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Influences on interactions between physicians in the public and private sectors and medical representatives in Yemen

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Abstract

Objective This study aims to assess the relative importance of attitude and subjective norms as well as physicians' characteristics and practice-setting factors in predicting the outcome of physicians' interactions with MRs.

Methods A cross-sectional survey was conducted among a convenience sample of 602 physicians in Sana'a, Yemen. The data were analysed using descriptive and inferential analyses. The *t*-test/Mann–Whitney test and ANOVA/Kruskal–Wallis test with post hoc analysis, principal component analysis, correlation analysis and regression analysis were applied at an a priori significance level of 0.05.

Key findings The response rate was 76.5%. Results showed that physicians who see a greater number of MRs per week or have academic affiliations were significantly more likely to have received high/low-value promotional items than were those who saw fewer MRs or have no academic affiliations (*P* values < 0.001 and 0.021, respectively). Also male physicians and physicians who have private clinics were significantly more likely to have received high-value promotional items (*P* value < 0.001). Three out of five hypotheses were supported (physicians' belief in the appropriateness of accepting high/low-value pharmaceutical companies' promotional techniques relate positively and significantly to their behaviour of interactions with MRs, and physicians' attitudes towards pharmaceutical companies relates positively and significantly to their interactions with MRs).

Conclusion Physicians in Yemen consider most of the promotional techniques as normal practice. The article provides empirical evidence for policymakers in developing countries in general, and Yemen specifically, to develop suitable policies and regulations for drug promotion.

Keywords drug promotion; ethical promotion; medical representatives; pharmaceutical industry; Yemen

Introduction

Pharmaceutical companies consider drug promotion and drug marketing to be factors that play a main role in their success.^[1] Therefore, a large amount of the budgets of pharmaceutical companies is spent on promotional activities. A study conducted in Canada reported that spending on sales representatives and journal advertising for the 50 most heavily promoted drugs went from a low of \$421 434 000 to \$562 926 000 and the ratio of R&D to promotion spending was 1.43 to 2.18.^[2] While these promotional activities differ widely in technique and extent of use, most of their budget was found to be targeting physicians.^[3] However, the question of the appropriateness of these promotional techniques and the marketing relationships between physicians and the pharmaceutical industry has been a matter of ongoing debate since the 1960s.^[4]

One promotional activity that has been heavily investigated and debated is drug-detailing by medical representatives (MRs), which is the most common technique used by pharmaceutical companies.^[1] This technique is highly effective, as MRs communicate the merits of a particular product directly to physicians.^[5] The literature has reported that even physicians themselves do not deny the effect of MRs on their prescribing habits.^[6,7] The type and frequency of interactions between physicians and MRs have received

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increased scrutiny from many stakeholders.^[8,9] Nonetheless, interactions between physicians and MRs continue to be among the most controversial subjects in pharmaceutical promotion studies over the last decade. A recent study conducted in Europe discussed transparency in reporting pharmaceutical companies' payment to health professionals.^[10] Physicians' attitudes towards such interactions have received considerable attention in the literature.^[8,9] However, only a few studies intended to identify physicians' attitudes towards MRs have been conducted in developing countries.^[11,12]

In addition to MR practices, the characteristics of physician interactions with medical representatives have been a subject of interest for many researchers in the area of drug promotion. Factors such as age, gender, race, specialty, number of years in practice, practice setting (e.g. private versus university or community hospital; urban versus rural), the business of physician practices, and whether physicians are governmental employers or self-employed have been of considerable interest.

Nevertheless, although there is a rich literature that has sought to measure the marketing relationship between physicians and the pharmaceutical industry, the perspective of physicians' belief in the appropriateness of accepting promotional items from pharmaceutical companies has rarely been studied, if at all. In addition, many of the studies investigating other perspectives are either outdated or cover particular specialties or were conducted in advanced countries that do not represent practices in developing countries. Additionally, most of these studies have not systematically investigated the possible predictors, mainly demographic characteristics and practice-setting factors, associated with physicians' beliefs and attitudes towards drug promotion. Therefore, studies that comprehensively investigate the predictors of this relationship, especially in developing countries, are scarce. This study aims to be more comprehensive because it investigates whether there is an association between physicians' beliefs and attitudes towards drug promotion and their characteristics and practice-setting factors. In this way, it hopes to fill gaps in the existing literature and provide a more complete picture.

Theoretical background

In the current study, the authors attempted to achieve a better understanding of the factors that influence physicians' interactions with MRs. A thorough literature review of drug promotion strategies was conducted. A list of factors believed to influence physicians' attitudes and beliefs in relation to interactions with medical representatives was generated. The relationship between these factors appears to be supported by the theory of planned behaviour (TPB),^[13] which therefore was considered an appropriate initial theoretical framework to guide the current study. The TPB has been extensively applied to the prediction of behaviour. Although it provides strong explanations for the overall prediction of individual behaviour, the authors further enhanced the TPB model based on the aforementioned literature review. Then, all the generated factors were mapped into a model adapted from the TPB (Figure 1) to assess the

relative importance of attitude and subjective norms as well as physicians' characteristics and practice-setting factors in predicting the outcome of physicians' interactions with MRs.

