Factors Affecting the Physician/Doctor Prescription Decision, the Moderating Role of Cost-Benefit Ratio

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Abstract

Purpose

This study aims to examine the factors influencing physician prescription behavior, which has been a topic of ongoing debate.

Methods

The study focuses on the perspectives of both medical representatives (MRs) and physicians and uses a "dyad" unit of analysis by collecting data from both groups. The study employs the concepts of drug information mavenism behavior (DIMB) of MRs and physicians' cost-benefit ratio (CBR) to investigate the relationship between MR effectiveness and physician prescription decision. The study uses SPSS and Process Hayes to conduct a moderated mediation analysis.

Findings

The results suggest that there is a positive correlation between DIMB and MR effectiveness, and that CBR plays a moderating role in the relationship between MR effectiveness and physician prescription decision. This study offers new insights into the role of DIMB and the importance of cost-benefit considerations in the prescription behavior of physicians and has implications for both research and practice in the healthcare industry.

1. Introduction

Healthcare is a crucial industry that has a global impact on individuals and societies (Ferreira et al, 2018). Having access to high-quality healthcare services is necessary for maintaining overall health and preventing premature deaths. However, the delivery of healthcare is a complicated process that is affected by various factors, such as the presence of healthcare facilities (Kim et al, 2013), the qualifications and skills of healthcare professionals, and the expenses associated with medications and other medical resources.

A crucial element of healthcare delivery is the prescribing choices made by clinicians. The decisions are influenced by various aspects, such as the efficacy and safety of pharmaceuticals (Aldin Sharifnia et al., 2018), the requirements and preferences of patients, and the monetary incentives provided by pharmaceutical corporations. Over the past few years, there has been a substantial increase in the cost of medications. Median prescription expenses have climbed from $2,115 in 2008 to more than $180,000 in 2022 (Nbcnews, 2022). This phenomenon has raised apprehensions over the possibility of conflicts of interest between medical practitioners and pharmaceutical corporations (Nagpal et al, 2017), as well as the influence of exorbitant drug prices on healthcare budgets and the availability of vital medications.

Aside from drug expenses, various factors that affect the choices made in prescribing medication include the accessibility of healthcare facilities, the regulations and policies that oversee the healthcare industry (Davari et al, 2018), and the sway of multinational pharmaceutical corporations (DiMasi, Grabowski & Hansen, 2016). The objective of this study is to analyse the several elements that impact the prescribing choices made by physicians, and to investigate the consequences of these choices on the delivery of healthcare services and the general well-being of people (Oecdlibrary. Org, 2020).

Doctors and physicians have a vital role in the healthcare system, but they also have the capacity to commit errors that can result in severe consequences for patients, such as loss of life (Bhatt, 2018). However, there is a dearth of study on the factors that contribute to errors made by doctors and physicians, which hinders efforts to enhance their practices and incorporate new knowledge. This matter transcends geographical boundaries and is a worldwide preoccupation. The prescribing decisions made by medical practitioners and other healthcare professionals can have critical consequences, underscoring the significance of comprehending and tackling the variables that lead to these mistakes.

Medicines are a vital tool for treating various diseases, and it is the responsibility of physicians to prescribe the appropriate medication to their patients. However, the prescription process is not solely based on medical factors, but also influenced by non-medical factors such as the influence of medical representatives and cost-benefit considerations (Viswanath, Bandi & Rao, 2019). The pharmaceutical industry is unique in that it is the physician, not the patient, who ultimately decides on the medication to be prescribed. This is why pharmaceutical companies often target physicians in order to promote their products. Understanding the various factors that influence prescription decisions is crucial for ensuring that patients receive the most appropriate and effective treatment.

The term "health maven" is employed to describe those who actively search for and disseminate health information online (Bhatt & Bhatt, 2017). Healthcare practitioners depend on this information to make well-informed decisions regarding patient care, which includes the prescription of medication. Furthermore, the promotion and influence exerted by medical representatives can have a substantial impact on the prescribing choices made by physicians (Atia, Gismallah, and Almogadmi, 2022). Drug information mavenism, also known as DIMB, has been discovered to enhance the effectiveness and credibility of the prescription process by equipping physicians with comprehensive understanding of certain pharmaceuticals and their possible adverse reactions (Agopian, 2019). Additional investigation is required to examine the determinants that impact the choices made by healthcare providers when prescribing medication. This research is necessary to guarantee that health professionals make well-informed judgements and to promote equitable access to healthcare for all individuals.

Patients may encounter challenges in acquiring the prescribed medications as a result of their unavailability in the market (Haseeb & Bilal, 2016). Hence, cost-benefit analysis plays a vital role in the healthcare sector by enabling patients to evaluate the advantages and disadvantages of a specific treatment or intervention, with a particular focus on the financial implications. Hospital physicians' prescribing practices are frequently affected by medical representatives (Atia, Gismallah, and Almogadmi, 2022). In order to optimise patient care, physicians should evaluate the cost-benefit ratio prior to prescribing drugs. Although there is extensive study on the elements to consider when prescribing a prescription, there is still a dearth of research that precisely investigates the impact of the cost-benefit ratio as a moderating factor. This research seeks to enhance the current body of knowledge by investigating the influence of

the cost-benefit ratio, drug information-mavenism behaviour, and the effectiveness of medical representatives on the decisions made by physicians when prescribing medication.

