

Original Research Article

Prescribing pattern of antibiotics and susceptibility of pathogens in upper respiratory tract infections: a study from a tertiary care hospital

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ABSTRACT

Background: Upper respiratory tract infections are mostly caused by viruses and are self-limiting. But it is seen that drug therapy is restored to many of them without adequate justifications. Sometimes multiple drug therapy imposes high cost burden on patients. Use of antibiotics in URTI patients have led to rise in bacterial resistance. So, this study was aimed to analyse the prescription pattern in upper respiratory tract infections and the antibiotic susceptibility of the isolated organisms.

Methods: An observational cross-sectional study was conducted in a tertiary care hospital for a period of three months. Based on the inclusion and exclusion criteria sixty patients were selected. Prescriptions of these patients were collected and analysed for the various WHO prescription indicators like average number of drugs per encounter, percentage of drugs prescribed by generic names, percentage of drugs prescribed as injection, drugs form the essential drug list etc. The swabs were collected from the site of infections and were analysed for the bacterial growth. Also, the antibiotic susceptibility of these organisms was tested.

Results: A total of sixty prescriptions were collected and analysed. The average number of drugs per prescription was 2.21. Antimicrobials were prescribed in 90% of cases. Approximately 50% cases the combination of amoxicillin and clavulanic acid was prescribed. The percentage of drugs prescribed by generic names was 87% and 68% drugs were form the essential drug list. The culture report of the specimen collected from the swabs showed that only 50% of cases were of some bacterial origin. And the organisms isolated were less susceptible to the antibiotics that were prescribed.

Conclusions: This study of prescribing patterns in patients gives appropriate feedback and awareness among health care providers. Rationale prescribing practice will prevent antibiotic resistance and reduction in the adverse drug reactions.

Keywords: Antibiotic susceptibility, Prescription pattern, Upper respiratory tract infections, WHO prescribing indicators

INTRODUCTION

Respiratory tract infections are one of the most common infectious diseases worldwide. It can be Upper Respiratory Tract Infections (URTI) or Lower Respiratory Tract Infections (LRTI). URTIs are

responsible for more visits to physicians than any other type of infectious diseases.¹ URTI is a nonspecific term used to describe acute infection involving nose, paranasal sinuses, pharynx, trachea and bronchi. The most common cause of URTI is viral infections like rhinovirus, parainfluenza virus, corona virus, adenovirus etc. However, most physicians prescribe antibiotics in URTIs.

Various studies have reported that antibiotics have no role in the management of common cold.² Compared to URIs, LRIs are more serious. Commonly diagnosed LRIs are bronchitis and pneumonia. Use of antibiotics in LRI remains controversial. Most LRIs are of bacterial origin, it needs to be treated with an antibiotic.

Most of the time, however, self-limiting infections (viral etc.) are over diagnosed and are prescribed with antibiotics. Such reckless prescribing leads to drug resistance, which is a matter of immense concern. A lot of antibiotics are available in the market now a days, and the physician has the option to choose the best and the most effective antibiotic depending on the most likely causative organism (empirical therapy). Culture and antibiotic susceptibility testing are not practically possible or feasible at the clinic level. Thus, the most likely organisms and their susceptibility pattern in an area need to be determined to initiate the most appropriate empirical therapy.

Drug utilization study is a research area in which the drug prescribing and drug usage is studied scientifically.³ Drug utilization has become an important tool in evaluation of health system. Yet very few studies have been done on the drug utilization study of antibiotics in upper as well as lower respiratory tract infections in India. So, this study was conducted with the objectives to do a prescription audit, to collect the data on prescription patterns of antibiotics and to analyze the same in Upper Respiratory Tract Infections (URTI). The other important objective was to identify the causative organism of the infections, the susceptibility of the pathogens towards the prescribed antibiotics and to optimize the prescribing pattern of drugs accordingly.

METHODS

This observational study was conducted in SRM Medical College Hospital and Research Centre, Kattankulathur, Tamil Nadu. The study was conducted over a three months period between June to August 2018 after the approval of Institute Ethics Committee. The study population was comprised of patients who were diagnosed with Upper Respiratory Tract Infections (URTI) in the outpatient department and inpatient ward of Otorhinolaryngology and General Medicine Departments.

