RESEARCH ARTICLE

An In-Depth Analysis of the Influence of Pharmaceutical Marketing Strategies on the Prescription Practices and Decision-Making Processes of Medical Professionals

Monu Singh[1], Pallavi, D. R[2], Suman Gulia[3], Ramachandran Manickam[4*]

[1]*Gandhi Institute of Technology and management (GITAM) University, Hyderabad, India.*
[2]*REST Labs, Krishnagiri, Tamil Nadu, India.*
[3]*Maharishi Markandeshwar (Deemed to be University),Mullana, Ambala, Haryana*
[4]*Lead Research Scientist, Biochemistry, REST Labs, Krishnagiri, Tamil Nadu, India.*

Received: 16th July, 2023; Revised: 19th July, 2024; Accepted: 04th September, 2024; Available Online: 31st August, 2024

ABSTRACT

The study seeks to explore how pharmaceutical marketing strategies impact doctors' prescribing habits within the complex relationships between healthcare providers and pharmaceutical companies. Five alternative pharmaceutical products are analyzed across six distinct evaluation parameters to understand the multifaceted impact of marketing efforts. The dataset includes information on marketing spend, prescription rates, and various evaluation criteria such as efficacy, safety, affordability, brand recognition, promotional materials, reputation, and convenience. These parameters are crucial in assessing the comprehensive influence of pharmaceutical marketing on doctors' decision-making processes. Understanding how pharmaceutical marketing impacts prescription practices is crucial for ensuring patient welfare and safety. It helps in evaluating whether prescriptions are driven by genuine medical needs or influenced by marketing strategies, thus promoting patient-centered care. The study addresses ethical concerns related to the interactions between pharmaceutical companies and healthcare professionals. Uncovering the extent of marketing influence aids in developing ethical guidelines and regulations, fostering transparency and trust in the healthcare system. The COPRAS-G method necessitates identifying selection criteria, evaluating relevant information for these criteria, and creating methods to assess how well the surrogate meets the participants' needs. Decision analysis involves a Decision Maker (DM) who must consider a specific set of alternatives and choose one from several options, often with conflicting criteria. Consequently, the developed complexity proportionality assessment (COPRAS) method can be applied. The results indicate that Doctor 03 ranked first, while Doctor 05 ranked the lowest.

Keywords: pharmacies, self-medication, prescription, pharmaceutical marketing.

International Journal of Pharmaceutical Quality Assurance (2024); DOI: 10.25258/ijpqa.15.3.37

How to cite this article: Singh M, Pallavi, DR, Gulia S, Manickam R. An In-Depth Analysis of the Influence of Pharmaceutical Marketing Strategies on the Prescription Practices and Decision-Making Processes of Medical Professionals. International Journal of Pharmaceutical Quality Assurance. 2024;15(3):1329-1335.

Source of support: Nil.

Conflict of interest: None

INTRODUCTION

This exploratory study examines how pharmaceutical promotional tools influence doctors' prescribing behavior. Through a comprehensive examination of various promotional strategies employed by pharmaceutical companies, including detailing sessions, free samples, and sponsored events, the study seeks to uncover the extent to which these tools influence physicians' prescription choices. By analyzing the data collected, the research aims to shed light on the nuanced interplay between promotional efforts and doctors' decision-making processes, providing valuable insights into the factors shaping prescribing behavior within the medical community[1]. This impact study delves into the diverse pharmaceutical promotional practices and their influence on the prescription behavior of Indian doctors. Examining a range of strategies such as marketing events, promotional gifts, and informational detailing, the research aims to discern the specific ways in which these practices shape physicians' prescription choices in the Indian context. Through a nuanced analysis of data, the study seeks to uncover patterns, preferences, and potential ethical considerations associated with promotional practices. The findings aim to offer a thorough understanding of the relationship between pharmaceutical promotions and the prescribing behavior of Indian doctors, providing valuable insights for healthcare practitioners and industry stakeholders alike[2]. By investigating how external influences, such as

**Author for Correspondence: sweetestchandran@gmail.com*

regulatory environments or healthcare system dynamics, shape the impact of marketing efforts, the research seeks to offer a detailed understanding of how contextual factors interact with pharmaceutical marketing strategies to influence physicians' prescription decisions.