2. Literature Review

2.1 Drug Information Mavenism Behaviour

Previous literature has identified "market mavens" as individuals who possess information about various aspects of the market and actively share this information with relevant parties (Kiani and Laroche, 2019). Similarly, in the pharmaceutical industry, medical representatives are often considered market mavens due to their knowledge of the latest information. A study by Ahmed et al. (2020) defined "health information mavens" as individuals who share health-related information with others through interpersonal communication and tend to report better health outcomes compared to their peers. In this context, the study incorporates the concept of drug information mavenism behavior (DIMB) as a characteristic of medical representatives. According to Kontos et al. (2011), DIMB is defined as a core set of information including drug indications, price consciousness, competitor behavior, and commission criteria. The increasing importance of mavenism in the market is also a significant factor in the pharmaceutical industry, as it refers to the acquisition of the most recent financial information regarding investment options to make informed decisions. In the context of drug prescription, mavenism refers to the latest information about the usage of a drug for a specific indication (Srivastava & Bodkhe, 2019). Medical representatives, as market mavens, pass this information to physicians. However, it is important to note that DIMB may not always provide accurate information, which can create complexities for physicians in their decision-making process and lead to problems for patients.

2.2 Cost Benefit Ratio

The cost-benefit ratio is a crucial factor in the pharmaceutical industry, as it enables pharmaceutical companies to establish agreements with physicians that distribute the expenses and advantages of a specific medication (Murshid and Mohaidin, 2018). This procedure allows physicians to assess the patient's financial capacity to afford a medicine, as well as the potential therapeutic benefits the patient can anticipate from the treatment. Through the analysis of the cost-benefit ratio, clinicians can enhance their decision-making process about the prescription of pharmaceuticals. López et al. (2021) state that clinicians utilise the cost-benefit ratio to make

decisions regarding the treatment of patients and the selection of medications. Shimura (2018) conducted a study to investigate the influence of cost-benefit strategies on the adherence to prescription medication and health outcomes in elderly individuals diagnosed with rheumatoid arthritis. The study revealed that regular treatment yielded superior results compared to a large quantity of prescription medications. Additionally, several pharmaceuticals were recommended as a cost-effective substitute for general treatment. Pharmaceutical corporations have implemented many techniques, including splitting costs with physicians, employing sales forces who work on commission, and seeking endorsements from physicians to promote their medicines (Farragher et al., 2016). Drug indication, along with cost-benefit ratio, significantly influences a physician's decision when prescribing medication. Drug indications refer to the properties and functions of a medication that are used to assess its appropriate use. Insulin is used to address elevated levels of glucose in the bloodstream, whereas opioids are employed to alleviate discomfort following an accident (Parli et al., 2017).

The cost-benefit ratio is a critical factor in establishing the connection between the effectiveness of medical representatives and the prescribing decisions made by physicians. According to a survey of literature, both medical reps and physicians consider the cost-benefit ratio when advertising and prescribing pharmaceuticals or medical equipment. According to Hayashi (2016), cost-effectiveness remains an important consideration, even in the presence of other relevant information. Physicians and medical representatives are more inclined to prefer drugs or medical equipment that have a greater cost-benefit ratio (Dawra et al., 2016; Hayashi et al., 2019). Therefore, this aspect plays a crucial role in influencing the judgements made by physicians when prescribing medication.

2.3 Physician Prescription Decision

Several studies have identified the essential qualities of a good medical representative, including effective communication skills, a refined demeanour, and the capacity to establish emotional connections with others (Ahmed et al., 2016; Jandhyala, 2020). These characteristics assist physicians in making informed decisions when prescribing medication for patients. Moreover, there are several elements that can influence a physician's decision-making process about medicine prescription. One of the variables that influences a person's behaviour is their personal attitude, which refers to their unique combination of qualities, attributes, and personality traits (Sun, Liu, and Krakow, 2016). Various factors, including memory, mood, and familiarity with

items, can potentially impact a physician's prescription behaviour (Ieva, De Canio & Ziliani, 2017). Another crucial factor to consider is patient preferences, which pertain to an individual's own choices and objectives about their health and overall state of being (Santillo et al., 2019). Healthcare practitioners' decisions regarding treatment alternatives can be influenced by these preferences.

The subsequent collection of factors found in the literature pertains to the modern factors. The initial criterion is FDA approval. The Food and Drug Administration (FDA) is a regulatory agency responsible for overseeing the healthcare and food sectors, with the primary goals of assuring product safety and promoting public health (Sun et al., 2016). Another current factor is the evaluation of costs and benefits. Murshid and Mohaidin (2018) define cost-benefit analysis as a collaborative process between pharmaceutical companies and physicians, in which they establish a contractual agreement to jointly bear the expenses and advantages associated with a particular drug. This procedure establishes a novel method of ensuring compliance among physicians (Shimura, 2018) and has been observed to influence the adherence to prescriptions and health outcomes of senior patients (Shimura, 2018).

2.4 Medical Representative Effectiveness (MRE)

Dawra, Katyal, & Gupta (2016) suggest that the ability of a medical representative to influence the prescribing decisions of physicians is influenced by factors such as the distribution of samples, frequency of visits, incentives, promotional techniques, and marketing plans. Medical representatives employ these strategies to influence the conduct of physicians. According to Bigsby & Hovick (2018), the lack of any of these traits and tactics can affect the medical representative's capacity to convincingly influence a physician's prescription behaviour.

