WORLD JOURNAL OF PHARMACEUTICAL RESEARCH
Coden USA: WJPRAP Impact Factor 8.63
Volume 15, Issue 15, 1614-1637. Research Article ISSN 2277–7105

A PROSPECTIVE OBSERVATIONAL STUDY ON EVALUATION OF RATIONAL USE OF ANTIBIOTICS, OUTCOME AND IMPACT OF PATIENT EDUCATION ON MEDICATION ADHERENCE AND QUALITY OF LIFE IN PNEUMONIA PATIENTS IN A TERTIARY CARE HOSPITAL: A PILOT STUDY.

[*1]Chandini Nair, [1]Alfiya Sudheer F., [1]Reeba Roy, [1]Sandra S. S., [2]Dr. Nithin Manohar R., [3]Dr. K. Madhu, [4]Mrs. Pavithra J., [5]Dr. Prasobh G. R.

[*1]Second Year Students, Doctor of Pharmacy Post Baccalaureate, Sree Krishna College of Pharmacy and Research Centre, Parassala, Thiruvananthapuram, Kerala, India.
[2]Professor and HOD, Department of Pharmacy Practice, Sree Krishna College of Pharmacy and Research Centre, Parassala, Thiruvananthapuram, Kerala, India.
[3]Director and Addl. Medical Superintendent, HOD and Senior Consultant Pulmonary, Critical Care and Sleep medicine, Cosmopolitan Hospital Post Graduate Institute of Health Sciences & Research, Thiruvananthapuram, Kerala, India.
[4]Lecturer, Department of Pharmacy Practice, Sree Krishna College of Pharmacy and Research Centre, Parassala, Thiruvananthapuram, Kerala, India.
[5]Principal, Sree Krishna College of Pharmacy and Research Centre, Parassala, Thiruvanan Thapuram, Kerala India.

Article Received on 05 July 2026,
Article Revised on 25 July 2026,
Article Published on 01 August 2026,

https://doi.org/10.5281/zenodo.21698968

***Corresponding Author**

Chandini Nair

Second Year Students, Doctor of Pharmacy Post Baccalaureate, Sree Krishna College of Pharmacy and Research Centre, Parassala, Thiruvananthapuram, Kerala, India.
chandininair29@gmail.com

How to cite this Article: [*1]Chandini Nair, [1]Alfiya Sudheer F., [1]Reeba Roy, [1]Sandra S. S., [2]Dr. Nithin Manohar R., [3]Dr. K. Madhu, [4]Mrs. Pavithra J., [5]Dr. Prasobh G. R.. (2026). A Prospective Observational Study on Evaluation of Rational Use of Antibiotics, Outcome and Impact of Patient Education on Medication Adherence and Quality of Life In Pneumonia Patients In A Tertiary Care Hospital: A Pilot Study. World Journal of Pharmaceutical Research, 15(15), 1614–1637.

ABSTRACT

Background: Pneumonia is a major cause of morbidity and mortality worldwide and is commonly treated with antibiotics. Irrational antibiotic use contributes to antimicrobial resistance, prolonged hospitalization, increased healthcare costs, and poor clinical outcomes. Clinical pharmacist–led patient education may improve medication adherence, knowledge, and quality of life among hospitalized pneumonia patients.

METHODOLOGY: A prospective observational study was conducted among hospitalized pneumonia patients admitted to the Department of Pulmonary and Critical Care of a tertiary care hospital. Eligible patients were enrolled after obtaining informed consent. Demographic details, clinical characteristics, laboratory findings, radiological investigations, prescribed antibiotics, and treatment outcomes were collected using a structured data collection form. The rationality of antibiotic prescriptions was assessed according to standard treatment guidelines. Medication adherence was evaluated using the

Adherence to Refills and Medication Scale (ARMS), while Knowledge, Attitude, and Practice (KAP) and Quality of Life (WHOQOL-BREF) were assessed before and after pharmacist-led patient education. Statistical analysis was performed using appropriate software, with a p-value of <0.05 considered statistically significant.

RESULTS: The study observed that broad-spectrum antibiotics were the most frequently prescribed agents for the management of pneumonia. Hypertension, diabetes mellitus, and chronic obstructive pulmonary disease were the predominant comorbidities among the study population. Most prescriptions complied with recommended treatment guidelines. Following pharmacist-provided counselling and patient education, significant improvements were observed in medication adherence, knowledge, attitude, practice, and quality of life. These findings demonstrate the positive impact of clinical pharmacist interventions on patient care and treatment outcomes.

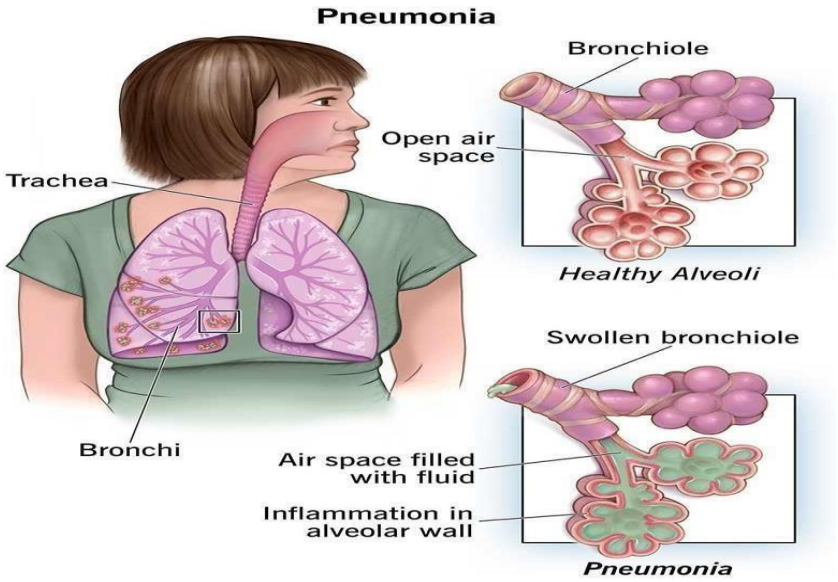
CONCLUSION: Rational antibiotic prescribing combined with effective patient education contributes to improved medication adherence, enhanced quality of life, and better clinical outcomes among hospitalized pneumonia patients. The active involvement of clinical pharmacists in multidisciplinary healthcare teams plays a vital role in promoting appropriate antibiotic use and improving overall patient management.

KEYWORDS: Pneumonia, Rational Antibiotic Use, Medication Adherence, Patient Education, Quality of Life, KAP

INTRODUCTION

Pneumonia is an infection of the lungs that causes inflammation of the alveoli, which may fill with fluid or pus. It is a major cause of illness and death worldwide, especially among older adults, children, and immunocompromised patients.

Pneumonia is classified into community-acquired pneumonia (CAP), hospital-acquired pneumonia (HAP), ventilator-associated pneumonia (VAP), and aspiration pneumonia. Common symptoms include fever, cough, sputum production, chest pain, and difficulty breathing.[1]



Bacteria are the most common cause of pneumonia, and antibiotics are the primary treatment. Early diagnosis and appropriate antibiotic therapy are essential for reducing complications and improving patient outcomes. Irrational antibiotic use can lead to antimicrobial resistance, adverse drug reactions, prolonged hospital stay, and increased healthcare costs.

