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An exploration of factors influencing the selection of generic and innovator medicines in Saudi Arabia using an observational cross-sectional study

Othman AlOmeir [a], Mansour Almuqbil [b], Asmaa Hussam Alsawadi [c], Alaa Mohamed Genedy [c], Ashwag fawaz Almutairi [c], Hams Talal Alaydaa [c], Saleh A. Alanazi [d,e,f,*], Numan Alabdan [d,e,f], Meshal Alshakrah [d,e,f], Rafiulla Gilkaramenthi [g], Syed Mohammed Basheeruddin Asdaq [c], Naira Nayeem [h,*]

[a] Department of Clinical Pharmacy, College of Pharmacy, Shaqra University, Shaqra 11961, Saudi Arabia
[b] Department of Clinical Pharmacy, College of Pharmacy, King Saud University, Riyadh 11451, Saudi Arabia
[c] Department of Pharmacy Practice, College of Pharmacy, AlMaarefa University, Dariyah, 13713 Riyadh, Saudi Arabia
[d] Pharmaceutical Care Services, King Abdulaziz Medical City, Riyadh, Saudi Arabia
[e] King Saud bin Abdulaziz University for Health Science College of Pharmacy, Saudi Arabia
[f] King Abdullah International Medical Research Center, Riyadh, Saudi Arabia
[g] Department of Emergency Medical Services, College of Applied Sciences, AlMaarefa University, Diriyah, 13713 Riyadh, Saudi Arabia
[h] Department of Pharmaceutical Chemistry, Faculty of Pharmacy, Northern Border University, Rafha 91911, Saudi Arabia

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ABSTRACT

Background and objectives: Generic medications are cost-effective without compromising therapeutic outcomes. Therefore, the goal of this study was to investigate, using a cross-sectional study design, the factors influencing Saudi Arabian consumers' preferences between innovator and generic medications.

Methods: This cross-sectional study was carried out in Saudi Arabia using a Google survey form. For data collection, a simple random sampling strategy was used. The recruited participants were surveyed using a validated questionnaire that focused on six influencing domains: physician, pharmacist, perceived effectiveness, price, information availability, and confidence based on prior experience. The obtained data was used to analyze factors that have an association with any of the six domains using multinomial regression analysis. A correlation analysis was performed to examine the relationship between domains.

Results: The 317 participants included 64.4 % females, 52 % aged $\geq$ 26, and a large proportion of Saudi nationals (82.6 %) and university graduates (78.9 %). Being employed (OR:3.029; P = 0.006; CI: 6.715–1.366), a healthcare providers (OR:2.298; P = 0.043; CI: 5.151–1.025), and having insurance coverage (OR:1.908; P = 0.017; CI: 3.245–1.122) had a greater influence on medication selection. Participants with linguistic and business educational backgrounds (OR:3.443; P = 0.022; CI: 9.950–1.191), those living in the northern region of Saudi Arabia (OR:3.174; P = 0.009; CI: 7.585–1.328), having chronic ailments (OR:3.863; P = 0.013; CI: 11.274–1.324), and possess insurance (OR:1.748; P = 0.039; CI: 2.971–1.028) get readily influenced by pharmacist. People who were married and lived in Saudi Arabia's southern region were influenced by perceived effectiveness when choosing medicine. Participants from the northern region were found to be influenced by the price of the medicines, information about the medicines, and confidence based on previous experience. The price of medicines has a significant impact on those suffering from chronic diseases. At a significant level of P = 0.01, all six influencing domains were found to be positively correlated with each other.

Conclusion: The study shows that healthcare providers, drug prices, perceived efficacy, and information availability all have a big influence on the Saudi Arabian population's choice of medications. Educational background, location, and chronic disease status are associated with several influencing domains. Aside from public

* King Abdullah International Medical Research Center, Riyadh, Saudi Arabia, AnaziS@MNGHA.MED.SA
E-mail addresses: O.k.alomeir@gmail.com (O. AlOmeir), mmetwazi@ksu.edu.sa (M. Almuqbil), Asmaaalsawadi@gmail.com (A. Hussam Alsawadi), Alaamoh18.am@gmail.com (A. Mohamed Genedy), Ashwag.fawaz1@gmail.com (A. fawaz Almutairi), HamsAlaydaa@gmail.com (H. Talal Alaydaa), anazis@mngha.med.sa (S.A. Alanazi), abdann@ngha.med (N. Alabdan), shakram@mngha.med.sa (M. Alshakrah), grafi@um.edu.sa (R. Gilkaramenthi), sasdag@um.edu.sa (S.M.B. Asdaq), naira_64@yahoo.co.in (N. Nayeem).