The pharmaceutical sector heavily depends on medical representatives, also known as market mavens, who possess extensive knowledge and stay updated on the latest information and developments in the field. According to Hayashi et al. (2020), individuals who actively share and distribute health information through interpersonal contact, known as health information mavens, experience better health outcomes than their peers. The efficacy of a medical representative is mostly contingent upon their capacity to effectively communicate and transmit knowledge in a persuasive manner. This is corroborated by the big five personality model, which asserts that individual traits play a vital role in determining occupational success.

2.5 Theoretical Framework

2.5.1 Socio-cultural Theory

The sociocultural theory asserts that social interactions play a vital role in the exchange of experiences and ideas. According to this theory, individuals acquire and understand information more effectively when they can apply it through observation and practice. According to this approach, information sharing extends beyond discussions and includes a range of communication strategies. When it comes to a physician's decisions about prescribing medication, the significance of sharing information cannot be emphasised enough. According to McCafferty (2016), it is important to consider this as a process of generating knowledge, in which doctors comprehend the significance of shared information and interpret events. Therefore, it is imperative for physicians to have full access to comprehensive information regarding a patient's medical history prior to writing any prescriptions.

2.5.2 Theory of Planned Behaviour

The idea of planned behaviour underscores the significance of knowledge exchange and accentuates important aspects that can enhance the process. The factors that are included include subjective standards, attitude, perceived control, and distributive fairness (Samadi, 2018). Samadi's (2018) research demonstrates the substantial influence that these components of the theory of planned behaviour exert on the knowledge sharing behaviours of nurses. Hence, this theory offers valuable perspectives that can be applied to improve the process of sharing knowledge. From the theoretical discussion, a conceptual framework was created that consists of four variables: drug information mavenism behaviour, medical representation effectiveness, cost-benefit ratio, and physician prescription decision.

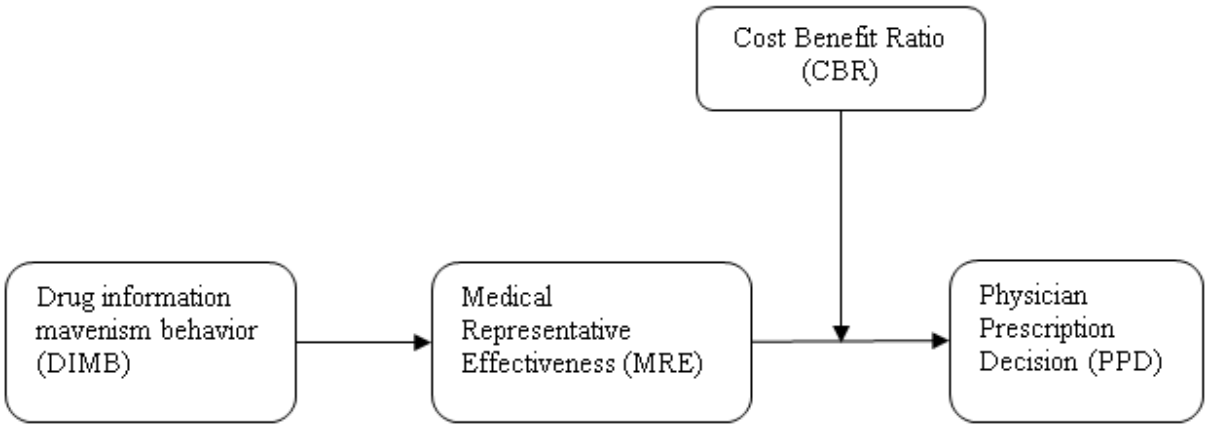

Figure 1 Conceptual Framework

3. Methodology

To conduct this study, the quantitative research design is selected to analyse the factors which affect the doctors and physicians in taking their decision regarding prescription. This study is conducted in a non-contrived setting. For this study, the individuals are focused on the unit of analysis. For this study, an estimated population were the people belonging to clinical professions in which there are MRs and physicians, both are included and considered as the population for the study. For this study, the sample size is 200 participants as a large sample size provides proper mean values. In this study, the sources used to collect primary data are being used by the researchers. Easy language is used and easy words are selected for proper understanding. The response rate of this study is 80% as there were 200 responses from a total of 250 which is considered a good response rate and helps in getting authentic results for the study. A 5 point Likert scale was used. For this study, two tools have been used for analysing the data. The first tool is the SPSS tool which led to conducting the regression and correlation analysis to find the correlation between the variables and the influence of the independent variables on the dependent one. Another tool that has been utilised in this study was the Hayes model. These procedures incorporate the use of mediation and moderation and moderated mediation models.

4. Analysis

Section 1- Doctors/Physicians' perception regarding MR effectiveness and physician prescription decision

Since the current study is from the perspectives of both doctors and medical representatives, the two sections discuss both perspectives independently. This section provides doctors' demographics, MR effectiveness opinions, and prescription behaviour.

4.1 Demographic Analysis

Demographic data about the participating doctors is supplied to identify how the medical representative influenced their behaviour.