Literature review and hypothesis derivation

Beliefs

Beliefs about objects are generated by personal experiences. These experiences accumulate over time and cause a person to view a specific behaviour either positively or negatively and thereby to form his or her beliefs about that specific behaviour. According to Ajzen and Fishbein,^[14] not all beliefs can affect or mediate behaviour, only salient beliefs do. Therefore, they consider salient beliefs to be immediate or prime determinants of behaviour. Physicians' belief in the appropriateness of accepting promotional items from pharmaceutical companies has been researched in the context of a variety of physicians' positions and healthcare settings, medical schools and residency programmes. The majority of physicians believe it is ethically appropriate to accept free drug samples from MRs.^[15,16] A study conducted in the United States among postgraduate trainees at an internal medicine residency programme revealed that a high proportion of the residents considered the vast majority of types of gift items to be appropriate.^[17] Another study conducted at a US medical college among faculty members and residents reported no difference between the two groups in believing that most drug promotion activities do not pose major ethical problems.^[18] Macneill et al.^[16] reported a finding that, although to a lesser extent than in previous years, some physicians still believed that it is appropriate to accept both low- and high-value gifts. A study conducted in Tatarstan, Russia, revealed that 42.9% of physicians and 77.8% of residents believed that the acceptance of gifts from MRs is ethical.^[19] Similarly, the Morgan survey found that approximately 40% of physicians disagreed that interactions with medical representatives should be more strictly regulated.^[15] Physicians who believed that it is ethically appropriate to accept promotional items from drug companies justified this belief in different ways. More than 50% of the respondents considered it ethical for physicians who were high-volume prescribers of that company's drugs to accept a consultantship honorarium from the company.^[15]

It is clear from this literature review that physicians have mixed views about their beliefs in the appropriateness of accepting promotional items from pharmaceutical companies. Studies conducted in both developed and developing countries have provided contradictory results. While some of those studies have found that most physicians described some ethical problems associated with encounters with MRs, other studies have indicated that most of the physician respondents did not consider most drug promotional activities to cause important ethical problems. Physicians tended to make distinctions about the appropriateness of accepting gift items depending on their type and cost and their educational value. Different categories of respondents justified the acceptance of gifts because giving them was seen as part of the free enterprise system, the way business works or, in

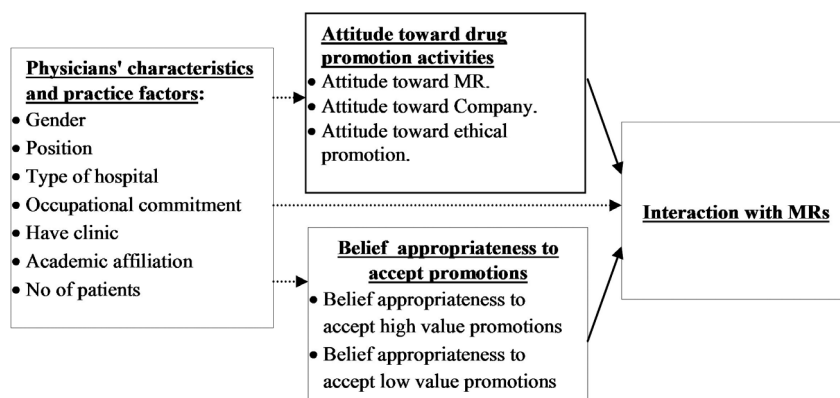


Figure 1 Conceptual framework of factors which influence physician interactions with MRs.

the case of residents, related to whether they needed financial assistance with their education.

Based on the above literature review and to test the model, as shown in Figure 1, the following hypotheses were proposed:

Hypothesis (H1)

There is a significant positive relationship between physicians' belief that it is appropriate to accept pharmaceutical companies' promotional items and physicians' interactions with MRs.

Corollary hypotheses

H1.1 There is a significant positive relationship between physicians' belief that it is appropriate to accept high-value promotional items and their interactions with MRs.

H1.2 There is a significant positive relationship between physicians' belief that it is appropriate to accept low-value promotional items and their interactions with MRs.

Attitude

Attitudes have been defined in different ways, but at the core is the idea of evaluation. Thus, attitudes are generally viewed as summary evaluations of objects along a dimension ranging from positive to negative.^[20] In the field of marketing and drug promotion, attitude is defined as the liking or disliking expressed by physicians towards MRs and the evaluation of the appropriateness of their promotional activities.^[21] The association between physician participation in promotional events and attitudes towards interactions with medical representatives has been researched in only a few studies. The literature shows a positive correlation between the extent of physicians' involvement in promotional activities, their general attitude towards and belief in the importance of medical representatives as information sources, and their belief in the appropriateness of gifts from medical representatives.^[22] Additionally, a study conducted in the United States revealed that higher positive attitudes towards a brand name developed among students

who were shown the brand promotional items in comparison with the control group, while the effect was reversed when restrictive policies were employed to restrain pharmaceutical marketing.^[23]

Based on the above, and again to test the model shown in Figure 1, the following hypotheses were proposed:

Hypothesis (H2)

There is a significant positive relationship between physicians' attitudes towards interactions with MRs and their interactions with MRs.