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awareness campaigns, healthcare professionals should be involved in the implementation of the generic medication policy.

1. Introduction

Bioequivalence is the state in which two pharmaceutical products have the same active ingredient but differ in their excipients, are administered by the same route of administration, have comparable therapeutic efficacy and bioavailability, and are identically formulated (Dunne et al., 2013). Regulators recognize generic drugs based on evidence of bioequivalence to originator/innovator compounds. According to World Health Organization guidelines, a generic drug can be manufactured without a permit from the innovator company after the original patent expires (US Food and Drug Administration, 2013). These products are less expensive and may contain different excipients than their original drug, but they contain comparable amounts and quality of the same active compound (s) in the same dosage form (Desai et al., 2019; Kesselheim et al., 2008; Vogler, 2012). The most important factor in bioequivalence is efficacy and safety; healthcare professionals and patients will be concerned about these issues when switching from originator to generic products. The goal of generic drug production is to promote rational drug use with ease of availability at a reasonable cost (Hkonsen). This negative expectation may lead to negative clinical outcomes possibly because of a neurobiological phenomenon known as the nocebo effect, which states that patients with negative expectations about generic medications may have negative clinical outcomes. Regretfully, many consumers and service providers believe that generic drugs are less safe and effective than the originators (Kesselheim et al., 2016). The use of generic products and pharmaceutical cost-cutting are inextricably linked. Therefore, before switching to a medication for any patient, it is crucial to comprehend the financial implications of generic products while taking clinical outcomes into account (Dunne et al., 2013; Johnston et al., 2010; Olsson and Sporrong, 2012).

A 2005 health study highlighted the financial savings from substituting innovative medications; for individuals under 65 and over 65, the savings were 5.9 and 2.9 billion dollars, respectively (Haas et al., 2005; Rizzo and Zeckhauser, 2009). France, Greece, Jordan, the Netherlands, Oman, Portugal, Qatar, Spain, Sweden, and the United Arab Emirates are among the countries that require the use of generic drugs in prescriptions, while it is strongly encouraged in the United Kingdom (Panteli et al., 2016). In the US, generic medications are being used more frequently and now make up nearly 90 % of all prescriptions (Desai et al., 2019). Electronic prescription software that integrates therapeutic guidelines with recommended generic drugs can significantly reduce the use of brand names in prescriptions. Even if physicians continue to prescribe brand-name medications, pharmacists can dispense generic equivalents. Evidence from the United States suggests that, while physicians typically consent to substitution, obtaining patient consent is associated with a 25 % decrease in successful substitutions of generic for branded medicines when compared to jurisdictions where patient consent is not required (Shrank et al., 2010).

In Saudi Arabia, branded medications, also known as innovator drugs, made up 54.5 percent of the overall drug market and 62.7 percent of prescription medications filled in 2016. This proportion is significantly higher than in many other countries with comparable income levels. Most branded drugs were imported, with the majority coming from the United States, Switzerland, Germany, and France (BMI Research, 2017). The practice of physicians prescribing by brand, which is based at least in part on a distrust of generic alternatives, contributes to the high consumption of originator and other branded medicines (Salhia et al., 2015). Prescription practices are not currently subject to any national laws or policies. While health officials and hospitals are increasingly attempting to use prescribing guidelines to encourage the use of generic drugs, when possible, physicians often remain resistant (M. S. Alsultan et al., 2012; World Bank, 2018). Studies indicate that cost control is not a major component of medical professionals' education or awareness (Alkhuzaee et al., 2016). In one study, fewer than half of 178 hospital-based doctors reported being aware of the cost benefits of generic medicines; researchers speculate that this is due to generous state funding, which means the costs are not borne by patients (Salhia et al., 2015). In a 2010 study of pharmacists in 27 Riyadh hospitals, only seven reported any training for prescribers on medication costs, even though 16 hospitals required approval for prescribing non-formulary products (M. S. Alsultan et al., 2012). As a result, there is a need to raise healthcare professionals' awareness of generic drugs and their impact on the healthcare system.

