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PHARMACOECONOMICS EVALUATION OF ANTIBIOTIC THERAPY IN HOSPITILIZED PATIENTS

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ABSTRACT

This study evaluated the pharmacoeconomic aspects of antibiotic therapy among 130 hospitalized patients. An observational study was conducted over three months to assess antibiotic use, clinical outcomes, and treatment costs. Among the patients, 70 (53.85%) were male and 60 (46.15%) were female. The 31–45 years age group was predominant (36.92%), and urinary tract infection was the most common infection (11.54%). Ceftriaxone was the most frequently used antibiotic (11.5%), while intravenous administration was predominant (69.2%). Targeted therapy was the most commonly used treatment approach (49.2%). Overall, 82 (63.1%) patients recovered, 45 (34.6%) improved, and 3 (2.3%) were not improved. The mean total treatment cost was ₹15,592.30 per patient, with hospital charges contributing the highest cost. The study highlights the importance of rational antibiotic use and pharmacoeconomic evaluation for achieving favorable clinical outcomes and optimizing healthcare.

KEYWORDS: Pharmacoeconomics, Antibiotic therapy, Cost analysis, Clinical outcomes, Hospitalized patients, Treatment cost.

INTRODUCTION

PHARMACOECONOMICS

Pharmacoeconomics is an area of health economics that focuses on assessing the **costs and therapeutic outcomes associated with medicines and healthcare services**. It enables

healthcare professionals and policymakers to compare various treatment alternatives and determine the most appropriate therapy by balancing clinical benefits with healthcare expenditure. Pharmacoeconomic assessments may include **medication costs, duration of therapy, length of hospital stay, adverse drug reactions, and treatment outcomes**.

The principal approaches used in pharmacoeconomic evaluation are **cost-minimization analysis (CMA), cost-effectiveness analysis (CEA), cost-utility analysis (CUA), and cost-benefit analysis (CBA)**. These approaches facilitate the comparison of different therapeutic options based on their economic and clinical consequences. Within hospital settings, pharmacoeconomics assists in **appropriate drug selection, reducing unnecessary expenditure, optimizing medicine utilization, and effective management of healthcare resources**.

Pharmacoeconomic evaluation of antibiotic therapy is especially significant because different antibiotics vary in terms of **price, therapeutic effectiveness, safety, administration route, and treatment duration**. Comparing the economic costs of antibiotics with their clinical outcomes can help determine suitable and cost-effective treatment options for hospitalized patients. Hence, pharmacoeconomic assessment contributes to **responsible antibiotic utilization, reduction of avoidable treatment costs, and improved quality of patient care**.

METHODS OF PHARMACOECONOMIS

1. Cost Minimization Analysis (CMA)

- Compares the costs of two or more treatments with identical clinical outcomes.
- The treatment with the lowest cost is preferred.
- Example: Comparing two brands of the same generic drug with equal efficacy.

Formula

CMA = Cost of treatment A – Cost of treatment B

2. Cost Effectiveness Analysis (CEA)

- Compares the cost of treatment with clinical outcomes measured in natural units.
- Outcomes may include:

Life years gained

Cases prevented

Disease-free days

- Expressed as cost per unit of effectiveness.

Formula:

CEA = Cost / Effectiveness

Example: Cost per life-year saved between two cancer treatments.

3. Cost Utility Analysis (CUA)

- A type of cost-effectiveness analysis where outcomes are measured in quality-adjusted life years (QALY).
- Considers both quantity and quality of life.
- Useful for comparing treatments for different diseases.

Formula:

CUA = Cost / QALY gained

Example: Comparing dialysis methods based on cost per QALY**.**

4. Cost Benefit Analysis (CBA)

- Both costs and benefits are converted into monetary values.
- Helps determine whether the economic benefit exceeds the cost.
- Used for healthcare policy decisions. ❖

Formula:

CBA = Benefit (money) – Cost (money)

ANTIBIOTIC THERAPY

Antibiotic therapy is the use of antibacterial medications to prevent and manage bacterial infections. The selection of an appropriate antibiotic depends on various factors, including the type of microorganism, severity of the infection, antimicrobial susceptibility, patient-specific conditions, and treatment duration. Proper and rational antibiotic use helps achieve effective therapeutic outcomes while limiting adverse drug reactions and the emergence of antimicrobial resistance (AMR). In hospitalized patients, suitable antibiotic therapy can lead to improved clinical outcomes, reduced complications, shorter treatment requirements, and lower unnecessary healthcare costs.