Examines the various promotional strategies used by pharmaceutical companies and their impact on doctors' prescribing behavior. Investigating strategies like detailing sessions, sponsored events, and sample distribution, the research aims to discern the direct impact of these practices on the decision-making process of physicians[3]. The findings contribute to understanding the intricate relationship between pharmaceutical promotional efforts and doctors' prescription choices[4]. Analyzes physicians' views and use of commercial drug information sources, providing an in-depth look at pharmaceutical marketing targeted at healthcare professionals. By exploring how physicians interpret and engage with commercial drug information, the research aims to provide insights into the dynamics of pharmaceutical marketing strategies and their impact on physicians' decision-making processes regarding prescription choices[5]. This research uses a Structural Equation Modeling (SEM)-based multivariate approach to explore the factors that contribute to consistency in physicians' prescription behavior. By examining various elements that may affect the uniformity of prescription patterns, the study seeks to identify the underlying drivers influencing physicians' prescribing choices. This method facilitates a detailed analysis of the intricate relationships between different variables, offering insights into the structural factors that affect the consistency in physicians' prescribing practices. The findings contribute valuable insights into understanding the determinants that lead to symmetry in prescribing practices within the medical community[6].

The study examines how the availability of drug samples affects physicians' prescribing behavior, focusing on whether receiving these samples influences their medication choices. By exploring this relationship, the research aims to provide insights into the potential impact of free samples on physicians' prescription decisions and broader healthcare practices[4]. The intricate dynamics among pharmacies, self-medication practices, and pharmaceutical marketing. It examines how pharmaceutical marketing strategies influence consumer behavior in terms of self-medication choices at pharmacies[7]. By analyzing the promotional tools employed by pharmaceutical companies, the research aims to elucidate the extent to which marketing impacts consumer decision-making in the realm of self-medication. The findings are expected to provide a nuanced understanding of the interplay between pharmaceutical marketing initiatives, the role of pharmacies as healthcare influencers, and the prevalence of self-medication practices within the broader context of the healthcare landscape[8].

The effects of detailing and sampling on new prescriptions, aiming to provide a numerical assessment of the impact of these pharmaceutical marketing strategies. By analyzing data related to detailing sessions and distribution of samples, the research seeks to measure the extent to which these practices influence the generation of new prescriptions, offering valuable insights into the efficacy of promotional efforts in shaping prescribing behavior[9]. The study explores prescribing behavior in clinical practice by analyzing the interaction between patients' expectations and doctors' perceptions of those expectations. It aims to illuminate the complex dynamics influencing prescribing decisions by examining how well physicians' views align with or differ from patients' treatment expectations. Additionally, the research assesses how pharmaceutical industry promotional efforts affect doctors' prescribing patterns for antibiotics. Analyzing various promotional strategies, the research aims to discern how marketing initiatives influence the choices made by doctors when prescribing antibiotics, providing insights into the potential implications for antibiotic prescription practices within the healthcare sector[10,11].

By analyzing various determinants such as regulatory frameworks, patient demographics, and pharmaceutical promotional strategies, the study aims to offer a thorough understanding of the various factors influencing prescription decisions in the context of hypertension treatment. The findings are expected to contribute valuable insights into the specific dynamics at play in Jordan's healthcare landscape, offering implications for improving prescribing practices, enhancing patient outcomes, and informing targeted interventions in the realm of anti-hypertensive drug prescriptions[12]. The research uses Structural Equation Modeling to examine physicians' loyalty to branded medicines in low- and middle-income countries. By analyzing factors such as promotional strategies, trust in pharmaceutical companies, and economic considerations, the study seeks to offer a comprehensive understanding of the intricate relationships that affect physicians' preferences for branded medications in resource-limited environments. The comprehension of consumers' awareness about brands in the pharmaceutical industry. By exploring factors such as advertising, product visibility, and informational campaigns, the research aims to elucidate the extent to which consumers are informed about pharmaceutical brands. Understanding the dynamics of consumer awareness in this industry is crucial for pharmaceutical companies to tailor effective marketing strategies, build brand recognition, and foster trust among consumers in an increasingly competitive and information-driven healthcare market[13, 14].

