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Research Article

Assessment of Rational Prescribing Awareness and Influencing Factors among Clinicians in North-West Maharashtra: A Cross-Sectional Study

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Background: Rational prescribing is essential for safe and cost-effective healthcare; however, pharmaceutical marketing and institutional factors may influence prescribing behavior. Data from tertiary care settings in North-West Maharashtra remain limited.
Methods: A cross-sectional, non-interventional survey was conducted among clinicians practicing in tertiary care outpatient departments in North-West Maharashtra. A pre-validated digital questionnaire assessed awareness of rational prescribing, influencing factors, exposure to pharmaceutical promotion, and institutional support mechanisms. The calculated minimum sample size was 103; 122 complete responses were analyzed. Associations were assessed using the Chi-square test, and multivariate logistic regression identified independent predictors of moderate-to-high perceived commercial influence. A p-value <0.05 was considered statistically significant.
Results: Most clinicians demonstrated moderate-to-high awareness of rational prescribing principles. Clinical efficacy, safety, and cost were the most commonly reported determinants of prescribing decisions, although a substantial proportion acknowledged pharmaceutical marketing influence. Fewer years of clinical experience and exposure to pharma-sponsored educational activities were independently associated with higher perceived commercial influence ($p < 0.05$), while availability of prescription audits showed a protective effect.
Conclusion: Despite adequate awareness, commercial exposure and limited institutional oversight significantly influenced prescribing behavior. Strengthening audit systems and promoting independent continuing medical education may enhance rational prescribing practices.

Keywords: Rational Prescribing, Pharmaceutical Marketing, Commercial Influence, Tertiary Care Hospitals, Logistic Regression, India.

INTRODUCTION

Rational prescribing is the cornerstone of ethical and effective medical practice. It ensures that patients receive medications appropriate to their clinical needs, in correct doses, for an adequate duration, and at the lowest possible cost to both patient and community[1]. Despite its importance, prescribing practices are increasingly influenced by pharmaceutical marketing, raising significant ethical concerns worldwide[2,3]. Physicians are frequently exposed to aggressive promotional tactics, such as free samples, sponsored conferences, and persuasive detailing, which may unconsciously alter clinical decision-making[4,5]. In India, where the healthcare system is already under strain, irrational prescribing carries profound public health and economic implications[6]. Prior research shows that frequent interactions with pharmaceutical representatives contribute to a preference for branded medications over equally effective generics, thereby escalating healthcare costs and potentially compromising patient care[3,7]. Moreover, many clinicians remain insufficiently aware of the subtle impact that marketing strategies exert on their choices, underscoring the need for ongoing medical education and

institutional safeguards to promote transparency[8].

The World Health Organization has consistently emphasized rational drug use and advocated for systems designed to reduce commercial bias in clinical practice[9]. In India, regulatory attempts such as the Uniform Code for Pharmaceutical Marketing Practices (UCPMP) have been introduced; however, adherence remains largely voluntary and inconsistently enforced[10]. In this context, institutional audits and self-regulatory mechanisms become critical for ensuring evidence-based, patient-centered prescribing[11,12]. Against this backdrop, the present study aimed to evaluate the factors influencing prescribing patterns among clinicians in the North-West Maharashtra region and to examine their association with rational prescribing practices. We hypothesized that exposure to pharmaceutical promotional activities and inadequate institutional oversight mechanisms would be significantly associated with higher perceived commercial influence and potential deviation from rational prescribing principles.

METHODS

Study Design and Study Setting

This was a non-interventional, cross-sectional observational survey conducted among clinicians practicing in the Outpatient Departments (OPDs) of tertiary care hospitals in the North-West Maharashtra region.

Study Participants

Clinicians from various specialties practicing in tertiary care hospitals in the North-West Maharashtra region were invited to participate.

Inclusion criteria: Clinicians actively involved in prescribing medications who provided informed consent.

