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RESEARCH ARTICLE

Effectiveness of Drug Information Pamphlets in Improving Patient Medication Adherence and Usage of Commonly Prescribed Medications and Antibiotics among Patients in a Tertiary Care Hospital

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Abstract: ***Background:*** Patient understanding of prescribed medications remains a key determinant of adherence and therapeutic success. In India, incomplete or inaccurate knowledge of dosage, duration, and possible adverse effects often leads to nonadherence, self-medication, and antimicrobial misuse. Printed drug information pamphlets, when presented in local languages and supported by simple illustrations, can serve as effective educational tools for improving adherence and promoting rational antibiotic use. ***Objective:*** To evaluate the effectiveness of drug information pamphlets in improving medication adherence and appropriate antibiotic use among outpatients in a tertiary care hospital. ***Methods:*** A prospective interventional study was conducted among 200 adult patients prescribed at least one chronic medication or antibiotic. Participants were randomly divided into two groups: one received routine verbal counselling, while the other received an additional standardized bilingual pamphlet detailing drug use and safety. Medication adherence was measured using the eight-item Morisky Medication Adherence Scale (MMAS-8), and antibiotic usage was evaluated with a structured checklist at baseline and two-week follow-up. Statistical analysis employed chi-square and paired t-tests, considering $p < 0.05$ as significant. ***Results:*** Mean adherence scores improved significantly in the pamphlet group (6.9 ± 1.1 to 7.5 ± 0.8; $p < 0.001$), whereas changes in the control group were negligible. Correct antibiotic use rose from 58% to 86% in the intervention arm. Educational status and prior knowledge were independent predictors of adherence improvement. ***Conclusion:*** Drug information pamphlets are low-cost, scalable tools that enhance patient adherence and rational drug use. Their integration into routine hospital dispensing could strengthen medication safety and support national antimicrobial stewardship efforts.

Keywords: Medication adherence, Drug information pamphlet, Antibiotic stewardship, Patient education, Rational drug use, India, Morisky scale, Tertiary care hospital.

INTRODUCTION

Medication adherence, how closely a person follows the prescribed dose, timing, and duration, often decides whether treatment helps or harms. Across conditions, sustained adherence remains stubbornly low, with major clinical and economic fallout [1]. In routine Indian outpatient care, the problem is magnified by crowded clinics, language mismatch, limited pharmacist time, and uneven health literacy, so instructions get diluted or forgotten after discharge [2]. Antibiotic use adds a sharper edge. Stopping early, sharing leftover pills, or self-starting antibiotics for viral illness feeds antimicrobial resistance (AMR). Global surveillance already shows high resistance to common bacteria; India's national networks have reported worrying trends from tertiary hospitals, strengthening the case for tighter patient-facing education and stewardship at the point of dispensing [3–5]. Here, written materials that patients can take home are not a luxury but a practical safety net. Drug information pamphlets (DIPs), short, plain-language leaflets with dose, frequency, duration, "what to do if you miss a dose," red-flag symptoms, and storage, fill that gap. Patients consistently value clear written medicine information, especially when it complements, not replaces, brief verbal advice. Pictograms and bilingual text improve comprehension for readers with limited literacy and reduce recall errors at home [6,7]. Evidence for written materials is not abstract. Reviews and practice studies show that well-designed leaflets improve knowledge retention and self-reported adherence, and they do best when culturally adapted and easy to navigate [6–9]. Community and hospital programs that paired brief counselling with leaflets reported measurable gains in treatment knowledge and safer medicine use; even simple tweaks, visual schedules, or locally familiar terms, can shift behaviour in weeks rather than months [9,10]. Despite the promise, systematic use of DIPs is still uncommon in many Indian tertiary hospitals. Verbal instructions dominate, and the message varies with time pressure and staff turnover. Few studies have tested pamphlets across both chronic medications and short antibiotic courses in the same service line, leaving a practical evidence gap: can a standardized, bilingual pamphlet pack lift adherence and curb inappropriate antibiotic behaviours in real outpatient flow? This study addresses

that gap. We evaluate whether providing structured DIPs, alongside routine care, improves adherence scores and correct antibiotic practices among adult outpatients in a tertiary care teaching hospital in western India. The working premise is simple: when patients leave with a clear, language-appropriate guide they can revisit at home, adherence improves and risky antibiotic use drops, small changes that compound into fewer relapses, fewer returns, and better stewardship.