The present study was conducted to evaluate the rational use of antibiotics in hospitalized pneumonia patients and to assess the impact of clinical pharmacist counselling on medication adherence, knowledge, and quality of life. The findings of this study will help improve antibiotic prescribing practices and enhance patient care.[2]

Pneumonia is an infection of the lungs that causes inflammation of the alveoli (air sacs). The alveoli may fill with fluid or pus, leading to cough, fever, chest pain, and difficulty in breathing.

EPIDEMIOLOGY

Pneumonia is one of the leading causes of illness and death worldwide. It commonly affects children under 5 years, older adults, and people with weakened immunity or chronic diseases.[3]

ETIOLOGY

Pneumonia may be caused by:

Bacteria (most common) Viruses Fungi

Aspiration of food or gastric contents

RISK FACTORS

- Age >65 years or <5 years
- Smoking
- Alcohol use
- Diabetes mellitus
- COPD and asthma
- Heart disease
- Chronic kidney disease
- Immunocompromised conditions
- Prolonged hospitalization.[4]

TYPES OF PNEUMONIA

- Community-Acquired Pneumonia (CAP): Acquired outside the hospital.
- Hospital-Acquired Pneumonia (HAP): Develops 48 hours or more after hospital admission.
- Ventilator-Associated Pneumonia (VAP): Occurs in patients on mechanical ventilation.
- Aspiration Pneumonia: Caused by inhalation of food, saliva, or gastric contents.

PATHOPHYSIOLOGY

Microorganisms enter the lungs and multiply in the alveoli, causing inflammation. The alveoli fill with inflammatory cells and fluid, reducing oxygen exchange and leading to breathing difficulty.[5]

SIGNS AND SYMPTOMS

- Fever
- Cough
- Sputum production
- Shortness of breath
- Chest pain
- Chills
- Fatigue
- Low oxygen saturation

STAGES OF PNEUMONIA

Stage 1: Congestion (First 24 Hours)

The infection takes hold, causing severe inflammation. Blood vessels swell, and the lung tissue becomes heavy and boggy as it fills with infectious fluid.

Symptoms: The feeling of a bad flu or cold, including fever, dry cough, fatigue, and chest discomfort.

Stage 2: Red Hepatization (Days 2–3)

Immune cells (white blood cells) and red blood cells flood the fluid in the air sacs. The lungs become firm and take on a red, liver-like appearance (hence *hepatization*).

Symptoms: High fevers, shaking chills, severe shortness of breath, sharp chest pain, and coughing up rust-colored mucus.

Stage 3: Grey Hepatization (Days 4–6)

Red blood cells break down, while immune cells continue to fight the infection. The lung tissue turns grey or yellow but remains solid and dense.

Symptoms: Breathing remains laboured and fatigue is significant, though fevers may start to decrease as the body controls the infection.

Stage 4: Resolution (Days 8–10 and onward)

White blood cells (macrophages) digest leftover dead cells and clear the inflammatory debris. The air sacs reopen, allowing airflow and lung function to return to normal.

Symptoms: Fever subsides, breathing becomes much easier, and energy slowly returns, though a productive cough may linger for weeks.[6]

DIAGNOSIS

- Medical history and physical examination
- Chest X-ray
- Complete blood count (CBC)
- Sputum Gram stain and culture
- Blood culture
- Pulse oximetry/Arterial blood gas (ABG) [7]

MANAGEMENT

Pharmacological

- Antibiotics
- Antipyretics
- Bronchodilators
- Corticosteroids (when indicated)
- Oxygen therapy

Non-Pharmacological

- Adequate rest
- Hydration
- Nutritious diet
- Chest physiotherapy (when indicated)
- Smoking cessation

COMPLICATIONS

- Respiratory failure
- Pleural effusion
- Lung abscess
- Sepsis
- Septic shock
- Acute respiratory distress syndrome (ARDS).[8]

PREVENTION

- Pneumococcal vaccination
- Influenza vaccination
- Hand hygiene
- Smoking cessation
- Good nutrition
- Early treatment of respiratory infections.[9]

RATIONAL USE OF ANTIBIOTICS

Rational use of antibiotics means prescribing the right antibiotic to the right patient at the right dose, route, frequency, and duration according to standard treatment guidelines. In

pneumonia, appropriate antibiotic therapy helps eradicate infection, reduce complications, shorten hospital stay, and prevent antimicrobial resistance. Clinical pharmacists play an important role in promoting rational antibiotic use by reviewing prescriptions, monitoring treatment, identifying drug-related problems, and educating patients.[10]

MEDICATION ADHERENCE (ARMS)

The Adherence to Refills and Medication Scale (ARMS) is a validated questionnaire used to assess patients' adherence to prescribed medications. It evaluates medication-taking behavior and prescription refill practices. Lower ARMS scores indicate better medication adherence. In this study, ARMS was used before and after patient counselling to evaluate the effect of pharmacist intervention on medication adherence.[11]

KNOWLEDGE, ATTITUDE AND PRACTICE (KAP)

The Knowledge, Attitude and Practice (KAP) questionnaire assesses patients' understanding of pneumonia, their attitude toward treatment, and their medication-related practices. It helps identify gaps in patient awareness and evaluates the effectiveness of counselling. In this study, KAP assessment was performed before and after patient education to determine improvements in patients' knowledge, attitude, and self-care practices.[13]

QUALITY OF LIFE (WHOQOL-BREF)

The World Health Organization Quality of Life-BREF (WHOQOL-BREF) is a standardized questionnaire used to assess patients' quality of life in four domains: physical health, psychological health, social relationships, and environmental health. It measures the impact of disease and treatment on daily life. In this study, WHOQOL-BREF was administered before and after patient counselling to evaluate changes in quality of life following clinical pharmacist intervention.[13]

AIM OF THE STUDY

- To evaluate rational use of antibiotics, outcome and impact of patient education on adherence and quality of life in hospitalized pneumonia patients.

OBJECTIVES

- To evaluate rational use of antibiotic in hospitalized pneumonia patients based on treatment guidelines.
- To assess medication adherence among hospitalized pneumonia patients.

- To evaluate outcome and impact of patient education on medication adherences
- To assess quality of life and Knowledge attitude and practice of patient before and after patient education.

PLAN OF ANALYSIS

STATISTICAL ANALYSIS

Statistical Package for Social Sciences [SPSS] for Windows Version 22.0 was used to perform statistical analyses.

Descriptive Statistics

Descriptive analysis of all the explanatory and outcome parameters were done using mean and standard deviation for quantitative variables, frequency and proportions for categorical variables. The data were presented in the form of tables, graphs and diagrams which ever may be applicable.

Inferential Statistics

Based on the data distribution a Paired t Test (parametric) / Wilcoxon Signed Rank Test (non-parametric) was used to compare the variables before and after counselling. The level of significance [P-Value] were set at P<0.05.

