Research Article

Antimicrobials Prescribing Patterns in Urban and Rural Hospitals-Determinants and Proposed Interventions

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Accepted on: 08-04-2013; **Finalized on:** 30-06-2013.

ABSTRACT

The aim of the study is to determine the prescribing pattern of antimicrobials at various rural and urban hospitals and to propose possible interventions on improving antibiotic usage by implementing pharmacist role to prevent antibiotic resistance in future for that a prospective – observational study was conducted in urban and rural hospitals, in Tamilnadu, India between June 2012 to January, 2013 which includes 360 antibiotic containing prescriptions are analyzed and Each prescription was compared with standard treatment guidelines and the observations are noted. A specially designed data entry form was used to collect data. From our study it was observed that Antibiotics are being extensively prescribed where alternate therapy is available. Irrational Use of much high power antibiotic to patients will cause resistance to antibiotics. To prevent this pharmacist role was implemented which undergone the issue of standard treatment guidelines, right drug for right microorganisms were made by using diagnostic tests, awareness were created about antimicrobial resistance to the health care providers. This showed slight change among physicians in their prescribing behavior. There is an urgent need to improve the prescription behavior of practitioners in India and ensure that patient receive evidence-based, cost-effective treatments for their health problems. Indiscriminate use of antibiotics can lead to drug resistance, necessitating monitoring of drug susceptibility and formulation of drug policy in hospitals.

Keywords: antibiotics, antibiotic resistance, antimicrobials.

INTRODUCTION

Antibiotic resistance is a global problem which is threatening, particularly in developing countries where the infectious disease burden is more and cost constrains the replacement of older antibiotics with newer which are more expensive ones. Management of common and lethal bacterial infections has been critically compromised by the appearance and rapid spread of antibiotic – resistant bacteria.[2] Antibiotics were once considered 'miracle drugs' and have been used for decades to effectively treat a variety of bacterial infections. Unfortunately, widespread use and misuse worldwide have led to the emergence of 'super bugs' and other drug-resistant bacteria. The bacterial disease burden in India is among the highest in the world[1]; consequently, antibiotics will play a critical role in limiting morbidity and mortality in the country. As a marker of disease burden, pneumonia causes an estimated 410,000 deaths in India each year, and it is the number-one killer of children. Many of these deaths occur because patients do not have access to life-saving antibiotics when and where these are needed. Antibiotics are used in situations where these cannot be expected to improve the patient's condition, particularly as treatment for the common cold and uncomplicated cases of diarrhea "Drug selection pressure" is the single most important factor in the evolution of drug resistance in bacteria[2]. Antibiotic use has been increasing steadily in recent years. Between 2005 and 2009, the units of antibiotics sold increased by about 40%.Increased sales of cephalosporin were particularly striking, with sales (in units sold) increasing by 60% over that five-year period, but some increase was seen in most antibiotic classes. The increased resistance is a result of many factors, but the foremost cause is the overall volume of antibiotic consumption. The fact that antibiotic use is increasing is not, itself, indicative of a problem, but evidence from studies of prescribing patterns suggests that antibiotics are often used in inappropriate ways.[3]

MATERIALS AND METHODS

This is a prospective – observational study carried out in rural and urban hospitals situated in Coimbatore district of Tamilnadu, India between June, 2012 to January, 2013 this includes 360 prescriptions from urban and rural hospitals. A specially designed data collection form was used to collect demographical data's which include age, sex, current problem, focus of infection, diagnosis, diagnostic tool, prescription indicators were collected from the prescription after physicians visit and interventions are made with the physicians. Prescriptions are compared with standard treatment guidelines and the observations are noted. The information collected regarding all the selected cases were recorded in a Master Chart. Data analysis was done with the help of computer using Epidemiological Information Package (EPI 2010) developed by Centre for Disease Control, Atlanta. Using this software range, frequencies, percentages, means, standard deviations, chi square and 'p' values

were calculated. Kruskul Wallis chi-square test was used to test the significance of difference between quantitative variables and Yate's chi square test for qualitative variables. 'p' value less than 0.05 is taken to denote significant relationship.

RESULTS AND DISCUSSION

Data collected from 360 prescriptions were compiled, analyzed and discussed below.