Inclusion criteria

- Patients of any age and sex, patients diagnosed with upper respiratory tract infections and having prescriptions with or without antibiotics.

Exclusion criteria

- Patients with prescriptions containing antibiotics which were prescribed outside the hospital and patients who had previously been undergoing

antibiotic treatment (local or systemic) were excluded.

- Patients who were not willing to participate also excluded from the study.

Based on the inclusion and exclusion criteria, a total of 60 patients with URTI were included for this study. The prescribing pattern of the antibiotics in those infections was recorded in the proforma. The informed consent in the study was obtained from all the patients for the swab collection. The different prescription indicators like average number of drugs per prescription, average number of antibiotics prescribed, percentage of drugs prescribed in generic name, percentage of drugs prescribed as injections, percentage of fixed dose combination and drugs prescribed from National List of Essential Medicines of India (NLEM, 2011) were noted down.^{4,5}

Collection of swabs

Sample was collected from the infected patients (pharyngitis, tonsillitis, otitis media cases) with the help of sterile cotton swab. Patient was asked to open their mouth wide and patients tongue was gently depressed with tongue depressor so that the throat is well exposed to collect samples. The swab was guided over the tongue into the posterior pharynx and was rubbed the over the infected area. The swab was then put into a transport media and the antibiotic sensitivity tests were done in the department of microbiology.

Preparation of medium

All the media plates were prepared in the laboratory. The recommended amount of medium and distilled water was mixed well and heated with frequent agitation. Media sterilization was done in autoclave for 15 minutes at 121 degree Celsius. The media was then allowed to cool for some time and the molten media was poured approximately 20 ml into each sterile petri plates and left undisturbed until it gets solidified.

Inoculation of medium

The swabs were inoculated in appropriate culture media. Blood agar, Chocolate agar were inoculated and incubated in CO₂ incubator and MacConkey agar was inoculated and incubated at 37°C for 24 hours.

Analysis of culture

The cultures were analyzed for growth. In case of positive culture, the organism was identified using gram staining and by using routine standard biochemical tests like coagulase test, catalase test and oxidase test.

Antibiotic sensitivity test

Antimicrobial susceptibility was done by the Kirby-Bauer disc-diffusion test and interpreted as per the CLSI

(Clinical laboratory standards Institute) guidelines. These antibiotics were selected based on prescription practices for URTIs in locality and CLSI guidelines.⁶

Statistical analysis

The data for prescription were collected in the predesigned proforma and were expressed as mean±SD. The descriptive tables were generated, and appropriate proportions were calculated.

RESULTS

In the current study, a total of 60 patients were included as per inclusion and exclusion criteria, out of which 26 (43.33%) were males and 34 (56.66%) were females. The number of patients between 1-14 years, 15-55 years and more than 55 years (3.33%) was 51.6%, 45% and 3.33% respectively. The mean age group of the study population was 22.92±15.94 years.

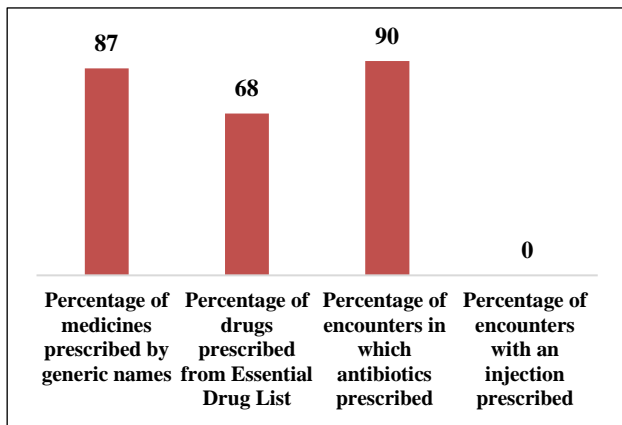
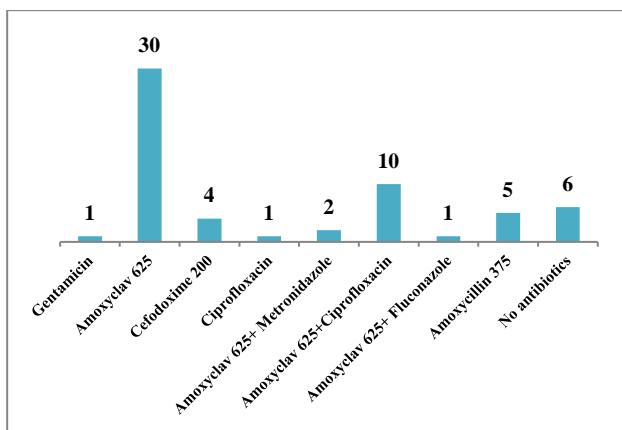


Figure 1: The various who prescribing indicators encountered.