Exclusion criteria: Clinicians not directly involved in prescribing practices; interns or undergraduate trainees without independent prescribing authority; clinicians on prolonged leave during the study period (defined as >1 month); Practitioners of non-allopathic systems of medicine (Ayurveda, Homeopathy, and Unani); and incomplete or duplicate questionnaire responses were excluded from analysis.

Sample Size

The sample size was calculated using the single-proportion formula described by Lwanga and Lemeshow (WHO, 1991) and Naing et al. (2006). An estimated prevalence of 60% for pharmaceutical marketing influence on prescribing was assumed based on previous studies (Narendran & Narendranathan, 2013; Khazzaka, 2019; Saxena et al., 2023; Patel & Sharma, 2024). Using a 95% confidence level and a 10% margin of error, the minimum required sample size was calculated as 94 participants. After adding 10% to account for potential non-response, the final minimum sample size was 103 clinicians. A total of 126 responses were received, of which 122 complete and eligible responses were included in the final analysis.

Sampling Technique

A non-probability purposive sampling method was employed to recruit clinicians actively involved in prescribing practices in tertiary care hospitals of the North-West Maharashtra region. Eligible participants were invited to participate through institutional communication channels. Only clinicians who provided informed consent and submitted complete responses were included in the final analysis.

Data Collection

Data were collected using a structured, pre-validated, self-administered digital questionnaire over a period of six months designed to assess prescribing practices and awareness of rational prescribing principles. The instrument comprised sections on demographic characteristics, prescribing behavior, influencing factors, and awareness of rational use of medicines. The survey was distributed electronically among eligible clinicians. Participation was voluntary, and electronic informed consent was obtained prior to survey completion. Responses were collected anonymously, and no personal identifiers were recorded to ensure confidentiality.

Study Variables

The primary outcome variable was perceived commercial influence on prescribing behavior. Responses were measured using a five-point Likert scale and were dichotomized into low influence (scores 1–2) and moderate-to-high influence (scores 3–5) categories for regression analysis. Independent variables included years of clinical experience, exposure to pharmaceutical-sponsored educational activities, awareness of rational prescribing principles, and availability of institutional audit mechanisms. Additional descriptive variables included demographic characteristics,

prescribing preferences (brand versus generic), and access to institutional resources supporting rational prescribing.

Statistical Analysis

Data were analyzed using IBM SPSS Statistics version 26.0. Categorical variables were summarized as frequencies and percentages. Continuous variables, where applicable, were expressed as mean ± standard deviation. Associations between categorical variables were assessed using the Chi-square test. Multivariate logistic regression analysis was performed to identify independent predictors of moderate-to-high perceived commercial influence on prescribing behavior. Adjusted odds ratios (AOR) with 95% confidence intervals were calculated. All statistical tests were two-tailed, and a p-value <0.05 was considered statistically significant.

Ethical Considerations

The study was conducted after obtaining approval from the Institutional Ethics Committee (IEC). Electronic informed consent was obtained from all participants prior to survey completion. Participation was voluntary, and respondents had the right to withdraw at any stage. No personal identifiers were collected, ensuring anonymity and confidentiality of responses. As this was a non-interventional, survey-based study, no physical or psychological risk was involved, and responses were analyzed in aggregate form. The study complied with the Declaration of Helsinki and the Indian Council of Medical Research (ICMR) guidelines (2023 update).

RESULTS

A total of 126 clinician responses were received, of which 122 complete and eligible responses were included in the final analysis after exclusion of incomplete entries. This exceeded the minimum calculated sample size of 103. The study population predominantly consisted of younger clinicians and residents, with the majority having less than five years of clinical experience, representing active frontline prescribers in tertiary care outpatient departments.

Baseline demographic characteristics of the study participants, including age group, gender, designation, specialty, and years of experience, are summarized in Table 1.