Type of patients based on residence

Out of a total of 360 patients who were taken for study, 210 were from the urban areas and 150 were from the rural areas. The hospitals which are in the rural areas, their the outpatient visiting time is limited, but when compare to these rural hospitals, the hospitals in the urban areas the daily visit of the patients are more, due to its multi specialties and the availability of physicians at any time. In rural India since home remedies also available, probably the initial treatment awareness is lacking and may be the cause for the severity or seriousness, and then the doctor is searched.

Sex and age-wise distribution

Almost the composition of males and female in both rural and urban hospitals remains nearly the same. It was found in rural hospitals, that the visits of female patients are more, when compared to males. An average of about 48% women and 52% of men were taken into the study.

Table 1: Distribution Based on sex

Sex	No. of patients (N=360)					
	Rural		Urban		Total	
	No	%	No	%	No	%
Male	69	46	102	48.6	171	47.5
Female	81	54	108	51.4	189	52.5
Total	150	100	210	100	360	100

Age – distribution

The composition of patients from both urban and rural areas remained the same in terms of age in years the mean showed significant difference between the groups. The P value is significant and that shows the mean age of the patients in this studies. Urban group treated were 32, whereas 25.4 in rural areas. Seasonality changes is the major driving factor among the public, showed slight variations in age groups in visiting the hospitals

Based on infected system

A Detailed scenario of the No. of patients who fought with infections is described in this portion (Table 3). Various type of infection in the urban settings is compared with the rural counterparts. The environment and the life style which now prevails in the urban paved the way for more infections. Based on the study, 108 patients with URTI visited rural hospitals which are more when compared to urban. Totally 51.7% patients got infection in upper respiratory tract, while only 9 patients reported GIT infections in urban areas occurrence is more. Eye infections and LRTI occurred in the same percentage almost.

While 27% has the complaints of the GIT in the urban areas, the rural group had no patients with GIT during the study period. Highest occurrence was the respiratory tract infections in both groups urban and rural. Specifically the upper respiratory tract infections are more prevalent. While in the urban group the percentage of patients with GIT infections were 37.1% (n=78), it resembles at a higher levels in rural areas with 72% (n=108)

Overall number of infections and the types of infections in the urban areas remained at a very high range. This might be due to the increasing rush, decreased time and exposure to harmful pathogens in polluted environment of the urban side, which is the biggest problem with the rising of numerous industries and the population in the urbanizing scenarios of the modern India.

Table 2: Age distribution

Age group (in years)	No. of patients					
	Rural		Urban		Total	
	No	%	No	%	No	%
Upto 10 years	24	16	9	4.3	33	9.2
11-20 years	27	18	24	11.4	51	14.2
21-30 years	42	28	87	41.4	129	35.8
31-40 years	36	24	39	18.6	75	20.8
41-50 years	15	10	27	12.9	42	11.7
> 50 years	6	4	24	11.4	30	8.3
Total	150	100	210	100	360	100
Range	1-59		3-65		1-65	
Mean	25.4		32.0		29.3	
SD	14.4		14.1		14.6	
't'	2.505					
'p'	0.0136					
Significance	Significant					

Table 3: Based on infected system

Infected system	No. of patients (N=360)					
	Rural		Urban		Total	
	No	%	No	%	No	%
Boils	3	2	-	-	3	0.8
Eye	9	6	9	4.3	18	5.0
GIT	-	-	57	27.1	57	15.8
GIT/UTI	-	-	3	1.4	3	0.8
LRT	6	4	9	4.3	15	4.2
Skin	-	-	9	4.3	9	2.5
Typhoid	3	2	-	-	3	0.8
URT	108	72	78	37.1	186	51.7
URT/LRT	-	-	3	1.4	3	0.8
URT/UTI	-	-	3	1.4	3	0.8
UTI	6	4	24	11.4	30	8.3
Wound	9	6	15	7.1	24	6.7
Others	6	4	-	-	6	1.6
Total	150	100	210	100	360	100

Based on the method of diagnosis

Diagnosis is a specialized intellectual talent of a physician in medical field. There are various methods to diagnose a disease or a disorder. The following methods are in practice, they are based on vital signs, symptoms, physical examinations, laboratory findings etc.

