***Original Research Article***

# Do Demographic Factors Influence Physicians' Perceptions of the Effectiveness of Pharmaceutical Marketing Strategies?


## ABSTRACT

*Pharmaceutical companies employ a variety of marketing strategies to influence physicians' prescribing behaviour in favour of their drugs. Every year, billions of dollars are spent on such marketing strategies. However, research on the role of physicians' socio-demographic variables in pharmaceutical marketing is scarce.Thus, the study aimed to determine whether physicians' demographic characteristics influence their perceptions of the effectiveness of marketing strategies. A structured questionnaire was used to collect primary data from a sample of 425 physicians. The study found that physicians' perceptions of the effectiveness of medical representatives and ads in medical journals were unaffected by their gender. Demographic variables such as age and experience significantly affected the effectiveness perceptions of physicians. However, only medical representatives were found to be significantly affected by physicians' areas of practice. According to the findings of this study, the older and more experienced the physicians are, the more they perceive marketing strategies are effective in influencing their prescribing behaviour. In addition, general physicians perceived medical representatives as more effective than specialists.This study would be a significant contribution to the existing body of knowledge and also aid pharmaceutical marketing managers in achieving their sales goals effectively.*



**Keywords:** Ads in medical journals, Effectiveness, Medical representatives, Perception, Pharmaceutical marketing strategies, Physician.


## 1. INTRODUCTION

The Pharmaceutical Industry has a key role in the world economy along with ascertaining and maintaining the health and welfare of people at large. Globally, the pharmaceutical industry is one of the rapidly growing industries, and as of end-2021, the global pharmaceutical market was valued at about $1.42 trillion [1]. The key drivers of growth will continue to be the United States and pharmerging markets (like India, China, Brazil etc) with 4–7% and 5–8% compound annual growth, respectively[2]. The Indian

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pharmaceutical industry is also a rapidly growing industry in the world and it is the third-largest pharmaceutical market in Asia. The Indian pharmaceutical sector is expected to grow to US$ 100 billion by 2025. Indian drugs are exported to more than 200 countries in the world with the US as a key market. India is the world's largest provider of generic medicines as the country's generic drugs account for 20 per cent of global generic drug exports [3]. The share of exported drugs is expected to increase continuously, owing to the policy support provided by the Indian government to the pharmaceutical industry in the form of pharma vision 2020, reduction in approval time for new facilities, single-window clearance, support for technology upgrades and foreign direct investments like initiatives.

The nature of the pharmaceutical sector is unique, given the fact that the chooser is not the user. Hence, the marketing strategies used in the pharmaceutical sector are also at variance with those used in other sectors [4]. Mostly, the drugs consumed by patients (users) are decided by physicians (choosers), and as a result, the major chunk of the marketing budget of pharmaceutical companies is expended in the direction of changing and influencing the physician prescribing behaviour to stimulate sales [5]. The dominant role played by physicians in the pharmaceutical sector can be comprehended by the fact that the prescription drugs market was valued at USD 1,015.63 billion in 2021 and is expected to reach USD 1,482.35 billion by 2029, registering a CAGR (Compound annual growth rate) of 4.84% during the forecast period of 2022 to 2029[6]. For that reason, the expenditure of pharmaceutical companies on marketing activities is ironically more than double they expend on research and development of new drugs[3].

Although there is rich literature which has sought to measure the marketing relationship between physicians and the pharmaceutical industry, the perspective of physicians regarding the effectiveness of marketing strategies has been rarelystudied[7]. According to previous research studies, the nexus between pharmaceutical companies and physicians has not been adequately studied in third-world nations [8], [9]. To address the identified gaps in the existing literature, the current study attempts to develop a framework for determining the role of specific demographic variables in affecting physicians' perceptions of the effectiveness of pharmaceutical marketing strategies.

## 2. LITERATURE REVIEW AND HYPOTHESES

Drug prescribing behaviour of physicians is a complex decision-making process affected by diverse factors such as marketing, pharmacists, contextual factors and so on[10]. A significant number of past studies have argued that the marketing strategies of

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pharmaceutical companies are one of the most influential factors[11]–[13]. The most commonly studied marketing strategies such as medical representatives (MRs), ads in medical journals, the brand of the drug, free drug samples, promotional gifts etc., are effective in swaying the prescribing decisions of physicians[12], [14]–[16]. Murshid and Mohaidinhave reported that a medical representative is a primary source of drug information for physicians, especially in the third-world nation[4]. The lack of sufficient and reliable sources of information in developing countries has been reported as the main reason for the influential role of medical representatives in such countries[4]. The knowledge of medical representatives about their drugs' efficacy, side effects, dosage etc., increases the importance of medical representatives in such poor resource countries by manifolds. Similarly, Waheed et al.and Al-Areefi et al.discovered that, in developing countries such as India and Yemen, MRs are considered to be an important source of information for physicians[17], [18]. Further, the direct face-to-face interaction between medical representatives and physicians also enables them to effectively influence the prescribing decisions of physicians in favour of their drugs[13].

