagnostic criteria for URTIs to avoid misdiagnosis and inappropriate antibiotic prescriptions [9]. Antibiotic treatment is beneficial to children only if symptoms persist for 10-14 days without improvement [10].

In India, several studies have reported that 45% to 86% of URRI cases are treated with antibiotics [11, 12]. The validity of these surveys may be diminished, however, by their use of a self-report survey design with a low response rate or a limited number of participating hospitals. Physicians responding to such surveys or in participating hospitals may more likely be conscious of the problem of antibiotic overuse, and therefore prescribe antibiotics less often than average, or may be inclined to report lower antibiotic prescription rates than reality. The accuracy of these estimations may be improved using a less biased source of information, such as insurance claims submitted for reimbursement [13, 14]. The financial benefit of prescriptions to the clinic may encourage excessive prescribing of drugs, albeit that recent decreases in reimbursement to in-clinic pharmacies have reduced their profitability.

In this study, we aimed to describe the frequency of antibiotic prescription for upper respiratory infections in children visited in teaching hospital. Studies of drug utilization in respiratory tract infection are low. The objective of present study is to focus on the trends in the antibiotic utilization in upper respiratory tract infections. This information is not disease specific but reflects overall rates and illustrates trends in utilization of antibiotics in the treatment of upper respiratory tract infection.

## MATERIALS AND METHODS

A cross-sectional, hospital-based study was carried out to evaluate the antibiotic prescription pattern in pediatric patients with upper respiratory tract infection. The study was conducted on all patients attending the pediatric outpatient and who were admitted to medicine department of a tertiary care teaching hospital Vijayawada, India with upper respiratory tract infection, from November 2014 to April 2015. Permission to collect the data was taken from the Head of the department of pediatrics before starting the study. Patients with the diagnosis of URTI were enrolled for the study. The data for children with diagnosis of URTIs from the outpatient record of each patient was collected in a separate preforma. The study included only one prescription per patient. Incomplete patient records were excluded from the study. The drug utilization data was retrieved from the medical records of patients using a specially designed data collection form. The form included the following domains: Socio demographic characteristics (Age, gender, nationality), Clinical data (Clinical diagnosis, Clinical manifestations, Examination findings), Laboratory data: (Culture and sensitivity data: Organism isolated, sensitivity and resistance pattern), Drug data: (Antibiotic agents prescribed, dose and duration of treatment, change of medication and response to treatment). Statistical analysis was carried out using Microsoft Excel.

## RESULTS

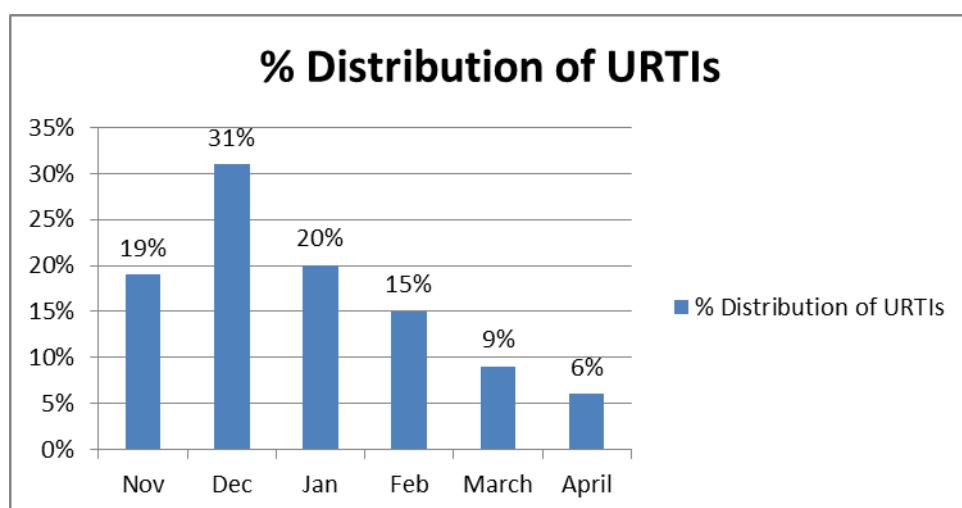
The study monitored the antibiotic/s utilization pattern to the patients treated to upper respiratory tract infection in pediatric department at teaching hospital, Vijayawada, India. Observations of the study are presented in the form of different figures and tables. The total sample studied in this research was 385 children have URTI among 1250 children attending to General Teaching Hospital from the first of November 2015 to end of April 2015 of the total URTI cases. Among the total of 385 children, 223 (57.9%) were males and