Corollary Hypotheses

H2.1 There is a significant positive relationship between physicians' attitudes towards MRs and their interactions with MRs.

H2.2 There is a significant positive relationship between physicians' attitudes towards pharmaceutical companies and their interactions with MRs.

H2.3 There is a significant positive relationship between physicians' attitudes towards the outcomes of promotional techniques and their scepticism about the ethicality of those promotional techniques and their interactions with MRs.

Method

This study is a cross-sectional survey that was designed to examine the relationship between physicians' beliefs and attitudes towards drug promotion and their characteristics and practice-setting factors. The study protocol was approved by the Ethical Committee of the MoPHP before the commencement of the study. Introductory letters from the deputy director of the Planning and Development sector of the MoPHP were addressed to each target hospital and presented to the hospitals involved in this research.

Tool development and validation

The questionnaire was composed of six parts. However, in this study, only four parts are included: experience with

drug promotion (14 items), belief in the appropriateness of accepting promotional items from pharmaceutical companies (13 items), attitude towards drug promotion activities (13 items), and physicians' characteristics and practice-setting factors. The items measuring these parts were informed by a literature review of studies that evaluated physicians' beliefs and attitudes towards drug promotion.^[17,24–26] All items were measured with a five-point Likert scale ranging from (1) 'strongly disagree' to (5) 'strongly agree'. Factor analysis was performed, and items measuring physicians' beliefs were condensed into two factors: belief in the appropriateness of accepting high-value promotional items and belief in the appropriateness of accepting low-value promotional items. At the same time, items measuring physicians' attitudes were condensed into three main factors: attitudes towards MRs, attitudes towards pharmaceutical companies and attitudes towards ethical promotions. Only the scores of these factors were employed in the model evaluation.

The construct validity of the questionnaire was assessed by determining the degree to which certain explanatory concepts are capable of accounting for performance. Two methods, expert content review and factor analysis, were used to validate the questionnaire. Prior to the distribution of the survey, the questionnaire items were reviewed via expert consultations with three individuals in related academic fields and in the field of pharmaceutical promotion. These individuals were asked to review and edit the questionnaire and eliminate any items that did not relate to the primary focus of the questionnaire. A pretest of the instrument was conducted among a sample of 10 physicians in the target population. A pilot study was conducted with 52 physicians possessing similar population characteristics to test the feasibility, reliability and validity of the proposed scale. The questionnaire was revised based on the results of the pilot test. To measure the internal consistency of the questionnaire, Cronbach's alpha (α) coefficients were calculated to ensure the reliability of the instrument. The results ranged between 0.638 and 0.840 among the main questionnaire constructs. This was taken as indicative of a high degree of internal consistency for the instrument.

Data collection

This study investigated factors that influence physicians' interactions with MRs. Therefore, to address the research objectives, this study gathered data from all physicians working in outpatient clinics in all governmental and six private hospitals.

A convenience sample was selected due to the difficulty of obtaining a complete sample frame. A document containing only the total number (1390), but no list, of licensed physicians was obtained from the Registry of Human Resources Department. This number was further subdivided into two numbers: 1159 physicians working in public hospitals and 231 physicians working in private hospitals.

During the period of June to August 2010, data were collected via a questionnaire survey carried out in Sana'a, Yemen. A total of 610 questionnaires were distributed, and with a response rate of 76.5%, our final sample for the

analysis included 450 physicians, which is larger than the sample size of 385 calculated by following the Cochran formula.^[27]

The sample comprised more than one-third ($n = 181$, 40%) of physicians who were specialists in a range of fields that included internal medicine ($n = 40$, 22.1%), gynecology ($n = 23$, 12.7%), surgery ($n = 23$, 12.7%) and paediatrics ($n = 21$, 11.6%). Of the respondents, 30.3% ($n = 136$) worked in private hospitals, while 30.1% ($n = 135$) maintained a private clinic and 15.1% ($n = 68$) held an academic position. Of the respondents, 30% saw more than 20 patients per day, and the mean overload of patients to physicians per day was 16.8 ± 11.00 with a median (IQR) of 15 (10–20). The mean overload of MR visits to physicians per week was 7.06 ± 5.91 , with a median (IQR) of 6 (3–9).

Data analysis

Statistical Package for Social Sciences (SPSS) version 16 (SPSS Inc. Released 2007. SPSS for Windows, version 15.0.; SPSS Inc., Chicago, IL, USA) was used for data entry and analysis. The mean (SD), frequency distribution and percentage of the variables were calculated to describe the data. A normality test was performed for continuous data. Inferential statistical analyses were used to answer the research questions and objectives. The *t*-test/Mann–Whitney test, ANOVA/Kruskal–Wallis test with post hoc analysis, principal component analysis, correlation analysis and regression analysis were applied at an a priori significance level of 0.05.

Results

Physicians' interactions with MR promotional techniques

A sample question in this part read as follows:

'During the last six months, how often have you received any of the following promotional items from drug companies or their representatives?' [14 promotional items listed]. The results are presented in Table 1 below:

To facilitate a graphic presentation, answers with a score of 2, 3, 4 or 5 were aggregated as category 'Yes', while scores of 1 remained as category 'No'. Figure 2 illustrates the percentage of physicians who have received or been subjected to a particular pharmaceutical promotional technique.