MATERIALS AND METHOD

Evaluation Parameter

Prescription rate, Efficiency, Marketing spend, Brand Recognition.

Prescription rate

Prescription rate refers to the frequency or number of prescriptions written by healthcare professionals over a specific period. It is a quantitative measure that indicates how often medical practitioners prescribe medications to patients. A higher prescription rate suggests a greater utilization of pharmaceutical treatments within a given population, and it

can be influenced by various factors such as the prevalence of certain medical conditions, treatment guidelines, healthcare practices, and pharmaceutical marketing strategies. Monitoring prescription rates is essential for assessing healthcare trends, evaluating the effectiveness of therapeutic interventions, and understanding prescribing behavior among healthcare providers.

Efficiency

In various contexts, efficiency can be measured by assessing the ratio of input to output, where higher efficiency indicates a more effective utilization of resources. It is a key concept in economics, business, engineering, and various other fields. In the context of a process or system, efficiency is often evaluated by considering factors such as time, cost, energy, and material usage, aiming to streamline operations and enhance productivity. Efficient processes or systems typically deliver desired outcomes while conserving resources and minimizing unnecessary efforts.

Marketing Spend

Marketing spend refers to the amount of money a company allocates or invests in its marketing activities and campaigns over a specific period. This expenditure covers various aspects of marketing, including advertising, promotions, public relations, market research, and other initiatives aimed at promoting a product, service, or brand. Monitoring and analyzing marketing spend is crucial for businesses to evaluate the effectiveness of their promotional efforts, allocate resources efficiently, and determine the return on investment (ROI) from marketing activities. It plays a significant role in shaping a company's overall strategy and influencing its market presence, brand awareness, and customer acquisition.

Brand Recognition

Strong brand recognition is essential for a company's success, as it often influences consumer choices and purchasing behavior. Brands with high recognition are more likely to attract and retain customers, as consumers tend to feel more familiar and comfortable with products or services associated with well-known and reputable brands. Successful marketing and consistent brand messaging contribute significantly to building and maintaining brand recognition.

Method

One widely utilized technique in Multiple Criteria Decision Making (MCTM) is COPRAS (Complex Proportionality Assessment). It involves determining the optimal solution by assessing the best-rated option among available choices, providing a superior alternative to address problematic solutions. However, COPRAS encounters challenges in decision-making. Researchers employ various methods to address these issues[15,16]. The COPRAS-G method involves defining selection criteria, evaluating relevant information related to these criteria, and creating techniques to assess how well participant needs are met. To evaluate the overall performance of a surrogate in decision-making, specific standards must be fulfilled. A decision maker (DM) must compare and choose among various options, each with distinct requirements. The Complex Proportionality Assessment (COPRAS) method is particularly effective in these situations. Originating in Lithuania in 1996, the COPRAS approach finds application in real estate, construction economics, and management[17]. An article discusses risk assessment in construction projects, employing several multi-objective evaluation techniques. The evaluation takes into consideration the interests, goals, and various factors influencing building efficiency and the growth in real estate prices in different countries[18]. When choosing a device tool, the Cobras approach is employed, resulting in the selection of triangular ambiguous numbers because of their computational efficiency. This methodology incorporates fuzzy logic, and three domain experts are enlisted to assign weights[19]. The ranking of System 1 (MC1) and device 2 (MC2) is similar, achieved by integrating the fuzzy Cobra's method with machine three and machine four. The evaluation of Consumer Relationship Management (CRM) performance employs COPRAS, wherein a panel of twenty experts provides a combined choice matrix based on three predefined criteria and five overall criteria. COPRAS addresses Multiple Criteria Decision Making (MCDM) challenges by calculating criterion weights and absolute performance ratings of alternatives using linguistic concepts[20]. This study investigates the effect of recent performance measures in Total Productive Maintenance (TPM) and COPRAS within an uncertain context, focusing on opinion-based multi-criteria selection using the degree of optimism approach[21]. The paper is structured as follows: Section 1 provides an overview of the disturbance and a literature review. Section 2 examines the Cobras-G technique and its associated literature. Sections 3 and 4 outline the core concepts of the Cobras-G methodology, highlighting its application in line with the proposed COPRAS-G approach[22]. The intricate proportional estimation method employs numerical data within the framework of Grey Systems Theory. The Cobras-G methodology is based on applications of Grey Systems Theory, real-world decision-making scenarios, and duration-based standard values, as detailed in the provided certificate[23]. The COPRAS methodology has transformed into a highly relevant social media network, employing a rank-and-choose approach. The framework's suggested applicability has been underscored through repeated demonstrations of its effectiveness[24]. COPRAS, which stands for Complex Proportionality Assessment, necessitates a comprehensive understanding of crucial criteria, exploration of potential alternatives, and a comparative analysis of information to assess the cumulative performance of different alternatives[25-27]. The utilization of such criteria to meet decision-makers' demands for grading and comparison places decision-makers in the challenging position of selecting from numerous available options, often characterized by predetermined and frequently incompatible standards. Consequently, the real-world application of the developed Complex Proportionality Assessment (COPRAS)