Table 4: Based on the method of diagnosis

Basis of diagnosis	No. of patients					
	Rural		Urban		Total	
	No	%	No	%	No	%
Lab. Report	15	10	36	17.1	51	14.2
Vital sign	-	-	90	42.9	90	25
Symptom	129	86	204	97.1	333	92.5
Physical exam	63	42	177	84.3	140	66.7

Note: For some patients diagnosis was done based on more than one method.

For to determine the exact microbes which cause infectious disease, proper diagnosis has to be carried out, as a part of this study the method of diagnosis was assessed, which showed most of the diagnosis was made by the symptoms. 86% in rural and 97.1% in urban were diagnosed by symptoms, 42% and 84.3% were diagnosed by the physical examination and least 10% from rural and 17% from urban was diagnosed on the basis of lab reports. For some patients diagnosis was done based on more than one method. GARP- India working group recommends which was also made by the ministry of health and family welfare task force-raises several issue. First many hospitals do not have the required facilities to conduct a range of diagnostic tests, laboratories are under resourced, physicians do not necessarily value the results from microbiology laboratories even when they exist which may result in the wrong diagnosis leads to inappropriate drug usage.

Prescription analysis

In this study the No. of antibiotics prescribed in the rural are significantly higher when compared to the urban counterparts. This may be due to poor laboratory resources.

Table 5: Number of antibiotics prescribed

Number of antibiotics	No. of patients					
	Rural		Urban		Total	
	No	%	No	%	No	%
1	126	84	195	92.8	321	89.1
2	21	14	15	7.1	36	10
3	3	2	-	-	3	0.8
Total	150	100	210	100	360	100
Range	0-3		0-2		0-3	
Mean	1.18		0.86		0.99	
SD	0.44		0.52		0.51	
't'	3.888					
'p'	0.0005					
Significance	Significant					

In the other side 82% of patients were treated with one antibiotic, compared to only 71.4% in the urban scenario. Rural patients received at least 1 to as high as 3 antibiotics in the treatment leading way to a significant P value. The study report coincides with results of Anita kotwani et al., 2011 that a very high consumption of antibiotics was observed in both rural and urban sector outpatients. There was a high use of broad spectrum and newer antibiotics in the community. Suitable and sustainable interventions should be implemented to promote rational use of antibiotics that will help in decreasing the menace of antibiotic resistance.

Patterns of antibiotics prescribed

The availability of antimicrobial drugs in the rural hospitals is limited when compared to the antimicrobial drugs in the urban hospitals. The pharmaceutical companies are in competition to promote their newer antimicrobials which showed the following results.

While 70% of the rural patients received plain amoxicillin, less than half of their counterparts in the urban areas 33% received plain amoxicillin as an antibiotic for the treatment. While there were a lot of options used in the urban setting, this could be attributed to the exposure, awareness and the availability of the variety of products in the urban market. Typically the rural consumption of antibiotics depends more on the primary health care centers, where the purchases are governed by various policies. Also a treatment protocol is placed which suggests amoxicillin as the first line of antibiotic in the rural settings. Also the private involvements in the urban sectors are high and so this leads to a good exposure of the clinicians to prescribe their choice based on the result requirement and their knowledge. Exposure this variety of antibiotics also contributes to the development of resistance. The urban scenario clearly shows that almost every group antibiotics are used in the setting. The infections related to which these antibiotics are prescribed are the RTI and the GIT infections.

Table 6: Based on the name of antibiotics prescribed

Antibiotics prescribed	No. of patients (N=360)					
	Rural		Urban		Total	
	No	%	No	%	No	%
Amoxicillin	105	70	15	7.1	120	33.3
Amoxillin/clavulanic	-	-	9	4.3	9	2.5
Azithromycin	-	-	15	7.1	15	4.2
Cefixime	-	-	6	2.9	6	1.7
Ciproflaxacin	12	8	12	5.7	24	6.7
Erythromycin	-	-	18	8.6	18	5.0
Gentamycin	12	8	-	-	12	3.3
Doxycyclin	3	2	-	-	3	0.8
Levoflaxacin	-	-	18	8.6	18	5.0
Metronidozole	15	10	15	7.1	30	8.3
Norflaxacin	-	-	15	7.1	15	4.2
Ofloxacin	-	-	45	21.4	45	12.5
Roxithromycin	-	-	3	1.4	3	0.8
Septron syrup	15	10	-	-	15	4.2