MATERIALS AND METHODS

1. Study Design

A **prospective/retrospective observational study** was conducted to evaluate the pharmacoeconomic aspects of antibiotic therapy among hospitalized patients.

2. Study Setting

The study was carried out in the **inpatient departments of TERITARY CARE HOSPITALS** over a study period of **3MONTHS**.

3. Study Population

Hospitalized patients who received **antibiotic therapy** during the study period were included in the study.

4. Inclusion Criteria

- Patients admitted to the hospital and receiving antibiotic therapy.
- Patients of either gender.
- Patients aged **18 years and above**.
- Patients who received antibiotics during hospitalization.
- Patients whose treatment and cost-related information was available.

5. Exclusion Criteria

- Patients receiving antibiotics only as prophylaxis, if not relevant to the study.
- Patients discharged or transferred before adequate treatment information was available.
- Patients with incomplete medical or cost records.
- Patients who did not receive antibiotic therapy.

6. Data Collection

Patient information was collected using a **structured data collection form**. The data included demographic details, diagnosis, antibiotics prescribed, dose, route of administration, frequency, duration of therapy, laboratory investigations, length of hospital stay, adverse drug reactions, and clinical outcomes.

7. Pharmacoeconomic Evaluation

The cost of antibiotic therapy was calculated by considering the **direct medication cost and other relevant treatment-related expenses**. The costs of different antibiotic regimens were compared with their respective clinical outcomes.

8. Clinical Outcomes

Clinical outcomes were assessed based on parameters such as **improvement in symptoms, treatment success or failure, duration of therapy, occurrence of adverse drug reactions and length of hospital stay**.

9. Cost Analysis

The total treatment cost was calculated for individual patients and antibiotic regimens. Costs were compared according to **antibiotic type, duration of treatment, route of administration and clinical outcome**.

10. Statistical Analysis

The collected data were entered into **Microsoft Excel** and analyzed using appropriate descriptive statistical methods. Results were expressed as **frequency, percentage, mean and standard deviation**, where applicable.

11. Ethical Considerations

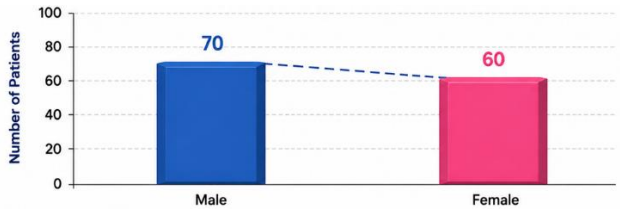
The study was conducted after obtaining approval from the **Institutional Ethics Committee (IEC)**. Patient confidentiality was maintained throughout the study and the collected information was used only for research purposes.

RESULT AND DISCUSSION

1. GENDER WISE DISTRIBUTION OF PATIENTS:

Among the **130 hospitalized patients**, **70 (53.85%) were male** and **60 (46.15%) were female**. The study showed a **slightly higher proportion of male patients** compared with female patients. Overall, the gender distribution was relatively balanced, indicating that antibiotic therapy was utilized among both male and female hospitalized patients.

Gender	Number of Patients	Percentage (%)
Male	70	53.85%
Female	60	46.15%
Total	**130**	**100%**

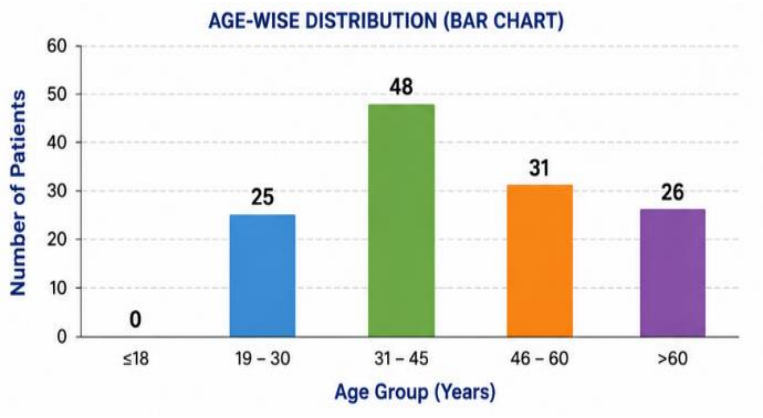


2. AGE WISE DISTRIBUTION

Among the 130 patients, the **31–45 years age group was the most predominant**, comprising **48 patients (36.92%)**. This was followed by the **46–60 years group with 31 patients (23.85%)** and the **>60 years group with 26 patients (20.00%)**. The 19–30 years group included **25 patients (19.23%)**, while no patients were below 18 years. The mean age

of the study population was **45.08 years**, indicating that middle-aged patients constituted the major proportion of the study population.

