Original article

Empirical use of Antibiotics in Emergency Department of Tribhuvan University Teaching Hospital and Treatment Success Rate in Discharged Patients

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Abstract

Introduction: Infectious diseases are the common presentation in emergency department, which require treatment within minutes. As a result, the empirical antibiotics are started prompt in emergency department before the bacteriological results are available. Therefore, the aim of this study was to explore the use of antibiotics at emergency room and to determine the success rate in discharged patients.

Methods: A descriptive, exploratory, non-interventional study was conducted during 8 weeks among the discharged patients from emergency department who received the antibiotic therapy and culture/ sensitivity test was asked. Patients were followed from emergency room and adequate information was taken from emergency records and also at the time of outpatient department visit.

Results: Out of 297 patients, only 179 patients were studied. We found that 75.1% of empirically prescribed antibiotics were oral. The most commonly administered intravenous and oral antibiotics were ceftriaxone (20.4%) and cefixime (17.0%). The most common isolate leading to emergency department visit was Escherichia coli (29 patients, 16.2%). In vitro sensitive test for gram positive and gram negative isolates, amoxicillin-clavulanate combination and ciprofloxacin were most effective and cefixime was the least effective antibiotic. The treatment success rate was found to be 147(82.1%) of the patients, as the medication prescribed at emergency room was continued by outpatient department physician.

Conclusion: Quinolones and cephalosporins groups of antibiotics are rising as the determinant antibiotics at emergency room. The rate of appropriate use of antibiotics and treatment success rate were found to be higher.

Key words: Antibiotics, Emergency department, Empirical therapy.

Introduction

Antibiotics are generally defined as empirical if they are chosen before susceptibility results are known. In practice however, microbiology laboratories often report preliminary results, prompting treating physicians to change antibiotics based on an increased index of suspicion for one or the other organisms. However, infectious diseases are common presentation in emergency department (ED). So, early diagnosis and prompt treatment are essential to protect the health of patients. As a result, empirical antibiotics therapy is started before bacteriological report is available. Hence, most antibiotics therapies are initiated in emergency room making it as an important source of inappropriate antibiotic prescribing.[1-3] Although antibiotic therapy is the cornerstone in the treatment of infections, the empirical prescription of antibiotics has led to increase in antibiotic resistance.[4] Inappropriate initial antibiotic therapy is associated with adverse outcome in antibiotic-resistant, particularly in patients with a high-risk source of bacteremia.[5]

Therefore, question regarding the rational use of antibiotics in ED is always topical.[6] Prescribing of antibiotics is found to be more common where no restrictive measures to antibiotic use are applied. The misuse of antibiotics for viral infections and the excessive use of broad spectrum antibiotics in place of narrow spectrum antibiotics have well documented in emergency room throughout the world.

The administration of one to two doses of intravenous antibiotics in ED followed by discharge on oral antibiotics has become general trend in treating patient in emergency room. Previously published studies on antibiotic use are based on admitted cases from ED and so their finding may not necessarily apply to discharged ones. Therefore, the aim of this study was to explore the use antibiotics at emergency room and to determine the success rate of antibiotic therapy on discharged patients.

Methods

Study design

A descriptive, exploratory and non-interventional study was conducted in Tribhuvan University Teaching Hospital, Kathmandu, Nepal. The ED of this hospital handled all the emergencies except ophthalmological, cardiovascular and pediatrics ones. The carbon copies of all the prescriptions were maintained and recorded in the ED.

Selection of the patients

All the patients visiting ED from July to August 2011 who received the empirical antibiotic therapy and culture/sensitivity (c/s) was requested from them and asked to follow up in outpatient department (OPD) were included. Patients whose medical records documented followings findings were excluded from the study; a) referred cases already prescribed with antibiotics b) discharged on request of patient from emergency department c) all the admitted cases as well as those referred to other centers. But the first time OPD visited patients who were referred to emergency department for further evaluation were included as part of study. Same as those patients who were kept in observation room of emergency department were also included in study.

