

## Factors Influencing the Physician Prescribing Behaviour of Medicines in Developed and Developing Countries: A Systematic Review

Viswanath Bandi<sup>1\*</sup>, Subrata Kumar Dey<sup>2</sup>, ORS Rao<sup>3</sup>

<sup>1</sup>Faculty of Management Studies, viswanath Bandi, ICFAI University Jharkhand, Ranchi, India.

<sup>2</sup>School of Commerce and Management, Subrato Kumar dey, Arka Jain University, Jamshedpur, India.

<sup>3</sup>Board of Governors, ICFAI University Jharkhand, Ranchi, India.

### Abstract

This review aims to explore the factors influencing the prescribing behavior of medicines by physicians from the developed and developing world. Scopus and Google Scholar electronic databases were searched from 2011 to 2021 using free-text words and medical subject headings relevant to the topic. Studies included were cross-sectional studies, longitudinal studies, and reviews. Studies with narrative reviews, case reports, opinion polls, and letters to the editor were excluded from data synthesis. Three reviewers independently extracted the data based on study design, study year, country, participant characteristics, setting, and other details collected. Physicians' prescribing behavior is influenced by main factors like product-related factors, product promotion factors, physicians' professional factors, and physicians' Psychological or Personality trait factors. Physicians' prescribing decisions are complex, with multiple stakeholders playing their roles across the value chain. A thorough understanding of the various factors which vary from product-related to product promotion to physician's professional factors and Physicians' personality traits from both developed and developing countries can further enhance the development of various physician-centric initiatives from both the authorities and pharmaceutical organizations, toward enhancing the physician's awareness, knowledge, and capabilities towards improvement in their precision of care, with evidence-based medicine. The ultimate goal is to empower physicians to make better prescribing decisions from the available therapeutic alternatives, which suit the patient best for faster recovery with safety from the disease condition.

**Keywords:** Physician, Prescription, Decision, Behavior

### Introduction

The global pharmaceutical industry is considered one of the best in the industrial segments for its contribution to a healthier world to live, by reducing the disease burden and suffering, despite its dependence on intense capital and deploying the latest technologies to produce drugs with the highest quality at a competitive price. This is essential in adhering to the essential steps with challenges, right from drug development to commercialization, while complying with the local regulations with longer incubation periods and prolonged periods of return-on-investment realization, finally changing disease trends [1].

Studies estimate the global pharmaceutical market to touch US\$ 962 billion by 2030 with a growth of 2.4% year on year, contributed by both developed and developing/emerging markets. Among the developed markets, North America, Europe, Australia, and Japan continue to demonstrate their dominance in terms of value primarily driven by key strong economic measures, policies, and inclusion of various national initiatives towards improving healthcare access to the citizens for availing the best of the care at an affordable price.

**Corresponding author:** Viswanath Bandi  
**Address:** Faculty of Management Studies, viswanath Bandi, ICFAI University Jharkhand, Ranchi, India.  
**E-mail:** ✉ viswanathbandi1391977@gmail.com  
**Received:** 03 May 2024; **Revised:** 14 August 2024; **Accepted:** 26 August 2024; **Published:** 30 September 2024

**How to Cite This Article:** Bandi V, Dey SK, Rao O. Factors Influencing the Physician Prescribing Behaviour of Medicines in Developed and Developing Countries: A Systematic Review. J Integr Nurs Palliat Care. 2024;5:21-34. <https://doi.org/10.51847/ZS3boQgksO>

Due to the prevailing conditions and uncertainties the world is witnessing, developed markets are under tremendous pressure to maintain their economy and curtail healthcare expenditure. As a result, stringent cost-cutting measures and policies are, on the rise, leading to a flat growth of the pharmaceutical business. However, with 80% of the global population concentrated in developing nations and underdeveloped nations, these markets have become the growth drivers for the pharmaceutical industry [1].

Among the emerging markets, countries like China, India, Russia, and Brazil are going to play a key role in the sustainable growth of the pharmaceutical industry [2]. In the current context, with a vision of embarking on India's global leadership (Top 5) in healthcare, the market which was 8.7 billion USD in 2007 [3] can go up to USD 120 to 130 billion with a growth of 11 to 12% by 2030, mainly due to acceleration in growth from the domestic market driven primarily by increased accessibility, affordability, potential breakthroughs in next-generation innovative product introductions and focusing on the off-patent market in the US with higher ANDA's share and Increasing the penetration among markets like Japan and China [4].

#### *Existing knowledge of the problem*

The physician-patient relationship is central to the healing part of medicine as the physician is at the center of making the prescription decision [5, 6]. Deciding on the accurate medication after judgment is the most important task of a physician as the medication is one of the most efficient ways of handling the sickness of patients. A medical decision (Rx) is a health-care plan of medical care for an individual case and is enforced by a good physician. It's because of the Prescribing Power of the physicians; all pharmaceutical companies channel their efforts to influence Physicians to prescribe their products to patients for treatment [7].

Faced with many contending substitutable branded generic products (with the same constituents) available but at different prices, physicians have to decide which product to prescribe to their patients. Besides medical factors, non-medical factors also weigh on the Physicians. So much so, at times, some Physicians are non-rational in defining medicines, thereby causing problems of over drugs. On the other hand, consumers' anticipations are also rising as they are getting more information from social media, posing questions to Physicians, and indeed enquiring about substitutes or other options.

Researchers across the world are investigating to understand the role, influence, and interplay of various factors like Physician's professional factors, Product related factors, Product Promotion factors, and Physician's personalities, on physician's prescribing decisions, both in developed and developing countries. The outcome will benefit all the stakeholders across the value chain towards streamlining the healthcare system, improving the standards in point of care and pharmaceutical product promotion practices, which decreases irrational practices and pill burden on the patients, and finally reaching the goal of affordable healthcare for all.

#### *Limitations to the existing knowledge*

The pharmaceutical market is a complex system in which several stakeholders put their interests. Product diversities and geographical coverage push organizations to establish their strategy on an individual level [8]. At the time of the physician's prescription decision, contextual factors consisting of drug attributes, cost-benefit ratio, and Physician's habit Persistence (representing a set of circumstances or facts) that are present at the time of physician's prescription decision are found to modulate the level of uncertainty, may influence the physician's decision thereby explaining the relationship between marketing strategies of pharmaceutical firms, contextual factors and the decision of the physician regarding drug prescription [9].