A principal component analysis with varimax rotation was used to examine the factor structure of all variables. A factor loading greater than 0.40 was considered significant.^[28] Two extracted factors, received low-value promotional items and received high-value promotional items, were identified, as presented in Table 2 below:

Independent *t*-tests were carried out to look at the differences in the score of 'received low-value promotional items' between categories of physicians' characteristics and practice-setting factors: gender, possession of a private clinic, occupational commitment, academic affiliation and type of hospital. ANOVA was run to compare the scores of

Table 1 Physicians' interaction with MRs promotion techniques

	Median (IQR)	Never (%)	Rarely (%)	Sometimes (%)	Usually (%)	Always (%)
Drug sample	4 (3-5)	17 (3.8)	39 (8.7)	132 (29.4)	135 (30.1)	126 (28.1)
Educational material	3 (2-4)	52 (11.6)	81 (18.0)	164 (36.5)	108 (24.1)	44 (9.8)
Small gifts	3 (2-4)	65 (14.5)	75 (16.7)	164 (36.5)	93 (20.7)	52 (11.6)
Seminar	3 (2-3)	68 (15.1)	129 (28.7)	186 (41.4)	66 (14.7)	0.0 (0.0)
Dinner	2 (2-3)	100 (22.3)	131 (29.2)	170 (37.9)	48 (10.7)	0.0 (0.0)
Patient educational material	2 (1-3)	152 (33.9)	102 (22.7)	122 (27.2)	50 (11.1)	23 (5.1)
Textbook	2 (1-2)	218 (48.6)	125 (27.8)	74 (16.5)	32 (7.1)	0.0 (0.0)
Practice aids	1 (1-2)	301 (67.0)	82 (18.3)	50 (11.1)	16 (3.6)	0.0 (0.0)
Prints	1 (1-2)	326 (72.6)	59 (13.1)	44 (9.8)	20 (4.5)	0.0 (0.0)
Conference	1 (1-1)	350 (78.0)	51 (11.4)	33 (7.3)	15 (3.3)	0.0 (0.0)
Social outing	1 (1-1)	352 (78.4)	70 (15.6)	18 (4.0)	9 (2.0)	0.0 (0.0)
Financial reward	1 (1-1)	382 (85.1)	37 (8.2)	30 (6.7)	0.0 (0.0)	0.0 (0.0)
Electronic devices	1 (1-1)	378 (84.2)	46 (10.2)	21 (4.7)	4 (0.9)	0.0 (0.0)
Honorarium consultation	1 (1-1)	407 (90.6)	27 (6.0)	8 (1.8)	7 (1.6)	0.0 (0.0)

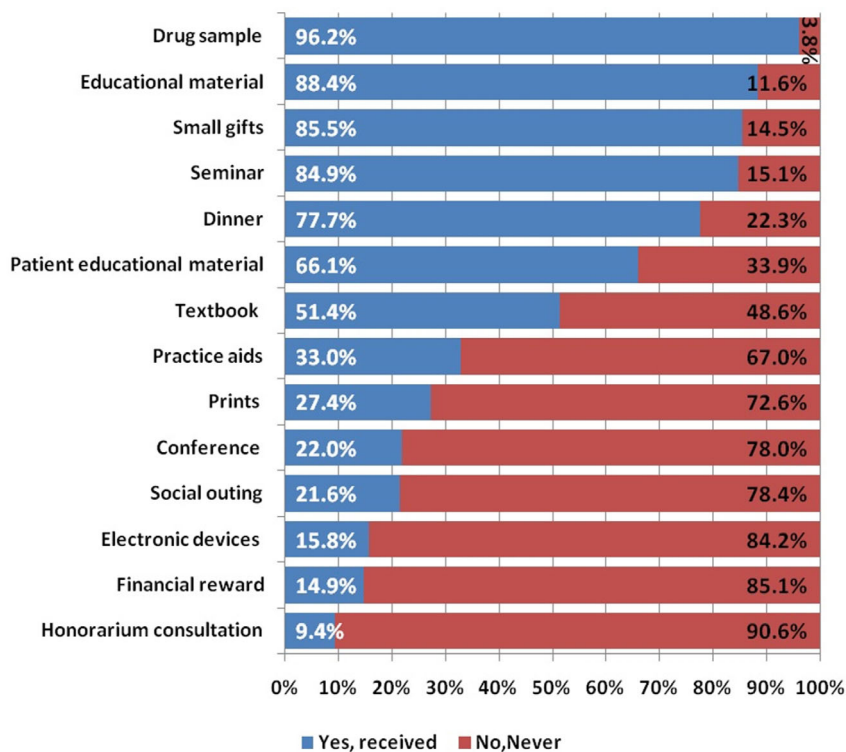


Figure 2 Percentages of physicians received or been subject to a particular pharmaceutical promotional technique.