RESULTS AND DISCUSSION

In this pilot study 31 patients were enrolled according to inclusion and exclusion criteria

AGE DISTRIBUTIONS

Table 4.1: Distribution of age.

Descriptive Statistics				
	N	Minimum	Maximum	Mean
AGE	31	28	84	63

Out of 31 individuals, the mean age was 84 years with a standard deviation of 16 years and a minimum age was 28 years and maximum age was 84 years.

The age is categorized as shown below.

AGE	Number (31)	Percent (%)
< 40	3	9.7
40 – 49	3	9.7
50 – 59	6	19.4
60 – 69	6	19.4

70 – 79	8	25.8
>= 80	5	16
Total	31	100

Out of 31 individuals, 3(10%) were from the age group less than 40 years, 3(10%) were from the age group 40-49 years, 6(19%) were from the age group 50-59 years, 6(19%) were from the age group 60-69 years, 8(26%) were from the age group 70-79 years and 5 (16%) were from the age group greater than or equal to 80 years.

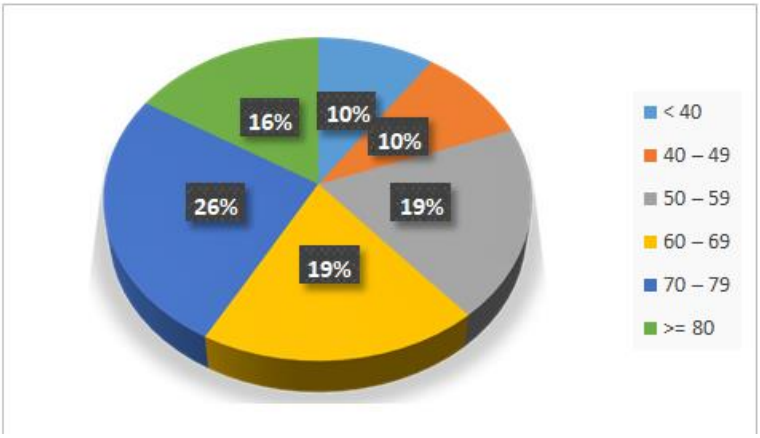


Fig 4.1: Pie diagram showing the distribution of age.

GENDER DISTRIBUTIONS

Table 4.2: Distribution of sex.

SEX	Number (31)	Percent (%)
FEMALE	17	55
MALE	14	45
Total	31	100

Out of 31individuals, 17(55%) were females and 14(45%) were males

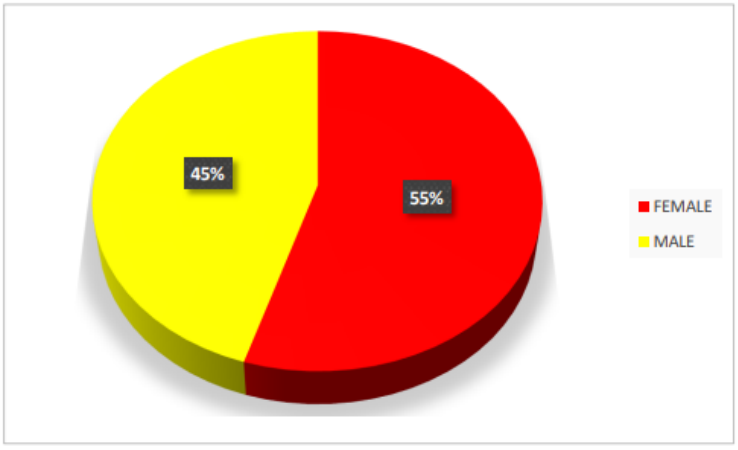


Fig 4.2: Pie diagram showing the distribution of sex.

DISTRIBUTION OF COMORBIDITIES

Table 4.3: Distribution of Comorbidities.

COMORBIDITIES	NUMBER (31)
HYPERTENSION	17
DIABETES MELLITUS	15
DYSLIPIDEMYA	9
COPD	5
HYPOTHYRODISM	8
CARDIAC DISEASE	7
OTHERS	1

Out of 31 individuals 17 have hypertension, 15 had diabetes mellitus, 9 had dyslipidaemia, 5 had COPD, 8 had Hypothyroidism, 7 had cardiac disease and 1 had other co morbidity like benign prostatic hyperplasia.

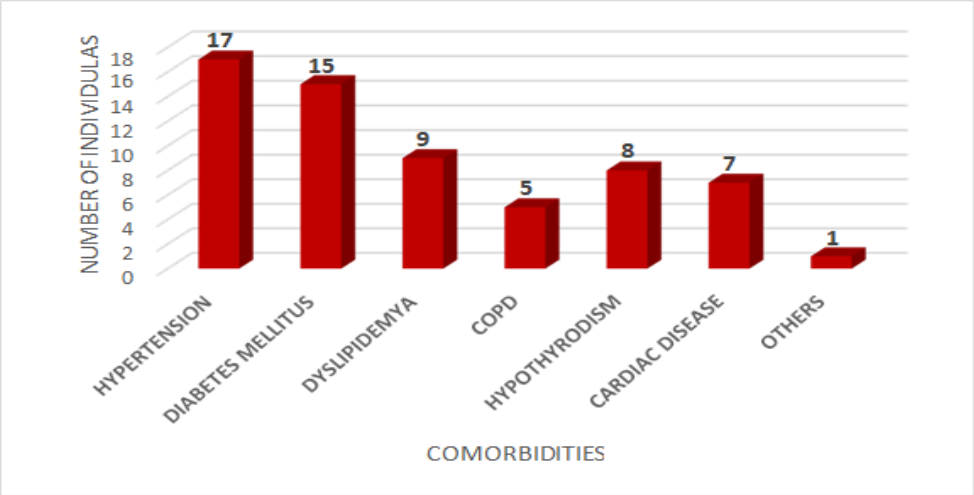


Fig 4.3: Bar diagram showing the distribution of comorbidities.

RATIONAL USE OF ANTIBIOTICS

Table 4.4: Distribution of Antibiotics used.

Antibiotic used	Number (31)	Percent (%)
Inj Piperacillin Tazobactam	7	22.6
Inj. Cefoperazone Sulbactam	12	38.7
Inj. Cefoperazone Sulbactam + T. Clarithromycin	3	9.7
Inj. Cefoperazone Sulbactam + T. Clarithromycin+ T. Levofloxacin	1	3.2
Inj. Meropenem	5	16.2
Inj. Meropenem +T. Faropenem +T. Azithromycin	1	3.2
Inj. Piperacillin Tazobactam+Inj. Meropenem Sulbactam + T. Clarithromycin	1	3.2
Inj.Piperacillin Tazobactam + Inj Cefoperazone Sulbactam+Inj Levofloxacin+ T.Clarithromycin	1	3.2
Total	31	100

Cefoperazone Sulbactum injection was the most commonly used antibiotics (12 cases) followed by injection piperacillin tazobactum (7 cases), injection meropenem (5 cases), 3 cases used cefoperozone injection and clarithromycin and other combinations were evenly distributed among the patients.