Table 1: Data Set

Doctor ID	*prescription rate*	*Efficiency*	*Marketing spend*	*Brand Recognition*
ID 1	120.00	4.50	5000.00	4.60
ID 2	90.00	4.00	7000.00	4.00
ID 3	150.00	4.80	4500.00	4.20
ID 4	110.00	4.20	6000.00	4.40
ID 5	80.00	3.80	8000.00	4.50

method emerges as a viable alternative in scenarios where the evaluation involves ambiguous criteria, and the values of standards cannot be easily quantified.

RESULTS AND DISCUSSION

Table 1 shows compare the above values Prescription Rate

Table 1 shows compare the above values Prescription Rate: Doctor 3 has the highest prescription rate (150.00), indicating they write the highest number of prescriptions. Doctor 5 has the lowest prescription rate (80.00), suggesting a comparatively lower frequency of prescribing medications. Efficiency: Doctor 3 also demonstrates the highest efficiency score (4.80), implying that this doctor achieves a high prescription rate with optimal resource utilization. Doctor 5 has the lowest efficiency score (3.80), suggesting potential areas for improvement in resource utilization to increase prescription rates. Marketing Spend: Doctor 5 has the highest marketing spend (8000.00), but this does not correspond to the highest prescription rate. This might prompt a closer examination of the effectiveness of the marketing strategies employed. Doctor 3, with a moderate marketing spend (4500.00), has the highest prescription rate and efficiency, indicating a potentially more effective allocation of resources. Brand Recognition: Doctor 1 has the highest brand recognition score (4.60), suggesting that this doctor's brand is well-recognized, which might positively influence prescription practices. Doctor 2 has the lowest brand recognition score (4.00), and their prescription rate is also relatively lower. This correlation could indicate the importance of brand recognition in prescription practices.

Figure 1 illustrates the graphical representation of Investigation of Pharmaceutical Marketing Influence on Prescription Practices of Doctors.

Table 2 shows Normalized data Prescription Rate

Table 2 shows Normalized data Prescription Rate: Ranges from 0.1455 to 0.2727, with each doctor's prescription rate scaled proportionally to fit within the normalized range. Efficiency: Ranges from 0.1784 to 0.2254, representing the normalized efficiency scores for each doctor. These values indicate the relative efficiency of each doctor concerning prescription practices. Marketing Spend: Ranges from 0.1475 to 0.2623, providing a standardized view of the marketing spend for each doctor. Higher values suggest a larger share of the total marketing spend. Brand Recognition: Ranges from 0.1843 to 0.2120, reflecting the normalized brand recognition scores. These values indicate the relative strength of brand recognition for each doctor.