162 (42.1%) were females. Sample characteristics are presented in Table 1. Average age of patients was 5 years (standard deviation: 18). The gender and age distribution of patients with URTI is listed in Table I.

**Table 1: Age and gender distribution pattern of URTIs (n=385)**

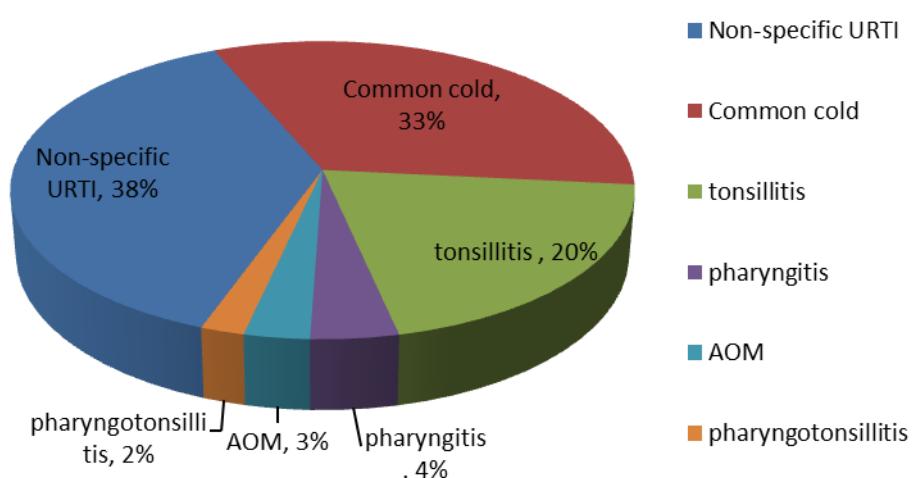
Age in years	No of cases	%
1-5	223	58 %
5-10	131	34 %
>10	31	8 %
Sex		
Male	223	57.9%
Female	162	42.1%

The monthly distribution of cases showed that the lowest frequency was in April, 23 (6%) followed by March, 35 (9%) and Feb., 58 (15%) then November, 73 (19%) and Jan., 77 (20%), while December showed the highest frequency, 119 (31%) (Figure 1).



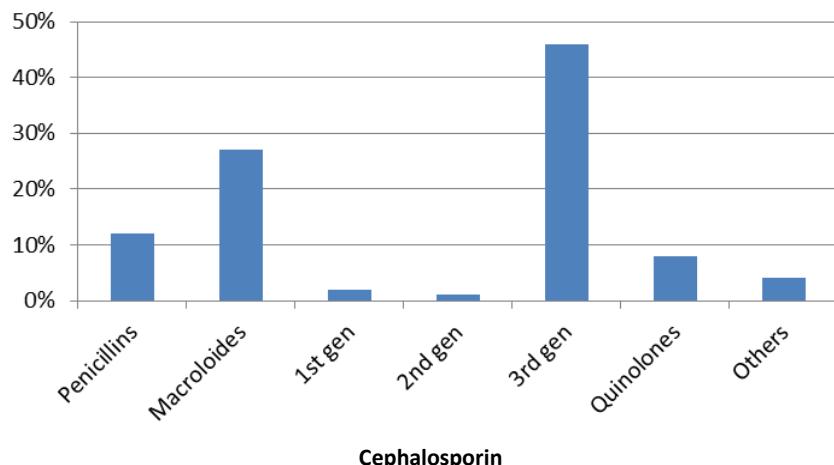
**Figure 1: The Monthly Distribution of Cases URTIs**

The most common diagnosis was non-specific URTI 145 (38%) followed by the common cold 128 (33%), then tonsillitis 77(20%), pharyngitis 15(4%), AOM 12 (3%) and pharyngitis & tonsillitis 8 (2%). Figure 2 shows the distribution of cases, according to illness (Fig2).