Drug advertisements in leading medical journals are another important marketing strategy of pharmaceutical companies to sway the prescribing decisions of physicians in favour of their drugs [19], [20]. ascertained that promotional literature such as ads in medical journals and drug brochures successfully influenced the prescribing decisions of physicians[21]. Similarly, Sharma et al. were of the view that drug promotional literature serves as an important marketing strategy to promote new drugs to physicians[22]. However, physicians for whom drug promotional literature is a primary source of information were found to indulge in irrational prescribing of drugs. Srivastavaand Bodkhein their research study established that the proven clinical effectiveness of drugs is an important criterion for physicians to choose a drug[23]. Thus, physicians trust the publication in medical journals as it gives them adequate information aboutside effects, results of clinical trials, dosage etc.

Previous research studies have attempted to decipher whether the perception of the physician toward pharmaceutical marketing activities is based on the physician's demographic profile [21], [24], [25]. The objective of the study conducted by Tanejawas to test whether physicians' age, gender, area of practice and income affect their perception oftheeffectiveness of pharmaceutical marketing[9]. The study ascertained that only area of practice influencetheattitude of physicians towards pharmaceutical marketingstrategies,

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especially medical representatives. Similarly, another study revealed that on the basis of hospital kind there exists a significant difference in the perceptions of physicians. However, other demographic characteristics of doctors such as gender, age, experience and speciality did not make any significant difference in the perceptions of doctors[21]. The existing literature has highlighted the need to understand the phenomenon of how the influence of marketing strategies varies from physician to physician [7]. Thus, it would be of great importance for pharmaceutical marketing managers to understand the role of demographic characteristics of physicians and develop customized marketing strategies for successfully influencing prescribing decisions in favour of their drugs. The current study sought to test the following stated hypotheses.

H1: Gender has a significant impact on medical representatives.

H2: Gender has a significant impact on ads in medical journals.

H3: Physicians' age has a significant effect on medical representatives.

H4: Physicians' age has a significant effect on ads in medical journals.

H5: Physicians'experience has a significant effect on medical representatives.

H6: Physicians'experiencehas a significant effect on ads in medical journals.

H7: Physicians'area of practice has a significant effect on medical representatives.

H8: Physicians'area of practice has a significant effect on ads in medical journals.

**The conceptual framework**

Based on the above discussion of findings from extant literature, the conceptual framework presented in Figure – 1 is proposed as the tool for understanding the existence of different direct and indirect relationships between independent variables. Socio-demographic characteristics such as gender, age, experience and area of practicehave been taken as independent (dummy)variables.Pharmaceutical marketing strategies viz. medical representatives and ads in medical journals were taken as dependent variables. Researchers believed demographic factors are very crucial in influencing the perceptions of physicians towards the effectiveness of marketing strategies.

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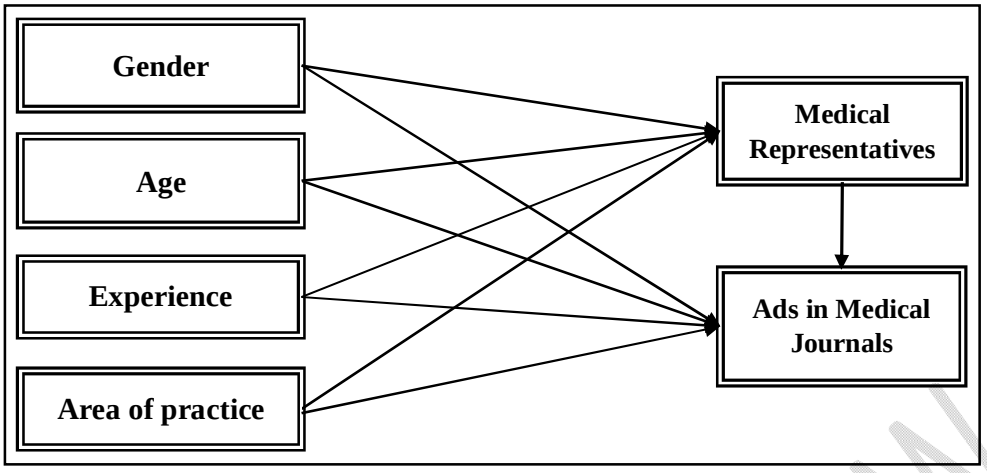


***Figure 1. Conceptual Framework***

## 3. RESEARCH METHODOLOGY

### 3.1. Study design and Sample

A descriptive cross-sectional survey design was used. The survey was anonymous, and the information was treated confidentially. The current study was carried out in the union territory of Jammu and Kashmir (J&K) and the collection of data was done between March and May 2022. The sample for the study was taken from the target population of physicians working in various district hospitals, sub-district hospitals and community health centresacross J&K. The probability sampling technique i.e., two-stage cluster sampling was used to select the respondents of the study.In the first stage, J&K was divided into two clusters viz. Jammu division and Kashmir division. From the two clusters, Kashmir was choosen randomly. In the second stage, Kashmir division was further divided into 10 homogenous clusters and out of which five were randomly choosen with the help of select cases feature of IBM SPSS. The two-stage cluster sampling method was preferred for two main reasons or advantages. First, when the population is dispersed over a large geographical area, cluster sampling is used to save time and money. Second, there is no requirement for a list of elements or a sampling frame in cluster sampling when selecting a population sample [26]–[28]. Because the study's respondents were dispersed across a large geographical area of J&K, cluster sampling was deemed to be the most appropriate technique for selecting respondents for the study.