A physician's suitable prescription is influenced by several factors that act on the decision to prescribe medication, such as drug characteristics (quality, price, and availability), the patient's state, the prescriber, and professional background and are often besieged with information, regulation, and suggestions towards their prescribing decision [5].

Physicians are always under continuous exposure to various tools deployed by pharmaceutical organizations to get their brand prescribed to the patient. Research has shown that along with awareness of the price of the drug, patients caring nature towards meeting patient expectations, and their personality also demonstrated a statistically significant positive effect on physician's prescribing behavior [10].

A previous systemic review on factors influencing the successful prescription decisions by physicians confirmed that multiple factors were influencing prescribing behavior of physicians such as the external factors, coordination and collaboration among medical team members, line of reporting, and patient plus individual factors [11].

#### *Research question*

As a physician's Prescribing decision is a very complex one, owing to the presence of many stakeholders and the existing literature from various researchers, revealed that most of the studies are focused on, one or the other aspect of external factors affecting g physician's prescribing decision and the emergence of the role of internal factors with the incorporation of emotional variables as a valuable approach to modifying the behavioral propositions of physicians prescribing decision [12].

Hence there is a need to revisit, examine, refine, and identify the most relevant factors from the literature that are playing a vital role along with their interplay towards a better understanding of the entire physician prescription process and suggesting the best possible framework under the different scenario that has a beneficial outcome under the current environment.

Through this systematic review, we mapped the literature on the factors influencing the prescribing behavior of physicians from both developed markets and developing markets like India, for understanding the factors and applying the learnings from the contributors towards discussing the possible future framework and finally providing a future agenda.

## Materials and Methods

### *Search strategy*

For this systematic search, we developed a search strategy to identify the relevant literature. This search strategy was tailor-made for our two databases: Scopus and Google Scholar, and the search terms used were the following: “Prescribing behavior”. All searches spanned from the database period range of 2011 until 2021, and included Journal articles, review papers, Research reports Thesis, and Essays, published in English only.

### *Selection criteria*

The selection criteria were based on the PRISMA statement. The search was narrowed down and was mainly focused on mapping existing literature on Physician Prescription behavior in the field of medical, business, and management fields. The search span was from the year 2011 to 2021. All articles before 2011 were excluded from the search.

The search was mainly focused on both developed and developing countries, whose classification has been undertaken based on Human Development Index (2019). A total of 29 research articles were excluded at this stage. There were 166 records were extracted at this stage. As a part of the screening, 144 articles were screened of which 38 were excluded and 106 records were subjected for eligibility.

### *Quality assessment*

The study is based only on original research articles, review papers, thesis reports, and conference papers. For maintaining the quality of the review, all duplications were checked thoroughly. Abstracts of the articles were checked for the analysis and refinement of the articles was done to ensure the quality and relevance of academic literature included in the review process. A careful evaluation of each research paper was carried out at a later stage. The next exclusion criterion was to limit the papers published in the English language only. We could not come across any article other than the English language. Furthermore, after reviewing the records towards meeting the eligibility criteria 14 more articles/ records were excluded from the study. We selected 92 articles after assessing each article on the aforementioned inclusion and exclusion criteria as shown in the below **Figure 1** PRISMA algorithm.

### *Data extraction*

In the data extraction phase, 92 articles were selected and the characteristics extracted were, Article must be an original paper, review paper, or conference paper. Published reports and case studies were excluded. The article must be in the English language and from the field of medicine, business, and management. Extracted articles were published between 2011 to 2021. The extracted articles were from both developed and developing countries.

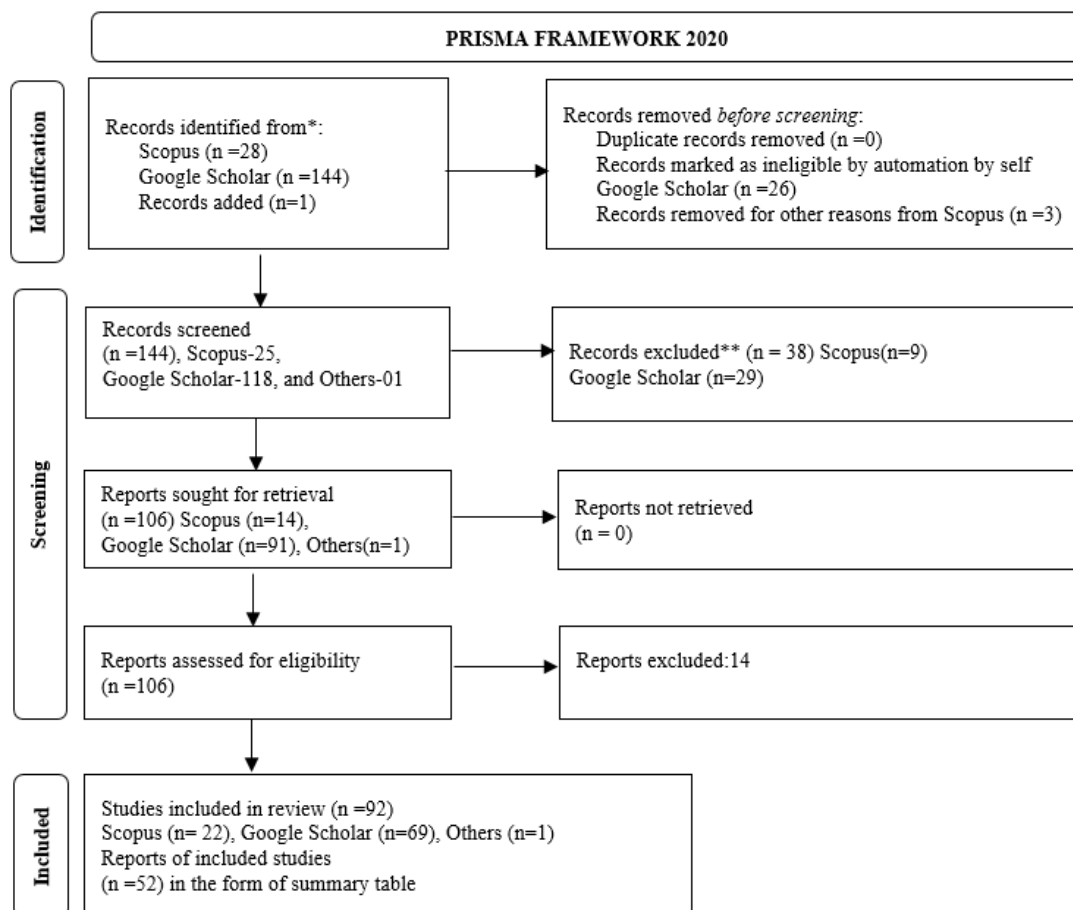


Figure 1. Prisma algorithm [13]

## Results and Discussion

All three reviewers individually checked the content from the title and abstracts focusing on the factors influencing the physician's prescribing behavior. 166 searched records were founded for their eligibility. After removing duplicates, articles not meeting the objective, and data cleaning, 92 eligible articles were retrieved and were taken forward for qualitative analysis for developing the review.