Age Group (Years)	Number of Patients	Percentage (%)
≤18	0	0.00
19–30	25	19.23
31–45	48	36.92
46–60	31	23.85
>60	26	20.00
Total	**130**	**100**



3. DISTRUBUTION OF INFECTINEOUS DISEASE

Among the major infections, UTI was the most common, accounting for 15 patients (11.54%). Cellulitis was the second most common infection with 9 patients (6.92%), followed by sepsis with 6 patients (4.62%). Pneumonia and infective endocarditis were each recorded in 5 patients (3.85%). These infections represent important conditions requiring antibiotic therapy among the hospitalized patients.

S. No.	Disease / Infection	No. of Patients	Percentage (%)
1	**Urinary Tract Infection (UTI)**	15	11.54%
2	**Cellulitis**	9	6.92%
3	**Sepsis**	6	4.62%
4	**Pneumonia**	5	3.85%
5	**Infective Endocarditis**	5	3.85%

4. MOST FREQUENTLY USED ANTIBIOTICS

Ceftriaxone was the most frequently utilized antibiotic (11.5%), followed by meropenem (8.5%) and vancomycin (6.2%). The use of multiple broad-spectrum antibiotics suggests that antibiotics were selected according to the clinical condition and severity of infection**.**

Antibiotic	Number (n)	Percentage (%)
Ceftriaxone	15	11.5
Meropenem	11	8.5
Vancomycin	8	6.2
Piperacillin + Tazobactam	7	5.4
Levofloxacin	7	5.4
Amoxicillin + Clavulanate	7	5.4
Nitrofurantoin	4	3.1
Cefazolin	4	3.1
Ciprofloxacin	4	3.1
Other antibiotics	63	48.5
Total	**130**	**100**

5. ROUTE OF ADMINISTRATION

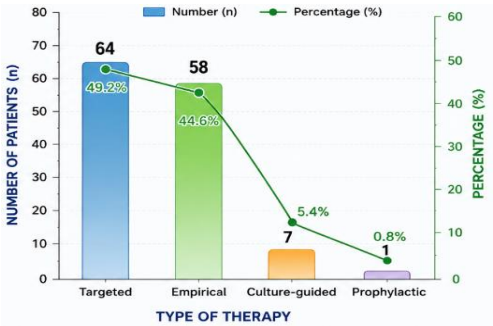
The intravenous route was predominant (69.2%), while 30.8% of patients received antibiotics orally. The higher use of IV therapy may be associated with hospitalized patients requiring rapid and reliable drug administration.

Route	Number (n)	Percentage (%)
Intravenous (IV)	90	69.2
Oral	40	30.8
Total	**130**	**100**

6. TYPE OF ANTIBIOTIC THERAPY

Targeted therapy was the most commonly used treatment approach (49.2%), followed by empirical therapy (44.6%). Culture-guided therapy accounted for 5.4%, while prophylactic therapy represented only 0.8%. The relatively high use of targeted therapy indicates that antibiotic selection was frequently directed toward the suspected or identified infection.

Therapy type	Number (n)	Percentage (%)
Targeted	64	49.2
Empirical	58	44.6
Culture-guided	7	5.4
Prophylactic	1	0.8
Total	**130**	**100**



7. CLINICAL OUTCOMES

The majority of patients recovered (63.1%), while 34.6% showed improvement. Only 2.3% of patients were recorded as not improved. Overall, the findings indicate a favorable clinical response to antibiotic therapy in the study population.