A total of 486 questionnaires were distributed out of which only 427 were received back. On the visual inspection of the received responses, two were identified as having

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significant missing values. After removing the responses with missing values, the total number of questionnaires that were complete and valid was 425. Thus, the response rate amounted to 87.44. The sample of 425 was determined significant for testing hypothesized relationships becausethe 10 times criteria for sample size was satisfied[29].

### 3.2. Measures

The six-point scale anchored from 1=strongly disagrees to 6=strongly agree, was utilized to acquire primary data from respondents. The demographic information of respondents such as gender, age, experience and area of practice (specialization) were collected in the first section of the questionnaire. This was followed by a section in which respondents were instructed to score their level of agreement or disagreement with the effectiveness of marketing strategies such as medical representatives and ads in medical journals.

There is a serious lack of suitable standardised instruments in the drug prescribing literature for assessing the influence of marketing factors on prescribing behaviour[30]. The studies reviewed were mostly descriptive in nature, relied on panel data from physicians via interviews or focus group discussions and assessed marketing factors using a single factor with a single item. With an aim to fill this void an instrument was developed and validated to analyse the model of the study. A sample of 72 respondents was used for pilot testing. The Cronbach's alpha of two constructs viz. medical representatives and ads in medical journals were assessed first.Thealpha values of medical representatives and ads in the medicaljournal were 0.84 and 0.86, respectively, and were above the acceptable cut-off value of 0.70 [31]. In the next step, exploratory factor analysis was conducted to test the factors. IBM SPSS (version 25) software was used to perform principal component analysis (PCA) along with varimax rotation on a total of 10 items. One item from each factor (medical representatives and ads in medical journals) did not load significantly on their respective factors and therefore wasremovedfrom the overall model. After removing problematic items, we obtained a clean factor matrix consisting of two factors and 8 items (see Appendix 1 and 2).

Gender was operationalized as a categorical variable consisting of two response categories such as male and female. Age was operationalized as an ordinal variable with three mutually exclusive response categories such as; up to 35 years, 36-55 and more than 55 years. An ordinal scale consisting of three response categories was used to measure the practicing experience of the participants. Finally, area of practice (specialization) was

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operationalized as a categorical variable consisting of two response categories such as general physician and specialist.

### *3.2.1. Breif description of the understudy variables.*

MRs (also known as detailing or detail men) is the use of pharmaceutical company personnel to provide information to physicians about the use of company-sponsored drugs [4], [32]. An MR may be perceived as a technical expert in the drug field on whom physicians can rely for accurate information relevant to their prescribing practice [33]. MRs are now also equipped with drug information, specialised training, and the authority to offer physicians sponsorships, promotional gifts, and other promotional items [12]. Due to their direct interaction with physicians and being the first source of new drug information to the doctors, MRs is the most effective marketing tool for persuading physicians to prescribe their drugs [34].

Medical journal advertising is another important marketing technique used by pharmaceutical companies to entice physicians to prescribe the promoted drugs[20], [35], [36]. Previous research studies have ascertained that the drug-related information (such as efficacy, safety, dosage, contradictions etc.,) provided in medical journals has a profound impact on the drug prescribing behaviour of physicians and as a result, is effective in swaying the prescribing decisions of physicians towards the promoted drugs [4], [19], [37], [38]. Table 1 depicts the scale items used to measure the effectiveness of medical representatives and ads in medical journals.

***Table 1. scale's items and sources***

| Factor | Item | Item code | Literature support/source |
|---|---|---|---|
| Medical representatives (MRE) | MRs help me to stay updated about the latest developments in the field of medicine | MRE1 | [30], [36], [39]–[41] |
| | MRs often listen attentively to identify and understand the real concerns of doctors | MRE2 | |
| | MRs provide drug information clearly and concisely through audio-visual aids | MRE3 | |
| | MRs serve as an important source for updating my knowledge about new drugs in the market | MRE4 | |
| Ads in medical | Advertisements in medical journals prevent | AMJ1 | [41], [42] |

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| | | | |
|---|---|---|---|
| journals (AMJ) | the under-use of potentially valuable drugs | | |
| | Ads in medical journals are effective in increasing my awareness about new drugs | AMJ2 | |
| | Ads in medical journals generate my interest in a drug | AMJ3 | |
| | Drug advertisements published in medical journals may influence my prescription decisions directly or indirectly | AMJ4 | |

### 3.3. Tools of Analysis

The exploratory factor analysis (EFA)/ pilot testing was carried out using the IBM Statistical Package for the Social Sciences (SPSS) version 25. The measurement and structural equation models were evaluated using the Partial Least Square Structural Equation Model (PLS-SEM) in SmartPLS version 3.3.3 [43]. PLS-SEM is a second-generation regression technique for complicated causal modelling, commonly known as variance-based structural equation modelling [44], [45]. PLS-SEM has become a well-established approach in marketing and business research. It also has numerous notable advantages over conventional regression techniques that were applicable to the current research study.