Table 4.1: Demographics

		Frequency	Percent
Gender	Male	52	51.5
	Female	49	48.5
	Total	101	100
Age	Below 30	27	26.7
	31-40	18	17.8
	41-50	29	28.7
	Above 50	27	26.7
	Total	101	100
Qualification of Respondents	HO	16	15.8
	PG	16	15.8
	MO	15	14.9
	Registrar	28	27.7
	Professor	26	25.7
	Total	101	100
Sector of Respondents	Govt. Sector	56	55.4

	Private Sector	45	44.6
	Total	101	100
Working Territory	Islamabad/Rawalpindi	29	28.7
	Lahore	42	41.6
	Multan	30	29.7
	Total	101	100

The 101 respondents in this survey were 52 men and 49 women. The study's demographics suggest that respondents were separated into three age categories, such as 31 to 40 with 18 participants. 29 individuals were aged 41 to 50, and 27 were above 50. The study's demographics suggest that respondents were separated into three age categories, such as 31 to 40 with 18 participants. 29 individuals were aged 41 to 50, and 27 were above 50. Demographic analysis showed that 56 participants were from the Govt. sector and 45 were from the Private sector. One of the most important parts of this study was the respondents' working territory. 29 responses were from Islamabad/Rawalpindi, 42 from Lahore, and 30 from Multan.

4.2 Scales reliability

The next section discusses reliability testing, which focuses on the concept. According to Bonett (2015), Cronbach alpha is used to determine the reliability of a measurement scale (survey questionnaire). The threshold for Cronbach alpha is 0.6, hence a number greater than 0.6 indicates a valid measurement scale. In Table 4.2, all four measurement variables have Cronbach alpha values above 0.6. As DIMB, MRE, CBR, and PPD were 0.751, 0.638, 0.885, and 0.878 correspondingly, all the measuring variables in the research instrument were reliable.

Table 4.2: Cronbach's Alpha Reliability Results

Variables	Cronbach's Alpha	N of Items
DIMB	0.751	5
MRE	0.638	5
CBR	0.885	6

PPD	0.878	3

Table 4.3 shows data by minimum, maximum, mean, and standard deviation. The minimal DIMB value is 1.20. The lowest response was close to strongly disagree. The maximum value is 5 the highest DIMB value was highly agreed upon. In MRE, strongly disagree is also the lowest reported number, while strongly agree is the highest. In the CBR, the minimum and maximum scores are 1 and 5, signalling strongly disagree and strongly agree are extreme answers. PPD minimum is 1 and maximum is 5. The lowest and highest responses are strongly disagreed and strongly disagreed.

The mean DIMB is 3.109 and the standard deviation is 0.814. The mean of 3.109 implies that most replies were neutral but leaned towards agreeing. A standard deviation of 0.814 suggests responses deviate this much from the mean. MRE averaged 3.141. This indicates that most comments are neutral. The standard deviation of 0.662 implies that the data diverged from the mean. The mean CBR is 3.389. The mean value implies that while most responses are neutral, there is a tendency to agree. PPD averages 3.990. This means most respondents agree. The standard deviation of 0.746 indicates that values deviate from the mean.

Table 4.3: Descriptive Statistics DIMB

	N	Minimum	Maximum	Mean	Std. Deviation
DIMB	101	1.20	5.00	3.109	0.814
MRE	101	1.00	5.00	3.141	0.662
CBR	101	1.00	5.00	3.389	0.831
PPD	101	1.00	5.00	3.990	0.746

4.3 Correlation of the variables

Correlation analysis helps determine the relationship between variables. Pearson Correlation measures the relationship between variables. The Pearson Correlation runs from 0 to 1 but can be positive or negative, indicating a positive or negative link between the variables. The same researcher found that a weak relationship exists between variables when the Pearson Coefficient

varies from 0.1 to 0.3. When this score is between 0.3 and 0.7, a moderately strong relationship is suggested. When values are between 0.7 and 1, a substantial relationship is suggested.

Table 4.4: Correlation Analysis (Doctors)

	DIMB	**MRE**	**CBR**	**PPD**
DIMB	1			
MRE	0.52**	1		
CBR	-0.31**	-0.12*	1	
PPD	0.38**	0.32**	0.13*	1

**Correlation is significant at the 0.05 level (2-tailed)*
*** Correlation is significant at the 0.01 level (2-tailed)*

In Table 4.4, DIMB and PPD have a Pearson Coefficient of 0.38, indicating a moderately strong relationship. The value between the dependant and moderator is 0.13, indicating a weak connection. The relationship between the moderator and independent variable is -0.31, indicating a reasonably strong yet negative link. A moderately high correlation between independent and mediating variables was confirmed. The Pearson Coefficient for the mediator-dependent relationship is 0.32. The value implies a reasonably high relationship between MRE and PPD.

4.4 Hypothesis Testing (Doctors' Perspective)

SPSS employed PROCESS Hayes to test hypotheses. Table 4.5 indicates CBR's moderating influence on DIMB and PPD, as well as DIMB's direct effect. SPSS employed PROCESS Hayes to test hypotheses.

Table 4.5: Moderation Analysis (DIMB□PPD, CBR)

Outcome variable: PPD							
	b	***SE***	***t***	**LLCI**	**ULCI**	***R2***	***F***
Constant	-	0.26	34.56***	8.31	9.32	0.22	22.89***
DIMB	0.41	0.05	7.41**	0.13	0.22		
CBR	0.24	0.05	4.42**	0.06	0.14		
DIMB ´ CBR	-0.01	0.01	-0.65	-0.01	0.00		

4.4.1 Hypothesis 1: DIMB influence PPD via MRE

The table presented below shows that medical representative efficacy mediates the association between medication information mavenism and physician prescription choice. Multiple regression using PROCESS Hayes (Model 4) was used to examine the indirect effect without the moderator with a 5000-bootstrap sample. Based on the table above (Table 4.5), it can be seen that DIMB has a significant and beneficial influence on MRE at the 1% threshold level. The generated regression model was significantly based on F-statistics 60.74. R-square = 0.27 means predictors explain 27% of the dependent variable. MRE partially mediates the link between DIMB and PPD (t > 1.96). The indirect impact significance was assessed using bootstrapping, and the preceding table shows that the confidence interval did not include 0, indicating that it was significant.