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Patterns of consumption of antibiotics based on classes

Table 7: Based on the Class of antibiotics prescribed

Class of antibiotics prescribed	No. of patients					
	Rural		Urban		Total	
	No	%	No	%	No	%
Aminoglycoside	12	8	-	-	12	3.3
Cephalosporin	-	-	6	2.9	6	1.7
Fluroquinolones	9	6	6	2.9	15	4.2
Macrolide	-	-	123	15.7	33	9.2
Penicillin	105	70	21	10	126	35
Quinolones	6	4	90	42.9	96	26.7
Sulfonamides	15	10	3	1.4	18	5.0
Tetracycline	3	2	-	-	3	0.8
Nil	-	-	54	25.7	54	15
Total	150	100	210	100	360	100

* More than one class of antibiotics was prescribed to some patients

The study showed that synthetic penicillin's are most often used. That is 70% of patient received penicillin in rural hospitals; on the other side 42.9 % patients received quinolones and 58.5% received macrolide class of antibiotics in urban hospitals. This may cause resistance among pathogens to these antibiotics in these regions. The total usage of penicillin in both urban and rural hospital is 35%. According to Leman kayas et al., if any antibiotics are more often used for specific infection, the sensitivity of antibiotic will gradually get reduced to that specific microorganisms like was in their study the most common causative agent was E.coli and the highest resistance ratios were against Trimethoprim-sulfamethoxazole, Ampicillin and Amoxicillin- clavulanate in children with UTI that presented in their study.

Pattern of antibiotic usage

The above table shows the total usage of drugs and classification of the usage in 2 parts as the appropriate and the inappropriate usage. In the rural population prescription analysis, out of 150 drug uses, 50% (n=75), were appropriate. Another 50% (n=75) was in appropriate. In the urban population where the prescriptions were analyzed, out of 210 drugs used 150 were appropriate and the rest 60 was found to be inappropriate. In total 225 drug uses were appropriate and 135 inappropriate.

Table 8: Based on the usage of drugs

Usage of drugs	No.of patients					
	Rural		Urban		Total	
	No	%	No	%	No	%
Appropriate	75	50	150	71.4	225	62.5
Inappropriate	75	50	60	28.6	135	37.5
Chi square	4.84					
'p'	0.0279					
Significance	Significant					

This shows the exposure of the clinicians in the respective areas for a justified antibiotic therapy. While the appropriate and inappropriate treatments contributed to each 50% in the rural areas, the awareness of the therapy due to continuous medical education in urban areas has led to more of appropriate treatments to the tune of up-to 62.5%. Moreover, we may also see that there is a significant dependence on the lab reports in the urban settings due to the availability of the services there more and less in the rural areas.

Impact of pharmacist role

It was found that the usage of antibiotics in urban hospitals from the month of June, 2012 to January 2013 was at extreme level. After the implementation of pharmacist role, like educational programs was conducted to the health care professionals, standard treatment guidelines was framed, any antibiotic use must be justifiable on the basis of the clinical diagnosis, resistant drugs are replaced with the sensitive. After pharmacist intervention it was found slight change in the attitudes of physician towards antimicrobials. This will continue in the upcoming future

CONCLUSION

By these complete observations the study reveals that antibiotics are extensively used in both rural and urban sectors. Irrational usage of antibiotic is a key driver of antimicrobial resistance. Antibiotics are overused particularly for minor infections, misused for self limiting viral infections. In this study after the pharmacist intervention the antimicrobial prescribing patterns showed positive outcomes. Results from this study shown that community based surveillance of antibiotic use are possible in resource – constrained settings and patterns of antibiotic use can be surveyed. However, the effort of collecting this data is only worthwhile if policy makers invest in the intervention urgently needed to improve the use of antibiotics in the community, without such actions increasing antimicrobial resistance will deny future generations the benefit of effective antibiotics to treat common infections.

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Source of Support: Nil, **Conflict of Interest:** None.