Although generic drugs offer significant cost savings, their acceptability is limited by healthcare professionals, owing to their perceived negative attitude toward them. Physicians make critical decisions about which drugs to include in their prescriptions. Physician and pharmacist attitudes, the availability of new drugs on the market, promotional tools, and free drug samples are all well-known factors that influence their decision on drug product prescription, in addition to their perception of the safety, efficacy, and expected clinical outcomes (Shamim-ul-Haq et al., 2014). To effectively develop strategies for increasing the prescription rate of generic drugs, it is imperative to investigate their role in the current drug selection setup. Therefore, using a cross-sectional study design, this study aims to investigate the factors associated with the established influencing domains, such as influence of pharmacists and physicians, the price of medications, perceived efficacy, information availability, and patient experience in selecting innovator versus generic medicine.

2. Materials and methods

2.1. Study design

This cross-sectional observational study was conducted in Saudi Arabia between October and December 2022. The factors influencing the selection of generic and innovator drugs were determined using Google form surveys. For data collection, a simple random strategy was used. Participants were asked to self-register their responses after sharing the validated pre-tested questionnaire on social media.

2.2. Participants

All Saudi residents over the age of 18 who were interested in participating in this study were eligible. The questionnaire was understood and completed by all participants. They were in good enough cognitive and emotional health to give their consent to participate in the study. The sample size for the study was determined with a larger margin of error because the public does not often distinguish between innovator and generic medications. The sample size for our study was found to be 267 using the sample size calculator available online at https://www.raosoft.com/samplesize.html, with a 6 % margin of error and a 95 % confidence level.

2.3. Ethical consideration

The study's research proposal was approved by the Institutional Review Boards of AlMaarefa University (IRB09-04122022–102) and King Abdullah International Research Center (IRB/2095/23). All participants provided informed consent. This was included at the beginning of the questionnaire, outlining the purpose, methodology, and potential outcomes of the study, as well as the voluntary nature of their

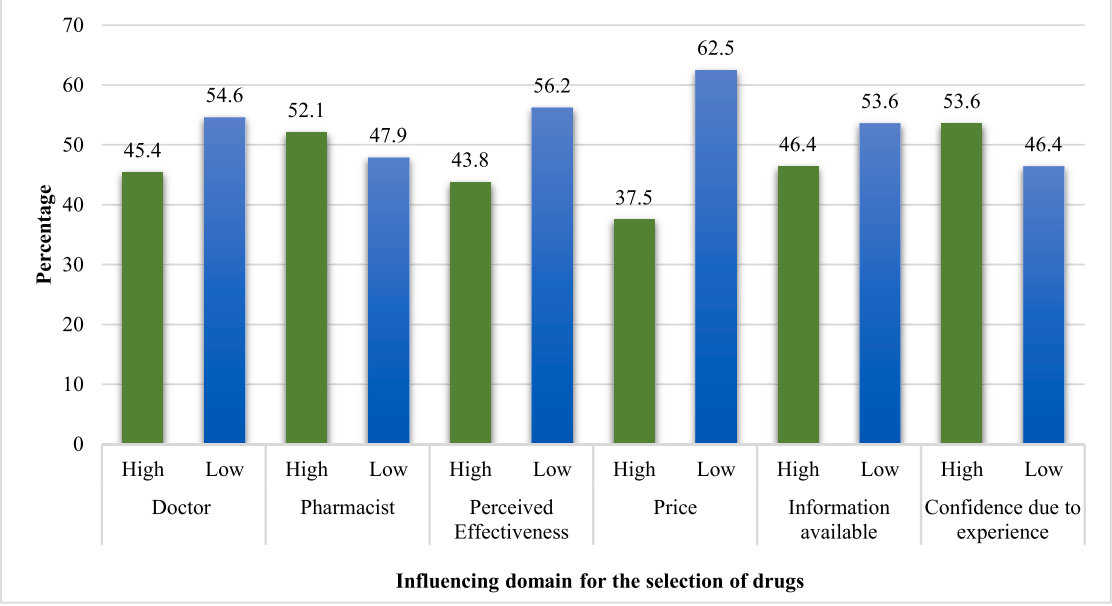

Fig. 1. Comparison of the percentage impact of the influencing domains in the selection of drugs.

participation and the confidentiality of their responses. Participants were informed that they could refuse or withdraw at any time without penalty if any item of the questionnaire was sensitive to them.