Data collection

Information on demographics, patient history, phone number, vitals, provisional diagnosis, empirically administered antibiotics at emergency room were taken from Emergency Department records. Patients were traced from emergency department and then followed on the day of OPD visit. All the microbiological (culture/sensitivity) reports were obtained from patient on the day of OPD visits. All the patients were called on telephone to obtain their date of OPD visit. The antibiotics prescribed at OPD were taken from patient on the day of OPD visit. The antibiotic therapy used in OPD visit was also taken by phone calls if they were missed to meet on OPD visit day. But no microbiological reports were entertained from the telephone calls.

Data management and analysis

Collected data were managed, analyzed, and presented using SPSS version 17.0. Descriptive statistics were counted for categorical variables by computing their frequencies. Some variables were not included in analysis due poor prescription visibility.

Ethical issues

This study was approved by Institutional Review Board of Institute of Medicine (N.327).

Results

During the study period, 297 patients met the criteria of sample. Out of which 179 patients were evaluated. 118 patients could not be followed either because of one or other reason, such as incomplete information, missing phone number or patient did not appear for the OPD visit especially where repeat culture was requested. Some patient abscond the treatment and rest continued their medical treatment in other centers. Data on demographics, infectious disease diagnosed, patient referred are presented on table 1. Of all 179 patients, physician at OPD continued their medication as prescribed at emergency room at the time of discharge in 147(82.1%) patients. The remaining 32(17.9%) patient's antibiotic therapy was changed by physician at OPD (Table 1).

Table 1 Characteristics of the patients

Characteristics	Number of patients (n=179)	Percent
Sex		
Male	75	41.9
Female	104	58.1
Age in years		
5-40	136	76.0
41-60	28	15.6
>60	15	8.4
Median age (Range)	27 (5-92)	
Provisional diagnosis at Emergency Department		
Gastro Intestinal Infections	32	17.9
Enteric fever /partially treated	49	27.4
Renal Infection / cystitis	104	58.1
Viral fever	4	2.20
Sepsis	1	0.6
Respiratory tract infections	26	14.5
Fever unknown evaluation	16	8.9
Others	45	25.10
Patient in ED		
Directly discharged from ED	126	70.4
Kept in observation	53	29.6
Antibiotic therapy prescribed at ED		
Continued with the therapy	147	82.1
Changed the therapy	32	17.9

Bacteriological investigation

A total of 228 bacteriological samples were taken from 179 patients. The most commonly performed investigation were urine cultures (133, 58.3%), blood cultures (83, 36.4%), sputum cultures (8, 3.5%) and high vaginal swab (4, 1.8%). Among the 228 bacteriological samples, no growth was reported in 188(82.4%) samples and pathogenic bacteria were isolated in 40(17.6%) samples. The most common isolates were Escherichia coli (29, 72.5%), Staphylococcus aureus (4, 10.0%), Enterococcus faecalis (3, 7.5%), Salmonella enterica sero type (2, 5.0%), Pseudomonas aeruginosa (1, 2.5%) and Klebsiella pneumoniae (1, 2.5%) (Table 2).

Table 2 Type of samples and bacterial isolates

Variables	Number	Percent
Type of samples taken for culture (n=228)		
Urine	133	58.3
Blood	83	36.4
Sputum	8	3.5
High vaginal swab	4	1.8
Bacterial growth (n=228)		
Yes	40	17.6
No	188	82.4
Bacterial isolates (n=40)		
Staphylococcus aureus	4	10.0
Enterococcus faecalis	3	7.5
Escherichia coli	29	72.5
Salmonella enteric	2	5.0
Pseudomonas aeruginosa	1	2.5
Klebsiella pneumonia	1	2.5

Antibiotics therapies

In our study, a total of 265 antibiotics were prescribed empirically in ED to 179 patients. The percentage of orally prescribed accounted 75.1% and parenteral was 24.9%. Among the parenteral antibiotics, ceftriazone 54(20.4%) was most commonly followed by amoxicillin-clavulanate 6(2.3%). The most commonly prescribed oral antibiotics were cefixime 45(17.0%) followed by ofloxacin 44(16.6%), norfloxacin 31(11.7%), ciprofloxacin 24(9.0%) and azithromycin 23(8.7%). If same antibiotic was used orally and intravenous, both were counted separately (Table 3).