'received low-value promotional items' between groups of physicians sorted by position and the number of MRs seen per week. No significant differences were seen between groups of physicians' positions, whereas there is a significant difference somewhere among the scores of category number of MRs seen per week. To examine where the differences actually occurred, post hoc analysis was conducted via Tukey's HSD. Post hoc comparisons showed that physicians who saw more than nine MRs per week were significantly ($P < 0.001$) more likely to have received low-value promotional items than were those who saw eight or fewer MRs per week. Physicians who saw 6–9 MRs per week

were also significantly ($P < 0.001$) more likely to have received low-value promotional items than were the group who saw 3–5 MRs per week. Details of the results of the independent t-test and ANOVA are presented in Table 3 below.

The Mann–Whitney test was carried out to examine the differences in the score of 'received high-value promotional items' between categories of physicians' characteristics and practice-setting factors (gender, possession of a private clinic, occupational commitment, academic affiliation and type of hospital). It was found that the median score was significantly ($P < 0.001$) greater among male respondents

Table 2 Factor analysis of physicians' interactions with MRs' promotional techniques

Rotated component matrix			
	Factors	Component	
		1	2
Received low-value promotion	Educational material	0.705	
	Seminar	0.693	
	Small gifts	0.684	
	Dinner	0.640	
	Patient educ. material	0.624	
	Drug sample	0.586	
	Textbook	0.554	
Received high-value promotion	Financial reward		0.773
	Electronic devices		0.758
	Prints		0.605
	Practice aids	0.436	0.574
	Social outing		0.408

Factor loadings of 0.40 or greater were retained.
Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

who possessed a private clinic and among respondents with an academic affiliation but did not differ significantly across occupational commitment and type of hospital. The Kruskal–Wallis test was conducted to compare the 'received high-value promotional items' score among groups of physicians sorted by position and number of MRs seen per week. Significant differences were observed between at least two groups for each factor. To examine where the differences occurred, post hoc analyses were conducted in the form of a Mann–Whitney test. The results showed that GPs and specialists were significantly ($P < 0.003$) more likely to have received high-value promotional items than were physicians still completing their residency programme. Although the post hoc results showed that physicians who saw a greater number of MRs per week were significantly ($P < 0.001$) more likely to have received high-value promotional items than were those who saw fewer MRs per week, it was nevertheless noteworthy that no significant difference existed between respondents who had seen ten or more MRs per week and those who had seen 6–9 MRs per week. Details of the results of the Mann–Whitney test and Kruskal–Wallis test are presented in Table 4 below.

Factors affecting physicians' interactions with medical representatives

Preliminary analysis

Mean scores were used to describe the study variables. Sufficient correlations were found between all independent and dependent variables. Highly correlated variables, at 0.36, which is less than 0.7, were shown. Tolerance was greater than 0.1, and VIF < 10 for each independent variable. These findings indicate that no multicollinearity existed.^[29] The authors also checked assumptions pertaining to outliers, normality, linearity, homoscedasticity and the independence of the residual regression model applied in this study. None

of the assumptions were shown to have been violated. Table 5 below presents the descriptive statistics for all variables in the model along with the zero-order correlation coefficients.

Hypothesis testing

Previous research has indicated that several factors might influence physicians' interactions with pharmaceutical representatives. One cluster was physicians sorted by characteristics and practice-setting factors: gender, position, years of experience, academic affiliation, occupational commitment, possession of a private clinic and number of patients seen per week. These seven factors were tested first and were subsequently used as controls for all further analyses of the primary variables of interest, which were attitude towards MRs, attitude towards pharmaceutical companies, attitude towards ethical promotions, belief in the appropriateness of accepting high-value promotional items and belief in the appropriateness of accepting low-value promotional items.

In model 1 (Adj. $R^2 = 0.093$), only academic affiliation, possession of a private clinic and number of patients seen per day out of the cluster of total variables related to physician characteristics and practice-setting factors were found to be significantly ($P < 0.02$, $P < 0.04$ and $P < 0.001$, respectively) associated with physicians' interactions with MRs. Details of the results of the association between physician characteristics and practice-setting factors and physicians' interactions with MRs are presented in Table 6 below:

In model 2 (Adj. $R^2 = 0.208$), the overall model of estimation that represents the factor 'influence physicians' interactions with MRs' accounted for 0.23% of the variance in physicians' interactions with MRs. Hypothesis 1 (H1) stated that physicians' belief in the appropriateness of accepting pharmaceutical companies' promotional items relates positively and significantly to their behaviour in interactions with MRs. Multiple regressions were conducted to examine the relationships between the dimensions 'belief in the appropriateness of accepting high-value promotional items', 'belief in the appropriateness of accepting low-value promotional items' and 'interaction behaviour with MRs'.