**Figure 2: Distribution of types of URTIs diagnoses**

An antibiotic was prescribed in 77% of visits with a URTIs. Third-generation cephalosporins were the most commonly-prescribed drug class (46%), followed by macrolides (27%) and quinolones (16%), while the least common classes were first/second generation cephalosporins and penicillin (Fig. 3). On analysis of individual antibiotics, cefpodoxime (third-generation cephalosporin) (20.1% of total antibiotics prescribed) and clarithromycin, azitromycin (macrolide) (19.5%) were the most frequently prescribed, followed by Cefdinir (third- generation cephalosporin) (12%) (Fig:3).

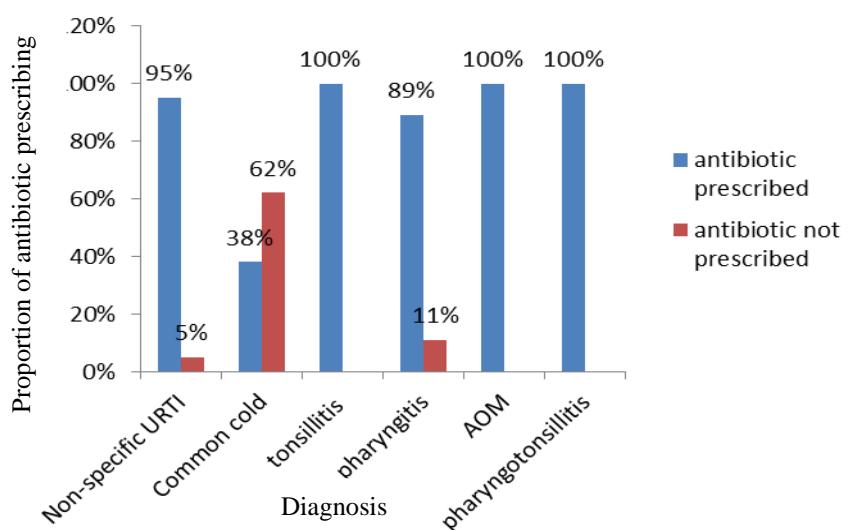


**Figure 3: Types of antibiotics prescribed for non-specific URTIs**

**Table 2: Antibiotics per prescription (n=385)**

Total number of prescriptions with an Antibiotic/s	296
Total number of antibiotics	334
Average number of antibiotics per prescription	0.76
Standard Deviation	0.47
Minimum number of antibiotics per prescription	0
Maximum number of antibiotics per prescription	2

That the total number of antibiotics for the entire sample (n=385) was 334 and on average each prescription contained 0.76 antibiotics ( $SD=\pm 0.470$ ) (Table 2).



**Figure 4: Distribution of antibiotic prescribing according to types of URTIs**

The rate of antibiotic prescribing for each specific diagnosis was: 145 (95% CI 90%, 98%) for non-specific URTIs, 77 (100%; CI 100%, 100%) for tonsillitis, 49 (38% CI 34%, 51%) for the common cold, 8 (89%; CI 52%, 100%) for pharyngitis, 8 (100%; CI 100%, 100%) for pharyngotonsillitis and 12 (100%; CI 100%, 100%) for AOM (Fig:4). This study also showed a significant relationship ( $\chi^2=143.790$ ,  $p=0.000$ ) between illness and antibiotic prescribing.

## DISCUSSION

The present study highlights the current trends in antibiotic prescriptions in the management URTIs at the department of pediatrics in tertiary teaching hospital in Vijayawada, India. The emerging problem of antibiotic resistance has become a major threat to the medical field. Excessive and inappropriate use of antibiotics has been a major contributor to this ever growing problem. The majority of childhood URTI is caused by viruses which do not require antibiotics. The highest frequency of URTIs cases were observed to be found in December. This is comparable to the results found by International consultation on the control of URTI in 1991 [15]. It might be due to overcrowding rather than climate [15], or due to seasonality of infective agents themselves [16].

