



Research Article

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PHARMACOECONOMIC ANALYSIS OF ANTIBIOTICS IN DIFFERENT CLINICAL SETTINGS OF HYDERABAD, PAKISTAN

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ABSTRACT

Pharmacoeconomics deals with the cost and consequences of pharmaceutical products and services. It helps in determination of drug therapies or treatments that gives maximum benefit at lower cost. The aim of this study is to evaluate prescribing trends of antibiotics and to analyze their cost effectiveness. This prospective, observational and non-interventional clinical study was led for a period of 6 months from April 2018 to September 2018 at Government hospital (Liaquat University hospital Hyderabad) and various private clinics of Hyderabad. Through purposive sampling technique 400 samples were gathered. 400 samples with various bacterial infections were included in which 170 patients had Urinary Tract Infections, and 216 had Respiratory Tract Infections 14 patients were suffering from *H. Pylori*. Levofloxacin was the most recommended class in UTI, while Macrolides was the most recommended class in RTI. Out of 400 patients 152 patients were recovered, 16 patients left therapy due to GIT symptoms and allergic reactions and remaining patients were out of reach. Costs of antibiotics were calculated according to the duration of therapy prescribed. Antibiotics were mostly prescribed for the duration of 7 days. To conclude, Cost of antibiotics therapy was high which puts a considerable burden on the patients.

Keywords: Pharmacoeconomics, Antibiotics, Hyderabad, Pakistan

INTRODUCTION

In developing countries, bacterial infections particularly, the diseases concerning the Respiratory Tract Infections (RTI's) and Urinary Tract Infections (UTI's) are indicating an increased prevalence. These infections cause a substantial economic burden on patients. Pharmacoeconomics is the sub-discipline of health economics that deals with the cost of pharmaceutical interventions and its outcomes, also helps to compare the estimation of one pharmaceutical drug to another. It has various types of evaluations, performed to reduce the cost although providing best treatment outcomes to the patient.¹ Economic assessments provides valuable information to health care departments in order to optimally allocate limited or constrained resources. A Pharmacoeconomic study evaluates the cost as well as impacts of a therapy.² Pharmacoeconomics utilizes, cost-effectiveness, cost minimization, cost benefit, cost of illness and cost utility to compare pharmaceutical therapies and treatment approaches. Cost Effective Analysis used to classify which one medication is high in viability and less in cost.³ Cost is considered in Pakistani rupees (PKR) and consequences are determined in terms of getting particular beneficial treatment outcomes in term of healing.⁴ It helps in analyzing competing treatments looking for similar results. CEA is chosen when outcomes are measured directly in natural units such as benefits from the given treatment (as lowering blood pressure and decrease in sensation of pain).⁵ Cost Minimization Analysis is a comparative evaluation method in which numerous drugs of similar effectiveness and same tolerability are utilized. Normally, it is done when the outcome is same for two medical therapies. In this, in a manner of taking required information about the input and output, for example if the expense or cost is considered, then alternative with least expense is chosen.⁴ CMA includes difference in price of

medicines of similar therapeutic agents and the distribution of the similar medication in altered programs.^{6,7} Cost Benefit Analysis is a procedure used to decide alternatives that provides the best way to deal with the adoption and practice in terms of time and cost savings.⁸ CBA research contemplate assists indiscrimination amongst the costs and benefits of one intervention to another substitutive intervention afterwards the outcomes is then declared in monetary values.⁹ CBA, used by institutions that operates the fundamental areas of health system, can influence a health policy of government so CBA is used moderately in macro level.¹⁰ CBA makes beneficial investment, also used in comparing several outcomes, also enumerate value of pain, suffering and quality of life.¹¹ Cost Utility Analysis (CUA) is another method of evaluation in which drugs/interventions with different outcomes can be compared, appropriately used for life long treatments or palliative care (in cancer chemotherapy or aids).¹² The main objective of Pharmacoeconomic studies is to observe the clinical and patient outcomes and cost-effectiveness of interventions that are same in efficacy with less cost. Pharmacoeconomics is also used for balancing the cost with the consequences (outcomes) of pharmaceutical therapies and services also shows the influence of pharmacologic interventions on patient psychopathology, functioning, and comfort and on costs of medical therapies.¹³⁻¹⁴. Novel therapies and technologies make the need for economic evaluation and pharmacoeconomic analyses.¹⁵

Methodology

This prospective, observational and non-interventional clinical study was conducted for a period of 6 months from April 2018 to September 2018 at Government hospital (Liaquat University Hospital Hyderabad) and various private clinics of Hyderabad.

400 samples of patients including criterion of having bacterial infections were collected through purposive sampling technique.