Clinical outcome	Number (n)	Percentage (%)
Recovered	82	63.1
Improved	45	34.6
Not improved	3	2.3
Total	**130**	**100**

8. ANTIBIOTIC THERAPY AND CLINICAL OUTCOMES

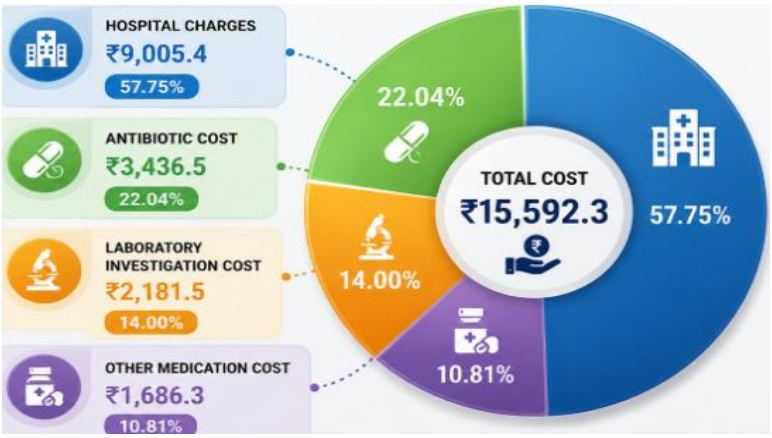
Among patients receiving targeted therapy, 39 recovered and 24 improved. Empirical therapy resulted in 39 recovered and 17 improved patients. Only three patients overall were categorized as not improved. These findings demonstrate generally favorable outcomes across the different antibiotic therapy approaches**.**

Therapy type	Recovered	Improved	Not improved	Total
Targeted	39	24	1	64
Empirical	39	17	2	58
Culture-guided	3	4	0	7
Prophylactic	1	0	0	1
Total	**82**	**45**	**3**	**130**

9. COST ANALYSIS OF ANTIBIOTIC THERAPY

The mean total treatment cost was ₹15,592.30 per patient. Hospital charges constituted the largest component of expenditure, with a mean of ₹9,005.40, followed by antibiotic cost of ₹3,436.50. Laboratory investigations and other medications contributed comparatively smaller amounts to the overall treatment cost.

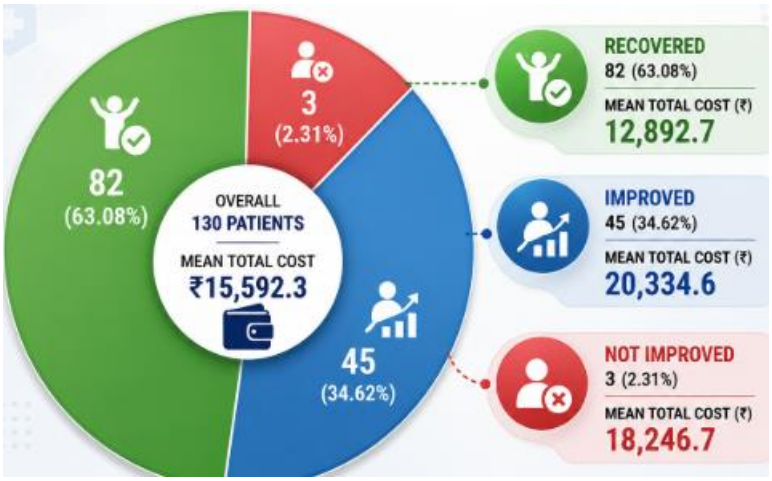
Cost component	Mean cost (₹)
Antibiotic cost	3,436.5
Laboratory investigation cost	2,181.5
Hospital charges	9,005.4
Other medication cost	1,686.3
Total cost	**15,592.3**



10. CLINICAL OUTCOMES AND TOTAL TREAMENT COST

Patients classified as recovered had a lower mean total treatment cost of ₹12,892.70, whereas patients who improved had a higher mean cost of ₹20,334.60. Patients who were not improved had a mean cost of ₹18,246.70. The higher cost among patients who did not achieve complete recovery may be related to increased treatment requirements, investigations, or hospitalization; however, further statistical analysis would be required to establish an association.

Clinical outcome	Number (n)	Mean total cost (₹)
Recovered	82	12,892.7
Improved	45	20,334.6
Not improved	3	18,246.7
Overall	**130**	**15,592.3**



CONCLUSION

The study concluded that antibiotic therapy produced favorable clinical outcomes among hospitalized patients, with 63.1% of patients recovered and 34.6% improved. Targeted

therapy was the most commonly used approach, followed by empirical therapy. The mean total treatment cost was ₹15,592.30 per patient, with hospital charges being the major contributor to overall expenditure. Patients who recovered had a lower mean treatment cost compared with those who only improved. The findings highlight the importance of rational antibiotic selection, appropriate therapy, and effective resource utilization to achieve better clinical outcomes while controlling treatment costs.

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