The age distribution of the patients showed that the age group of 1-5 years constituted 58% of the patients followed by the age group of 5-10 (34%) and above 10 years (8%). Male patients were more infected with URTIs than female, but there was no significant association between gender and the severity of URTIs [17, 18]. The common diagnosis was non-specific URTI. The average number of drugs / prescription was 2.15; the lower number of drugs noted is a welcome sign and needs to be encouraged. There may be an increase in compliance, lower cost of therapy and decreased risk of drug interactions when lesser number of drugs is prescribed. Most of the drugs were prescribed by brand name.

This study show that antibiotics were prescribed in 77% of children visits for URTI. Third-generation cephalosporins were the most frequently prescribed type, followed by macrolides. These findings show that India suffers the same problem of antibiotic over-use in URTI patients as many other countries (19-21). However, the prescription of broad-spectrum antibiotics appeared more frequent than in other countries.

In this study 174 (45%) pediatric cases were diagnosed with common URTI. URTI is a nonspecific term used to describe acute infections involving the nose, paranasal sinuses, pharynx, larynx, trachea, and bronchi. The prototype is the illness known as the common cold [22] with symptoms that last up to 10-14 days (CDC, 2012). Non-specific URTI is typically an acute viral infection and as already mentioned it can also involve lower airway symptoms, which are frequently present, but are not prominent [22]. In this study, 95% (95% CI 90%, 98%) of the children with a diagnosis of a non-specific URTI had an antibiotic prescribed. A study by Teng et al., (2004) [23] showed a result comparable to the one of this study, that is, antibiotics were prescribed for 68.4% (95%CI 65.4%, 71.4%) diagnosed to be URTI whereas the other study Gill, et al. (2006) [24], reported a lower rate of 33%. All these results show that, although viruses cause most URTI, antibiotics continue to be widely and inappropriately prescribed in many places. In India, this problem could be fuelled by the lack of specifications in the treatment guidelines on how to manage nonspecific URTIs and whether antibiotics should be prescribed in non-specific URTI. This gap in the guidelines could have attributed to the high rate of antibiotic prescribing, especially in children (60%). Other guidelines like the CDC do not recommend antibiotic prescribing in non-specific URTIs because antibiotics neither enhance illness resolution nor prevent complications (CDC, 2012).

About 38% (95% CI 34%, 51%) of children with the common cold were prescribed an antibiotic. This rate is a cause for concern because antibiotics have no role in the treatment of the common cold. The result of this study is higher than that of Paraidathathu, Li & Siang (2012) [25] in Malaysia, where the rate of antibiotic prescribing for common cold was 18.5%. Kho, Ong, Tan and wee (2013) [26], also reported a much lower rate of 3.9%. This suggests that compared to the mentioned studies, the results of this study suggest that the problem of antibiotic prescribing for the common cold could be worse in hospitals. It is well known that the common cold is caused by viruses and studies have also shown that prescribing antibiotics for common cold does not benefit patients (adults and children) in any way but could increase the risk of developing side effects, especially in children. In addition, antibiotics do not warrant better outcome in terms of cure or persistence of symptoms in patients that receive antibiotics compared to those that do not [27]. Unfortunately, the practice of antibiotic prescribing for common cold has continued and is often an attempt to

meet patient's expectations. Some of the other reasons that fuels this irrational use of antibiotics are: health care providers' unfounded beliefs in the effectiveness of antibiotics and believe that antibiotics could prevent complications of common cold even though they know that the common cold is a viral infection that is self-limiting [28], physicians perceived parental expectations [29], unrealistic patient expectations , patient pressure to prescribe antibiotics and insufficient time to educate patients about the effectiveness of antibiotics.