Table 4.6: Mediation Analysis (DIMB□MRE□PPD)

Outcome variable: MRE							
	b	***SE***	***t***	**LLCI**	**ULCI**	***R2***	***F***
Constant	-	2.8	11.37***	26.34	37.36	0.27	60.74***
DIMB	0.51	0.05	10.61***	0.59	0.86		
Outcome variable: PPD							
	b	***SE***	***t***	**LLCI**	**ULCI**		
Constant		1.05	2.11*	0.15	4.28		
DIMB	0.26	0.06	4.36***	0.01	0.16		
MRE	0.16	0.06	2.64**	0.01	0.08		

4.4.2 Hypothesis 2: CBR will moderate the effect of MRE on PPD

After testing models 1 and 4, we ran model 14 of PROCESS Hayes to analyse CBR's effect on MRE and PPD and the total moderated mediation effect. Cost-benefit ratio moderates the relationship between medical representative effectiveness and physician prescription decision. Table presented belwo shows that medical representative effectiveness (MRE) interacted with cost-benefit ratio (CBR) to affect physician prescription decision (PPD) (t > 1.96, p 0.05). It

means that the cost-benefit ratio affects the association between MRE and PPD, validating our second hypothesis.

Table 4.7: Moderated Mediation Analysis (DIMB□MRE□ [CBR] □PPD)

Outcome variable: MRE							
	b	***SE***	***t***	**LLCI**	**ULCI**	***R2***	***F***
Constant	-	2.8	11.37***	26.34	37.36	0.27	60.74***
DIMB	0.51	0.05	10.61***	0.59	0.86		
Outcome variable: PPD							
	b	***SE***	***t***	**LLCI**	**ULCI**	***R2***	***F***
Constant	-	1.04	3.45***	1.54	5.63	0.25	20.92***
DIMB	0.33	0.061	5.38***	0.09	0.19		
MRE	0.16	0.064	2.49*	0.01	0.08		
CBR	0.24	0.051	4.63***	0.06	0.15		
MRE ´ CBR	0.10	0.047	2.09*	-0.01	0.00		

4.4.3 Hypothesis 3: The mediation path from DIMB to PPD via MRE will be moderated by CBR

As mentioned in the below mentioned table (Tables 4.8), lower and upper limit confidence intervals are both negative with a 95% significance. CBR moderates the transition from DIMB to PPD via MRE. Table 4.9 demonstrates conditional indirect effects.

Table 4.8: Moderated Mediation Index

	Index	**Boot SE**	**Boot LLCI**	**Boot ULCI**
CBR	-0.0038	0.0018	-0.0074	-0.0002

Table 4.9: Conditional indirect effect analysis

CBR	**Effect**	**Boot SE**	**Boot LLCI**	**Boot ULCI**
-1 (SD)	0.05	0.02	-0.02	0.04
Mean	0.03	0.01	0.01	0.05
+1 (SD)	0.01	0.02	0.02	0.09

Table 4.9 displays conditional indirect effect calculations with the moderator's standard deviation above and below the mean. The mediated effect is substantial for both high cost-benefit ratio (0.02, 0.09, 95%) and the mean (0.01, 0.05, 95%). According to doctors and physicians, the cost-benefit ratio affects prescription decisions and medical reps' effectiveness.

<u>Section 2- Medical representatives' perception regarding their own effectiveness and physician prescription decision</u>

4.5 Demographical Analysis

This component of the study provides a demographic analysis of the medical representative's data, which helps the researcher determine their effectiveness over physicians' prescription behaviours.

Table 4.10: Demographics

		Frequency	Percent
Gender	**Male**	80	80
	Female	20	20
	Total	100	100
Age	**Below 30**	52	52
	31-40	24	24
	41-50	16	16
	Above 50	8	8
	Total	100	100
Qualification of Respondents	**Secondary**	10	10
	Bachelor	26	26
	Master	51	51
	Doctorate	13	13
	Total	100	100
Sector of Respondents	**Medical**	54	54
	Non-medical	46	46
	Total	100	100

Working organisation	**National**	43	43
	Multinational	57	57
	Total	100	100
Working Territory	**Islamabad/Rawalpindi**	34	34
	Lahore	38	38
	Multan	28	28
	Total	100	100

In this section, 100 respondents were asked about medical representative effectiveness; 80 were male and 20 were female. In this study, respondents were separated by age, with 24 from 31 to 40 and 16 from 41 to 50. 8 responses were over 50. 26 respondents had bachelor's degrees, 51 had master's degrees, and 13 had doctorates. 54 responders were from the medical industry, while 46 were non-medical. In this study, respondents' working organisations were classified as national or international; 43 were from national organisations and 57 from multinational organisations. This study incorporated the respondents' working territories to make the analysis more location-specific. 34 respondents were from Islamabad/Rawalpindi, 38 from Lahore, and 28 from Multan.