## 4. RESULTS

### 4.1. Demographic characteristics of respondents

The total number of respondents who took part in this study was 425 respondents from Jammu and Kashmir, India. There were 58.6% males and 41.4% females in the study. 25.4% of all respondents were up to the age of 35years, 67.1% were between the ages of 36 and 55 years, and 5.4% were beyond 55 years. In relation to the overall number of participants, 44.2% reported their practicing experience ofup to 10 years, 44.9% had an experience of 11 to 20 years and 10.8% were having experience above 55 years. This study also collected information about respondents' specialization; 30.8% declared that they were general physicians and 69.2% were specialists.

### 4.2. Valuation of the measurement model

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The model must be tested for reliability and validity before examining hypothesized relationships. Table 2 displays the extracted "factor loadings, Cronbach's alpha (α), Composite reliability, and average variance extracted (AVE)" score of the variables. Cronbach's alpha (α), composite reliability (CR), and factor loadings greater than 0.70 are considered reliable [44]. The convergent validity of the indicators has been established with AVE exceeding the 0.50 threshold value [46]. The current study's alpha values ranged from 0.821 to 0.913, confirming the scale's reliability.

Table 2: Reliability and Validity results

| Construct | Items | Loadings | Cronbach's Alpha (α) | Composite Reliability (CR) | Average Variance Extracted (AVE) |
|---|---|---|---|---|---|
| Medical Representatives (MRE) | MRE1 | 0.764 | 0.821 | 0.875 | 0.584 |
| | MRE2 | 0.802 | | | |
| | MRE3 | 0.791 | | | |
| | MRE4 | 0.811 | | | |
| Ads in Medical Journals (AMJ) | AMJ1 | 0.809 | 0.913 | 0.933 | 0.698 |
| | AMJ2 | 0.873 | | | |
| | AMJ3 | 0.864 | | | |
| | AMJ4 | 0.867 | | | |

The discriminant validity was determined by utilising the Heterotriat-Monotrait correlation (HTMT). The HTMT value shown in Table 3is less than the cut-off of 0.85[46]. As a result, the measurement model exhibits discriminant validity, and the model's constructs are all distinct from one another.

Table3: Discriminant Validity Results(HTMT)

| | Medical Representatives | Ads in Medical Journals |
|---|---|---|
| Medical Representatives | | |
| Ads in Medical Journals | 0.589 | |

### 4.3. Regression results

Collinearity between the constructs should also be verified while evaluating the structural model. Inner VIF scores were examined to check issues of multicollinearity among items. The presence of multicollinearity among the items can cause serious doubts about the

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robustness of the results of regression analysis [47]. According to James et al.,VIF values of 0.5 or higher indicate the presence of problematic multicollinearity. In the current study, all the VIF scoreswere less than the cut-off value (see appendix 3)and thus,there was no issue of multicollinearity in the model[48].

Table 4 presents the regression results of the hypothesized relationships.The study's empirical results show that gender had no significant impact on both variables (medical representatives and ads in medical journals). Thus,there is no significant difference in the perception of physicians regarding the effectiveness of pharmaceutical marketing strategies. These results substantiate the findings of the previous studies of Handa et al.[21] and Taneja[9]. These studies discovered that only specialization and hospital type (public or private) influenced the perceptions of physiciansregardingtheeffectiveness of marketing strategies.

***Table 4. Hypotheses testing results***

| Hypotheses | Relationships | | Path coefficient |
|---|---|---|---|
| H1 | Gender -->MRE | Male ->MRE | 0.006 |
| | | Female ->MRE | 0.013 |
| H2 | Gender -->AMJ | Male ->AMJ | -0.041 |
| | | Female ->AMJ | 0.09 |
| H3 | Age -->MRE | Up to 35 years -> MRE | -0.501** |
| | | 36 to 55years ->MRE | -0.463** |
| | | More than 55 ->MRE | 0.182** |
| H4 | Age -->AMJ | Up to 35 years ->AMJ | -0.565** |
| | | 36 to 55 years ->AMJ | -0.458** |
| | | More than 55 ->AMJ | 0.178* |
| H5 | Experience -->MRE | Up to 10 ->MRE | -0.235** |
| | | 11 to 20 ->MRE | 0.384** |
| | | More than 20 ->MRE | 0.409** |
| H6 | Experience-->AMJ | Up to 10 ->AMJ | 0.225 |
| | | 11 to 20 ->AMJ | 0.310* |
| | | More than 20 ->AMJ | -0.138 |
| H7 | Area of practice -->MRE | General physician ->MRE | 0.162* |
| | | Specialists ->MRE | -0.139* |
| H8 | Area of practice -->AMJ | General physician ->AMJ | 0.105 |
| | | Specialists ->AMJ | -0.047 |

*Note: *P<0.05; **P<0.001: MRE=Medical Representatives; AMJ=Ads in Medical Journals*

In terms of the impact age of respondents, a considerable impact on both variables was observed. Thus, hypotheses H3 and H4 were supported by the empirical results of the study. These findings are in line with the study of Khazzakawhich ascertained that the perception of the effectiveness of pharmaceutical marketing among physicians

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significantly tends to differ on the basis of age[24]. Hypotheses H5 and H6 predicted that the experience of physicians has a significant impact on medical representatives and ads in medical journals. Only H5 was supported by the results of the study. These findings indicated that the more experienced the physicians are, the more effective they perceive medical representatives to be. Further, the final set of hypotheses (H7 and H8) anticipated that the area of practice (general physicians or specialists) exerts a significant influence on the effectiveness perception of physicians. The study's findings supported only H7, indicating that general physicians believe medical representatives are quite effective in influencing their prescribing decisions. Medical representatives, on the other hand, were deemed ineffective by specialists.These findings were discovered to be consistent with the previous literature [49].