All patients in this study (12 children) that were diagnosed with AOM received antibiotics. The proportion of patients diagnosed with AOM was too small (3%) to make a meaningful conclusion about antibiotic prescribing in AOM among patients with URTIs at this hospital.. The recommended antibiotics are commonly amoxicillin. However, the guideline does not give an alternative choice of antibiotic in patients allergic to penicillin. WHO (2001) also recommends amoxicillin, cotrimoxazole and cefuroxime as in penicillin allergic patients. AOM can be caused by viral or bacterial infection. Bacterial infection with the common respiratory pathogens (*Streptococcus pneumoniae*, *Haemophilus influenzae*, and *Moraxella catarrhalis*) is often preceded by a viral infection. Viruses (especially respiratory syncytial virus and influenza) can cause AOM without confection with bacteria [30]. This means that since the physicians only gives antibiotic therapy as first line, this could be promoting irrational antibiotic prescribing in some of the cases that are viral. According to the CDC guidelines (2012), AOM does not always require antibiotic therapy; but observation is an acceptable option in, for example, cases of healthy children with mild symptoms. This option is appropriate only when follow-up can be ensured and antibacterial agents started if symptoms persist or worsen. Symptoms of mild illness include mild otalgia and fever <102°F in the past 24 hours. Severe illness is moderate to severe otalgia or fever > 102°F. Antibiotics are recommended in all children younger than six months, in those between six months and two years if the diagnosis is certain, and in children with severe infection. Ascertain diagnosis of AOM meets the following 3 criteria: rapid onset, signs of middle ear effusion and signs and symptoms of middle-ear inflammation.

About 15 (89%; CI52%, 100%) of patients with pharyngitis, 77 (100%; CI, 100%-100%) with tonsillitis and 8 (100%; CI, 100%-100%) with pharyngotonsillitis had an antibiotic/s prescribed. The Indian standard treatment guidelines, recommend antibiotic therapy and analgesics for patients with tonsillitis/pharyngitis or both. This could explain the high rate of antibiotic prescribing in these conditions. The other explanation being that, even though a definition and cause (viral or bacterial) of these infections is given in the guideline, there is no clear guideline of identifying and managing the infections that could be viral. This study also showed that only 2 (11%) children with pharyngitis did not receive antibiotics.

In any case, the present results show an unacceptably high frequency of antibiotic prescribing. Given epidemiological data showing that the predominant cause of URI is viral infection [6-8, 31], most URTI patients do not require antibiotics; and even for those that did have a bacterial URTI, and current guidelines recommend narrow-spectrum medications such as penicillin and erythromycin for the first-line therapy [6]. Although we could not distinguish cases of second line therapy after the failure of initial treatment based on claims data, a previous study showed that the frequency of treatment failure is low (31).

Irrational prescribing is a habit that is difficult to cure [24]. However, retention is possible by interventions such as short problem based training course in Pharmacotherapy [24] and rational use focused workshops [25]. There is a need to increase doctor's awareness of the lack of proven benefits, the definitive cost and side effects of many prescriptions for the self-limiting illness. Prescribing an antibiotic or an antihistamine for URTI may reinforce the parents' belief in the necessity of such treatment every time the child develops such symptoms. More than 30% of children with viral URTI cough have mucopurulent rhinitis (discoloured nasal discharge) for more than two weeks. This indicates that cough and other lingering symptoms is an expected part of uncomplicated viral URTI. Prescribing by generic names has to be encouraged. Training of standard treatment guidelines for URTI and prescriber education regarding rational use of medicines may be helpful. There is a pressing need for education of both parents and doctors regarding the limited contribution that the doctor or an antibiotic can make to this self-limiting condition URTI.

## CONCLUSION

The problem of antibiotic overuse for URTI patients is a worldwide phenomenon. Here, we found that antibiotics are frequently prescribed for Indian URTIs patients. Doctors should be educated on more

appropriate and cost effective prescribing. There have been many forum of intervention aimed at changing physician's prescribing behavior. These have included audit studies, group discussions and feedback, introduction of hospital formulary, guidelines for antibiotics and NSAID's. The benefits of the intervention studies, namely the use of fewer and cheaper prescriptions are shown to disappear overtime, which suggests the need for repeating the intervention at frequent intervals. Rational prescribing messages should be promoted at national and local medical meetings. Drug utilization studies have the potential to make objective evaluation and analysis of health professionals work and provide them with feedback to stimulate thinking about their practice and looking for ways to improve their own performance.

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