Hypothesis 2 stated that physicians' attitudes towards MRs related positively and significantly to their interaction behaviour with MRs. Multiple regressions were therefore conducted to examine the relationships between the attitude dimensions 'physicians' attitudes towards MRs', 'physicians' attitudes towards pharmaceutical companies', 'physicians' attitudes towards/scepticism about pharmaceutical companies' ethical promotions' and 'physicians' interactions with MRs'. Details of the associations of factors predicting physicians' interactions with MRs are presented in Tables 7 and 8 below:

Discussion

Physicians' interactions with MR promotional techniques

This study revealed that a high proportion (96.2% to 85.5%) of physicians received drug samples, educational

Table 3 Differences in 'received low-value promotions' among groups of physicians' sorted by characteristics and practice-setting factors

Variable	Factors	Group	N	Mean ± SD	P-value
Received low-value promotions	Gender ^a	Male	334	2.70 ± 0.72	0.400
		Female	115	2.63 ± 0.66	
	Have private clinic ^a	Yes	135	2.78 ± 0.71	0.060
		No	314	2.64 ± 0.70	
	Occupational commitment ^a	Normal day	340	2.64 ± 0.68	0.040
		Overtime	109	2.80 ± 0.76	
	Academic affiliation ^a	Yes	68	2.90 ± 0.86	0.021
		No	381	2.64 ± 0.67	
	Type of hospital ^a	Public	313	2.69 ± 0.71	0.744
		Private	136	2.66 ± 0.70	
	Position ^b	Intern	25	2.44 ± 0.78	0.220
		GPs	115	2.67 ± 0.69	
		Board (Resident)	128	2.65 ± 0.62	
		Specialist	181	2.74 ± 0.76	
		No. of MRs per week ^b	up to 2	85	
	3 to 5	138	2.58 ± 0.59		
	6 to 9	115	2.79 ± 0.60		
	≥10	111	3.16 ± 0.64		

Bold numbers are significant at $\alpha = 0.05$.

^aIndependent *t*-test.

^bANOVA was conducted at $\alpha = 0.05$.

Table 4 Differences in 'received high-value promotion' among groups of physicians sorted by characteristics and practice-setting factors

Factors	Group	N	Mean Rank	Median, (IQR)	P-value
Gender ^a	Male	334	237.86	1.2 (1.0–1.6)	<0.001
	Female	115	187.64	1.0 (1.0–1.2)	
Have private clinic ^a	Yes	135	270.15	1.4 (1.0–1.8)	<0.001
	No	314	205.59	1.0 (1.0–1.4)	
Occupational commitment ^a	Normal day	340	222.46	1.2 (1.0–1.6)	0.440
	Overtime	109	232.91	1.2 (1.0–1.6)	
Academic affiliation ^a	Yes	68	284.51	1.4 (1.0–1.9)	<0.001
	No	381	214.38	1.2 (1.0–1.4)	
Type of hospital	Public	313	226.19	1.2 (1.0–1.6)	0.757
	Private	136	222.27	1.2 (1.0–1.6)	
Position ^b	Intern	25	207.54	1.0 (1.0–1.6)	0.003
	GPs	115	230.18	1.2 (1.0–1.8)	
	Board (Resident)	128	194.25	1.0 (1.0–1.4)	
	Specialist	181	245.87	1.2 (1.0–1.6)	
No of MRs per week ^b	up to 2	85	159.96	1.0 (1.0–1.2)	<0.001
	3 to 5	138	193.71	1.0 (1.0–1.4)	
	6 to 9	115	256.47	1.2 (1.0–1.6)	
	≥10	111	281.09	1.4 (1.0–2.0)	

Bold numbers are significant at $\alpha = 0.05$.

^aMann–Whitney test.

^bKruskal–Wallis test was conducted at $\alpha = 0.05$.

materials, and small gifts and had been invited to seminars or symposia within the 6 months preceding the study. This is not a surprise, as interacting with MRs is common among physicians worldwide. Several studies have revealed that a wide range of promotional items, such as samples, industry-sponsored meals, gifts, promotional materials, funding for travel or lodging to attend conferences, honoraria, research funding, continuing medical education (CME) sponsorship

and employment, were often received by physicians.^[30–32] A study conducted in Ethiopia also reported that half of the participating physicians accepted gifts from MRs.^[33] However, participation in a social outing within or outside Yemen, attendance at an international medical conference via the sponsorship of a drug company, or even the reception of furniture or electronic devices, financial rewards and an honorarium was also reported, although to a lesser extent

Table 5 Summary of the construct's variables

Items (constructs)	Mean ± SD	Bivariate correlations					
		1	2	3	4	5	6
1. Physicians' behaviours (interaction with MRs)	2.12 ± 0.54	1					
2. Belief in the appropriateness of accepting high-value promotions	3.15 ± 1.06	0.248 ^a (<0.001) ^c	1				
3. Belief in the appropriateness of accepting low-value promotions	4.16 ± 0.67	0.227 ^a (<0.001)	0.338 ^a (<0.001)	1			
4. Attitude towards MRs.	3.91 ± 0.54	0.159 ^a (0.001)	0.045 (<0.001)	0.340 (<0.001)	0.184 ^a (<0.001)	1	
5. Attitude towards pharmaceutical company.	3.17 ± 0.67	0.339 ^a (<0.001)	0.355 ^a (<0.001)	0.221 ^a (<0.001)	0.361 ^a (<0.001)	1	
6. Attitude towards ethical promotion.	2.69 ± 0.69	0.009 (0.843)	0.032 (0.501)	0.018 (0.699)	0.228 ^a (<0.001)	0.116 ^b (0.014)	1

^aCorrelation is significant at the 0.01 level (2-tailed).