## 5. DISCUSSION

The study adds to the existing body of pharmaceutical marketing literature by investigating the role of physicians' socio-demographic characteristics in influencing their perception of marketing strategies. This study compares the scores of physicians' perceptions of drug promotion across socio-demographic groups of physicians. This was accomplished by investigating the relationships between physicians' perceptions of the effectiveness of marketing strategies and demographic and occupational characteristics. Although similar studies have been conducted in other countries, with the exception of two studies conducted in Japan [50] and Yemen [7], those studies did not use factor analysis to validate measurements of perception towards drug promotion strategies.

It was discovered that physicians' perceptions of the effectiveness of medical representatives and ads in medical journals in influencing their prescribing behaviour are influenced by demographic factors such as age, experience, and area of practice. The study's findings revealed that as physicians age, their perceptions toward medical representatives and ads in medical journals improve. In other words, younger physicians were found to be less influenced by pharmaceutical marketing strategies as compared to older physicians. Furthermore, it was ascertained that the working experience of physicians also plays an important role in the relationship between the effectiveness of pharmaceutical marketing strategies and drug prescribing behaviour. Physicians with more than 20 years of experience rated medical representatives as more effective than physicians with 11 to 20 years of experience. Therefore, as experience grows, physicians'

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perceptions of the effectiveness of medical representatives improve. However, in terms of the effectiveness of ads in medical journals, only physicians with moderate experience (11 to 20 years) believed ads in medical journals were effective in influencing prescribing behaviour.

The impact of the demographic factor viz. area of practice (specialization) was observed to be statistically significant. The perceptions of general physicians about the effectiveness of medical representatives were found significantly different than specialists. In other words, general physicians deemed the marketing strategy of medical representatives to be effective in influencing their prescribing decisions. Our empirical research into physicians' perceptions and conclusions will aid in the betterment of the pharmaceutical industry's marketing strategies. Pharmaceutical managers should use the right promotional strategy and target the group of physicians who are more influenced than others because of the fact that once prescribing habits are formed, it may be challenging to change them[24]. As a result, the pharmaceutical company will be able to outperform its competitors in terms of marketing expense optimization and increasing sales while spending less on promotions.

## 6. CONCLUSION

This paper is a novel study on physicians' perceptions oftheeffectiveness of medical representatives and ads in medical journals in affecting their prescribing behaviour. The perceptions of physicians towards marketing strategies were found to differ in relation to demographic variables such as age, experience and area of practice. Both medical representatives and advertisements in medical journals were deemed effective by older physicians in influencing their prescribing behaviour. Physicians' perceptions of effectiveness were discovered to be gender-independent. General practitioners rated medical representatives as being more effective, and physicians with more experience tend to perceive marketing tactics are more successful in influencing their prescribing decisions.In pharmaceutical marketing, physicians play an important role. Thus, influencing the physician is critical to pharmaceutical sales, and by using appropriate promotional tools, a pharmaceutical company can increase sales while spending less on marketing.

### Consent

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As per international standard or university standard, respondents' written consent has been collected and preserved by the author(s).

**Limitations and directions for future research studies.**

Although the current study adds to the pharmaceutical marketing literature in a timely and significant way by investigating the role of demographic variables. The current study, like previous studies, has several limitations. First, because the study was designed as a cross-sectional survey, it was difficult to establish casual relationships. Second, the study collected primary data through a self-reporting questionnaire method. The fact that physicians' prescribing behaviour is self-reported may be a source of bias. To overcome these limitations, future research studies could use a longitudinal or experimental research design. Third, while pharmaceutical companies employ a variety of marketing strategies to influence physician prescribing behaviour, only two were tested in the current study. Future studies can investigate the impact of other important marketing strategies such as drug brand, free drug samples, promotional gifts, and so on to draw more robust conclusions.

**REFERENCE**


[1] M. Mikulic, "Pharmaceutical market worldwide revenue 2001-2021," *Statista*, 2022. https://www.statista.com/statistics/263102/pharmaceutical-market-worldwide-revenue-since-2001/ (accessed Sep. 24, 2022).

[2] IQVIA Institute for Human Data Science, "The Global Use of Medicine in 2019 and Outlook to 2023," 2019. https://www.iqvia.com/insights/the-iqvia-institute/reports/the-global-use-of-medicine-in-2019-and-outlook-to-2023 (accessed Mar. 22, 2020).

[3] India Brand Equity Foundation, "June 2020," *IRO J. Sustain. Wirel. Syst.*, vol. 2, no. 2, 2020, doi: 10.36548/jsws.2020.2.

[4] M. A. Murshid and Z. Mohaidin, "A systematic review of the influence of medical representatives and promotional tools on prescribing: A comparison between developed and developing countries," *Int. J. Pharm. Healthc. Mark.*, vol. 11, no. 4, pp. 361–394, 2017, doi: 10.1108/IJPHM-09-2016-0047.