### *Descriptive analysis*

Descriptive analysis was undertaken by researchers concerning the research works conducted on Physician Prescribing behavior topic in the last decade for analyzing the year-on-year trend, researchers representing the countries actively pursuing research to give a sense of feeling the importance of this research work on the entire healthcare ecosystem.

### *Research work publication trend*

As shown in the **Figure 2** indicating the year on year works publication trend , over the last decade, 92 research publications from various researchers, across the world have published their work focusing on the dynamics, and factors, affecting the physician Prescribing decision process towards identifying the insights and recommendations to all the stakeholders involved in the entire healthcare ecosystem on further streamlining and adding value towards offering better healthcare experience to patients.

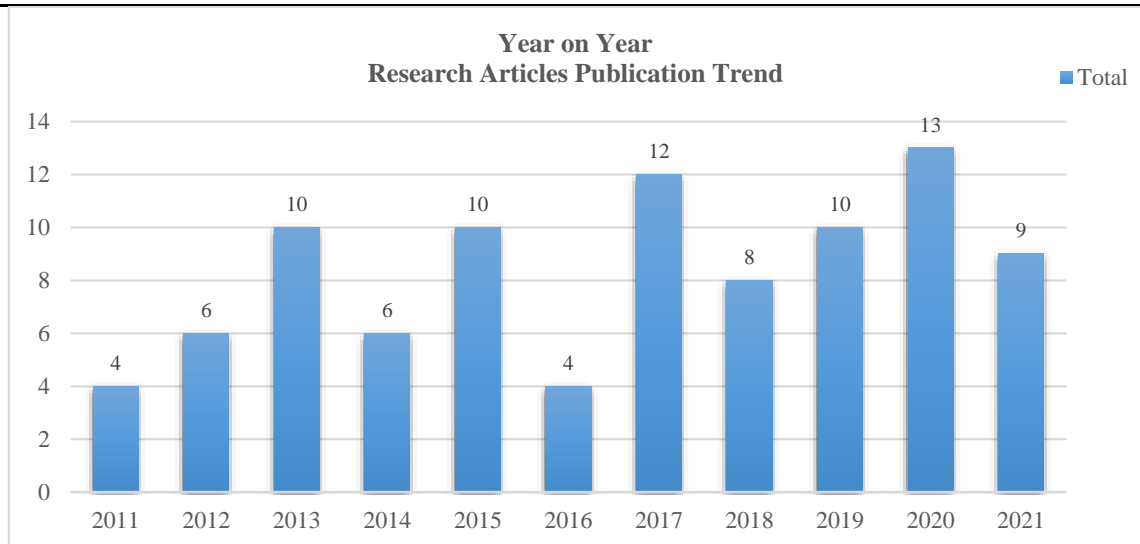


Figure 2. Year-on-Year Research Works Publication Trend

As seen above, 9 is the mean reported research work per year, with every alternative year contributing more than the yearly average. This clearly shows, that in the healthcare system understanding the factors influencing “Physician Prescribing behavior” is of prime importance across the 32 geographies right from Australia to the USA.

However, it is important to make a note that 26% of the published research work is from the USA, which clearly emphasizes the importance of understanding the elements involved in the entire healthcare ecosystem which influence the physician to make a prescribing decision on behalf of a patient for a predictable outcome as per expectation.

After the USA, the growing economies and the future growth drivers of the pharmaceutical industry, have reported 6% to 7% published research work in this domain led by China, India, and Pakistan, indicating the importance of further improving the health care system. Efforts are also being made by other countries from Europe and African nations toward a better understanding of the factors that influence prescription behavior as shown in the below **Figure 3** indicating the country wise research articles publications contribution.