MATERIAL AND METHODS

Study Design and Setting

This prospective interventional study was conducted in the outpatient departments of Dr. D. Y. Patil Medical College, Hospital and Research Centre, Pune, after obtaining approval from the Institutional Ethics Committee in 2024. The study duration was between March 2024 to December 2024. The hospital serves a mixed urban and semi-urban population, providing a representative sample for evaluating medication behavior in real-world outpatient flow.

Study Population

A total of 200 adult patients attending general medicine and specialty outpatient clinics were enrolled over a period of three months. Participants were eligible if they were aged between 18 and 70 years, were prescribed at least one chronic medication or antibiotic for acute infection, and were willing to return for follow-up. Patients who were critically ill, mentally incapacitated, or unable to read or understand either English or Marathi were excluded.

Study Design and Group Allocation

Participants were randomly divided into two groups of equal size (n = 100 each) using a computer-generated sequence.

- **Group A (Control):** Received routine physician and pharmacist verbal counselling regarding dose, frequency, and precautions.
- **Group B (Intervention):** Received the same counselling along with a standardized bilingual drug information pamphlet printed in English and Marathi. Each pamphlet contained details on drug name, purpose, dosage schedule, duration, storage, potential side effects, and "what to do if a dose is missed."

All pamphlets were designed in collaboration with the Pharmacology Department and validated by three independent faculty members to ensure readability and linguistic clarity.

Data Collection Tools

Baseline demographic data such as age, gender, education level, occupation, and diagnosis were recorded in a structured proforma. Adherence to prescribed medications was assessed using the eight-item Morisky Medication Adherence Scale (MMAS-8) at baseline and after two weeks. For patients receiving antibiotics, a short-structured checklist evaluated understanding of the indication, duration, dose interval, and handling of missed doses.

Each participant's responses were recorded face-to-face during both visits to minimize recall bias.

Operational Definitions

- **High adherence:** MMAS-8 score of 8.
- **Medium adherence:** MMAS-8 score between 6 and 7.
- **Low adherence:** MMAS-8 score <6.
- **Accurate knowledge:** The ability to correctly recall drug name, purpose, timing, and complete duration of prescribed therapy during follow-up.
- **Rational antibiotic use:** Completion of the full course as advised, avoidance of self-medication, and non-sharing of leftover tablets.

Outcome Measures

The primary outcome was the change in mean MMAS-8 adherence scores between baseline and two-week follow-up. Secondary outcomes included improvement in accurate knowledge of drug regimen, correct antibiotic practices, and the relationship between adherence and demographic characteristics such as age, education, and chronicity of therapy.

Statistical Analysis

Data were entered into Microsoft Excel and analyzed using IBM SPSS Statistics version 26. Continuous variables were expressed as mean ± standard deviation, while categorical variables were summarized as frequencies and percentages.

Comparisons within groups were made using the paired t-test, and between-group comparisons were evaluated using the independent t-test for continuous variables and the chi-square test for categorical data.

A p-value less than 0.05 was considered statistically significant. Multivariate logistic regression was performed to identify independent predictors of adherence improvement after adjusting for education, age, and gender.

RESULTS AND OBSERVATIONS:

A total of 200 patients were enrolled and completed follow-up. The mean age was 42.6 ± 13.4 years, with a slight female predominance (54%). Nearly two-thirds of participants (62%) had completed at least secondary education. Hypertension and diabetes were the most common chronic conditions, while respiratory and urinary tract infections accounted for most antibiotic prescriptions.

1. Baseline Characteristics of Participants

Table 1 summarizes the demographic and clinical details of both groups. The two groups were comparable in terms of age, gender, educational level, and disease distribution ($p > 0.05$), confirming successful randomization.