Data are mentioned in percentage (%)

Figure 2: Prescribing pattern of antibiotics from different therapeutic classes.

The prescriptions were analysed for various prescription indicators as laid down by World Health Organization

(WHO) and is mentioned (Figure 1). The average number of drugs per prescription was 2.21. The use of Antimicrobial Agents (AMA) was seen in 90% of the prescriptions (Figure 2). The combination of amoxicillin and clavulanic acid was prescribed in 50% cases followed by combination of amoxicillin (625 mg) and ciprofloxacin (500 mg) in 17% cases. Amoxicillin (375 mg) was prescribed in 05 cases. Apart from antimicrobial agents, the other commonly drugs prescribed in these patients were paracetamol (75%). Antihistaminic like diphenhydramine, cetirizine/levocetirizine were prescribed in around 61% cases.

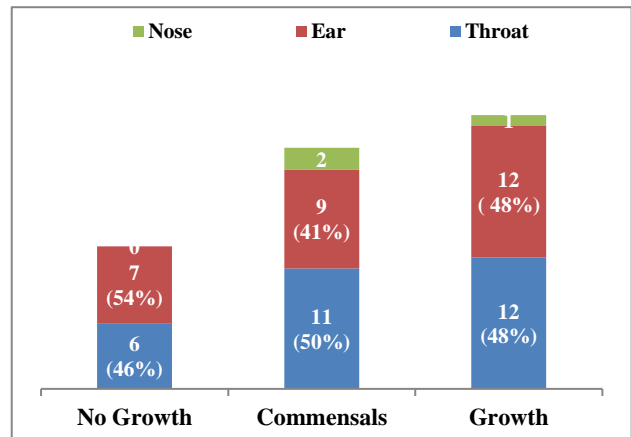


Figure 3: Different isolates from the culture of specimen from nose, ear and throat.

Table 1: Microorganism isolated from different sites.

Microorganisms isolated	Throat swabs N (%)	Ear swabs N (%)	Nose swabs N (%)	Total N (%)
<i>Klebsiella pneumoniae</i>	7 (63.6)	4 (36.4)	0 (0)	11 (44)
<i>Pseudomonas aeruginosa</i>	2 (25)	6 (75)	0 (0)	8 (32)
<i>Staphylococcus aureus</i>	1 (33.3)	1 (33.3)	1 (33.3)	3 (12)
Others				
<i>Moraxella spp.</i>	-	1 (33.3)	-	3 (12)
<i>Asperigillus spp.</i>	-	1 (33.3)	-	3 (12)
<i>Acinetobacter spp.</i>	1 (33.3)	-	-	1 (4)
Total	11 (44)	13 (52)	01 (4)	25 (100)

A total of sixty patient’s samples were collected and processed, of which twenty-nine were throat swabs, followed twenty-eight ear swabs and three swabs from internal nares as shown in Figure 3.

Twenty five of the sixty samples (41%) showed growth when culture was done. The maximum isolates were of *Klebsiella pneumoniae* followed by *Pseudomonas aeruginosa* (Table 1). Seventy percent of *Pseudomonas* strains were sensitive to ciprofloxacin. *Klebsiella* strains

were more resistant to most antibiotics like amoxicillin and ciprofloxacin (Table 2).

Table 2: Antimicrobial susceptibility (%) of bacterial strains recovered from different sites.