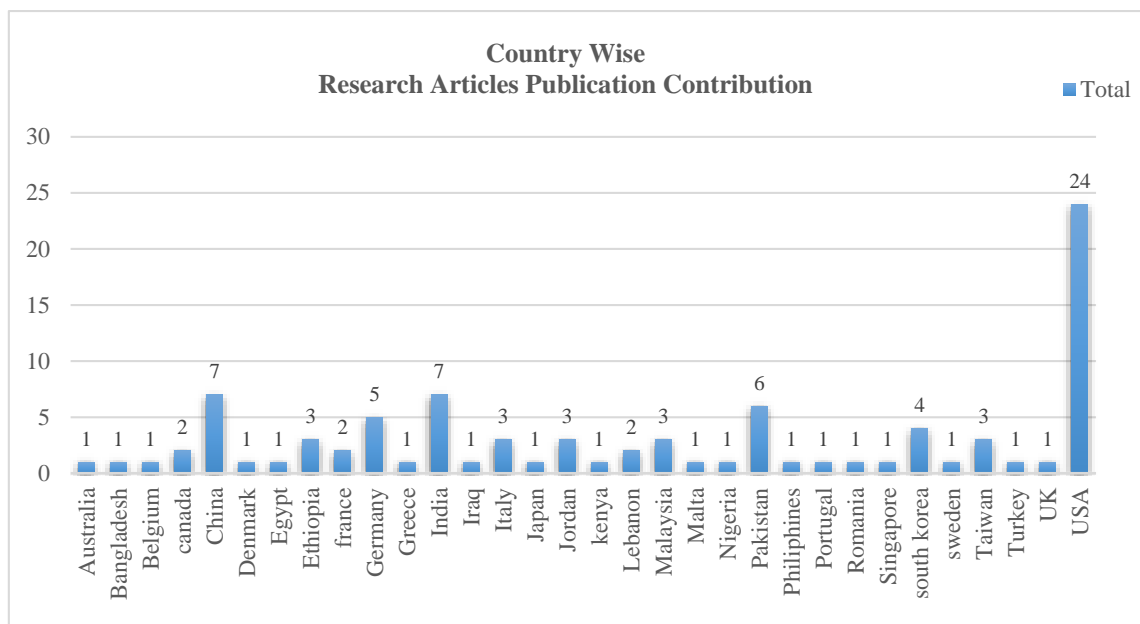
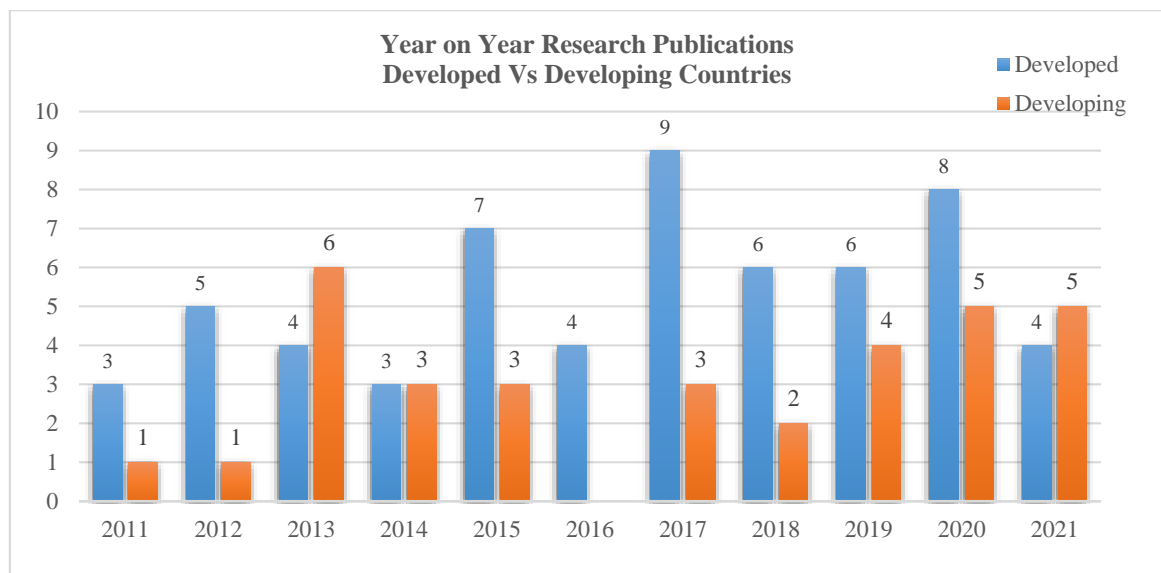


Figure 3. Country-wise Research articles publication Contribution

As shown in the **Figure 4** comparing research work contribution from the developing countries vs the developed countries has shown that in developing countries, with health becoming an important priority for all the local

governments and administrations, efforts are being made toward improving the healthcare infrastructure and system. This led researchers towards solving some of the local challenges through research, for the formation of the country-specific healthcare system, which is evident with the consistent efforts in the form of publications of works to the tune of 36% towards a better understanding of physicians prescribing behavior from developing countries like Bangladesh, Egypt, Ethiopia, Iraq, Jordan, Kenya, Lebanon, Nigeria and Philippines in comparison to developed countries contributing to 64% primarily driven by the USA.



**Figure 4.** Developing Vs Developed Countries Research Work Contribution

As per our search strategy, we have used two databases namely Scopus and Google Scholar for this review consisting of 22 research publications from Scopus, 69 research publications from Google Scholar, and 1 research publication that has been incorporated from Research Gate. We have observed that there, there is a need to increase research publications among Scopus-indexed journals in comparison to the google scholar indexed Journals of 4 publication in google scholar in 2011 vs 7 publications in google scholar plus 2 publications in scopus indexed journals. Publications in scopus indexed journals can substantially improve the quality of research work information, which will help towards creating a robust system, whose integration with the community can result in to improving the entire value chain of the healthcare ecosystem.

As shown in the below **Table 1** representing the year on year top 10 journals research work contribution, it is quite evident that 1 research work on Physicians prescribing behavior out of 4 research works on the same topic is being published by the below indicated top 10 Journals assuring the Quality and the intensity of the involved research work. Efforts from the developing world should be made towards increasing the publication of research works in the top Journals which is an authentication and assurance of Quality of research undertaken by researchers towards better understating and contributing, towards decoding the factors affecting the physician's prescription decision.

**Table 1.** Year on Year Top 10 Journals Research Work Contribution

Name of the Journal	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Total
BMC Family Practice									2		1	3
BMC Health Services Research					1				2			3
Health Policy					3							3
International Journal of Pharmaceutical and Healthcare Marketing				1		1				1		3
European Journal of Social Sciences			2									2
JMIR mHealth and uHealth									2			2
Journal of Clinical Oncology			2									2



*Mapping the literature*

While mapping the literature, we have categorized the factors affecting the physician's prescribing decision into 4 types aiming for more clarity on each one of them affecting factors described both for developed and developed market contexts. They are,

- Pharmaceutical Product Promotion factors
- Pharmaceutical product-related factors
- Physician's Professional factors.
- Physician's attitudes /psychological / personality factors.

*Pharmaceutical product promotion factors* [1, 5, 9, 11, 12, 14-39]

Toward understanding the extent of interactions between physicians and the pharmaceutical industry, 14 studies from the developed world have emphasized the impact of pharmaceutical marketing mix tools on physicians' prescribing behavior. Physicians' interactions with sales representatives in a competitive environment have been found to affect the physician's prescribing behavior with a wide array of pharmaceutical marketing tools. For the below tools, Physicians have shown an inclination towards

- Scientific Promotion led by product detailing from the Visual-aid, mentioning the brand name followed by the presentation of useful information in the form of brochures and booklets relating to the product.
- CMEs, workshops, preferably online focusing on the latest developments for implementation in the practice for patient benefit.
- Financial Support for attending conferences of repute.
- Accepting Gifts based on the utility
- Accepting the products physician samples based on the need.
- Relationship with the PSR developed over a while, assurance of trust.

However, 2, studies have reported either moderate or no effects of pharmaceutical marketing on prescription behavior patterns.

In the case of developing countries, 18 studies have indicated a positive correlation between the credibility of marketing and promotion tools in comparison to the extent to which it influences prescription behavior. Some studies have indicated that 50% of physicians perceived that pharmaceutical marketing mix strategies influence their prescribing behavior. Like the developed world, physicians from the developing world have shown an inclination towards,

- Scientific Promotional literature including clinical trial results.
- Quality in the service provided.
- Promotional items or tangible rewards are being presented. Studies demonstrate that physicians consider gift acceptance a non-ethical practice regarding gift acceptance.
- Product samples, for treating some of their poor patients.
- Conference participation towards improving knowledge and skills.