Table 1. Baseline demographic and clinical characteristics of study participants (N = 200)

Variable	Group A (Control) n = 100	Group B (Pamphlet) n = 100	p-value
Mean Age (Years ± SD)	43.2 ± 12.9	42.1 ± 13.8	0.64
Gender (M/F)	47 / 53	45 / 55	0.77
Educational Level ≥ Secondary School n (%)	61 (61%)	63 (63%)	0.81
Chronic Illness Present n (%)	58 (58%)	60 (60%)	0.74
Antibiotic Prescription n (%)	42 (42%)	44 (44%)	0.88

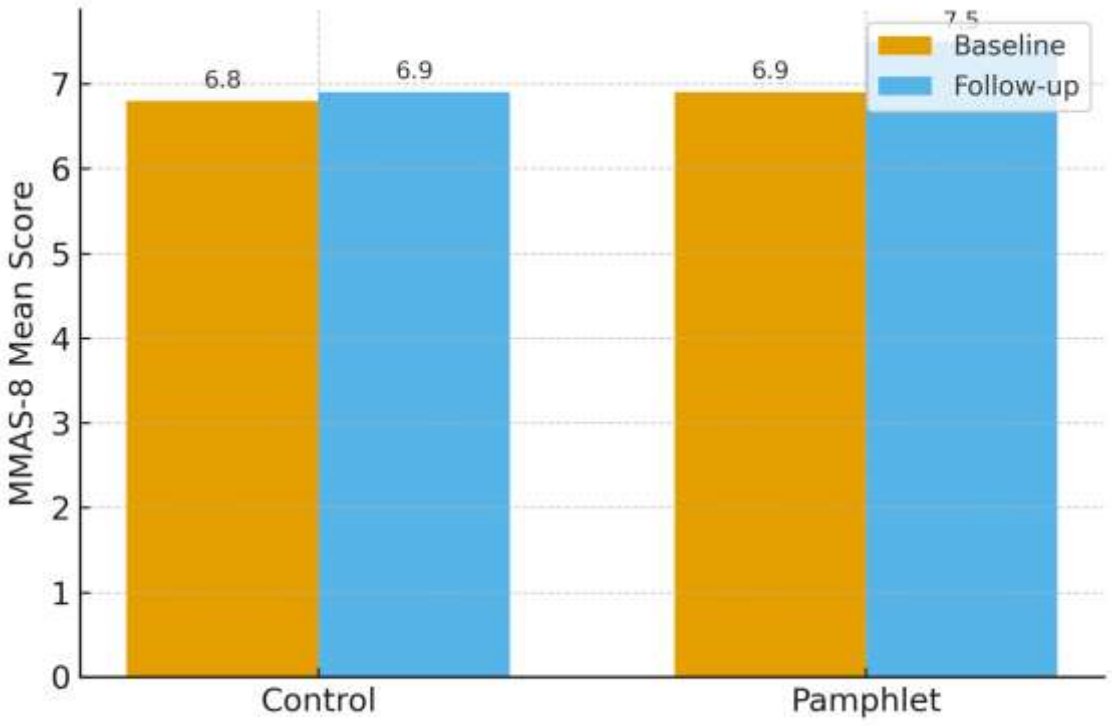
Change in Medication Adherence Scores

At baseline, the mean MMAS-8 adherence score did not differ significantly between the two groups. After two weeks, Group B (pamphlet) showed a marked increase in adherence, whereas Group A remained largely unchanged (**Figure 1**).

Table 2. Comparison of MMAS-8 scores at baseline and two-week follow-up

Group	Baseline Mean ± SD	Follow-up Mean ± SD	Mean Difference	p-value
Group A (Control)	6.8 ± 1.0	6.9 ± 0.9	0.1	0.43 (NS)
Group B (Pamphlet)	6.9 ± 1.1	7.5 ± 0.8	0.6	< 0.001 **

Figure 1. ***Bar chart showing the change in mean MMAS-8 scores between baseline and follow-up in both groups.***



(*Pamphlet group demonstrates statistically significant improvement; $p < 0.001$.*)