Table 3 Types of antibiotics used at ED

Antibiotics	Types of antibiotics (n=265)	
	Parenteral (%)	Oral (%)
Ceftriaxone	54 (20.4)	
Amoxicillin-clavulanate	6 (2.3)	9 (3.4)
Ciprofloxacin	3 (1.1)	24 (9.0)
Flucloxacin	3 (1.1)	1(0.4)
Cefixime		45 (17.0)
Ofloxacin		44 (16.6)
Norfloxacin		31 (11.7)
Azithromycin		23 (8.7)
Amoxicillin		13 (4.9)
Nitrofurantoin		6 (2.2)
Levofloxacin		2 (0.8)
Cefadroxil		1 (0.4)

The most frequently antibiotics for renal infections/urinary tract infections were ofloxacin (33 patients), norfloxacin (27 patients), ceftriaxone (24 patients), cefixime (16 patients) and ciprofloxacin (15 patients). Similarly cefixime (22 patients), ceftriaxone (21 patients) followed by ofloxacin (12 patients) were most commonly prescribed in enteric fever (Table 4).

*The number in the table represents the number of antibiotics prescribed under specific provisional diagnosis. The total number of antibiotics may not be equal to above data due to multiple provisional diagnoses at emergency department.

† includes acute peptic disease, acute appendicitis, acute gastroenteritis and pain abdomen.

‡ includes acute renal failure, pyleonephritis, uteric colic and recurrent vaginitis.

§ also includes those patient who were partially treated by self medication without physician consultation.

|| pneumonia, lower respiratory tract infection, acute pharyngitis, chest infection and acute exacerbation of coronary obstructive pulmonary disease.

RTI- Respiratory Tract Infection

UTI- Urinary Tract Infection

Among the empirically prescribed antibiotics for both gram positive and gram negative isolates, amoxicillin and clavulanate combination and ciprofloxacin were most effective whereas the cefixime was least effective (Table 5).

Table 4 Empirically prescribed antibiotics according to diagnosis.*

DIAGNOSIS		Amoxicillin	Amoxicillin-clavulanate	Azithromycin	Cefadroxil	Cefixime	Ceftriaxone	Ciprofloxacin	Flucloxacin	Levofloxacin	Norfloxacin	Nitrofurantoin	Ofloxacin
GI infections †	1	0	0	0	6	6	9	0	1	9	0	9	
Renal infections/UTI ‡	5	5	5	1	16	24	15	1	1	27	5	33	
Enteric fever §	0	8	8	1	22	21	6	0	0	1	2	12	
Viral fever	0	1	1	0	2	1	0	0	0	0	0	1	
RTI ||	7	18	18	1	4	5	1	0	0	2	0	1	
Sepsis	0	0	0	0	1	0	0	0	0	0	0	0	
Fever under evaluation	2	3	3	0	4	4	2	0	1	2	0	2	
Other	3	4	4	0	12	14	5	0	0	9	2	9	

Table 5 Antibiotic susceptibility pattern of gram positive and gram negative bacteria

Empirically prescribed antibiotics	Gram negative bacteria		Gram positive bacteria	
	Sensitive	Resistant	Sensitive	Resistant
Ceftriaxone	5	4	1	1
Nitrofurantoin	1	1	0	0
Ofloxacin	3	3	1	2
Norfloxacin	4	5	1	1
Amoxicillin-clavulanate	1	0	1	0
Ciprofloxacin	4	3	1	0
Cefixime	0	5	0	1

Discussion

Our study revealed that most of the patients visiting ED had urinary tract infections (58.1%). So, mostly urine sample was collected for the culture and antibiotic susceptibility testing (AST). Among the 228 samples, 82.4% had no growth. This suggests that prescription of antibiotics to the patients during the emergency visit was appropriate. In a study done, the success rate of treatment in ED patients with intravenous antibiotics was about 75%.[7] This is lower than that of this study; however, right choice of antibiotics was made. Therefore, the physicians should be prudent in selection of appropriate antibiotics from the provisional diagnosis.