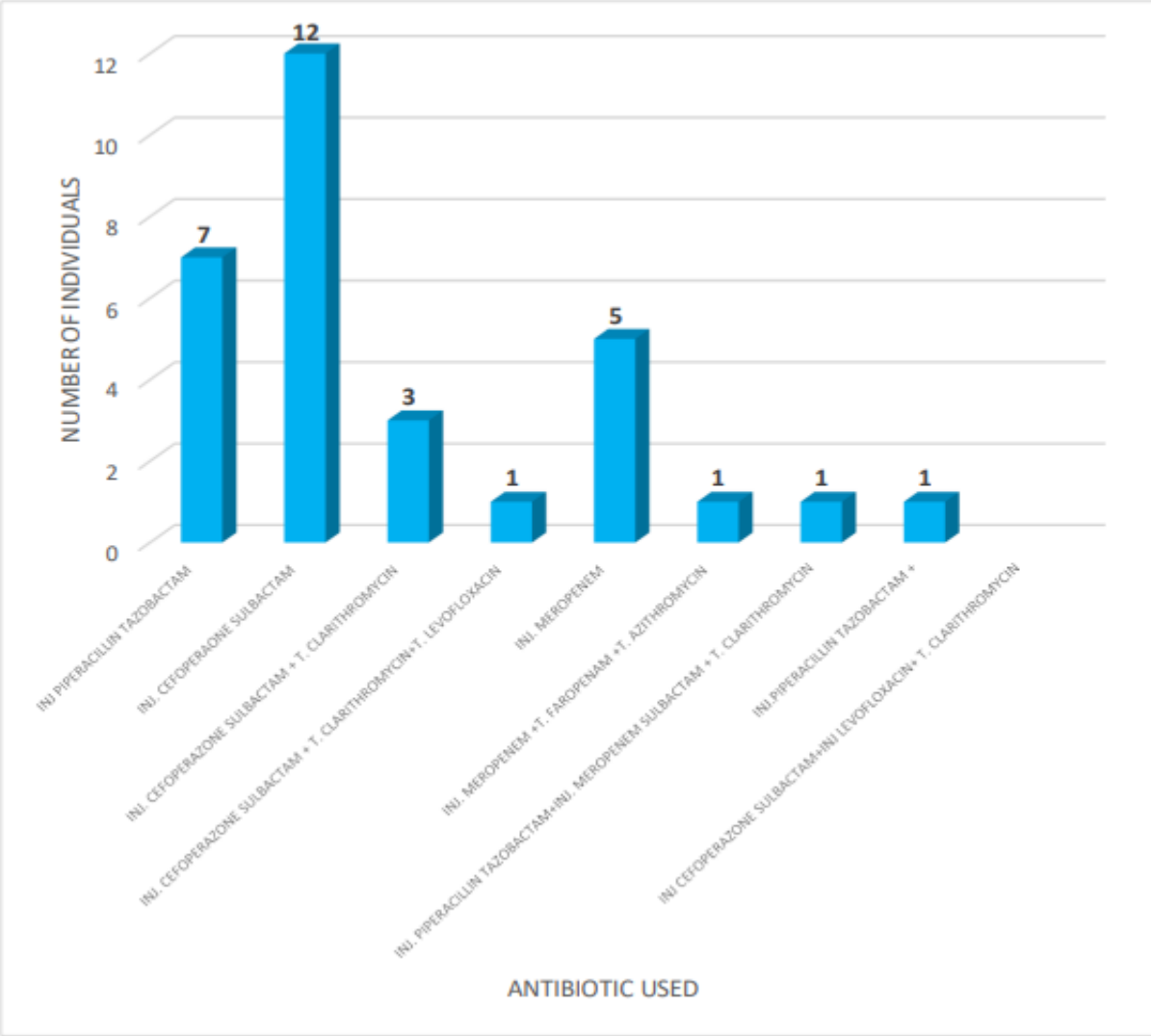


Fig 4.4: Bar diagram showing the distribution of antibiotics used.

MEDICATION ADHERENCE

COMPARISON OF MEDICATION ADHERENCE (ARMS) SCORE BEFORE AND AFTER COUNSELLING OF PNEUMONIA PATIENTS

Comparing the medication adherence (ARMS) score before and after counselling of pneumonia patients, a statistical test was used. To choose an appropriate statistical test, check the assumption of the normality of the variables to be tested was checked and decide whether a parametric or non-parametric test was suitable for the comparison. The null hypothesis for

this assumption were the data follows normal distribution. This normality assumption was assessed by a statistical test called Shapiro Wilks test. The ARMS score before and after counselling not follows normal distribution because the Shapiro Wilks test was significant (P<.05). Hence, for the comparison ARMS score before and after counselling a non-parametric test called Wilcoxon Signed Rank test which was equivalent to a parametric test called paired t-test was applied.

Table 4.5: Descriptive statistics of the ARMS score.

Descriptive Statistics					
Arms Score	**N**	**Minimum**	**Maximum**	**Mean**	**Std. Deviation**
Before Counselling	31	12	33	16.84	5.07
After Counselling	31	12	16	12.23	0.81

The mean ARMS score before counselling was 16.84 with a standard deviation of 5.07 and after counselling the ARMS score becomes 12.23 with a standard deviation of 0.81. There was an observed reduction of ARMS score after counselling. The lower ARMS score indicates better adherence. The findings suggest that the counselling had a positive impact on medication adherence. This observed reduction in the ARMS score was compared by a non-parametric test called Wilcoxon Signed rank test.