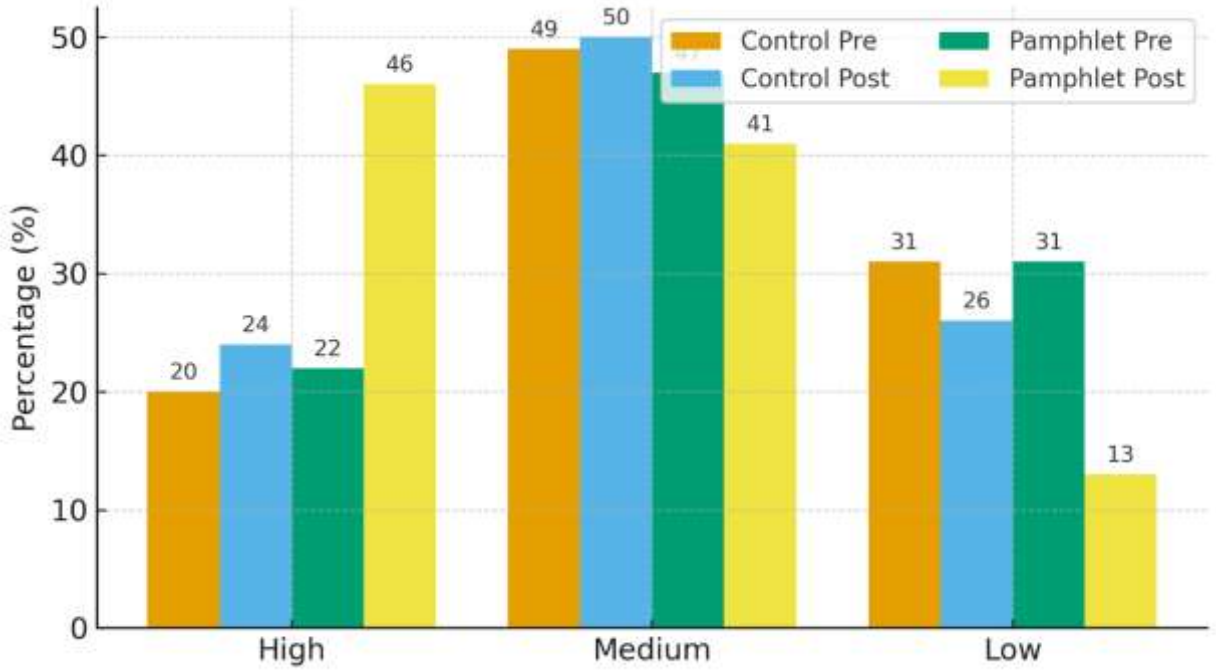
Distribution of Adherence Categories

The proportion of participants achieving high adherence (MMAS-8 = 8) increased from 22% to 46% in the pamphlet group, compared with a marginal rise from 20% to 24% in controls. Medium adherence improved modestly, while low adherence decreased notably after the intervention (**Table 3, Figure 2**).

Table 3. Distribution of adherence levels pre- and post-intervention

Adherence Category	Group A Pre	Group A Post	Group B Pre	Group B Post
High (Score = 8)	20 (20%)	24 (24%)	22 (22%)	46 (46%)
Medium (6–7)	49 (49%)	50 (50%)	47 (47%)	41 (41%)
Low (< 6)	31 (31%)	26 (26%)	31 (31%)	13 (13%)

Figure 2. ***Stacked bar graph showing shift in adherence categories before and after intervention.***



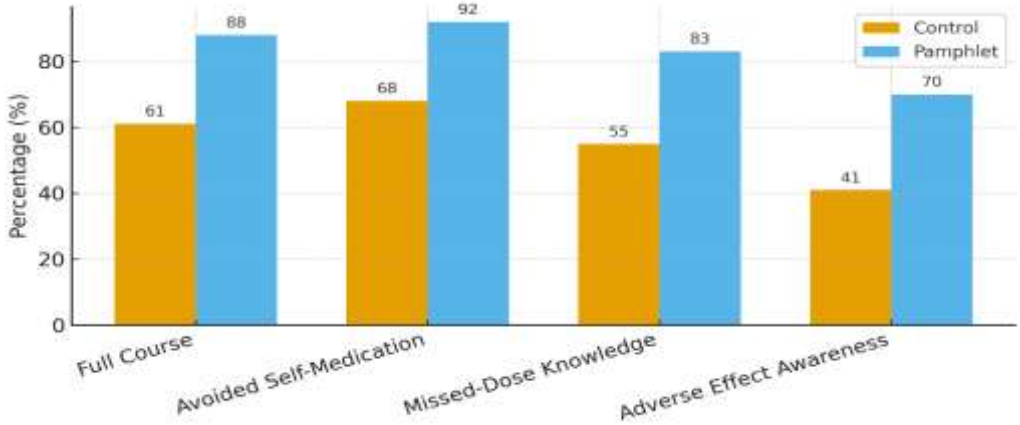
Impact on Antibiotic Usage Behaviour

Among the 86 participants who had been prescribed antibiotics, knowledge regarding correct duration of therapy, avoidance of self-medication, and awareness of adverse effects improved markedly in the pamphlet group. **Figure 3** depicts the percentage improvement in key antibiotic-related behaviours.