Table 1: Baseline Characteristics of Study Participants

Variable	Category	n (%)
Age group	Below 30 years	103 (84.9)
	30–40 years	9 (7.4)
	41–50 years	8 (6.6)
	Above 50 years	2 (1.6)
Gender	Male	64 (52.4)
	Female	58 (47.6)
Designation	Resident	56 (46.0)
	Assistant Professor	8 (6.6)
	Associate Professor	3 (2.5)
	Professor	24 (19.7)
	Consultant	31 (25.4)
Years of clinical experience	< 5 years	78 (64.0)
	5–10 years	24 (19.7)
	11–20 years	6 (4.9)
	> 20 years	14 (11.4)

Awareness of Rational Prescribing Principles

The level of awareness regarding the World Health Organization (WHO) principles of Rational Use of Medicines is depicted in Figure

1. Most clinicians reported moderate to high awareness, with the highest proportion selecting the midpoint of the Likert scale, followed by high and very high awareness categories. Only a small proportion reported low or minimal awareness.

Since awareness scores were measured on an ordinal Likert scale, they were summarized using frequencies and percentages. For analytical purposes, awareness levels were dichotomized into low (scores 1–2) and adequate (scores 3–5) awareness.

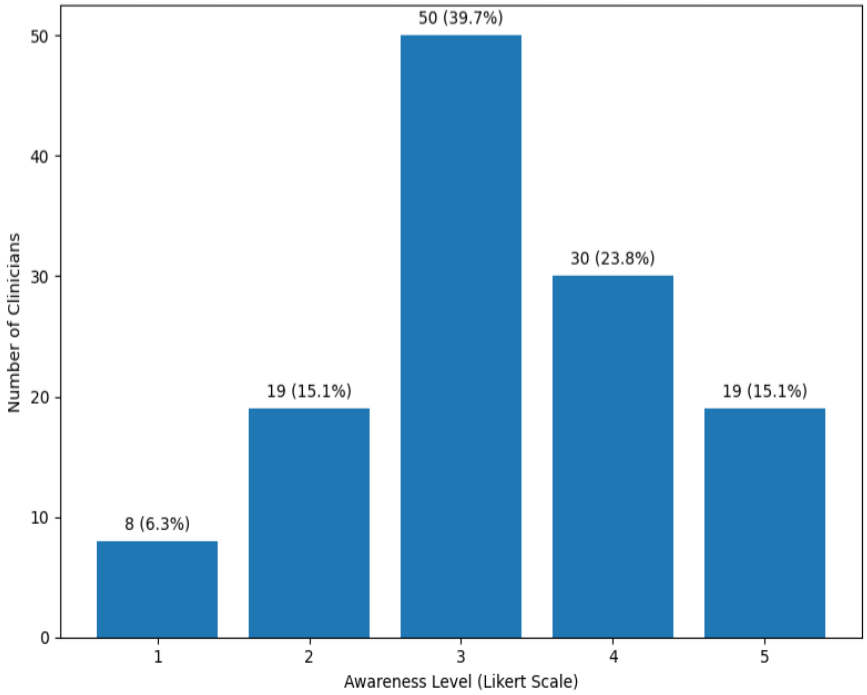

Figure 1: Awareness of WHO Rational Use of Medicines

Knowledge of Components of Rational Prescribing

Clinicians' responses regarding components considered part of rational prescribing are illustrated in Figure 2. The majority correctly identified appropriate drug selection, correct dose and duration, and minimization of adverse drug reactions. However, a comparatively lower proportion identified strict adherence to Standard Treatment Guidelines (STGs) and the Essential Medicines List (EML) as essential components.

As this was a multiple-response categorical variable, results were expressed as percentages of total respondents without inferential testing.