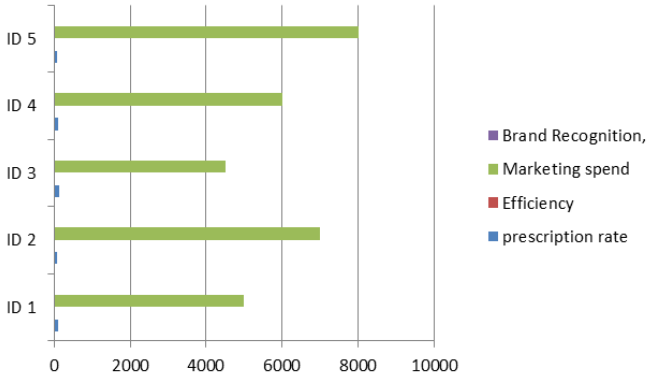

Figure 1: graphical representation of Investigation of Pharmaceutical Marketing Influence on Prescription Practices of Doctors

Table 2: Normalized data Prescription Rate

Doctor ID	*prescription rate*	*Efficiency*	*Marketing spend*	*Brand Recognition*
ID 1	0.2182	0.2113	0.1639	0.2120
ID 2	0.1636	0.1878	0.2295	0.1843
ID 3	0.2727	0.2254	0.1475	0.1935
ID 4	0.2000	0.1972	0.1967	0.2028
ID 5	0.1455	0.1784	0.2623	0.2074

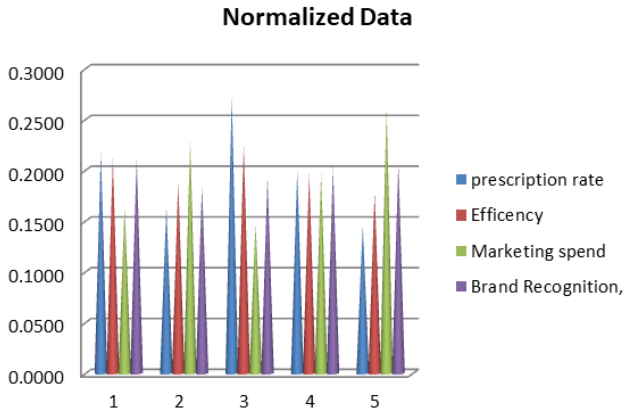

Figure 2: Normalized data

The normalized data presented in Figure 2 includes four key factors

Normalized Data (Figure 2)

The normalized data presented in Figure 2 includes four key factors: Prescription Rate, Efficiency, Marketing Spend, and Brand Recognition. Each factor is measured across five distinct data points. The Prescription Rate ranges from 0.1455 to 0.2727, reflecting varying levels of prescription activity. Efficiency scores span from 0.1784 to 0.2254, indicating differences in how effectively prescriptions are managed. Marketing Spend varies between 0.1475 and 0.2623, showcasing the different levels of investment in promotional activities. Brand Recognition ranges from 0.1843 to 0.2120,

Table 3: Weight ages

Doctor ID	*Prescription rate*	*Efficiency*	*Marketing spend*	*Brand Recognition,*
ID 1	0.25	0.25	0.25	0.25
ID 2	0.25	0.25	0.25	0.25
ID 3	0.25	0.25	0.25	0.25
ID 4	0.25	0.25	0.25	0.25
ID 5	0.25	0.25	0.25	0.25

highlighting the varying degrees of brand awareness. This data provides a comprehensive view of how these factors interact and influence prescription practices.

Table 3 shows weight ages the interpretation of these weights suggests that all four metrics (prescription rate, Efficiency, Marketing spend, Brand Recognition.) are considered equally important in the assessment of Investigation of Pharmaceutical Marketing Influence on Prescription Practices of Doctors.

The table 4 weighted normalized decision matrix for doctors, as shown in the table, provides a comparative assessment of five doctors across four criteria. For Doctor ID 1, the weighted scores are 0.05 for each criterion, reflecting a consistent performance across the factors. Doctor ID 2 has slightly higher scores in the Marketing Spend and Brand Recognition categories, with a weighted score of 0.06 in Marketing Spend, while maintaining a score of 0.05 in the other criteria. Doctor ID 3 shows a notable score of 0.07 in Prescription Rate, with other criteria being slightly lower. Doctor ID 4's scores are uniformly set at 0.05, indicating a balanced performance across all factors. Doctor ID 5 has the highest score of 0.07 in Marketing Spend, with lower scores in the other criteria. This matrix helps in evaluating and comparing the performance of different doctors based on weighted criteria.