^bCorrelation is significant at the 0.05 level (2-tailed).

Table 6 The relationship between independent variables and physicians' interactions with MRs

Model	R	R ²	Adj. R ²	F change	Sig. F change	Standardized coefficients Beta	P-value
1	0.337^a	0.113	0.093	5.604	0.000		
(Constant)							0.000
Gender (Male)						0.027	0.577
intern						-0.016	0.768
GPs						0.031	0.616
Board (Residents)						-0.007	0.906
Experience years						-0.012	0.851
Type of hospital (Public)						0.030	0.538
Occupational commitment (Normal day)						-0.079	0.124
Have clinic						0.112	0.040
Academic affiliation						0.118	0.020
No. of patients per day						0.234	0.000

Bold numbers are significant at $\alpha = 0.05$.

Dependent Variable: Behaviours interaction with MRs.

^aPredictors: (Constant), No. of patients per day, Type of hospital, GP, intern, Gender, Academic affiliation, Occupational commitment, Have clinic, Board, Experience years.

(21.6% to 9.4%). Similar practices have been documented in other countries.^[34]

Factors affecting physicians' interactions with medical representatives

According to TPB, both attitude and subjective norm constructs could explain significant amounts of variance in physicians' interactions with MRs, as was shown in the proposed model, which explained a significant amount of variance ($R^2 = 0.24$, $P < 0.001$). The previous literature has proven that physicians' characteristics and practice-setting factors significantly affected their attitudes towards interactions with pharmaceutical industry promotional activities.^[35] However, in the current study, only certain physician characteristics and practice-setting variables exerted a significant influence on physicians' interactions with MRs.

In this study, attitude towards pharmaceutical companies was found to be the most important construct when predicting physicians' interactions with MRs ($\beta = 0.225$, $P < 0.001$). This finding coincides with those of many previous studies reporting the positive attitudes of physicians towards MRs.^[4,36-42]

Factors such as the number of patients seen per week and academic affiliation were the second and fourth most important factors, respectively, when predicting physicians' interactions with MRs ($\beta = 0.209$ and 0.108 ; $P < 0.001$ and < 0.024 , respectively). Although a low amount of variance ($R^2 = 0.11$, $P < 0.001$) was explained when only the physicians' characteristics and practice-setting factors were included in model 1, these two factors remained significant and therefore continued to contribute to the model's ability to predict physicians' interactions with MRs. However, although previous studies supported the current finding that

Table 7 The relationship between independent variables and physicians' interactions with MRs

Model	R	R ²	Adj. R ²	R ² change	Sig. F change	Standardized coefficients Beta	P-value
2	0.485^a	0.235	0.208	0.121	0.000		
(Constant)							0.000
Gender (Male)						0.005	0.912
intern						-0.036	0.492
GPs						0.001	0.980
Board(Residents)						-0.027	0.643
Experience years						-0.023	0.688
Type of hospital (Public)						0.016	0.732
Occupational commitment (Normal day)						-0.071	0.142
Have. clinic						0.073	0.159
Academic affiliation						0.108	0.024
No. of patients per day						0.209	0.000
Belief appropriateness to accept high-value promotions						0.109	0.026
belief appropriateness to accept low-value promotions						0.118	0.011
Attitude towards MRs						0.047	0.321
Attitude towards Company						0.225	0.000
Attitude towards ethical promotion						-0.047	0.286

Bold numbers are significant at $\alpha = 0.05$.

Multiple regression analysis was conducted at $\alpha = 0.05$.

Predictors: (Constant), No. of patients per day, type of hospital, GP, intern, gender, academic affiliation, occupational commitment, have clinic, board, experience years.

Dependent Variable: Behaviours interaction with MRs.

^a Predictors: (Constant), No. of patients per day, type of hospital, GP, intern, gender, academic affiliation, occupational commitment, have clinic, board, experience years, belief appropriateness to accept low-value promotions, attitude towards ethical promotion, attitude towards company, attitude towards MRs, belief appropriateness to accept high-value promotions.

Table 8 Summary of hypotheses results

Hypotheses	Latent variables	Causal paths	Latent variables	Regression result
H _{1.1}	Interactions with MRs	←	Belief in the appropriateness of accepting high-value promotions	Supported
H _{1.2}	Interactions with MRs	←	Belief in the appropriateness of accepting low-value promotions	Supported
H _{2.1}	Interactions with MRs	←	Attitude towards MRs	Not supported
H _{2.2}	Interactions with MRs	←	Attitude towards pharmaceutical company	Supported
H _{2.3}	Interactions with MRs	←	Attitude towards ethical promotion	Not supported

academic affiliation is an important factor when predicting physicians' interactions with MRs, interestingly, in contrast to the current study, they showed a negative effect. According to those studies, the negative effect may be due to narrower exposure to pharmaceutical industry promotional activities as well as richer drug information resources, leading to less dependence on MRs than that of physicians who have no academic affiliations.^[43]