4.6 Scales reliability

Cronbach alpha is a statistical indicator that determines if a measuring scale is dependable. Since the Cronbach alpha criterion is 0.6, values above 0.6 are considered credible. DIMB's Cronbach alpha is 0.614, indicating its questions are internally consistent. 0.680 is the Cronbach alpha. Cronbach alpha shows MRE questions are internally consistent. CBR's Cronbach alpha is 0.90. This means queries in this area are consistent. PPD's Cronbach alpha is 0.906, indicating that its questions are internally consistent.

Table 4.11: Cronbach's Alpha Reliability Results

Variables	Cronbach's Alpha	N of Items
DIMB	0.614	5
MRE	0.680	5

CBR	0.907	6
PPD	0.906	3

4.7 Descriptive statistics

The following descriptive statistics explain medical representative executive data. DIMB's minimum value is 1.20 and its maximum is 5. The lowest recorded rating was near strongly disagreeing, while the highest was highly agreeing. The mean was 3.096 and the standard deviation was 0.8285. Despite the 0.8285 standard deviations, most comments were neutral. The minimum and maximum MRE values were 1 and 5, indicating strongly disagreeing and disagreeing were the lowest and highest recorded values for this measure. With a standard deviation of 0.696 and a mean of 3.112, most responses were near neutral.

CBR's minimum value is 1 and maximum value is 5. Firmly disagree and strongly agree are the extremes. The mean value is 3.330, indicating most replies are neutral or agree-leaning. The standard deviation of 0.8835 suggests the values deviated from the mean. PPD's minimum and maximum scores are 1 and 5, indicating that strongly disagree and strongly agree are its two extremes. The mean value of 3.997 indicates that respondents tend to agree, and the values differ from the mean by 0.8144.

Table 4.12:1 Descriptive Statistics MRE

	Mean	**Std. Deviation**
DIMB	3.096	0.8285
MRE	3.112	0.6965
CBR	3.330	0.8835
PPD	3.997	0.8144

4.8 Hypothesis Testing (Medical Representatives' Perspective)

The results of moderation analysis indicates CBR's moderating influence on DIMB and PPD, as well as DIMB's direct effect.

Table 4.13: Moderation Analysis (DIMB→PPD, CBR)

Outcome variable: PPD							
	b	***SE***	***t***	**LLCI**	**ULCI**	***R2***	***F***
Constant	-	0.21	27.95***	5.5351	6.2039	0.19	7.83***
DIMB	0.48	0.05	8.43**	0.0871	0.7559		
CBR	0.18	0.05	3.26**	-0.1714	0.4974		
DIMB ´ CBR	-0.02	0.03	-0.65	-0.3539	0.3149		

The abovementioned table indicates CBR's moderating influence on DIMB and PPD, as well as DIMB's direct effect.

Table 4.14: Mediation Analysis (DIMB→MRE→PPD)

Outcome variable: MRE							
	b	***SE***	***t***	**LLCI**	**ULCI**	***R2***	***F***
Constant	-	0.2	6.74***	0.9538	1.7491	0.45	82.67***
DIMB	0.56	0.06	9.09***	0.4445	0.6928		
Outcome variable: PPD							
	b	***SE***	***t***	**LLCI**	**ULCI**	***R2***	***F***
Constant	-	0.35	7.05***	1.7866	3.184	0.17	10.08***
DIMB	0.23	0.05	4.6***	-1.8345	2.2945		
MRE	0.48	0.14	3.29**	0.1924	0.7746		

Table 4.15 shows that medical representative efficacy mediates the connection between medication information mavenism and physician prescription choice. Multiple regression using PROCESS Hayes (Model 4) was used to examine the indirect effect without the moderator with a 5000-bootstrap sample.

Table 4.15: Moderated Mediation Analysis (DIMB→MRE→ [CBR] →PPD)

Outcome variable: MRE							
	b	***SE***	***t***	**LLCI**	**ULCI**	***R2***	***F***

Constant	-	0.2	6.74***	0.9538	1.7491	0.45	82.67***
DIMB	0.56	0.06	9.09***	0.4445	0.6928		
Outcome variable: PPD							
	b	***SE***	***t***	**LLCI**	**ULCI**	***R2***	***F***
Constant	-	1.04	3.45***	1.54	5.63	0.25	20.92***
DIMB	0.28	0.06	4.67***	0.09	0.14		
MRE	0.48	0.14	3.29**	0.1924	0.7746		
CBR	0.18	0.05	3.26**	-0.1714	0.4974		
MRE ´ CBR	-0.17	0.089	-1.95*	-0.3487	0.003		

In the MRE model, the computed t-statistics show a substantial and positive effect of DIMB at the 1% threshold. The regression model's F-statistics were 82.67. R-square = 0.45 shows predictors explain 45% of the dependent variable. The second part of the model determines the direct influence of the independent variable on the dependent and the effect of the mediator on the dependent. Table 4.15 suggests that DIMB improves PPD. The mediator also has a direct effect on the dependent variable. Since both the independent and mediating variables have a significant effect on the dependent variable, MRE mediates the relationship between DIMB and PPD, according to Nitzl (2016).