Table 5 shows Bi, Ci, Min (Ci)/Ci value Bi and Ci:Bi and Ci are variables representing different aspects of the investigation. Without specific information about the context or definitions of Bi and Ci, it's challenging to provide a precise interpretation. Typically, these could represent various factors, such as prescription rates, efficiency scores, marketing metrics, or other variables relevant to the study. Min(Ci)/Ci: This column appears to calculate the minimum value of Ci divided by Ci for each corresponding set of Bi and Ci values. This ratio is useful in identifying the relative impact of the minimum value in the Ci set on the overall Ci values. A higher Min(Ci)/Ci ratio suggests that the minimum value has a more pronounced influence on the overall Ci. Interpretation Example: Taking the first row as an example, if Bi is 0.107 and Ci is 0.094, the minimum value in the Ci set is 0.094, and the Min(Ci)/Ci ratio is calculated as 0.9074. This indicates that the minimum value in the Ci set has a relatively high impact on the overall Ci value in this case.

Table 6 shows Qi, Ui value Qi seems to be a numerical value associated with each doctor, potentially representing a composite score or a metric summarizing the influence of pharmaceutical marketing on prescription practices for each doctor. The exact calculation or definition of Qi would require additional context or information. Ui: Ui appears to be another numerical value associated with each doctor, possibly indicating a certain aspect of the investigation. Similar to Qi, the specific meaning of Ui would depend on the context of the study.

Table 4: Weighted normalized decision matrix

Doctor ID	*prescription rate*	*Efficiency*	*Marketing spend*	*Brand Recognition,*
ID 1	0.05	0.05	0.04	0.05
ID 2	0.04	0.05	0.06	0.05
ID 3	0.07	0.06	0.04	0.05
ID 4	0.05	0.05	0.05	0.05
ID 5	0.04	0.04	0.07	0.05

Table 5: Bi, Ci, and Min (Ci)/Ci value

Doctor ID	*Bi*	*Ci*	*Min(Ci)/Ci*
ID 1	0.107	0.094	0.9074
ID 2	0.088	0.103	0.8242
ID 3	0.125	0.085	1.0000
ID 4	0.099	0.100	0.8538
ID 5	0.081	0.117	0.7262

Table 6: Qi, Ui and Rank

Doctor ID	Qi	Ui	Rank
ID 1	0.213	88.3980	2
ID 2	0.183	76.2778	4
ID 3	0.240	100.0000	1
ID 4	0.198	82.4622	3
ID 5	0.165	68.6872	5

The Figure 4 data provided outlines the performance metrics for four doctors, as represented by two key indicators: Qi and Ui. Doctor ID 1 has a Qi value of 0.213 and an Ui score of 88.3980, reflecting a moderate performance with a high level of effectiveness. Doctor ID 2 exhibits a Qi value of 0.183 and a Ui score of 76.2778, indicating slightly lower performance and effectiveness compared to others. Doctor ID 3 stands out with the highest Qi value of 0.240 and a perfect Ui score of 100.0000, demonstrating the strongest performance and effectiveness among the doctors. Doctor ID 4 has a Qi value of 0.198 and an Ui score of 82.4622, showing a solid performance with a notable level of effectiveness. This data helps in assessing and comparing the overall performance and effectiveness of each doctor based on these metrics.

Figure 5 Shows ranking of Investigation of Pharmaceutical Marketing Influence on Prescription Practices of Doctors Doctor 03 is got the first rank whereas Doctor 05 is having the lowest rank.