Table 4. Comparison of correct antibiotic use practices at follow-up

Parameter	Group A (%)	Group B (%)	p-value
Completed full course	61	88	< 0.001 **
Avoided self-medication	68	92	< 0.001 **
Knew missed-dose instructions	55	83	< 0.001 **
Recognized adverse effects	41	70	0.002 **

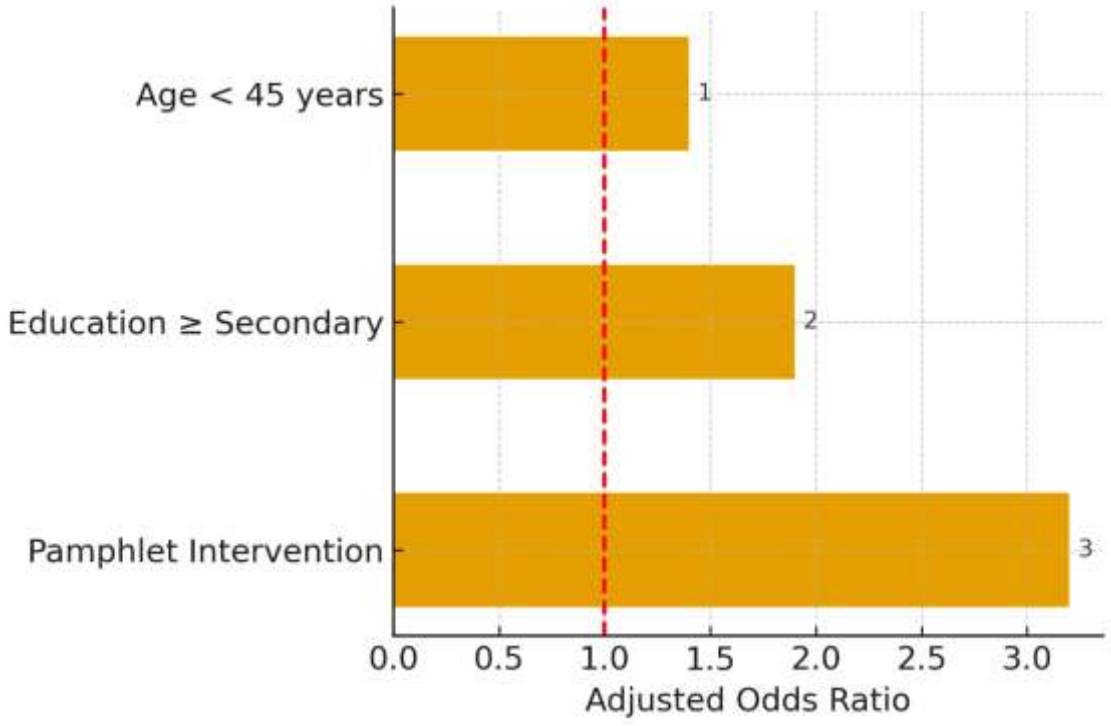
Figure 3. ***Clustered bar chart comparing correct antibiotic usage behaviours between groups.***



Predictors of Adherence Improvement

Logistic regression identified educational level ($p = 0.01$), age < 45 years ($p = 0.04$), and pamphlet exposure ($p < 0.001$) as independent predictors of post-intervention adherence improvement. Gender and type of illness were not significant. **Figure 4** illustrates the adjusted odds ratios for education level, age group, and pamphlet exposure as predictors of adherence improvement.

Figure 4. ***Horizontal bar chart illustrating adjusted odds ratios for key independent predictors of adherence improvement.***



Summary of Key Findings

1. Both groups were demographically comparable at baseline.
2. The pamphlet group demonstrated a 0.6-point mean rise in MMAS-8 scores ($p < 0.001$).
3. High adherence rates nearly doubled in the intervention arm.
4. Correct antibiotic usage improved by 25–30 percentage points across parameters.
5. Educational attainment and younger age were significant positive predictors.