Principal/Findings

We performed a Pharmaco-economical comparative analysis and cost of treatment for antibiotics. Cost analysis was done for determining the most cost-effective medication. Costs of antibiotics were taken from their respective sources. Costs of therapy were calculated in Pakistani rupees according to the duration of therapy and dosage interval mentioned in the samples. Antibiotics were prescribed for the duration of 3 days, 5 days, 7 days and 14 days, depending on the severity of infections. Dual therapy of antibiotics was shown in eradication of *H. Pylori*. Patients suffering from respiratory tract infection Urinary tract infection and *H. Pylori* with 25-50 years age group were included in this study. Pregnant and lactating mothers were excluded.

Table 1: Samples Distribution

Setups	Frequency (n = 400)	Percentage (100%)
Government Hospital	200	50
Private Clinical	200	50

Table 3: Geographical Distribution

Locality	Frequency (n = 400)	Percentage (100%)
Urban	169	42.25
Rural	137	34.25
Not mentioned	94	23.5

RESULTS

The Pharmacoeconomic evaluation comprised of medical results for 400 surveyed outpatients. 400 samples with antibiotics were collected, 200 samples were collected from government hospital and 200 samples were collected from private clinics (Table 1). Demographic information collected from data shows that 60% (240) were males and 40% (160) were females (Table 2). Samples collected from the patients were mostly from the rural side 42.25% (169), 34.25% (137) patients were from the urban side, in remaining 23.5% (94) samples locality was not mentioned (Table 3). Diagnostic information gathered by clinical presentation mentioned in samples shows that patients suffering from RTI's were 54% (216), UTI's 42.5% (170), *H. Pylori* patients were 3.5% (14) (Table 4).

Table 2: Gender Distribution

Gender	Frequency (n = 400)	Percentage (100%)
Males	240	60
Females	160	40

Table 4: Clinical Presentations

Clinical Presentations	Frequency (n = 400)	Percentage (100%)
RTI	216	54
UTI	170	42.5
<i>H. Pylori</i>	14	3.5

Antibiotics classes that were prescribed in the samples are mentioned in Table 5, with their agents. Macrolides was the most prescribed class of antibiotics followed by fluoroquinolones cephalosporin and co-amoxiclav. (Table 5)

Table 5: Antibiotics used in this study

Antibiotic Class	Agents
Macrolides	Clarithromycin Azithromycin Erythromycin
Fluoroquinolones	Ciprofloxacin Levofloxacin Moxifloxacin Ofloxacin
Penicillin-Like Antibiotics	Amoxicillin
Cephalosporins	Cefuroxime Cefixime Cephalexin
Pyridopyrimidine Class of Antibiotics	Pipemidic acid
Co-Amoxiclav	Amoxicillin/Clavulanic Acid
Tetracyclines	Doxycyclines
Lincomycin	Clindamycin

Antibiotics prescribed for RTI and UTI are mentioned in Table 6 and 7. Characteristics of prescribed antibiotics including dose, dose interval

Table 6: Antibiotics in Respiratory Tract infection

Antibiotics	Dose	Dose Interval	No of Patients (n = 216)	Percentage of total patients
Amoxicillin/ Clavulanate	625 mg/125 mg	12 hr	32	14.8%
Doxycycline	100 mg	12 hr	04	1.8%
Cefuroxime	250 mg	12 hr	12	5.5%
Cefixime	400 mg	12 hr	08	3.7%
Azithromycin	500 mg	12 hr	58	26.85%
Clarithromycin	500 mg	12 hr	50	23.14%
Ciprofloxacin	500 mg	12 hr	20	9.25%
Moxifloxacin	400 mg	12 hr	32	14.81%

Table 7: Antibiotics in Urinary Tract Infections

Antibiotics	Dose	Dose Interval	No of Patients (n = 170)	Percentage of total patients
Ciprofloxacin	500 mg and 250 mg	12 hr	32	18.82%
Levofloxacin	500 mg and 250 mg	12 hr	44	25.88
Ofloxacin	400 mg	12 hr	04	2.35%
Cephalexin	500 mg	12 hr	19	11.17%
Cefuroxime	250 mg	12 hr	25	14.7%
Amoxicillin	250 mg	12 hr	16	9.4%
Clindamycin	300 mg	12 hr	08	4.7%
Pipemidic Acid	200 mg	12 hr	22	12.94%

Comparative Analysis of Cost of Different Brands of Antibiotics

Direct costs are determined based on the dose of the antibiotics prescribed by the prescribers. Since outpatients were included in this study. Direct costs for the antimicrobial treatment are main factor of cost in this study. Indirect costs for different antimicrobial treatment of infections are not mulled over, since

ambulatory treatment does not provide significant information for indirect costs evaluation.

Cost effectiveness research is intended to be a source of rational information for medical decision making and policy setting. In given table below (Table 8) antibiotics from multinational and local brands are mentioned with their cost (bid) in Pakistani rupees for 1 to 7 days.