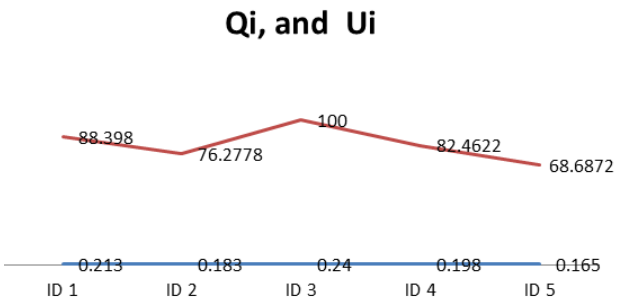

Figure 4: Qi, Ui value

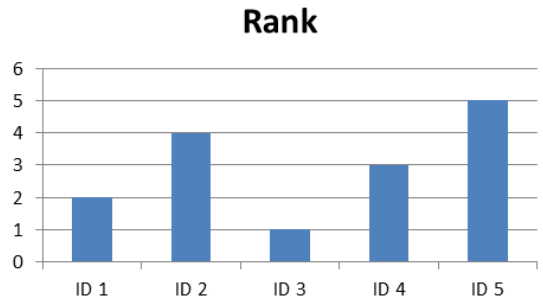

Figure 5: Ranking of Investigation of Pharmaceutical Marketing

CONCLUSION

The investigation into the influence of pharmaceutical marketing on the prescription practices of doctors reveals a complex interplay of factors that impact medical decision-making. The findings underscore the significant impact of marketing strategies employed by pharmaceutical companies on physicians' prescribing behaviors. The extensive outreach programs, sponsored events, and provision of educational materials create an environment where doctors may be subtly swayed towards prescribing promoted drugs. Clinical evidence and physicians' ethical considerations also play pivotal roles. While pharmaceutical marketing undoubtedly exerts influence, its impact is not absolute, and healthcare professionals must remain vigilant in maintaining the integrity of their prescribing practices. Addressing the potential biases introduced by marketing efforts requires a holistic approach, combining regulatory measures, ongoing medical education, and ethical guidelines to ensure that patient care remains the central focus of medical decision-making.

REFERENCES

1. Kasliwal N, Bansal I. Influence of pharmaceutical promotional tools on doctors prescribing behaviour: an exploratory study. Indian journal of Marketing. 2013;43(8):23-34.
2. Krunal VS, Solanki S, Inumula KM. Impact Study of Various Pharmaceutical Promotional Practices on Indian Doctor 'S Prescription Behavior. European Journal of Molecular & Clinical Medicine. 2020;7(8):2020.
3. Murshid MA, Mohaidin Z, Nee GY. Moderating effects of contextual factors on relationship between pharmaceutical marketing strategies and physician prescription decision: A review. Tropical Journal of Pharmaceutical Research. 2016;15(7):1559-1568.
4. Lundin D. Moral hazard in physician prescription behavior. Journal of health economics. 2000;19(5):639-662.
5. Spiller LD, Wymer Jr WW. Physicians' perceptions and uses of commercial drug information sources: An examination of pharmaceutical marketing to physicians. Health marketing quarterly. 2001;19(1):91-106.
6. Ahmed RR, Channar ZA, Soomro RH, Vveinhardt J, Streimikiene D, Parmar V. Antecedents of symmetry in physicians' prescription behavior: evidence from SEM-based multivariate approach. Symmetry. 2018;10(12):721.
7. Warrier R, Monaghan MS, Maio A, Huggett K, Rich E. Effect of drug sample availability on physician prescribing behavior: a systematic review. Clinical Review Opinion. 2010;2(4):41-48.
8. Shanmugasundar G, Vanitha M, Čep R, Kumar V, Kalita K, Ramachandran M. A comparative study of linear, random forest and adaboost regressions for modeling non-traditional machining. Processes. 2021;9(11):2015.
9. Mizik N, Jacobson R. Are physicians "easy marks"? Quantifying the effects of detailing and sampling on new prescriptions. Management Science. 2004;50(12):1704-1715.
10. Cockburn J, Pit S. Prescribing behaviour in clinical practice: patients' expectations and doctors' perceptions of patients' expectations—a questionnaire study. Bmj. 1997;315(7107):520-523.
11. Napit PR. Promotional efforts of pharmaceutical industries on prescribing pattern of antibiotics among medical doctors in Nepal. Journal of Business and Social Sciences Research. 2016;1(2):201-214.
12. Abulhaj E, ELSamen AA, Alabbadi I. Investigating the factors affecting doctor's prescribing behavior in Jordan: Antihypertensive drugs as an example. European Journal of Social Sciences. 2013;38(3):380-391.
13. Mehralian G, Sharif Z, Yousefi N, Akhgari M. Physicians' loyalty to branded medicines in low-middle-income countries: A structural equation modeling. Journal of Generic Medicines. 2017;13(1):9-18.
14. Srivastava RK, Kumar SJ. Understanding of consumer's awareness about brands in pharmaceutical industry: An empirical study. Journal of medical marketing. 2014;14(2-3):99-107.
15. Yazdani M, Alidoosti A, Zavadskas EK. Risk analysis of critical infrastructures using fuzzy COPRAS. Economic research-Ekonomska istraživanja. 2011;24(4):27-40. DOI: https://doi.org/10.1080/1331677X.2011.11517478
16. Aghdaie MH, Zolfani SH, Zavadskas EK. Market segment evaluation and selection based on application of fuzzy AHP and COPRAS-G methods. Journal of Business Economics and Management. 2013;14(1):213-33. DOI: https://doi.org/10.3846/16111699.2012.721392
17. Kildienė S, Kaklauskas A, Zavadskas EK. COPRAS based comparative analysis of the European country management capabilities within the construction sector in the time of crisis. Journal of Business Economics and Management. 201;12(2):417-434.
18. Das MC, Sarkar B, Ray S. A framework to measure relative performance of Indian technical institutions using integrated fuzzy AHP and COPRAS methodology. Socio-Economic Planning Sciences. 2012;46(3):230-241. DOI: https://doi.org/10.1016/j.seps.2011.12.001