[5] Y. Kobashi, M. Watanabe, H. Kimura, A. Higuchi, and A. Ozaki, "Are


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Pharmaceutical Company Payments Incentivising Malpractice in Japanese Physicians ?," *Kerman Univ. Med. Sci.*, vol. 8, no. 10, pp. 627–628, 2019, doi: 10.15171/ijhpm.2018.60.

[6] D. B. M. Research, "Prescription Drugs Market Definition, Segmentation, Revenue, Scope, & Global Analysis By 2029," *Data Bridge Market Research*, 2022. https://www.databridgemarketresearch.com/reports/global-prescription-drugs-market (accessed Sep. 30, 2022).

[7] M. A. Al-Areefi, M. I. M. Ibrahim, M. A. A. Hassali, and A. A. Alfadl, "Relationships between physicians' characteristics and practice-setting factors and their attitude towards drug promotion," *J. Pharm. Heal. Serv. Res.*, vol. 10, no. 3, pp. 325–332, 2019, doi: 10.1111/jphs.12284.

[8] A. De Ferrari, C. Gentille, L. Davalos, L. Huayanay, and G. Malaga, "Attitudes and relationship between physicians and the pharmaceutical industry in a public general hospital in Lima, Peru," *PLoS One*, vol. 9, no. 6, pp. 1–7, 2014, doi: 10.1371/journal.pone.0100114.

[9] G. Taneja, "Impact of Pharmaceutical Industry Promotion Mix on Doctor's Prescribing Behaviour," *Asia Pacific Bus. Rev.*, vol. 4, no. 4, pp. 82–95, Oct. 2008, doi: 10.1177/097324700800400408.

[10] A. Teixeira Rodrigues, F. Roque, A. Falcão, A. Figueiras, and M. T. Herdeiro, "Understanding physician antibiotic prescribing behaviour: A systematic review of qualitative studies," *International Journal of Antimicrobial Agents*, vol. 41, no. 3. Elsevier B.V., pp. 203–212, 2013, doi: 10.1016/j.ijantimicag.2012.09.003.

[11] M. A. Murshid and Z. Mohaidin, "Physicians' perceptions towards brand medicine and its effect on prescribing: A narrative review," *Journal of Generic Medicines*, vol. 13, no. 4. pp. 157–183, 2017, doi: 10.1177/1741134317709509.

[12] M. A. Al-Areefi, M. A. Hassali, and M. I. B. M. Ibrahim, "Physicians' perceptions of medical representative visits in Yemen: A qualitative study," *BMC Health Serv. Res.*, vol. 13, no. 1, pp. 1–8, 2013, doi: 10.1186/1472-6963-13-331.

[13] P. Agarwal and S. Kaur, "Pharmaceutical Promotion and Its Influence on Prescription Behavior : Ethical Issues and Legal Framework in India," *Asian*

UNDER PEER REVIEW

*Bioeth. Rev.*, pp. 73–85, 2017, doi: 10.1007/s41649-017-0011-2.

[14] L. M. Ion, A. I. Vodă, R. C. Butnaru, G. I. Butnaru, and G. M. Chirita, "Effect of pharmaceutical companies' corporate reputation on drug prescribing intents in Romania," *Econ. Res. Istraz.* , vol. 34, no. 1, pp. 521–544, 2021, doi: 10.1080/1331677X.2020.1798263.

[15] R. G. Pinckney, A. S. Helminski, A. G. Kennedy, C. D. MacLean, L. Hurowitz, and E. Cote, "The effect of medication samples on self-reported prescribing practices: A statewide, cross-sectional survey," *Journal of General Internal Medicine*, vol. 26, no. 1. Springer, pp. 40–44, Jan. 31, 2011, doi: 10.1007/s11606-010-1483-x.

[16] S. Salmasi, L. C. Ming, and T. M. Khan, "Interaction and medical inducement between pharmaceutical representatives and physicians: A meta-synthesis," *Journal of Pharmaceutical Policy and Practice*, vol. 9, no. 1. BioMed Central Ltd., pp. 1–12, Nov. 17, 2016, doi: 10.1186/s40545-016-0089-z.

[17] K. Abdul Waheed, M. Jaleel, and M. Laeequddin, "Prescription loyalty behavior of physicians: An empirical study in India," *Int. J. Pharm. Healthc. Mark.*, vol. 5, no. 4, pp. 279–298, 2011, doi: 10.1108/17506121111190112.

[18] M. A. Al-Areefi, M. I. M. Ibrahim, M. A. A. Hassali, and A. A. Alfadl, "Perceptions of Yemeni physicians about interactions with medical representatives," *J. Pharm. Heal. Serv. Res.*, vol. 8, no. 4, pp. 255–260, 2017, doi: 10.1111/jphs.12195.

[19] R. R. Ahmed, Z. A. Channar, R. H. Soomro, J. Vveinhardt, D. Streimikiene, and V. Parmar, "Antecedents of symmetry in physicians' prescription behavior: Evidence from SEM-based multivariate approach," *Symmetry (Basel).*, vol. 10, no. 12, 2018, doi: 10.3390/sym10120721.