Additionally, the results of this study suggest that the subjective norm (i.e. the belief that it is appropriate for physicians to accept low-/high-value promotional items) was an important construct when predicting physicians' interactions with MRs, with the beta weight ($\beta = 0.118$, $P < 0.011$) of the belief that it is appropriate for physicians to accept low-value promotional items being slightly higher than the beta weight ($\beta = 0.109$, $P < 0.026$) of the belief that it is appropriate for physicians to accept high-value

promotional items. Coinciding with this finding, several studies in the literature have recorded physicians' beliefs in the appropriateness of accepting low-value promotional items such as conference registration fees, informational luncheons, sponsorship of departmental journal clubs, anatomical models and free drug samples.^[32,37,40,44,45] With regard to high-value promotional items, physicians who received honoraria or money to attend pharmaceutical symposia or as research support have been found to consider these appropriate gifts.^[46,47] However, while some studies have reported physicians' beliefs in the appropriateness of perceiving MRs as sources of both education and funding,^[37,40,48,49] other studies have documented sceptical attitudes towards these promotional activities.^[38,50]

The hypothesized relationship between attitude towards MRs and attitude towards the ethicality of promotions (H2.3), which was disconfirmed in analysing the data, was

of particular interest because it indicated that physicians distinguished between the tangible benefits they received from pharmaceutical companies and their expressed reasons for receiving MR visits as a moral duty and a social contact with the MRs.^[6] Although attitude towards the ethicality of promotions was not significantly related to behaviour during physician-MR interactions ($\beta = -0.047$, $P > 0.05$), it is nevertheless suggested that it could play a possible role in enhancing the scepticism of physicians towards the unethical promotional activities of pharmaceutical companies.

Factors such as gender, position, experience, practice type, occupational commitment and possession of a private clinic did not significantly influence physicians' interactions with MRs. The literature has reported conflicting results regarding these factors. For example, while Alkhateeb et al.^[43] reported that older physicians see MRs more frequently than other physicians, Watkins et al.^[51] documented no significant relation between physicians' age and frequency of seeing MRs. Additionally, in contrast to this current study, some studies have reported differences in the attitudes of physicians towards MRs according to position, with primary care physicians tending to see MRs more frequently than other physicians.^[43,52] In addition, while Watkins et al.'s^[51] finding that physicians' experience was not significantly related to their interactions with MRs supported this study, another researcher reported that length of practice service was found to have a significant effect on attitude towards MRs.^[24] Additionally, Watkins et al.,^[51] contradicting this study, reported that male physicians were more willing to see MRs than were their female partners.

By the examination of the dynamics of interactions between medical representatives and physicians and physicians' attitudes towards these interactions, specific theoretical contributions were generated. The relative importance of attitude and subjective norms as well as physicians' characteristics and practice-setting factors in predicting the outcome of such interactions was clarified. Apparently, only belief in the appropriateness of accepting high-value promotional items, belief in the appropriateness of accepting low-value promotional items and attitude towards pharmaceutical companies affect physicians' interactions with medical representatives, while attitude towards MRs and attitude towards ethical promotions do not. This finding suggests that attitude towards MRs and attitude towards ethical promotions are no longer critical factors in determining physicians' interactions with medical representatives.

Managerially, this study provides an in-depth understanding of factors predicting the outcome of physicians' and medical representatives' interactions, which can help public health policymakers and marketing managers effectively develop strategies to better regulate those interactions. For example, the study findings showed that the majority of physicians appeared to believe that most promotional techniques do not pose major ethical problems and that it is acceptable for physicians to accept most promotional items, which they considered a normal practice. These findings suggest that these beliefs and attitudes towards pharmaceutical companies have predictors that account for physicians' interactions with MRs. Hence, governments could establish a code of ethics regulating interactions with pharmaceutical

companies. Faculties of medicine and health sciences and medical regulatory authorities should contribute to developing guidelines for physicians to regulate their interactions with the MRs of pharmaceutical companies.

Conclusion

The study findings suggest that physicians' beliefs in the appropriateness of their acceptance of promotional items from pharmaceutical companies play a significant role in predicting their interactions with MRs. Similarly, physicians' attitudes towards pharmaceutical companies play a significant role in predicting their interactions with MRs. However, attitude towards MRs and attitude towards ethical promotions did not contribute to the ability to predict physicians' interactions with MRs. Additionally, the findings of the study supported the suggestion that physicians' characteristics and practice-setting factors – such as academic affiliation, private clinic possession and number of patients seen per day – influence physicians' interactions with MRs.

Despite its contributions, this study has limitations that should be addressed in further research. It was conducted in only one region, Sana'a. Accordingly, generalizability might be a problem. Nevertheless, as Sana'a is the capital, and the most populated city in Yemen, in addition to being the base for all pharmaceutical companies operating in Yemen, this may enhance the generalizability of the results. Additionally, as the participants were asked to state their involvement in a sensitive subject (drug promotional practices), they might not always have answered candidly; hence, social desirability bias is expected. Further research should therefore consider including an independent measure of social desirability. Future research to explore ethical issues, such as accepting financial promotional items from medical representatives, and conflicts of interest surrounding this practice should be discussed with physicians through in-depth face-to-face interviews.

Declarations

Conflict of interest

The authors declare that they have no conflicts of interest to disclose.

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Authors' contributions

All Authors state that they had complete access to the study data that support the publication.

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