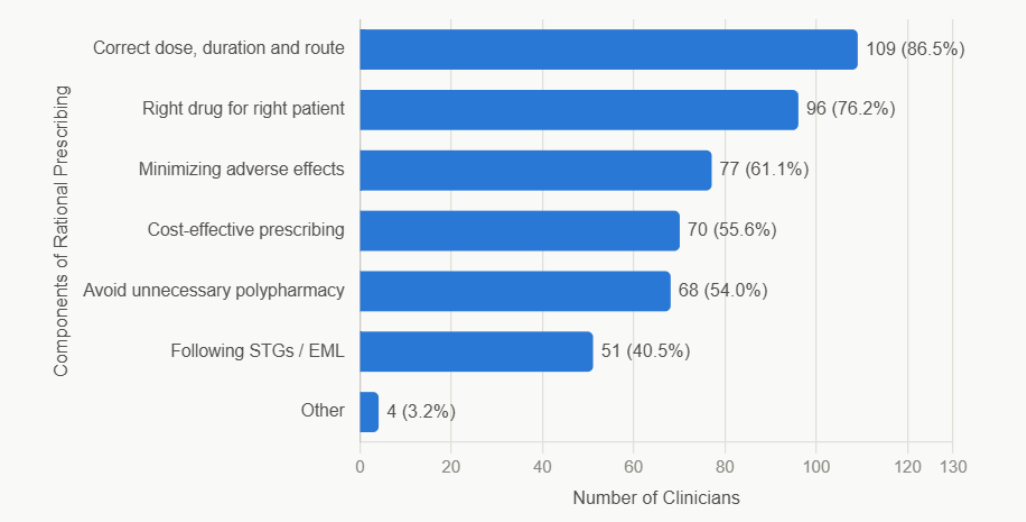

Figure 2 : Components of Rational Prescribing

Utilization of STGs and EML before Prescribing

The frequency of referring to STGs and EML before prescribing is shown in Figure 3. Most respondents reported referring to guidelines "always" or "often," while a substantial proportion reported only "sometimes" or less frequent use.

For inferential analysis, responses were categorized into regular users (always/often) and irregular users (sometimes/rarely/never).

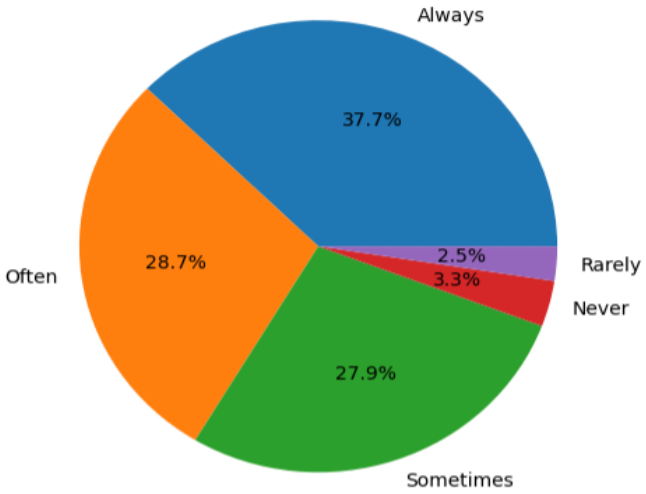

Figure 3 : Frequency of Referring to STGs and EML

Factors Influencing Prescribing Decisions

Factors influencing prescribing decisions are presented in Figure 4. Clinical efficacy, safety profile, cost affordability, and drug availability were the most frequently cited factors. Notably, a significant proportion of clinicians acknowledged the influence of pharmaceutical marketing and promotional incentives.

As these were multiple-response categorical variables, descriptive statistics were used. No single inferential test was applied due to overlapping responses.

Exposure to Pharmaceutical Promotion and Ethical Perceptions

Attendance at pharma-sponsored CME programs and exposure to promotional materials are summarized in Figure 5, while perceptions regarding ethical boundary blurring are shown in Figure 6. Most clinicians reported exposure to pharmaceutical promotion, and a majority perceived that ethical boundaries were sometimes or often blurred during such interactions.