[20] T. Dhonden, N. Trung Kien, P. Wilairatana, P. Ngamjarussrivichai, and T. Konosu, "Impact of pharmaceutical promotional strategies on physicians' prescription behavior in India," *Proc. - 2020 9th Int. Congr. Adv. Appl. Informatics, IIAI-AAI 2020*, pp. 659–664, 2020, doi: 10.1109/IIAI-AAI50415.2020.00134.

[21] M. Handa, A. Vohra, and V. Srivastava, "Perception of physicians towards pharmaceutical promotion in India," *J. Med. Mark.*, vol. 13, no. 2, pp. 82–92, 2013,

UNDER PEER REVIEW

doi: 10.1177/1745790413480519.

[22] S. Sharma, N. Akhoon, H. W. Moe, D. R. Nair, and V. Shashidhar, "A study of perceptions and exposure of drug promotional literature among clinicians in a teaching hospital," *Perspect. Clin. Res.*, vol. 12, no. 3, pp. 140–145, 2021, doi: 10.4103/picr.PICR_36_19.

[23] R. K. Srivastava and J. Bodkhe, "Does brand equity play a role on doctors prescribing behavior in emerging markets?," *Int. J. Healthc. Manag.*, vol. 13, no. S1, pp. 1–11, 2020, doi: 10.1080/20479700.2017.1409954.

[24] M. Khazzaka, "Pharmaceutical marketing strategies' influence on physicians' prescribing pattern in Lebanon: Ethics, gifts, and samples," *BMC Health Serv. Res.*, vol. 19, no. 1, pp. 1–11, 2019, doi: 10.1186/s12913-019-3887-6.

[25] A. Siddiqi *et al.*, "Relevant influence of promotional tools by pharmaceutical industry on prescribing behaviors of doctors: A cross-sectional survey in Pakistan," *African J. Pharm. Pharmacol.*, vol. 5, no. 13, pp. 1623–1632, 2011, doi: 10.5897/AJPP11.243.

[26] S. N. Sanyal, S. K. Datta, and A. K. Banerjee, "Factors influencing prescribing decisions among physicians: an empirical study on generic drugs," *Int. J. Pharm. Healthc. Mark.*, vol. 11, no. 4, pp. 330–360, 2017, doi: 10.1108/IJPHM-06-2016-0031.

[27] S. Shamimulhaq, A. R. Raheem, A. Nawaz, I. Khoso, and P. Vishnu, "Factors Influencing Prescription Behavior of Physicians," *Pharma Innov. J.*, vol. 3, no. 5, pp. 30–35, 2014, [Online]. Available: http://papers.ssrn.com/abstract=2463088.

[28] S. H. aldin Sharifnia *et al.*, "Main factors affecting physicians' prescribing decisions: The Iranian experience," *Iran. J. Pharm. Res.*, vol. 17, no. 3, pp. 1105–1115, Jun. 2018, doi: 10.22037/ijpr.2018.2260.

[29] D. Barclay, R. Thompson, and C. Higgins, "The Partial Least Squares (PLS) Approach to Causal Modeling: Personal Computer Adoption and Use an Illustration," *Technol. Stud.*, vol. 2, no. 2, pp. 285–309, 1995.

[30] M. A. Murshid, Z. Mohaidin, and M. Zayed, "Development and validation of an instrument designed to measure factors influencing physician prescribing

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decisions," *Pharm. Pract. (Granada).*, vol. 17, no. 4, pp. 1–11, 2019, doi: 10.18549/PharmPract.2019.4.1616.

[31] J. C. Nunnally, *Psychometric theory*, 2nd ed. New York: McGraw-Hill, 1978.

[32] A. Datta and D. Dave, "Effects of Physician-directed Pharmaceutical Promotion on Prescription Behaviors: Longitudinal Evidence," *Heal. Econ. (United Kingdom)*, vol. 26, no. 4, pp. 450–468, Apr. 2017, doi: 10.1002/hec.3323.

[33] G. E. O'Connor, "Emerging promotional and pricing approaches in the US pharmaceutical market," *J. Prod. Brand Manag.*, vol. 23, no. 7, pp. 572–580, Nov. 2014, doi: 10.1108/JPBM-08-2014-0684.

[34] A. Faisal, M. S. Ahmad, R. Thurasamy, and R. Ahmed, "Doctors' Interactions with Pharmaceutical Sales Representatives: Modelling Doctors Prescription Behaviour," *Community Ment. Health J.*, vol. 56, no. 3, pp. 456–463, 2020, doi: 10.1007/s10597-019-00501-w.

[35] R. R. Ahmed, J. Vveinhardt, and D. Streimikiene, "The direct and indirect impact of pharmaceutical industry in economic expansion and job creation: Evidence from Bootstrapping and normal theory methods," *Amfiteatru Econ.*, vol. 20, no. 48, pp. 454–469, 2018, doi: 10.24818/EA/2018/48/454.

[36] M. A. Murshid and Z. Mohaidin, "The Influence of Information, Brand, Medical Representatives and Sales Promotion on Physician Prescribing Decision," *J. Pharm. Heal. Serv. Res.*, vol. 9, no. 3, pp. 259–269, 2018, doi: 10.1111/jphs.12228.