Studies have shown that the major tools that physicians agreed to are mostly motivated by the visits of medical representatives as they are the most important source of information. Although this holds for the developed world as well, however, in the developing world, we noticed that physicians expect value addition from pharmaceutical representatives and they expect them to be trained enough to handle their product queries with standards of market knowledge, product knowledge, and maintaining the corporate reputation. while calls aiming at sales with a personal touch, off-label promotion, and selling activities with pressure seem to be less influential.

*Pharmaceutical product-related factors*

Previous research findings indicate the impact of different elements of products on physicians' prescribing behavior. Product elements comprising of product's attributes and benefits in terms of therapeutic response, relative advantage, cost-effectiveness, therapy cost along with attractiveness were found to influence physician's prescribing behavior, as indicated by various researchers [21]. The clinical effectiveness of a drug that forms one of the most important factors for consideration among physicians for prescribing a drug to patients was emphasized in the research conducted in Cyprus and Greece [1].

In this review, 6 studies all from the developing world highlighted the physician's inclination for products /drugs with proven efficacy, demonstrated results, the onset of action, safety profile, compatibility with other drugs, devoid of complications with least resistance development. Due to these factors, physicians across the developing world, including India, choose to prescribe the products with the brand name to their patients for managing pathological conditions as the branded drug stands by its promise with an assurance of predictable outcome in the form of relief to the patient at an affordable price unlike neither by innovator nor by a generic substitute [14, 29, 33, 35, 40, 41].



---

*Physician's professional factors* [4, 6, 10, 11, 15, 21, 28, 33, 34, 40, 42, 43]

The physician's professional factors and their empathy for the patients constitute an important factor for the physician in taking a prescribing decision. Various elements are constituting this factor that is studied by previous researchers both in developed and developing markets.

We have reviewed 30 studies from the developed world and 17 studies from the developing world. This clearly shows the extent of the impact of Physician's professional factors on their prescribing decision.

Physicians' prescriptions were based on their location, specialty, education, workload, working department, clinical experience, disease profile, demographic trends, relationship with the patient, patient profile, Patient social class or status, and attitudes. In the developed world, Physicians focus more on protocol, organization, and practice-based aspects of running a clinic/hospital, without a holistic mindset that is less flexible, non-accommodating, and not sensitive. No patient attributes or organizational factors influenced a physician's willingness to accede to a patient's medication request.

The respective physician societies and government agencies are now emphasizing guideline adherence, to create trust in the government policy by addressing the potential benefits of promoting evidence-based strategies, moving beyond guideline dissemination and education. Though the variation in guidelines adherence seems to take place, the existing gaps in scientific information and rational management of procedure implementation were detected. Hence HCP educational interventions like professional meetings provide education and disease management, expert opinions experience, and collaboration for organizational change and organizational peer effects positively. In addition to educational interventions, tools like Shared decision-making strategies and patient-facing decision aids, following algorithms and sticking to them, with an electronic system in place, and finally rewarding physicians for adherence in improving the implementation percentage by physicians in their clinical practice.

As branded drugs assure Quality with safety, physicians often not displayed price consciousness but showed a slow switch from Branded name drugs to generics, it has been seen that physicians maintain a balance between prescribing innovator brands vs branded generics vs generics. In this competitive environment, sometimes, GPs prescribe more medicines per patient, which is also the patient expectation, as more medicines indicate better Quality and care from the patient's perspective. However, this effect has demonstrated an inverse effect with an increase in physicians' age.

A limited drug prescription has modest effects on medication adherence and out-of-pocket costs in some classes. Non-adherence to treatment by patients leads to Physicians switching to better and discontinuing lesser effective drugs to improve adherence. Physicians receiving payments tend to prescribe a particular medicine to patients, however, the percentage of physicians receiving industry payments has decreased over the years since the implementation of the Sunshine Act.

Health systems may need to offer educational interventions to clinicians to improve their ability towards recommending tailor-made treatments that suit individual patient needs, which comply with the operating guidelines in the presence of various influencing stakeholders towards bringing sustainability and consistency in their prescribing behavior.

In the developing world, when we reviewed 17 studies, physicians indicated that their prescribing decision to a patient would be based on their work experience and clinical experience (safety, efficacy, adverse events), and guideline recommendations for the drugs apart from availability and cost along with the socio-economic factors of the patient like the age, educational background, dress code, and appearance along with the severity of the disease.

From the physician's perspective, we noticed scope for improving their clarity on prescribing a particular drug to the patients especially with the younger physicians having less clinical experience in comparison to senior physicians. The same can be achieved through various continuing educational programs, training initiatives, and learning from shared decision-making events from an expert, which will impact positively all physicians with their confidence in prescribing behavior leading to better patient management for a longer duration of time.

Although physicians work under the purview of all government stakeholders, physicians now have initiated following the government act of mentioning only the generic names for patient benefit in their prescription, however, this is low in private practice Vs Public hospitals. The possible reasons can be the trust, efficacy, and safety enjoyed by the branded drug over its generic version, even though at a high price. The other probable reason can be the financial incentives or services associated with it to the physician by the promoting organization.

In comparison to the developed world, in the developing world, the role of the pharmacist is limited. Hence devising interventions aiming toward improving the pharmacist's role, responsibilities, and accomplishments through digitization with regular prescription audits and sharing the feedback with the stakeholders will improve prescription behavior and reduces prescribing errors leading to the practicing of evidence-based medicine with precision for the benefit of the patient's recovery and good health.

*Physician's attitudes / Psychological / Personality factors* [6, 9, 14, 15, 25, 43]

Studies have shown that each physician has a unique personality, and responds differently to various personal selling factors, there is a significant relationship between the individual characteristics of the medical doctors and

their prescription behavior. In addition to this research towards assessing Human Factors affecting physician behaviors and their impact on the business of medicine has indicated that most physicians tend to have very strong ego-centric personalities which perpetuate individualism, and autonomy and concluded to provide appropriate education and training to help physicians gain a better understanding of these issues will help when trying to introduce programs to help address physician attitudes and behaviors.

In this review, 6 studies were included, 5 from the developed world (USA, Germany, Taiwan, Malaysia) and 1 study from the developing world (Jordan) that studied the impact of physicians' personalities on their prescribing behavior.