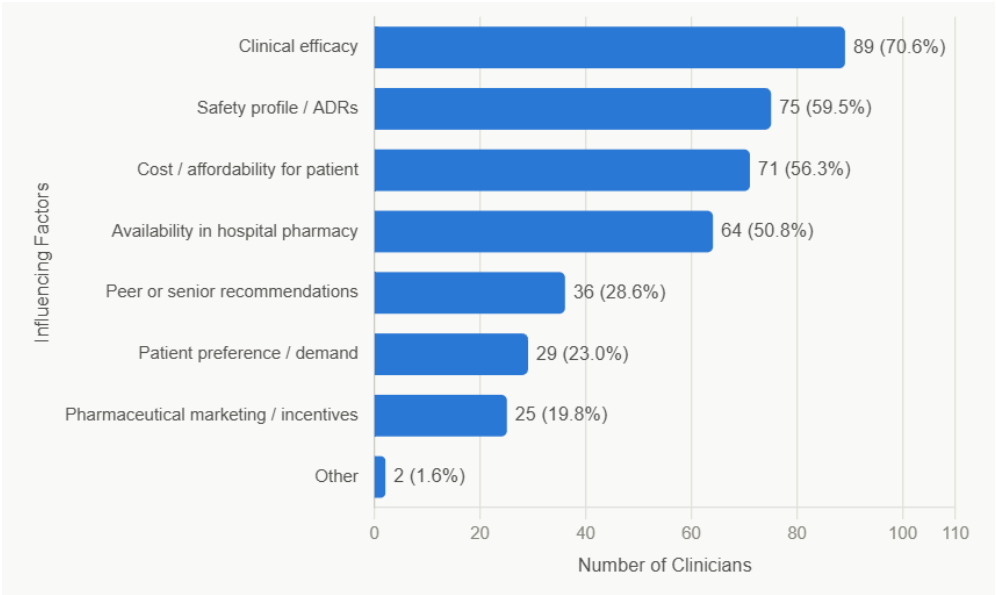

Figure 4 : Factors Influencing Prescribing Decisions

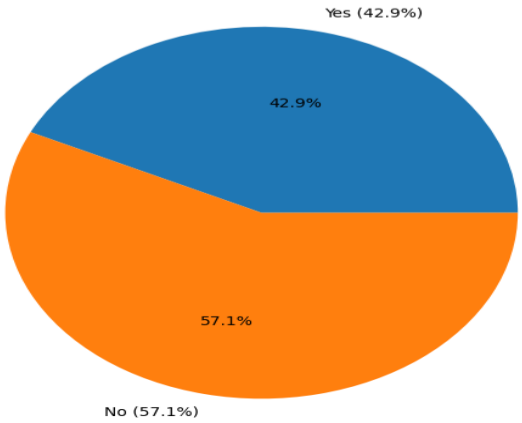

Figure 5 : Attendance at Pharma-Sponsored CME Programs and Exposure to Promotional Materials

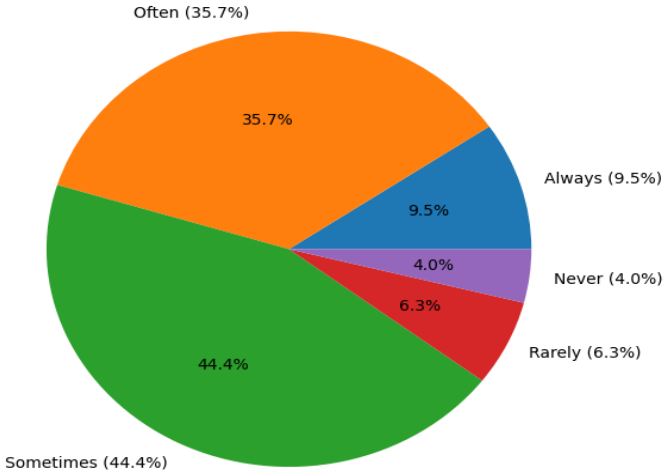

Figure 6: Perceptions Regarding Ethical Boundary Blurring

Institutional Support and Audit Mechanisms

Availability of institutional resources supporting rational prescribing, including hospital formulary, STGs, EML, Drug and Therapeutics Committee, and prescription audits, is depicted in Figure 7. While formularies and EMLs were widely available, regular prescription audits and feedback mechanisms were inconsistently implemented.