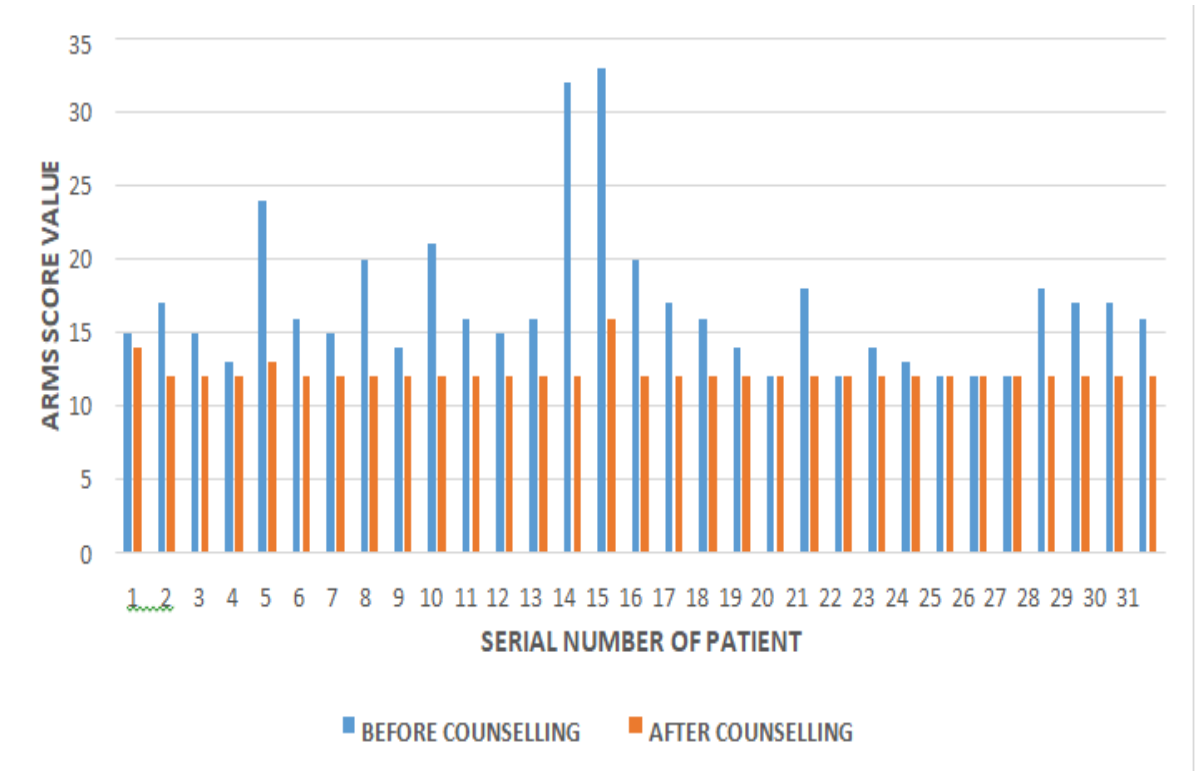


Fig 4.5: Diagram showing the ARMS score before and after counseling.

Table 4.6: Comparison of ARMS score before and after counseling.

Wilcoxon Signed Ranks				
		N	Mean Rank	Sum of Ranks
Medication Adherence After - Medication Adherence Before	Negative Ranks	26[a]	13.50	351
	Positive Ranks	0[b]	0.00	0.00
	Ties	5[c]		
		31		
Medication Adherence After – Medication Adherence Before Z- Value		-4.465		
P-Value		0.001		
a. medication adherence after < medication adherence before				
b. medication adherence after > medication adherence before				
c. medication adherence after = medication adherence before				

Out of 31 individuals, 26 have ARMS score after counselling that were lower than the ARMS score before counselling, and no one has ARMS score after counselling that were greater than before counselling and 5 have ARMS score unchanged or ties. This observed reduction in the ARMS score after counselling is statistically significant according Wilcoxon Signed Rank test (Z=-4.465, P=.001). Since the P-value was less than the specified significance level of 0.05, the test results were statistically significant and had provided strong evidence against the null hypothesis. Hence, rejected the null hypothesis and conclude that there was a significant reduction in the ARMS score after counselling as compared to before counselling.

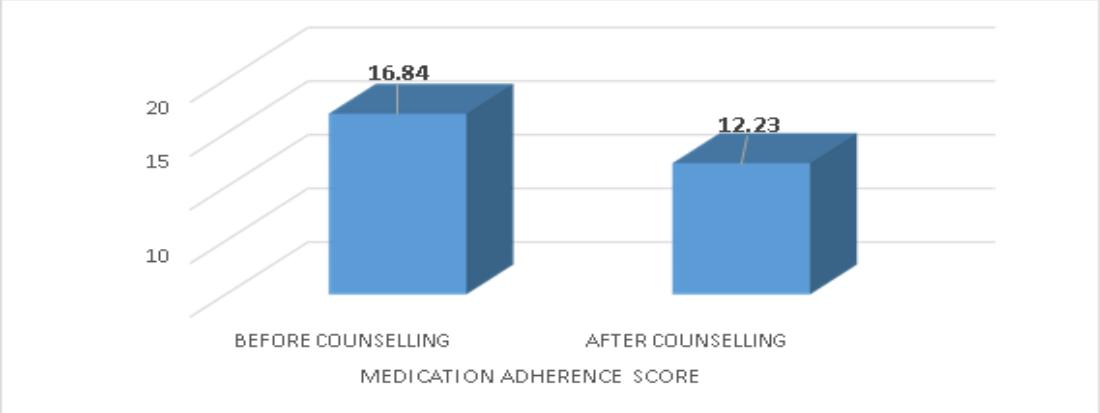


Fig 4.6: Comparison of mean ARMS score before and after counseling.

Comparison of Quality of Life (Who Bref) Assessment Score Before And After Counselling of Pneumonia Patients

To compare the quality of life (WHO BREF) assessment score before and after counselling of pneumonia patients, a statistical test was used. To choose an appropriate statistical test, check the assumption of the normality of the variables was tested and decide whether a parametric or

non-parametric test is suitable for the comparison. The null hypothesis for this assumption were that data follows normal distribution. This normality assumption is assessed by a statistical test called Shapiro Wilks test. The WHO BREF score before and after counselling not follows normal distribution because the Shapiro Wilks test were significant(P<.05). Hence, for the comparison WHO BREF score before and after counselling a non-parametric test called Wilcoxon Signed Rank test which was equivalent to a parametric test called paired t-test were applied.

Table 4.7: Descriptive statistics of the WHO BREF score.

Descriptive Statistics					
		BEFORE		AFTER	
WHO BREF SCORE	N	MEAN	SD	MEAN	SD
PHYSICAL	31	52.06	12.34	70.10	7.21
PSYCHOLOGICAL	31	64.10	11.57	76.44	7.55
SOCIAL	31	81.05	22.10	81.05	22.10
ENVIORNMENTAL	31	75.45	12.53	83.97	16.66
OVERALL	31	68.17	12.05	77.89	9.75

The mean physical score before counselling is 52.06 with a standard deviation of 12.34 and after counselling the physical score becomes 70.10 with a standard deviation of 7.21.

There was an observed improvement in the physical score after counselling. Patient counselling improved the physical score.

The mean psychological score before counselling is 64.10 with a standard deviation of 11.57 and after counselling the psychological score becomes 76.44 with a standard deviation of 7.55.

There was observed improvement in the psychological score after counselling. Patient counselling improved the psychological score.

The mean social score before counselling is 81.05 with a standard deviation of 12.53 and after counselling the social score was unchanged. There were no observed improvement in the social score after counselling.

The mean environmental score before counselling is 75.45 with a standard deviation of 12.53 and after counselling the environmental score becomes 83.97 with a standard deviation of 16.66. There was an observed improvement in the environmental score after counselling. Patient counselling improved the environmental score.

This observed improvement of the Physical, Psychological, Social and Environmental WHO BREF score was compared by a non-parametric test called Wilcoxon Signed rank test.