A study from a developing country (Jordan), a Quantitative study, had shown the role of a physician's personality on the physician's prescribing behavior. The same was true for an earlier Qualitative study conducted in Germany which showed the three motives dimension of a physician, which include, Being on the cutting edge and self-expression, Efficiency, effectiveness, and Diversity and convenience. The study has confirmed that these three physicians' motives affect physician-patient communication and subsequent prescribing behavior. However, research from Taiwan in 2012 did not show the impact of physicians' personalities on their prescribing behavior. One of the three most recent studies from the developed world has proposed a theoretical model with physician's attributes being one factor for further validation of the model in the prescribing decision. However, 2 studies from the USA have indicated the need for the development of educational programs for future practitioners that focus on structural and psychosocial factors and may contribute to more sustainable behavior change outcomes with a potential synergy of digital health modalities and behavioral strategies as an approach for clinicians to prescribe, motivate, monitor, and sustain healthy behaviors.

Based on the stage, nature, and stakeholders driving the pharmaceutical industry, efforts in the form of research are being conducted by various researchers across the world toward a better understanding of the factors that are influencing the prescription behavior of physicians. As the policymakers felt the need for streamlining the healthcare system, similarly the marketers also realized the need for developing a country-specific framework on similar, lines with various available tools that best describes in totality the factors affecting the physician's prescribing decision of a promoted drug over that are available in the market. From our review,

We have noticed in the last decade, an upsurge in the research towards understanding the factors influencing the physician's prescribing behavior both in developed and developing countries. While the USA is ahead of other countries in narrowing down research up to a granular level towards understanding every factor component in great detail, the other countries specifically, countries from Europe, Asia, and Africa, can accelerate in identifying the potential factors toward the development of a framework that best describes physician's prescribing decision. Concerning product Promotion factors, our review has confirmed the positive impact on physicians prescribing behavior led by various Promotional tools both in developed and developing markets. However, in developing countries, physicians expressed their apprehension about the value addition from pharmaceutical representatives, w.r.t product promotion, indicating the need for improvement in knowledge dissemination, value creation, and Query resolutions done confidently to physicians by pharmaceutical representatives with timely training interventions from organizations end or the promoted brand over the available alternatives in the operating market. Concerning product Related factors, our review has confirmed that physicians both in developed and developing nations prefer to prescribe only those branded drugs which confirm 100% assurance on all product-related parameters. With healthcare infrastructure in place, backed up with insurance reimbursement this is currently practiced by physicians across developed nations. However, in developing countries, where the patient is the payer for the treatment, physicians often choose to prescribe the products with the branded generic to their patients for managing pathological conditions as the branded generic drug stands promoted by an organization gives the assurance of predictable outcome in the form of relief to the patient at an affordable price, unlike innovator drugs which are expensive and generic drugs, who lack perception for efficacy and quality both by physicians and patients.

Concerning physicians' professional factors, in developed countries, physicians tend to be rigid in accommodating patients' requirements and tend to follow a predefined algorithm. However, physicians in developing countries, tend to be more receptive to patients which on certain occasions can lead to the overuse prescription of medicines. Physicians from both the world expressed their willingness for learning from individual clinical experiences or learning from Peers on various platforms.

Concerning physicians' personality factors, we reviewed 5 research works of which most the studies were Qualitative, theoretical models, and 1 quantitative study, all of which have shown a positive correlation between physicians' personality and their prescribing behavior. Hence there is a need for studying Physicians' personalities focusing on Physicians' core values, motives, preferences, and their impact on the prescribing decision in the presence of other factors both from the developed and developing world as shown in the below summary as **Table 3** indicating the summary w.r.t the Impact of factors affecting the physician prescribing behaviour in developed countries Vs developing countries along with the remarks.

**Table 3.** Summary w.r.t the Impact of factors affecting the physician prescribing behaviour in developed countries Vs developing countries along with the remarks.

Factor	Elements	Developed countries (17)	Developing countries (15)	Remarks
	No of Studies	50	42	
Pharmaceutical Product Promotion factors	Brand Detailing from the Visual-aid	+++ve impact	NA impact	Brand detailing has high impact in developed countries than in developing countries. Indicating the importance of scientific information
	Literatures Brochures and clinical study Booklets	+++ve impact	+++ve impact	Literature with information is of value in developed countries, whereas in the developing world, Physician prefer to have clinical details of the drug
	CME	+++ve impact	+ve impact	CME with the latest scientific deliberations for improving knowledge was found to have more impact on physicians from developed countries in comparison to developing countries.
	workshops through societies	+++ve impact	+++ve impact	HCPs from both developed and developed countries expressed faith in workshops for exchanging clinical practice. However, HCPs from developing countries are particular about the services also provided.
	Quality of Services rendered	+ve impact	+++ve impact	
	Financial Support for attending conferences	++ve impact	++ve impact	Physicians are influenced by financial support for attending conferences in both developed and developing countries.
	Accepting Gifts	+ve impact	- ve impact	Gifts have been shown to influence the prescribing behavior among physicians from developed countries. However, it has no impact on physicians from the developing world.
	Tangible rewards / Promotional items	NA impact	++ve impact	Physicians in developing countries have been shown to get influenced by tangible rewards, unlike developed physicians who are not influenced by tangible rewards owing to the sunshine act.
	Physician Sample	+ve impact	+ve impact	Physician samples have been found to have very less influence on their prescription behavior.
	PSR's relationship with HCP	+ve impact	-ve impact	PSR relationship with physicians is found to influence the prescribing behavior among developed countries' physicians however physicians from developing countries have no impact on their relationship with PSRs.
The efficiency of PSR (Appearance, Knowledge, HCP Query handling, and attire)	+++ve impact	-ve impact	Physicians see PSRs as a valuable source of information in developed countries however, physicians from developing countries expressed expectations from PSRs.	
Pharmaceutical product-related factors	Quality of the Drug	+++ve impact	+++ve impact	In both developed and developing countries the basis for selecting a drug/brand has remained constant w.r.t Quality, efficacy, and formulation benefit to the patient.
	Efficacy of the drug being demonstrated	+++ve impact	+++ve impact	
	Safety of the drug being established	+++ve impact	+++ve impact	
	Superior Dosage forms beneficial for the patient	+++ve impact	+++ve impact	