Bacterial strains	N	PEN	AMC	ERY	CRO	CAZ	FOX	AZM	CIP	CLI	ERY	SXT	GEN
KPN	11	-	27	-	27	-	-	-	36	-	-	27	36
PAE	10	-	-	-	-	80	-	-	70	-	-	-	70
SAU (MSSA)	3	0	-	100	-	-	100	100	100	100	100	-	100

DISCUSSION

This prescription-based drug utilization study is considered to be one of the best and effective methods to assess the prescribing trends among physicians. Prescribing pattern of antibiotics reflects the appropriateness of antibiotic use. It helps in reduction in the cost of therapy, minimize polypharmacy and improves the rationale use of antibiotics.⁷ The World Health Organization (WHO) has developed the prescribing indicators for rationale use of drugs and these indicators are used to measure the performance of the physicians related to rational prescribing practice. In this study we have used the drug prescribing indicators of the WHO and the results of the can be used as a feedback to guide and help the physician in rationale drug use. The average number of drugs per prescription was 2.21 which is close to the internationally accepted idle no 2. This shows that the physicians are prescribing less number of drugs to increase the compliance, lower the cost of therapy and to decrease the drug-drug interactions. Similar results have been shown by Sharma et al, where the average number of drugs prescribed was 2.38.⁸ The percentage of drugs prescribed by generic names was 87 % in this study which shows excellent signs of rationale prescription. This may be due to the recent Medical council of India's circular to all the physicians regarding prescribe the drugs in generic names. The global number of percentage prescribing in generic names varies from 13.3% to 93%.⁹ The reason for prescriptions without generic names in this study could be limited availability, combinations of drug formulations for cough and cold. Mostly the drugs used for URTI contain a combination of anti-allergic, expectorants, demulcents etc.

Further in this study, 68% of drugs were prescribed from the Essential Drug List (EDL). According to WHO prescribing indicators, most of the prescribed drugs should be from essential drug list based on the safety, efficacy and cost benefit ratios.¹⁰ In this study, the percentage of encounter in which antibiotics are prescribed was 90%. The value was as low as 33% in another study.⁸ Higher percentage of antibiotics prescribed in URTI have been found in the study done by Linder et al, (67%) and Kancherla et al, (88.8%).^{11,12} These values are high considering the viral etiology of

the most of the cases of URTI and is a matter of concern. In this study most of the patients were prescribed the combination of amoxicillin and clavulanic acid either as a single antibiotic (58%) or along with other antibiotics like ciprofloxacin, metronidazole. The empirical use of this combination without evidence of penicillinase resistance is a matter of concern. This issue should be addressed and corrected properly. The injection per encounter in this study was nil which an appreciable finding is. Apart from antibiotics, the other common drug prescribed was paracetamol (73%) and antihistaminic (67%). This is expected as most of the patients of URTI suffer from fever, cold, runny nose etc. So, these drugs were prescribed for the symptomatic relief of the patients. Studies have shown that there is very little support for use of antihistamines in common cold.¹³

The culture results of the collected specimens showed that there were only 41.6% growth and rest were either commensals (36.6%) or no growth (21.6%). Among the organisms identified, the most common was found to be *Klebsiella pneumoniae* (44%) followed by *Pseudomonas aeruginosa* (32%) and *Staphylococcus aureus* (12%). So only 41.6% of the patients had some infections of bacterial origin and had been prescribed with various antibiotics. But the rest of the cases where antibiotics were prescribed could be of viral origin or some other non-bacterial origin. Most URTIs resolve spontaneously in 3 to 10 days with symptomatic therapy alone. So irrational use of antibiotics in infections of nonbacterial origin can be a matter of concern and can lead to drug resistance.

CONCLUSION

Upper respiratory tract infection is one of the most common diagnosed diseases in the OPD of General medicine and Otorhinolaryngology dept. The most common antibiotics prescribed were penicillin, cephalosporin, and ciprofloxacin. Less than half of the patients had infections of bacterial origin and the organisms isolated were less susceptible to the prescribed antibiotics. This irrational prescription can lead to antibiotic resistance which is a matter of concern. Training of health care professionals in antibiotics use guidelines and prescribing pattern can ensure appropriate rationale therapy. Cautious and judicious use of

antibiotics will reduce the burden of multi drug resistance. This will lead to reduce morbidity and mortality arising from respiratory tract infections. This type of study will give appropriate feedback and awareness among the physicians. Time to time monitoring and evaluation of prescriptions is essential to promote rationale prescribing of antibiotics.

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