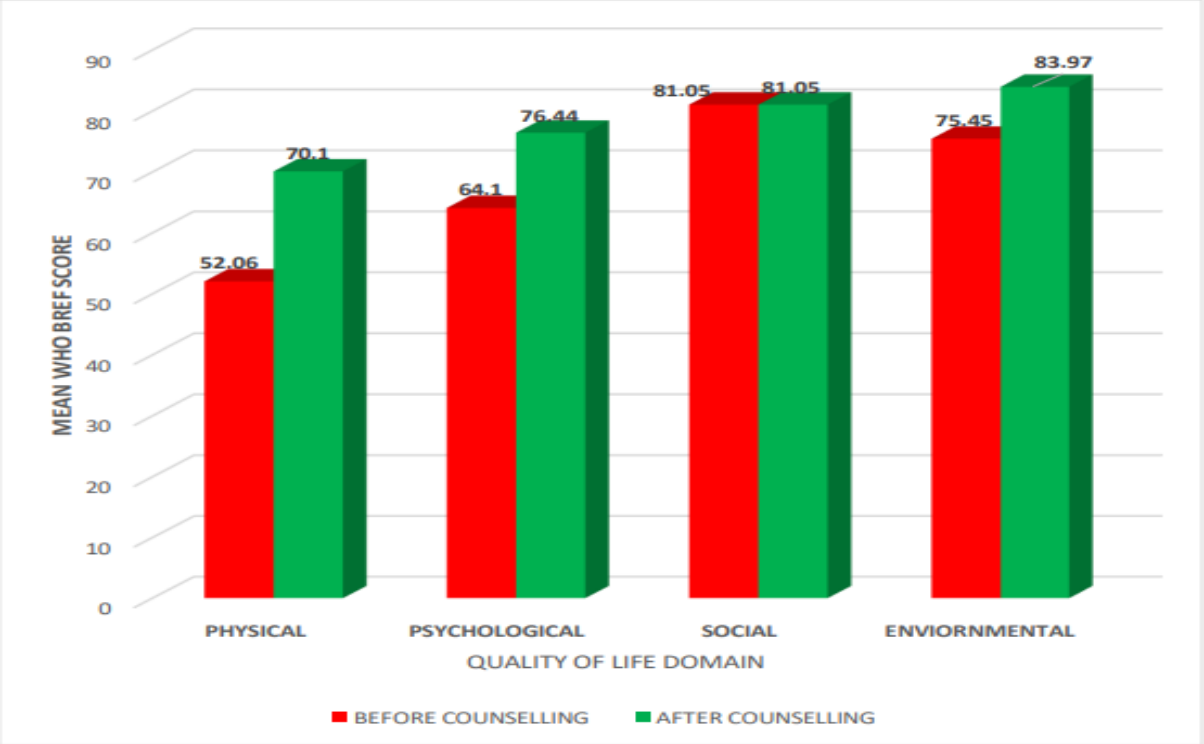


Fig 4.7: Comparison of WHO BREF Score before and After Counselling.

Table 4.8: Comparison of WHO BREF score before and after counseling.

Wilcoxon Signed Ranks				
		N	**Mean Rank**	**Sum of Ranks**
Physical After - Physical Before	Negative Ranks	0[a]	0.00	0.00
	Positive Ranks	31[b]	16	496
	Ties	0[c]		
	Total	31		
Psycological After - Psycological Before	Negative Ranks	0[d]	0.00	0.00
	Positive Ranks	29[e]	15.00	435
	Ties	2[f]		
	Total	31		
Social After - Social Before	Negative Ranks	0[g]	0.00	0.00
	Positive Ranks	0[h]	0.00	0.00
	Ties	31[i]		
	Total	31		
Environmental After – Environmental Before	Negative Ranks	0[j]	31	31
	Positive Ranks	31[k]	15.50	465
	Ties	0[l]		
	Total	31		

a. physical after < physical before
b. physical after > physical before
c. physical after = physical before
d. psychological after < psychological before
e. psychological after > psychological before
f. psychological after = psychological before
g. social after < social before
h. social after > social before
i. social after = social before
j. environmental after < environmental before
k. environmental after > environmental before
l. environmental after = environmental before

- In the physical score out of 31 individuals, all 31 have WHO BREF score after counselling was greater than before counselling.
- In the psychological score out of 31 individuals, all 29 have WHO BREF score after counselling was greater than before counselling and 2 have WHO BREF score unchanged or tie after counselling.
- In the social score out of 31 individuals, all 31 have WHO BREF score unchanged or ties after counselling.
- In the environmental score out of 31 individuals, all 30 have WHO BREF score after counselling was greater than before counselling and only 1 has after counselling was less than before counselling and no ties.

Table 4.9: Wilcoxon Signed Rank test.

Test Statistics				
	Physical After - Physical Before	Psychological After– Psychological Before	Social After - Social Before	Environmental After - Environmental Before
Z	-4.862[b]	-4.707[b]	0.000[c]	-4.255[b]
Asymp. Sig. (2- tailed)	0.001	0.001	1	0.001
a. Wilcoxon Signed Ranks Test				
b. Based on negative ranks.				
c. The sum of negative ranks equals the sum of positive ranks.				

- This observed improvement in the physical score after counselling were statistically significant on a Wilcoxon Signed Rank test (Z=-4.862, P=.001). Since the P-value was less than the specified significance level of 0.05, the test results were statistically significant and have strong evidence against the null hypothesis. Hence, reject the null hypothesis and conclude that was significant improvement in the Physical Score after counselling as compared to before counselling.

- This observed improvement in the psychological score after counselling was statistically significant on a Wilcoxon Signed Rank test (Z=-4.707, P=.001). Since the P-value was less than the specified significance level of 0.05, the test results were statistically significant and have strong evidence against the null hypothesis. Hence, reject the null hypothesis and conclude that were significant improvement in the Psychological Score after counselling as compared to before counselling.
- There were no observed improvement in the social score after counselling, which was not statistically significant on a Wilcoxon Signed Rank test (Z=0.000, P=1.00). Since the P-value was greater than the specified significance level of 0.05, the test results were not statistically significant and have no evidence against the null hypothesis. Hence, do not reject the null hypothesis and conclude that there was no significant improvement in the social Score after counselling as compared to before counselling.
- This observed improvement in the environmental score after counselling was statistically significant on a Wilcoxon Signed Rank test (Z=-4.255, P=.001). Since the P-value was less than the specified significance level of 0.05, the test results were statistically significant and have strong evidence against the null hypothesis. Hence, reject the null hypothesis and conclude that were significant improvement in the environmental Score after counselling as compared to before counselling. But in the social domain the result was not statistically significant after counselling.

The overall result of the WHO quality of life BREF score was statistically significant on a Wilcoxon signed rank test (Z=-4.311, P=.001), This indicates that the overall WHO quality of life BREF score have a positive impact on the quality of life of the patients who diagnosed as pneumonia.

COMPARISON OF KAP SCORE BEFORE AND AFTER COUNSELLING OF PNEUMONIA PATIENTS

Comparing the knowledge, attitude and practice (KAP) assessment score before and after counselling of pneumonia patients, a statistical test were used. To choose an appropriate statistical test, check the assumption of the normality of the variables to be tested and decide whether a parametric or non-parametric test was suitable for the comparison. The null hypothesis for this assumption were data follows normal distribution. This normality assumption is assessed by a statistical test called Shapiro Wilks test. The KAP score before and after counselling not follows normal distribution because the Shapiro Wilks test was

significant(P<.05). Hence, for the comparison KAP score before and after counselling a non-parametric test called Wilcoxon Signed Rank test which was equivalent to a parametric test called paired t-test is applied.