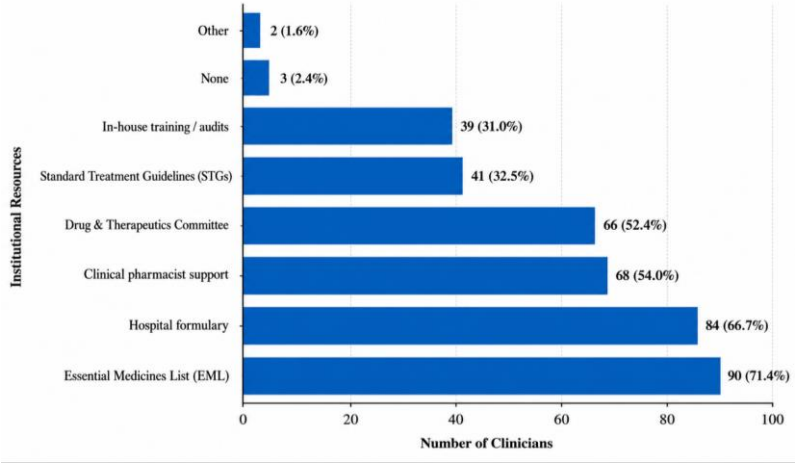

Figure 7 : Availability of Institutional Resources Supporting Rational Prescribing

Brand versus Generic Prescribing

Prescribing preference for brand versus generic medicines is illustrated in Figure 8. Only a minority of clinicians reported exclusive generic prescribing, while most prescribed branded medicines or a combination of both.

Association between Clinical Experience and Commercial Influence

The association between years of clinical experience and perceived commercial influence on prescribing behavior is summarized in Table 2. On Chi-square testing, a statistically significant association was observed (χ^2 test, $p < 0.05$), with clinicians having less than five years of experience reporting higher levels of moderate-to-high commercial influence compared to more experienced clinicians.

Table 2: Association Between Years of Experience and Commercial Influence (n =

Years of experience	Low influence n (%)	Moderate-High influence n (%)	Total
< 5 years	21 (26.9)	57 (73.1)	78
≥ 5 years	22 (50.0)	22 (50.0)	44
Total	43	79	122

Chi-square test: $\chi^2 = 6.12$, $p = 0.013$ (statistically significant)

Table 2 : On Chi-Square Testing, a Statistically Significant Association was Observed Between Years of Clinical Experience and Perceived Commercial Influence on Prescribing Behavior (P = 0.013).

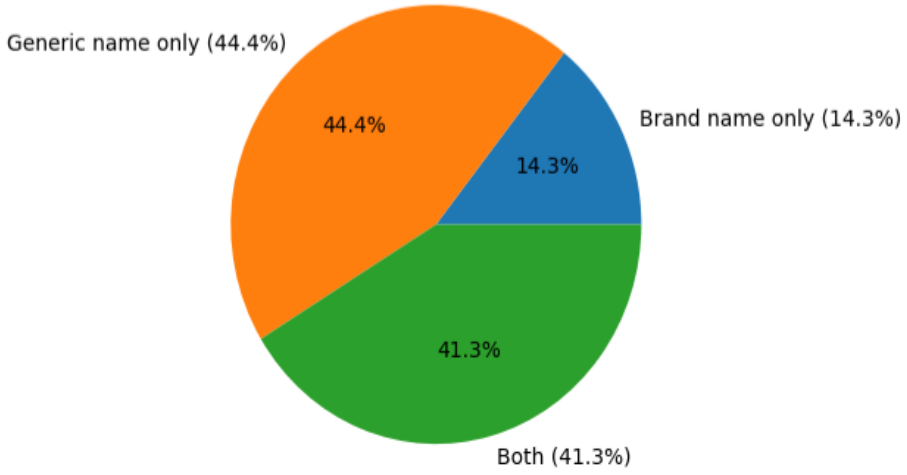

Figure 8 : Brand Versus Generic Prescribing

Multivariate Logistic Regression Analysis

To identify independent predictors of deviation from rational prescribing, a multivariate logistic regression analysis was performed (Table 3).