We found that 75.1% of the empirically prescribed antibiotic was oral and 24.9% accounted parenteral. The most commonly administered intravenous and oral empirical antibiotic therapy were ceftriazone 20.4% and cefixime 17.0% respectively. Similarly, ofloxacin 44 (16.6%), norfloxacin 31(11.7%), ciprofloxacin 24 (9.0%), were most commonly prescribed antibiotics orally after cefixime at emergency room. A study reported that ceftriazone 35% was most commonly used after cefazolin 64% among intravenously used antibiotic.[8] A much higher rate of intravenous antibiotic was documented in the study done by Kam et al (47.9%).9 In a study, antibiotics prescribed for chronic heart failure patients visiting emergency department macrolides with or without ceftriazone represents 52% to 80%.[10] Published studies have shown that amoxi-clavulanate (both oral and parenteral) being the most frequently used antibiotics in emergency room.[6, 11] One ED based study, reported cefuroxime and benzyl penicillin intravenous; the predominant antibiotics at emergency room.[6] However, our study demonstrated that cephalosporins group and quinolones group of antibiotics are the rising as the determinant antibiotic at emergency room.

In this study the most common isolate leading to ED visit was E. coli (29 patients, 16.2%). In vitro sensitive test for both gram positive and gram negative isolates, among the empirically prescribed antibiotics amoxicillin –clavulanate combination and ciprofloxacin were most effective whereas the cefixime was least effective. A study conducted in Tribhuvan University Teaching Hospital (TUTH) found that norfloxacin and ciprofloxacin were the most useful antibiotics.[12] Our findings were supported by a study where ciprofloxacin (98.7%) was considered most sensitive antibiotic followed by ofloxacin (98.2%).13 Similarly, a study documented that ciprofloxacin (79.2%) was most effective for gram positive bacteria involved in causing lower respiratory tract infection.[14] Our study shows that cefixime was most ineffective antibiotic prescribed empirically at emergency room. One of the reasons might be due to increased prescribing of cefixime accounting 17.0%. The other reason could be due to fact that 2.2% patients visited ED prior self-administered cefixime. Recently published study on randomized comparison of gatifloxacin and cefixime for uncomplicated enteric fever showed that gatifloxacin was the better option.[15] Although appropriate uses of initial antibiotics have been shown to be important factor for patient survival, increased use of antibiotics has increased emergence of resistance.[1, 12, 16] Therefore, the physicians should minimize the antibiotics as much as possible and prescribe the effective ones after the AST results.

In our study, antibiotics prescribed for 17.9% of the patients at emergency room were inadequate and OPD physician changed antibiotic therapy. In a study conducted in university hospital, incidence of inadequate empirical therapy against blood stream infections was higher (27.2%).17 In previous studies for admitted cases, empirical antibiotics were inadequate and inappropriate.[3, 8] However, a study reported that 86% of the empirical antibiotic therapy against P. aeruginosa bacteremia was appropriate.[18] Similarly, a study reported that only 47.2% received appropriate initial empirical antimicrobial therapy.[5] Thus, inappropriate use of antibiotics in our patient did not appear more frequent than that of other institutions. The incidence of lower inappropriate antibiotics reported might be due to fact that, a large number of admitted and referred cases were excluded.

Conclusion

The rate of appropriate use of antibiotics and treatment success rate was found to be higher. However, as quinolones

and cephalosporins were the major antibiotics used at ED, they were being less effective. Therefore, it is imperative to prescribe antibiotics judiciously.

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