Table 4.10: Descriptive statistics of the WHO BREF Score.

Descriptive Statistics					
	N	**Minimum**	**Maximum**	**Mean**	**Std. Deviation**
Knowledge Before	31	2	5	3.29	1.10
Knowledge After	31	5	5	5	0.00
Attitude Before	31	4	5	4.74	0.45
Attitude After	31	5	5	5	0.00
Practice Before	31	2	5	4.42	0.77
Practice After	31	5	5	5	0.00

- The mean knowledge score before counselling is 3.29 with a standard deviation of 1.10 and after counselling the mean knowledge score becomes 5.0. There were observed improvement in the knowledge score after counselling.
- The mean attitude score before counselling was 4.74 with a standard deviation of 0.45 and after counselling the mean attitude score becomes 5.0 there was an observed improvement in the attitude score after counselling.
- The mean practice score before counselling was 4.42 with a standard deviation of 0.77 and after counselling the mean practice score becomes 5.0 that was observed improvement in the practice score after counselling.

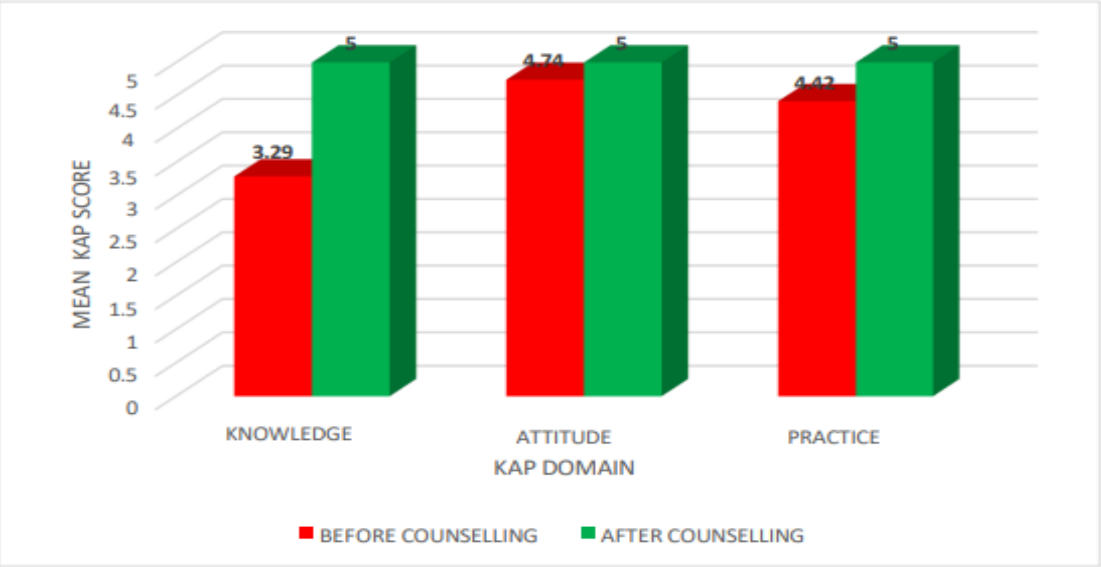


Fig 4.8: Bar diagram showing the mean KAP score before and after counselling.

The improvement in the KAP score before and after counselling was compared by a Wilcoxon signed rank test.

Table 4.11: Comparison of KAP score before and after counseling.

Wilcoxon signed ranks				
		N	**Mean Rank**	**Sum of Ranks**
Knowledge after - knowledge before	Negative ranks	0[a]	0.00	0.00
	Positive Ranks	25[b]	13	325
	Ties	6[c]		
	Total	31		
Attitude after – attitude before	Negative ranks	0[d]	0.00	0.00
	Positive Ranks	8[e]	4.50	36
	Ties	23[f]		
	Total	31		
Practice after – practice before	Negative ranks	0[g]	0.00	0.00
	Positive Ranks	14[h]	7.50	105
	Ties	17[i]		
	Total	31		
a. knowledge after < knowledge before				
b. knowledge after > knowledge before				
c. knowledge after = knowledge before				
d. attitude after < attitude before				
e. attitude after > attitude before				
f. attitude after = attitude before				
g. practice after < practice before				
h. practice after > practice before				
i. practice after = practice before				

- In the knowledge score out of 31 individuals, 25 individuals have knowledge score after counselling was greater than before counselling and 6 individuals have unchanged or tie in knowledge score.
- In the attitude score out of 31 individuals, only 8 individuals have attitude score after counselling was greater than before counselling and 23 individuals have unchanged or tie in attitude score.
- In the practice score out of 31 individuals, 14 individuals have practice score after counselling is greater than before counselling and 17 individuals have unchanged or tie in practice score.

This implies that patient counselling improved the knowledge, attitude and practice score.

Table: 4.12 Wilcoxon Signed rank test result.

Test Statistics			
	Knowledge after - knowledge before	Attitude after - attitude before	Practice after - practice before
Z	-4.437[b]	-2.828[b]	-3.491[b]
Asymp. Sig. (2-tailed)	0.001	0.005	0.001
a. Wilcoxon Signed Ranks Test			
b. Based on negative ranks.			

- This observed improvement in the knowledge score after counselling was statistically significant on a Wilcoxon Signed Rank test (Z=-4.437, P=.001). Since the P-value was less than the specified significance level of 0.05, the test results were statistically significant and have strong evidence against the null hypothesis. Hence, reject the null hypothesis and conclude that there was significant improvement in the knowledge Score after counselling as compared to before counselling.

- This observed improvement in the attitude score after counselling was statistically significant on a Wilcoxon Signed Rank test (Z=-2.828, P=.005). Since the P-value was less than the specified significance level of 0.05, the test results were statistically significant and have strong evidence against the null hypothesis. Hence, reject the null hypothesis and conclude that there was significant improvement in the attitude Score after counselling as compared to before counselling.

- This observed improvement in the practice score after counselling was statistically significant on a Wilcoxon Signed Rank test (Z=-3.491, P=.001). Since the P-value was less than the specified significance level of 0.05, the test results were statistically significant and have strong evidence against the null hypothesis. Hence, reject the null hypothesis and conclude that there was significant improvement in the practice Score after counselling as compared to before counselling.

- The overall result of the KAP score were statistically significant on a Wilcoxon signed rank test (Z=-4.739, P=.001), This indicates that the patients counselling has significantly improved the overall knowledge, attitude and practice score.

INFERENCE

- There were a significant reduction in the ARMS score indicates better adherence. This reduction demonstrates a significant improvement in patients' adherence to medication refills and medication taking behavior after the counselling. This implies that the counselling had a positive impact on medication adherence.
- There were a significant improvement in the WHO QOL BREF score indicates that the post counselling had a positive impact on the patients' quality of life.
- There were a significant improvement in the KAP score indicates that patients' counselling improved the Knowledge, attitude and practice scores.