	Cost of the Drug to the patient	+ve impact: Not essential	+++ve impact	Physicians from developing countries are very much cost-conscious in choosing a drug over physicians from the developed world.
	Preference for Innovator Drug being Prescribed	+++ve impact	+Ve impact	Physicians from developed countries are very much inclined toward offering innovative medicines to physicians over existing therapeutic options, unlike physicians from developing countries.
	Preference for branded Generic drugs prescribed	++Ve impact	+++ve impact	Physicians from both developed and developing countries are giving preference either to branded generics or innovator drugs as an assurance of drug quality
	Image of the organization Promoting the drug/brand	+++ve impact	+Ve impact	As mentioned above, physicians from developed countries are very much concerned about the image of the organization whereas in developing countries physicians are not very much particular, when the quality is assured, they consider prescribing brands even from any organization.
Physician's Professional factors	Following Guidelines of treatment	+++ve impact	++ve impact	In developed countries, physicians prescribe drugs based on the evidence, guidelines, and clinical experience beneficial to the patients for their early recovery without accommodating any patient's requests in comparison to physicians from the developing world who try to accommodate patients' requests at the same time trying their best towards adhering to their clinical experience and guidelines.
	Adhering to the treatment algorithms	+++ve impact	+ve impact	
	Accommodating the patient's requests	-ve impact	+++ve impact	
	Clinical experience of the drug	+++ve impact	++ve impact	
	Cross Learning from experts/ Peers	+ve impact	+++ve impact	Physicians from the developing world are very much inclined to learn from experts, unlike physicians from developed countries who follow guidelines, evidence, etc.
	Improving scientific knowledge from international experts (Society/Company)	++ve impact	+ve impact	Physicians from both developed and developing countries attend ISPs for awareness from the experts w.r.t the latest developments with very much less influence on their prescribing decision.
	Role and Influence of Pharmacists on Prescription	++ve impact	NA impact	The pharmacist is highly influencing physicians prescribing behavior in developed countries in comparison to the developing country as physicians prescribe the branded generic or innovator brand.
Physician's attitudes/psychological/ personality factors	Physician's motives and psychological factors	+++ve impact	+++ve impact	Physician's personality attributes have been found to influence physician's prescription behavior both in developing and developed countries physicians.

(+++ve impact: Significantly Positive impact; ++Ve impact: Positive impact; +ve impact: Not essential, requirement based on the need or utility or time; -ve impact: no impact. NA: Not that important)

*Strengths and limitations of the study*

A most important highlight of this review is an attempt to capture the research over the (2011 to 2021) as a systematic review of studies from both the developing world and the developed world, exploring the factors affecting physician prescribing behavior in various types of practice. Another strength of this study exploring the role of physicians' personalities in their prescribing decision. Moreover, we performed an extensive search in two databases. Some of the limitations of this review are related to the included studies, as some did not provide evidence for the significance of their findings or had varying study designs and outcomes, Also, the included studies were subject to the risk of bias related to the lack of validity of outcome measurement and inadequate handling of significant potential confounders.

*Future research*

The pharmaceutical industry is the major growth driver in the healthcare segment. As Physician is central to Prescription, efforts should be made in undertaking interventions either from government agencies or by the industry towards enhancing their clinical knowledge based on their interest level with the customization and matching with their internal stimuli as far as possible for their active participation from learning to practice. This will also lead to optimal and effective utilization of resources. Further studies should be undertaken by researchers both from developed and developing countries like India, towards creating a comprehensive framework as a result of integrating the factors constituting to human element which, when resonates with all experiences of the physicians, under the influence of external factors will lead to a predictable physician prescribing decision.

**Acknowledgments:** I would like to express my very great appreciation to my mentor Prof (Dr) ORS Rao and supervisor Dr. Subrato kumar Dey for their valuable and constructive suggestions during the planning and development of this research project. Special thanks to Prof (Dr) ORS Rao for his willingness to give his time towards reviewing the manuscript along with suggestions, so generously has been very much appreciated.

**Conflict of Interest:** None

**Financial Support:** None

**Ethics Statement:** The paper reflects all the authors' own research and analysis in a truthful and complete manner.

**References**

1. Tripathy JP, Bahuguna P, Prinja S. Drug prescription behavior: A cross-sectional study in public health facilities in two states of North India. *Perspect Clin Res.* 2018;9(2):76-82.
2. Korom RR, Onguka S, Halestrap P, McAlhaney M, Adam MB. Brief quality improvement interventions are effective in changing mid-level provider prescribing behavior in a developing country context. *Ann Glob Health.* 2015;81(1):85.
3. Ramakrishnan S, Ingole S, Dey A, Jain R. Management of hypertension: Insights into prescribing behavior with a focus on angiotensin receptor blockers. *J Pract Cardiovasc Sci.* 2017;3(1):22.
4. Hocking L, Parks S, Altenhofer M, Gunashekar S. Reuse of health data by the European pharmaceutical industry. RAND Corporation. 2019.
5. Ali Z, Rana ML, Mahmood A, Hanan MA, Noshina S, Naila K. Relationship between doctors' prescribing behavior and pharmaceutical promotional tools: A Pakistani case. *Iran J Public Health.* 2015;44(5):709-10.
6. Hardie Alvanzo A, Cohen GM, Nettleman M. Changing physician behavior: Half-empty or half-full? *Clin Gov: Int J.* 2003;8(1):69-78.
7. Wong JQ, Baclay JR, Duque RG, Roque PM, Serrano GK, Tumlos JO, et al. The prevalence of Philippine prescribing, dispensing, and use behavior in relation to generic drugs and their risk factors. *PIDS Discussion Paper Series;* 2014.
8. Feinberg BA, Cooper J, Wong W, Winn D, Olson T, Trehan RS, et al. Shifting revenue from drug sales to cognitive services: Impact on physician prescribing behavior. *J Clin Oncol.* 2013;31(15\_suppl):6629.
9. Negash M, Adamu A. The impact of pharmaceutical promotion strategies on prescribing behavior of physicians a developing country experience: Case of Addis Ababa, Ethiopia. 2017;9(8):9-18.
10. Chen C, Dong W, Shen JJ, Cochran C, Wang Y, Hao M. Is the prescribing behavior of Chinese physicians driven by financial incentives? *Soc Sci Med.* 2014;120:40-8.
11. Cheo R, Ge G, Godager G, Liu R, Wang J, Wang Q. The effect of a mystery shopper scheme on prescribing behavior in primary care: Results from a field experiment. *Health Econ Rev.* 2020;10(1):1-9.
12. Connor-Smith JK, Flachsbart C. Relations between personality and coping: A meta-analysis. *J Pers Soc Psychol.* 2007;93(6):1080-107.
13. Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: An updated guideline for reporting systematic reviews. *BMJ* 2021;372:n71. doi:10.1136/BMJ.n71
14. Abulhaj E, ELSamen AA, Alabbadi I. Investigating the factors affecting doctor's prescribing behavior in Jordan: Antihypertensive drugs as an example. *Eur J Soc Sci.* 2013;38(3):380-91.
15. Rosenstein AH. Human factors affecting disruptive physician behaviors and its impact on the business of medicine. *J Bus Hum Resour Manag.* 2016;2:012.
16. Mouloudj K, Njoku A, Asanza DM, Bouarar AC, Evans MA, Mouloudj S, et al. Modeling predictors of medication waste reduction intention in Algeria: Extending the theory of planned behavior. *Int J Environ Res Public Health.* 2023;20(16):6584.