Table 8: Comparative cost

Antibiotics	Cost/Day	Cost of 3 Days	Cost of 5 Days	Cost of 7 Days
Clarithromycin (500 mg)				
Brand 1	130.94 PKR	392.8 PKR	654.7 PKR	916.58 PKR
Brand 2	82.6 PKR	247.8 PKR	413 PKR	578.2 PKR
Brand 3	76 PKR	228 PKR	380 PKR	532 PKR
Brand 4	84 PKR	252 PKR	420 PKR	588 PKR
Brand 5	88 PKR	264 PKR	440 PKR	616 PKR
Azithromycin (500 mg)				
Brand 1	93.2 PKR	279.6 PKR	466 PKR	652.4 PKR
Brand 2	90 PKR	270 PKR	450 PKR	630 PKR
Brand 3	88 PKR	264 PKR	440 PKR	616 PKR
Co-Amoxiclav (625 mg)				
Brand 1	44.24 PKR	132.72 PKR	221.2 PKR	309.68 PKR
Brand 2	40 PKR	120 PKR	200 PKR	280 PKR
Brand 3	40.34 PKR	121.02 PKR	201.7 PKR	282.38 PKR
Brand 4	42 PKR	126 PKR	210 PKR	294 PKR
Levofloxacin (500 mg)				
Brand 1	58 PKR	174 PKR	290 PKR	406 PKR
Brand 2	30 PKR	90 PKR	150 PKR	210 PKR
Brand 3	56 PKR	168 PKR	280 PKR	392 PKR
Moxifloxacin (400 mg)				
Brand 1	190 PKR	570 PKR	950 PKR	1330 PKR
Brand 2	132.8 PKR	398.4 PKR	664 PKR	929.6 PKR
Brand 3	140 PKR	420 PKR	700 PKR	980 PKR

Treatment regimen for eradication of *H. Pylori* is a triple therapy including amoxicillin, clarithromycin and a PPI (proton pump inhibitor) for 10-14 days depending on the severity of infection. Direct cost of triple therapy of medications prescribed for *H. Pylori* including both the antibiotics especially Clarithromycin causes.

Table 9: Dual therapy of Antibiotics in *H. Pylori* Patient's

Therapy	Frequency (n = 400)	Percentage (100%)
Mono Therapy	386	96.5
Dual Therapy	14	3.5

Table 10: Antibiotics Prescribed Through Brand or Generic Names

Names	Frequency (n = 400)	Percentage (100%)
Brand Names	345	86.25
Generic Names	55	13.75

In majority of samples antibiotics were prescribed through their brand names.

Patient's adherence to prescribed medications was also reviewed in which 4% patients left their therapy due to gastrointestinal manifestations (diarrhea, vomiting, and stomach ache) and allergic reactions (skin rash, itching, hives, swelling at fingers), 38% patients were recovered, and there were no follow up or any contact to 58% of patients.

Table 11: Patient's Adherence

Patient's Response	Frequency (n = 400)	Percentage (100%)
Recovered	152	38
Left therapy due to GIT manifestation and allergic reactions.	16	4
No any follow up or contact	232	58

DISCUSSION

Poor socioeconomic conditions, low health care awareness, polluted drinking water and inadequate sanitation are main causes of infections these days. Research findings from this study shows that Levofloxacin was the most prescribed antibiotics in UTI's, while observations from another study carried out by Kamran Ghanbari shows that 45% of cephalosporins were prescribed while fluoroquinolones was more effective for pneumonia that why it wasn't prescribed in UTI's.¹⁶ Macrolides was the most prescribed class of antibiotics in RTI's, similar observations were seen in a study carried out by Acevski Stevche shows that according to ICER Moxifloxacin, Doxycycline, Cefpodoxime and Cefuroxime were the most cost effective options.⁴ Amoxicillin and Amoxicillin/ Clavulanic acid were the most prescribed antibiotics under different brand names. Cost effectiveness studies were carried on the basis of different classes and brand of antibiotics. It was concluded that Moxifloxacin and Clarithromycin were the most expensive classes of antibiotics especially in patients suffering from *H. Pylori* infections because of the use of triple therapy of Clarithromycin and amoxicillin with a PPI; the treatment cost was very high and in some way unaffordable for the patients with low income. There was also a huge difference in price of local pharmaceutical brands of antibiotics as compared to multi-national pharmaceutical products. Comparative cost analysis of different brands of antibiotics shows a great difference in the costs of therapy as shown in Table 4. Reportedly, data related to Pharmacoeconomic studies based on government and private setups were not found. Patient compliance related to adverse effects of treatment was carefully followed with some untoward effects of antibiotics related to Gastrointestinal tract issues that causes discontinuation of therapy in some cases, study carried out by Maria Bau shows the same results about Gastrointestinal symptoms.¹⁷

CONCLUSION

This study proves that cost of antibiotics were very high which puts a considerable burden on the patients. Considering the Pharmacoeconomics, local brands of antibiotics are more economical. It is suggested that, while starting the drug therapy economic status of the patients should be kept in consideration.

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