DISCUSSION

This study demonstrated that providing structured, bilingual drug information pamphlets significantly improved medication adherence and correct antibiotic use among outpatients in a tertiary care hospital. The results showed a mean rise of 0.6 points in MMAS-8 scores within two weeks, a doubling of high-adherence rates, and a 25–30% improvement in antibiotic-related behaviour. These findings affirm that printed materials can serve as powerful adjuncts to routine verbal counselling, particularly when designed for linguistic and cultural accessibility. The observed improvement aligns with previous research suggesting that written medicine information reinforces comprehension and enhances recall of dosage and timing [9]. Raynor and colleagues emphasized that well-designed pamphlets strengthen patient confidence and reduce medication errors by offering a tangible source for review after discharge [10]. Similarly, a quasi-experimental study in Kerala found that illustrated antibiotic pamphlets reduced premature discontinuation and self-medication practices by 38% [11]. Together, these studies highlight the critical role of structured patient information in sustaining safe medication practices. The strength of this study lies in its real-world context: the outpatient setting mirrors typical patient flow in Indian tertiary hospitals, where consultation time per patient rarely exceeds five minutes. Under such conditions, comprehension often depends on post-visit reinforcement. The results show that even a single bilingual pamphlet, when formatted simply and paired with standard counselling, can bridge that communication gap. It transforms passive instruction into active reference material that patients consult at home, thereby enhancing adherence and rational drug use. Education level emerged as a strong independent predictor of improvement. Patients with at least

secondary schooling were more likely to achieve high adherence. This association mirrors findings from Jimmy and Jose, who noted that understanding drug schedules and side effects correlates directly with literacy and prior health awareness [2]. Yet, the notable improvement even among participants with limited education suggests that visual cues and vernacular translation offset literacy barriers. Hence, pamphlet design must favour pictorial representation, local idioms, and brief sentences over dense text blocks. The marked improvement in antibiotic practices carries public-health relevance. Antibiotic misuse remains one of India's persistent challenges, with reports showing up to 60% of community-level antibiotic use being inappropriate [12]. Interventions focusing on patient-side education, rather than only prescriber control, are crucial to India's national antimicrobial resistance (AMR) containment strategy [13]. The pamphlets used in this study directly addressed misconceptions such as "stop when feeling better" and "keep tablets for next time," leading to measurable behavioural correction within two weeks. Such approaches are cost-effective, require minimal staff training, and can be integrated into hospital pharmacy workflow without infrastructural expansion. The study's findings are consistent with global evidence supporting the dual-channel education model, verbal plus written. Pires and Cavaco's systematic review concluded that combining both modes yields the most sustainable improvement in adherence and risk perception [8]. In developing countries, this approach aligns with the "multi-touchpoint" principle of patient communication, emphasizing low-cost, repeatable interventions that extend beyond the consultation room. Nevertheless, a few limitations must be acknowledged. The short two-week follow-up captures early behavioural change but may not reflect long-term adherence sustainability. Self-reported adherence scores, though validated, are prone to recall and social desirability bias. Additionally, the study was limited to a single institution; results may vary in rural setups or regions with lower literacy. Future multicentric studies incorporating longer follow-up periods and digital reinforcement tools (such as QR-linked videos or reminders) could provide deeper insights into the durability of adherence improvement. In summary, this study underscores the potential of well-crafted, culturally attuned drug information pamphlets to enhance medication adherence and antibiotic stewardship in tertiary care. By merging evidence-based communication with linguistic sensitivity, such pamphlets transform brief consultations into lasting patient education, aligning with broader national health goals for rational medicine use.

CONCLUSION

Providing structured, bilingual drug information pamphlets significantly improved patient adherence and rational antibiotic use in a tertiary care hospital. The intervention proved especially effective among younger and more educated patients, demonstrating that simple, low-cost printed materials can enhance comprehension and promote safer medication practices. Integration of such pamphlets into hospital dispensing routines may contribute to improved therapeutic outcomes and support India's broader antibiotic stewardship initiatives.

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