Table 4.16: Moderated Mediation Analysis (DIMB→MRE→ [CBR]→PPD)

Outcome variable: MRE							
	b	***SE***	***t***	**LLCI**	**ULCI**	***R2***	***F***
Constant	-	0.2	6.74***	0.9538	1.7491	0.45	82.67***
DIMB	0.56	0.06	9.09***	0.4445	0.6928		
Outcome variable: PPD							
	b	***SE***	***t***	**LLCI**	**ULCI**	***R2***	***F***
Constant	-	1.04	3.45***	1.54	5.63	0.25	20.92***
DIMB	0.28	0.06	4.67***	0.09	0.14		
MRE	0.48	0.14	3.29**	0.1924	0.7746		
CBR	0.18	0.05	3.26**	-0.1714	0.4974		

MRE ´ CBR	-0.17	0.089	-1.95*	-0.3487	0.003

After testing models 1 and 4, we ran model 14 of PROCESS Hayes to analyse CBR's effect on MRE and PPD and the total moderated mediation effect. Cost-benefit ratio moderates the relationship between medical representative effectiveness and physician prescription decision. If we look at the t-value (t = -1.95), lower limit confidence interval (-0.3487), and upper limit confidence interval (0.003) of the interaction effect of MRE and CBR, we can conclude that CBR does not moderate the link between MRE (mediator) and PPD (dependent variable). Our second hypothesis fails.

Table 4.17: Conditional Indirect Effect Analysis

CBR	Effect	Boot SE	Boot LLCI	Boot ULCI
-1 (SD)	0.24	0.18	-0.14	0.57
Mean	0.16	0.14	-0.1	0.44
+1 (SD)	0.07	0.13	-0.19	0.34

The lower limit confidence interval is negative and the upper limit confidence interval is positive (passing zero), proving that the mediated path from DIMB to PPD via MRE is not controlled by CBR. The overall mediated effect is not significant for all three levels of the cost-benefit ratio (-1SD, mean, +1SD). The cost-benefit ratio doesn't affect prescription decisions, but effectiveness does. The third hypothesis is thus rejected.

5. Discussion and Conclusion

The study investigates the relationship between MR’s knowledge on drugs and the effectiveness of medical representatives. Medical reps have a vital role in educating doctors about the advantages of various products and therapies that are now available in the market.

Nevertheless, it is crucial to contemplate the manner in which medical representatives communicate the cost-benefit ratio of these treatments to doctors, who are responsible for making well-informed decisions regarding the prescription of pharmaceuticals to patients. Research indicates that medical representatives can exert a substantial influence on the prescribing behaviour of hospital physicians (Atia, Gismallah, and Almogadmi, 2022).

Therefore, it is imperative for medical representatives to furnish precise and pertinent information regarding the expense and effectiveness of various therapies, in order to guarantee that doctors make optimal judgements for their patients. In addition, clinicians should consider the cost-benefit ratio when prescribing pharmaceuticals to ensure that patients receive the best suitable care at a reasonable cost (Murshid & Mohaidin, 2018; Shimura, 2018).

The present study has important implications for understanding the role of drug information mavenism (DIMB) on medical representatives and physician prescribing behavior. Its findings demonstrate the importance of accurate and comprehensive information in shaping decision making among healthcare professionals. However, there is a need for further research to examine the specific factors that comprise DIMB and how they impact medical representatives and physicians. To achieve this, future studies should include a diverse range of participants from various specialties, such as doctors, nurses, and pathologists, in order to gather a more comprehensive data set. Additionally, it is crucial to study how medical representatives communicate the costs and benefits of medication to physicians and how this information influences their prescribing decisions. However, one of the limitations of the current study is that it has a limited sample size which limits generalization of the findings.

Recent studies have demonstrated that the key attributes of a drug representative encompass soft skills, a polished demeanor, effective communication, emotional intelligence, and proficiency in psychology (Ahmed et al., 2016; Jandhyala, 2020). Hence, it would be beneficial for future studies to investigate the influence of personal traits and qualities of medical representatives on the prescription behaviour of physicians, and how this interaction is affected by DIMB. Furthermore, it is crucial to take into account the influence of patient preferences and the consequences of cost-benefit analysis on the choices made when prescribing medication (Santillo et al., 2019; Murshid and Mohaidin, 2018). In summary, this study emphasises the necessity for additional research in order to gain a more comprehensive understanding of the intricate dynamics between DIMB, medical representatives, and the behaviour of physicians when it comes to prescribing medication.

The study's findings suggest that healthcare facilities should prioritize information sharing to improve the effectiveness of medical representatives. The study investigates the concept of drug information mavenism (DIMB) as a novel factor that can enhance the organisation and structure of decision-making, in accordance with the idea of planned behaviour (Samadi, 2018).

In addition, the DIMB can be analysed from a sociocultural perspective, which emphasises the significance of social connections in the exchange of experiences and ideas (Savolainen, 2017). The study can assist healthcare stakeholders in leveraging DIMB to enhance the efficiency of healthcare personnel, including nurses, doctors, and medical residents.

Moreover, the pharmaceutical sector might utilise the study's findings to modify drug packaging and enhance the efficacy of medical representations. Healthcare practitioners can make more educated decisions when providing pharmaceuticals to their patients by taking into account cost-benefit ratios (Murshid & Mohaidin, 2018).