17. Shah A. *Influence on influencers: Pharmaceutical marketing mix instruments impact on prescribing behavior* (Doctoral dissertation, Iqra National University, Peshawar).
18. Banu B, Shahi MS, Begum K, Ahmed T, Choudhury HA, Ali L. Prescribing behavior of diabetes treating physicians in selected health care facilities of the diabetic association of Bangladesh. *Indian J Public Health*. 2014;58(3):180-5.
19. Chen X, Fu F. Social learning of prescribing behavior can promote population optimum of antibiotic use. *Front Phys*. 2018;6:139.
20. Dickov V, Mitrovic D, Kuzman B. Analyzing pharmaceutical industry. *Natl J Physiol Pharm Pharmacol*. 2011;1(1):1.
21. Freemantle N, Eastaugh J. Using effectiveness studies for prescribing research, part 2. *J Clin Pharm Ther*. 2002;27(6):469-73.
22. Pathak G, Bhola SS. Stakeholders in pharmaceutical business. *ZENITH Int J Multidiscip Res*. 2014;4(3):155-8.
23. Handa M, Vohra A, Srivastava V. Perception of physicians towards pharmaceutical promotion in India. *J Med Mark*. 2013;13(2):82-92.
24. R. Hansen C, Bradley CP, Sahn LJ. Factors influencing successful prescribing by intern doctors: A qualitative systematic review. *Pharmacy*. 2016;4(3):24. doi:10.3390/pharmacy4030024
25. Joyce GF, Carrera M, Goldman DP, Sood N. Physician prescribing behavior and its impact on patient-level outcomes. *Am J Manag Care*. 2011;17(12):e462.
26. Kuo SC, Chen YC, Yang HH. A preliminary investigation of hypnotic prescribing behavior by physicians: A qualitative study. *Tai J Publ Health/Tai Gong Gong Wei Sheng Za Zhi*. 2012;31(6):556-9.
27. Lu YL, Yan M. Use of the American experiences for reference on the intervention of pharmacists to prescribing behavior in China. *Chinese Pharm J*. 2018;53(24):2132-6.
28. Davari M, Khorasani E, Tigabu BM. Factors influencing prescribing decisions of physicians: A review. *Ethiop J Health Sci*. 2018;28(6):795.
29. Mikhael EM, Alhilali DN. Gift acceptance and its effect on prescribing behavior among Iraqi specialist physicians. *Pharmacol Pharm*. 2014;5(07):705-15.
30. Murshid MA, Mohaidin Z, Yen Nee G. The influence patient's characteristics "requests and expectations" on physician prescribing behavior: A review. *Int J Pharm Healthc Mark*. 2016;10(4):390-411.
31. Sahu SK. Globalization, WTO, and the Indian pharmaceutical industry. *Asian Aff*. 2014;41(4):172-202.
32. Parmata UM, Chetla SP. Effect of service quality on doctor's satisfaction and prescribing behavior in pharmaceutical supply chain—A study with reference to a major Indian pharmaceutical company. *Int J Pharm Healthc Mark*. 2021;15(2):173-211.
33. Raza MA, Ms SA, Raza SM, Shahzad S. Social determinants influence physicians behavior in prescribing antibiotics-factors and consequences. *Biomed J Sci Tech Res*. 2021;34(2):26657-61.
34. Riaz H, Malik F, Raza A, Hameed A, Ahmed S, Shah PA, et al. Assessment of antibiotic prescribing behavior of consultants of different localities of Pakistan. *Afr J Pharm Pharmacol*. 2011;5(5):596-601.
35. Manju M, Sharma V. An analysis of exports performance of Indian pharmaceutical industry during pre and post-trips period. *PalArch's J Archaeol Egypt/Egyptol*. 2020;17(6):1636-42.
36. Theodorou M, Tsiantou V, Pavlakis A, Maniadakis N, Fragoulakis V, Pavi E, et al. Factors influencing prescribing behaviour of physicians in Greece and Cyprus: Results from a questionnaire based survey. *BMC Health Serv Res*. 2009;9:1-9.
37. Bandi V, Rao O. Factors influencing drug prescription behavior of physicians in India. *Pharm Rev*. 2019:57-62.
38. Wang D, Liu C, Wang X, Zhang X. Association between physicians' perception of shared decision making with antibiotic prescribing behavior in primary care in Hubei, China: A cross-sectional study. *Antibiotics*. 2020;9(12):1-0.
39. Zhou X, Zhang X, Yang L, Hu X, Shen A, Huang X, et al. Influencing factors of physicians' prescription behavior in selecting essential medicines: A cross-sectional survey in Chinese county hospitals. *BMC Health Serv Res*. 2019;19(1):1-8.
40. Chukwu EE, Oladele DA, Enwuru CA, Gogwan PL, Abuh D, Audu RA, et al. Antimicrobial resistance awareness and antibiotic prescribing behavior among healthcare workers in Nigeria: A national survey. *BMC Infect Dis*. 2021;21(1):1-2.
41. Sarma PG. Psychiatrists' Prescriptions. *Telangana J Psychiatry*. 2015;1(1):21-3.
42. Basu S, Santra S, Bhatnagar N, Laul A. Outpatient antibiotic prescribing behavior and their psychosocial predictors among early-career clinicians in Delhi, India. *Int J Acad Med*. 2022;8(1):11.
43. Srivastava RK, Bodkhe J. Does brand equity play a role in doctors prescribing behavior in emerging markets? *Int J Healthc Manag*. 2020;13(S1):1-1.