SUMMARY

This prospective observational pilot study was conducted among 31 hospitalized pneumonia patients to evaluate the rational use of antibiotics and to assess the impact of clinical pharmacist–led patient education on medication adherence, knowledge, attitude, practice (KAP), and quality of life (WHOQOL-BREF).

The majority of patients were aged 70–79 years, with a mean age of 63 years, and females constituted 55% of the study population. Hypertension and diabetes mellitus were the most common comorbidities. Among the prescribed antibiotics, cefoperazone–sulbactam was the most frequently used, followed by piperacillin–tazobactam and meropenem, reflecting adherence to standard treatment practices for hospitalized pneumonia patients.

Medication adherence was assessed using the ARMS questionnaire. The mean ARMS score significantly decreased from 16.84 before counselling to 12.23 after counselling (P = 0.001), indicating improved medication adherence following pharmacist intervention.

Quality of life assessment using the WHOQOL-BREF showed significant improvements in the physical, psychological, and environmental domains after counselling (P = 0.001), while the social domain showed no statistically significant change. Overall quality of life improved significantly after patient education.

The KAP assessment demonstrated significant improvements in patients' knowledge, attitude, and practice after pharmacist counselling. Knowledge scores increased from 3.29 to 5.00, attitude scores from 4.74 to 5.00, and practice scores from 4.42 to 5.00, with statistically significant improvements in all three domains.

Overall, the findings indicate that pharmacist-led patient education positively influenced medication adherence, patient knowledge, quality of life, and rational antibiotic use, thereby contributing to better therapeutic outcomes in hospitalized pneumonia patients.

CONCLUSION

The present pilot study demonstrates that the rational use of antibiotics, together with structured clinical pharmacist–led patient education, plays a significant role in improving the management of hospitalized pneumonia patients. Broad-spectrum antibiotics, particularly cefoperazone–sulbactam, were commonly prescribed in accordance with treatment guidelines, supporting appropriate antimicrobial therapy.

Pharmacist counselling significantly improved medication adherence, patients' knowledge, attitude, practice, and overall quality of life. Significant improvements were observed in the physical, psychological, and environmental domains of WHOQOL-BREF, although no significant change was noted in the social domain. These findings highlight the important contribution of clinical pharmacists in promoting rational antibiotic use, enhancing patient understanding of disease and treatment, and improving adherence to prescribed therapy.

Overall, this study supports the integration of clinical pharmacists into multidisciplinary healthcare teams to optimize antibiotic prescribing, improve patient-centred care, and enhance clinical outcomes in hospitalized pneumonia patients. Further studies with larger sample sizes and longer follow-up periods are recommended to validate these findings and strengthen the evidence for pharmacist-led interventions.

REFERENCE

1. Rajanna AH, Swetha R, Hosalli N, Raju R, et al. To study the impact of stewardship program on antibiotic administration in community-acquired pneumonia: a before-and-after interventional study. J Assoc Physicians India. 2026; 74(5): 20-23.
2. Ghosh S, Salhotra R, Singh A, Lyall A, Arora G, Kumar N, et al. New antibiotic prescription pattern in critically ill patients ("Ant-critic"): prospective observational study from an Indian intensive care unit. Indian J Crit Care Med. 2022; 26(12): 1275-84.
3. Singh S, Wattal C, Joshi S, et al. Variations in antibiotic use across India: multicentre study through Global Point Prevalence Survey. J Hosp Infect. 2019; 103(3): 280-3.
4. Balakrishnan S, Rakesh PS, Jayasankar S, Sunilkumar M, Krishnaveni V, Gopal B, et al. Lung Health Care pilot project trims patient pill load and antibiotic prescription in

primary health care settings in Kerala, India. Indian J Tuberc. 2020; 67(2): 202-7.

5. Dikid T, Sharma A, et al. Antibiotic stewardship initiative in a Medicine unit of a tertiary care teaching hospital in India: a pilot study. Indian J Med Res. 2019; 150(Suppl): S54-S63.
6. Walia K, Ohri VC, Mathai D, et al. A multicentre point prevalence survey of antimicrobial use amongst admitted patients in tertiary care centres in India. J Antimicrob Chemother. 2021; 76(4): 1094-101.
7. Patel A, Sharma M, et al. Identifying opportunities for antimicrobial stewardship through a point prevalence survey in an Indian tertiary-care teaching hospital. J Glob Antimicrob Resist. 2020; 23: 315-20.
8. Rajanna AH, Swetha R, Hosalli N, et al. Evaluation of guideline adherence and de-escalation practices following antimicrobial stewardship intervention in hospitalized pneumonia patients. J Assoc Physicians India. 2026; 74(5): 20-23.
9. Kanungo S, Bhattacharjee U, Prabhakaran AO, et al. Adverse outcomes in patients hospitalized with pneumonia aged ≥60 years: a prospective multicentric hospital-based study in India. PLoS One. 2024; 19: e0297452.
10. Chandini Nair, et al. A Review on The Rational Use of Antibiotics In Hospitalized Pneumonia Patients Based on Treatment Guidelines. World Journal of Pharmaceutical Research, 2026; 15(10): 1329–1343.
11. Reeba Roy, et al. A review on Evaluation of Outcome and Impact of Patient Education on Medication Adherence in Hospitalised Pneumonia Patients. European Journal of Pharmaceutical and Medical Research, 2026; 13(5): 698–703.
12. Alfiya Sudheer F, et al. A review on assessment of medication adherence in hospitalised pneumonia patients. Indo Am J Pharm Sci. 2026; 13(5): 317-321.
13. Sandra S.S, et al. A review on assessment of quality of life and knowledge attitude and practice of patient before and after Patient education in hospitalised pneumonia patients. World Journal of Pharmacy and Medical Science, 2026; 2(6).
14. Gupta R, et al. Evaluation of antibiotic prescription appropriateness for patients with pneumonia in the emergency department of an Indian tertiary care hospital. JEM Int. 2026; 1: 100007.
15. Kumar S, et al. Impact of antimicrobial stewardship intervention in India: evaluation of post-prescription review and feedback in intensive care units of a tertiary care hospital. Infect Control Hosp Epidemiol. 2019; 40: 517-24.
16. Ministry of Health and Family Welfare, Government of India. National Treatment

Guidelines for Antimicrobial Use in Infectious Diseases. New Delhi: MoHFW; 2022.

17. Indian Council of Medical Research. Treatment Guidelines for Antimicrobial Use in Common Syndromes. New Delhi: ICMR; 2023.
18. Indian Council of Medical Research. Antimicrobial Stewardship Program Guidelines. New Delhi: ICMR; 2022.
19. Metlay JP, Waterer GW, Long AC, Anzueto A, Casas J, Campbell RT, et al. Diagnosis and treatment of adults with community-acquired pneumonia. Am J Respir Crit Care Med, 2025; 211: 450-75.