19. Dhiman HS, Deb D. Fuzzy TOPSIS and fuzzy COPRAS based multi-criteria decision making for hybrid wind farms. Energy. 2020;202:117755. DOI: https://doi.org/10.1016/j.energy.2020.117755
20. Fouladgar MM, Yazdani-Chamzini A, Lashgari A, Zavadskas EK, Turskis Z. Maintenance strategy selection using AHP and COPRAS under fuzzy environment. International journal of strategic property management. 2012;16(1):85-104. DOI: https://doi.org/10.3846/1648715X.2012.666657
21. Turanoglu Bekar E, Cakmakci M, Kahraman C. Fuzzy COPRAS method for performance measurement in total productive maintenance: a comparative analysis. Journal of Business Economics and Management. 2016;17(5):663-684.DOI: https://doi.org/10.3846/16111699.2016.1202314
22. Zolfani SH, Rezaeiniya N, Aghdaie MH, Zavadskas EK. Quality control manager selection based on AHP-COPRAS-G methods: a case in Iran. Economic research-Ekonomska istraživanja. 2012;25(1):72-86.DOI:https://doi.org/10.1080/1331677X.2012.11517495
23. Tavana M, Momeni E, Rezaeiniya N, Mirhedayatian SM, Rezaeiniya H. A novel hybrid social media platform selection model using fuzzy ANP and COPRAS-G. Expert Systems with Applications. 2013;40(14):5694-5702.DOI: https://doi.org/10.1016/j.eswa.2013.05.015
24. Singh C, Yashwant, Gupta AK. Formulation and the Study of Finished Products Used for Anginal Disease. International Journal of Pharmaceutical Quality Assurance. 2022;13(4):385-388. DOI: 10.25258/ijpqa.13.4.07
25. Al-Mashhadani, Z. I., A. M. Aljeboree, N. D. Radia, and O. K. A. Alkadir. "Antibiotics Removal by adsorption onto eco-friendly surface: characterization and kinetic study." International Journal of Pharmaceutical Quality Assurance 2021;12(4):252-255.
26. Abed, Saif M., May A. Hamed, and Hussein T. Abdulabbas. "The Effect of Boric Acid on Immune Response in Mice Vaccinated by Proteus Vulgaris Antigen." International Journal of Pharmaceutical Quality Assurance (2019);10(33):741-746.
27. Kouchaksaraei RH, Zolfani SH, Golabchi M. Glasshouse locating based on SWARA-COPRAS approach. International Journal of Strategic Property Management. 2015 ;19(2):111-122. DOI: https://doi.org/10.3846/1648715X.2015.1004565