[37] A. S. Gallan, "Factors That Influence Physicians' Prescribing of Pharmaceuticals: A Literature Review," *J. Pharm. Mark. Manag.*, vol. 16, no. 4, pp. 3–46, 2004, doi: 10.3109/J058v16n04_02.

[38] F. Windmeijer, E. de Laat, R. Douven, and E. Mot, "Pharmaceutical promotion and GP prescription behaviour," *Health Econ.*, vol. 15, no. 1, pp. 5–18, 2006, doi: 10.1002/hec.1007.

[39] D. N. Behrman and W. D. Perreault, "Measuring the performance of industrial salespersons," *J. Bus. Res.*, vol. 10, no. 3, pp. 355–370, 1982, doi: 10.1016/0148-2963(82)90039-X.

[40] M. Ali and M. Zurina, "Physician perception of patients ' requests for medications

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in Yemen," *Drugs Ther. Perspect.*, no. 0123456789, pp. 13–15, 2019, doi: 10.1007/s40267-019-00607-x.

[41] K. Campo, O. De Staebel, E. Gijsbrechts, and W. Van Waterschoot, "Physicians' decision process for drug prescription and the impact of pharmaceutical marketing mix instruments," *Health Mark. Q.*, vol. 22, no. 4, pp. 73–107, 2005, doi: 10.1300/J026v22n04_05.

[42] G. J. Kyle, L. M. Nissen, and S. E. Tett, "Pharmaceutical company influences on medication prescribing and their potential impact on quality use of medicines," *J. Clin. Pharm. Ther.*, vol. 33, no. 5, pp. 553–559, 2008, doi: 10.1111/j.1365-2710.2008.00948.x.

[43] C. . Ringle, S. Wende, and J. . Becker, "SmartPLS 3," 2015. http://www.smartpls.com (accessed Dec. 05, 2021).

[44] J. F. Hair, C. M. Ringle, and M. Sarstedt, "PLS-SEM: Indeed a silver bullet," *J. Mark. Theory Pract.*, vol. 19, no. 2, pp. 139–152, Apr. 2011, doi: 10.2753/MTP1069-6679190202.

[45] J. Hair Jr, G. T. Hult, C. Ringle, and M. Sarstedt, *A Primer on Partial Least Squares Structural Equation Modeling (PLS-SEM)*. 2016.

[46] M. Sarstedt, C. M. Ringle, and J. F. Hair, "Partial Least Squares Structural Equation Modeling," in *Handbook of Market Research*, no. September, 2017.

[47] R. M. O'Brien, "A caution regarding rules of thumb for variance inflation factors," *Qual. Quant.*, vol. 41, no. 5, pp. 673–690, Mar. 2007, doi: 10.1007/s11135-006-9018-6.

[48] G. James, D. Witten, T. Hastie, and R. Tibshirani, *An Introduction to Statistical Learning with application in R*, vol. 7, no. 10. 2013.

[49] S. Vancelik, N. E. Beyhun, H. Acemoglu, and O. Calikoglu, "Impact of pharmaceutical promotion on prescribing decisions of general practitioners in Eastern Turkey," vol. 8, pp. 1–8, 2007, doi: 10.1186/1471-2458-7-122.

[50] S. Saito, K. Mukohara, and S. Bito, "Japanese practicing physicians' relationships with pharmaceutical representatives: A national survey," *PLoS One*, vol. 5, no. 8, p. e12193, 2010, doi: 10.1371/journal.pone.0012193.

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## *Appendix*

### *Appendix 1. Initial Rotated Component Matrix*

| Items | Component | |
|---|---|---|
| | **MRE** | **AMJ** |
| MRE3 | **0.900** | 0.043 |
| MRE1 | **0.828** | 0.244 |
| MRE2 | **0.828** | 0.223 |
| MRE4 | **0.768** | 0.216 |
| MRE5 | 0.469 | -0.252 |
| AMJ1 | 0.298 | 0.187 |
| AMJ2 | 0.076 | **0.843** |
| AMJ3 | 0.226 | **0.842** |
| AMJ4 | 0.207 | **0.800** |
| AMJ5 | 0.164 | **0.754** |

***Note**: MRE=Medical representatives; AMJ=Ads in medical journals;*
*Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.a. Rotation converged in 9 iterations.*

### *Appendix 2. Rotated Component Matrix after item deletion*

| Items | Component | |
|---|---|---|
| | MRE | AMJ |
| MRE3 | 0.908 | |
| MRE2 | 0.858 | |
| MRE1 | 0.846 | |
| MRE4 | 0.803 | |
| AMJ2 | | 0.879 |
| AMJ3 | | 0.839 |
| AMJ4 | | 0.812 |
| AMJ5 | | 0.777 |

***Note:** MRE=Medical representatives; AMJ=Ads in medical journals*
*Extraction Method: Principal Component Analysis; Rotation Method: Varimax with Kaiser Normalization.*

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*Appendix 3. Collinearity Statistics (Inner VIF)*

| Constructs | ATT | BIT | PPB |
|---|---|---|---|
| Ads in medical journals | 2.445 | | 2.636 |
| Medical representatives | 2.129 | | 2.327 |

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