Dependent variable: Moderate-to-high perceived commercial influence (Yes/No)

Independent variables:

- Years of clinical experience
- Exposure to pharma-sponsored CME
- Availability of institutional prescription audits
- Level of awareness of rational prescribing

After adjustment for confounding variables, fewer years of clinical experience and exposure to pharma-sponsored CME programs emerged as independent predictors of moderate-to-high commercial influence ($p < 0.05$). In contrast, availability of institutional audits showed a protective association, reducing the likelihood of commercial influence.

Table 3: On Multivariate Logistic Regression Analysis, Fewer Years of Clinical Experience and Exposure to Pharma-Sponsored CME were Independently Associated with Higher Odds of Moderate–High Commercial Influence, while Availability of Prescription Audits Showed a Protective Association.

Predictor	Adjusted Odds Ratio (AOR)	95% Confidence Interval	p value
< 5 years clinical experience	2.48	1.18 – 5.22	**0.017**
Exposure to pharma-sponsored CME	2.91	1.32 – 6.41	**0.008**
Availability of prescription audits	0.54	0.29 – 0.98	**0.042**
Adequate awareness of RUM	0.89	0.46 – 1.71	0.720

Clinical Interpretation of Statistical Findings

The regression analysis indicates that institutional and educational factors, rather than lack of awareness alone, play a decisive role in influencing prescribing behavior. In tertiary care hospitals, junior clinicians working under high workload and time constraints appear particularly vulnerable to commercial influence, while structured audit-feedback mechanisms act as important safeguards promoting rational prescribing.

DISCUSSION

The present cross-sectional study evaluated clinicians' awareness of rational prescribing principles and the influence of various factors on prescribing behavior in tertiary care hospitals of North-West Maharashtra. The findings demonstrate that although clinicians exhibit moderate to high awareness of rational prescribing concepts, actual prescribing practices are influenced by commercial and institutional factors, indicating a gap between theoretical knowledge and real-world practice.

The level of awareness observed in the present study is comparable to that reported by Güler et al.[14], who found adequate conceptual understanding of rational drug use among residents, but frequent deviation from standard guidelines due to external pressures. Similar observations have been reported in Indian tertiary care settings by Shetty et al.[2], where deviations from treatment guidelines persisted despite satisfactory clinician awareness. These findings suggest that awareness alone is insufficient to ensure rational prescribing, particularly in tertiary care hospitals managing complex referral cases and high patient load.

Regarding the components of rational prescribing, most clinicians in the present study emphasized appropriate drug selection and correct dosing practices, while relatively fewer prioritized adherence to STGs and EML. Comparable findings were reported by Kapoor et al.[18], who observed that deviations from standard guidelines in pediatric outpatient departments were often justified by clinicians based on perceived case complexity and time constraints. The World Health Organization has consistently emphasized that STGs and EMLs are essential tools for ensuring consistency, cost-effectiveness, and patient safety in clinical practice[9]. In tertiary care hospitals, underutilization of these tools may contribute to inter-clinician variability and reduced auditability of prescribing practices.

A significant finding of the present study was the acknowledged influence of pharmaceutical marketing activities on prescribing decisions. This observation is consistent with the findings of Sharma and Sinha[13], who demonstrated that promotional strategies such as medical representative visits and sponsored educational events significantly influence prescribing behavior in India's branded generic market. Similar trends have been documented by Saxena et al.[5], who reported increased preference for branded medicines among clinicians frequently exposed to pharmaceutical representatives. These findings indicate that even in tertiary care teaching hospitals, where clinicians are expected to practice evidence-based medicine, commercial influence continues to shape prescribing decisions.