Moreover, the study might provide valuable insights for the creation of training programs for medical representatives, with a specific emphasis on the significance of precise and thorough information dissemination, as well as the proficient communication of expenses and advantages to physicians. Moreover, the study can also be utilised to enlighten the creation of guidelines and policies inside healthcare facilities to foster knowledge dissemination and enhanced decision-making among healthcare personnel. According to Srivastava & Bodkhe's (2019) study, having precise and thorough knowledge on pharmaceuticals can assist physicians in making well-informed decisions and enhancing the quality of treatment given to patients. The pharmaceutical sector can utilise the study to enhance their marketing tactics by emphasising cost-benefit ratios and drug indication, enabling them to effectively target the appropriate physicians and enhance their sales performance.

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Annex-1: Survey (For Doctors)

Gender:

1. Male
2. Female

Age:

1. Below 30
2. 31 – 40
3. 41 – 50
4. Above 50

Education:

1. HO
2. PG
3. MO
4. Registrar
5. Professor

Working Sector:

1. Govt. Sector
2. Private Sector

Working Territory:

1. Islamabad/Rawalpindi
2. Lahore
3. Multan

Using the scale given below, rate your experience with the brand you hate:

1 (Strong Disagree) 2 (Disagree) 3 (Neutral) 4 (Agree) 5 (Strongly Agree)

Opinion regarding Medical Representatives		**SD**	**D**	**N**	**A**	**SA**
1	Medical representative like introducing new medicines/drugs to his friends and family	1	2	3	4	5
2	Medical representative like helping people by providing them with information about medicines	1	2	3	4	5
3	People often ask medical representative for information about medicines	1	2	3	4	5
4	If someone asked medical representative where to get the best information about a particular medicine, he could tell him or her where to go	1	2	3	4	5
5	Medical representative's friends think of him as a good source of information when it comes to new information about medicines	1	2	3	4	5

Considerations while prescribing drugs		SD	D	N	A	SA
6	I consider prescribing drugs where the medical representatives possess sufficient knowledge on medicines that they market	1	2	3	4	5
7	I consider prescribing drugs that have medical representatives explaining the side effects of the drug that can affect the patient	1	2	3	4	5
8	I consider prescribing drugs that have medical representatives who keep in constant contact with them (e.g. repeated visits)	1	2	3	4	5
9	I consider prescribing drugs that have medical representatives who follow ethical and professional standards at all times	1	2	3	4	5
10	I always consider prescribing drugs which have medical representatives who share social and interpersonal relationships with the physicians	1	2	3	4	5
Whenever I write prescription:		**SD**	**D**	**N**	**A**	**SA**
11	Drug price interferes with my prescription	1	2	3	4	5
12	Patient incomes interfere with my prescription	1	2	3	4	5
13	The existence of generic drugs interfere with my prescription	1	2	3	4	5
14	Drugs that can be obtained without payment by governmental supports interfere with my prescription	1	2	3	4	5
15	Patient history interferes with my prescription	1	2	3	4	5
16	Relation cost/benefit interferes on my prescription	1	2	3	4	5
17	The type of drug (generic or branded) determines what I prescribe to the patient	1	2	3	4	5
18	I follow the treatment guidelines every time I prescribe the drug to the patient	1	2	3	4	5
19	I prescribe the drug to the patient based on his or her purchasing power (that is, the patient's ability to buy drug)	1	2	3	4	5

Thank you for your time and cooperation.

Annex-2: Survey (For Medical Representatives)

Gender:

1. Male
2. Female

Age:

1. Below 30
2. 31 – 40
3. 41 – 50
4. Above 50

Education:

1. Secondary
2. Bachelor
3. Master
4. Doctorate

Education Background

1. Medical
2. Non-Medical

Working Organization:

1. National
2. Multinational

Working Territory

1. Islamabad\ Rawalpindi
2. Lahore
3. Multan

Using the scale given below, rate your experience with the brand you hate:

1 (Strong Disagree) 2 (Disagree) 3 (Neutral) 4 (Agree) 5 (Strongly Agree)

		SD	D	N	A	SA
1	I like introducing new medicines/drugs to my friends and family.	1	2	3	4	5
2	I like helping people by providing them with information about medicines	1	2	3	4	5
3	I like helping people by providing them with information about medicines**.**	1	2	3	4	5

4	If someone asked where to get the best information about a particular medicine, I could tell him or her where to go	1	2	3	4	5
5	If someone asked where to get the best information about a particular medicine, I could tell him or her where to go	1	2	3	4	5
6	I possess sufficient knowledge on medicines that the company promote.	1	2	3	4	5
7	I have the ability to explain the side effects of the drug that can affect the patient	1	2	3	4	5
8	I keep on visiting the doctor constantly (e.g. repeated visits)	1	2	3	4	5
9	I always follow ethical and professional standards at all times	1	2	3	4	5
10	I tend to share social and interpersonal relationships with the physicians	1	2	3	4	5
Whenever the doctor/physician write a prescription, he/she considers the following		**SD**	**D**	**N**	**A**	**SA**
11	Drug price	1	2	3	4	5
12	Patient income	1	2	3	4	5
13	The existence of generic drugs	1	2	3	4	5
14	Drugs that can be obtained without payment by governmental supports	1	2	3	4	5
15	Patient history	1	2	3	4	5
16	Relation cost/benefit	1	2	3	4	5
17	The type of drug (generic or branded) determines what the physician prescribe to the patient	1	2	3	4	5
18	The physician follow the treatment guidelines every time he/she prescribe the drug to the patient	1	2	3	4	5
19	The physician prescribe the drug to the patient based on his or her purchasing power (that is, the patient's ability to buy drug)	1	2	3	4	5

Thank you for your time and cooperation.