The perception that ethical boundaries are sometimes or often blurred during interactions

with pharmaceutical companies aligns with concerns raised by Avorn and Angell[19], who emphasized that marketing influence often operates subtly rather than through overt inducements. An Indian study by Joshi and Patil[15] similarly reported ethical discomfort among clinicians participating in pharma-sponsored CMEs due to lack of institutional funding for independent academic programs. In tertiary care hospitals, where clinicians also function as educators and role models, such ethical ambiguity may influence prescribing behavior among trainees.

Institutional support mechanisms varied across study settings. While hospital formularies and EMLs were commonly available, regular prescription audits and feedback mechanisms were inconsistently implemented. This finding corroborates observations by Banerjee et al.[16], who demonstrated that clinicians exposed to regular audit-feedback systems were more likely to maintain rational prescribing practices. Additionally, Reddy and Mahajan[17] highlighted that absence of structured institutional oversight in Indian hospitals creates an environment conducive to marketing-driven prescribing. In tertiary care hospitals, inadequate audit mechanisms reduce accountability and limit opportunities for corrective interventions.

The limited practice of exclusive generic prescribing observed in the present study is consistent with findings reported by Narendran and Narendranathan[1] and Khazzaka[3], who documented a strong preference for branded medications among clinicians exposed to pharmaceutical promotion. In government tertiary care hospitals, brand-based prescribing has significant economic implications, increasing out-of-pocket expenditure for patients and complicating drug procurement processes.

Overall, the findings of the present study, when interpreted alongside existing literature, suggest that deviations from rational prescribing in tertiary care hospitals are driven less by lack of knowledge and more by systemic, institutional, and commercial pressures. The voluntary nature of regulatory frameworks such as the **Uniform Code for Pharmaceutical Marketing Practices (UCPMP, 2024)**[20] further limits their effectiveness, highlighting the need for stronger institution-driven governance mechanisms.

CONCLUSION

The present study concludes that clinicians in tertiary care hospitals of North-West Maharashtra possess moderate to high awareness of rational prescribing principles; however, commercial exposure, inconsistent adherence to STGs and EML, limited prescription audits, and institutional constraints significantly influence real-world prescribing behavior.

Awareness alone is insufficient to ensure rational prescribing in tertiary care settings characterized by high patient load, complex case profiles, and time constraints. The findings underscore the need to strengthen institution-level interventions rather than relying solely on individual clinician knowledge or voluntary regulatory frameworks.

Conflict of Interest

The authors declare no conflicts of interest.

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Clinical and Institutional Implications

The findings of this study have important implications for tertiary care practice. Strengthening routine prescription audits and structured feedback mechanisms may enhance accountability and promote adherence to evidence-based prescribing principles. Reinforcement of Standard Treatment Guidelines (STGs) and Essential Medicines List (EML) utilization, while allowing flexibility for complex clinical scenarios, may reduce inter-clinician variability. Encouraging generic prescribing practices could substantially decrease patient expenditure, particularly in public-sector tertiary hospitals. Furthermore, incorporating structured ethical prescribing training within postgraduate medical education may help mitigate subconscious commercial influence.

From a policy perspective, the development of independent, institution-funded continuing medical education (CME) programs may reduce reliance on pharmaceutical-sponsored educational activities. Establishing active Drug and Therapeutics Committees (DTCs) can further support rational drug selection, formulary governance, and cost containment. The findings also underscore the need for stronger regulatory enforcement mechanisms beyond voluntary frameworks such as the Uniform Code for Pharmaceutical Marketing Practices (UCPMP).

Future research should adopt interventional and longitudinal designs to evaluate the impact of audit-feedback systems, independent CME models, and regulatory enforcement strategies on prescribing behavior in tertiary care settings.

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