2.4. Study instrument

Using published literature, the research team developed a questionnaire for this study based on the research objectives (Hajleh et al., 2021 Jul 17). The questionnaire was validated for content, construct, and criteria validity with the help of experts in the field. Using the forward and backward method, the survey was translated into Arabic. The participants were given a bilingual (English and Arabic) version of the questionnaire. The questionnaire was divided into three sections:

1. Participant socioeconomic characteristics. It included twelve questions about age, gender, nationality, educational level, educational background, location, family member details, income, employment status, and preferred source of health-related information.

2. Medical and health status of the participants.

This section had four items to explore whether participants were suffering from any chronic illness, whether they take any drugs regularly, the type of hospitals they visit, and their medical insurance status.

3. Factors affecting the choice of drugs (generic vs branded).

This section included 26 items divided into six domains: doctor, pharmacist, perceived efficacy, price, information available, and experience. Six items were included in the doctor domain, four items in the pharmacist domain, and five items in the perceived effectiveness domain. There were three items in the price domain, and four items each in the availability of information and confidence based on previous experience domains. The reliability test, Cronbach's alpha, was used to evaluate internal consistency within the items included in each domain. It was found to be 0.712, 0.702, 0.704, 0.741, 0.810, and 0.828, respectively, for the doctor's, pharmacist's, effectiveness, price, information, and confidence domains. As part of the pilot/pretest, a questionnaire was distributed to 20 eligible participants to determine if there was any misunderstanding of any of the questions of the study. Although there were only minor changes made in the questionnaire after the pilot study, the responses from pilot samples were not included in the final analysis.

All 26 items were graded on a Likert scale of 5 to 1, with 5 representing strong agreement with the item and 1 representing strong disagreement. The average score for all items in each domain was calculated; for example, the score of items 1 through 6 in the doctor's domain was added and divided by 6 for all participants. This was determined to be 3.52 for the doctor's domain. Similarly, the mean scores for the pharmacist, effectiveness, price, information, and confidence domains that influence medicine selection were 3.64, 3.43, 3.68, 3.77, and 3.44, respectively. Cases falling below the average were deemed low influenced, and all cases scoring at or above the mean (average) were deemed highly influenced (Alhomrani et al., 2022). For instance, if a doctor's overall score on all items was equal to or higher than the 3.52 mean score, the level of their influence over each case was deemed high; if the item mean was lower than 3.52, it was declared low. Furthermore, this was transformed into percentages to streamline the number of cases that impact high or low for particular domain types. All influencing domains were scored, and the percentage was calculated using the same methodology, and the results are shown in Fig. 1.

2.5. Statistical analysis

The study's data was entered and analyzed in the SPSS application using appropriate descriptive and inferential analysis methods. Pearson correlation analysis was used to determine the relationship between various influencing domains (the role of the physician, the role of the pharmacist, the role of perceived effectiveness, the role of price, the availability of information, and confidence in the drug) that impact drug selection. A multinomial regression analysis was then performed to determine the association of factors with each of the influencing domains. The P value was kept at less than 0.05 for all statistical purposes.

3. Results

3.1. Sociodemographic description of the participants

Out of the 317 participants, 64.4 % were female, 52 % of them were $\geq$ 26 years old, and many of them were Saudis (82.6 %) and university graduates (78.9 %). Around 32.2 % of them had a health science educational background, and 43.2 % belonged to the central region of Saudi Arabia. Almost 50 % of them agreed that they change medications without consent from a health science professional (Table 1).

The mean of the items included in the doctor's domain was 3.52, and cases scoring equal to or higher than the mean score were considered highly influenced by the doctor in the selection of medicines. Similarly,

Table 1
Characteristics of the participants.

Number	Characteristics	Variables	Frequency	Percentage
Demographic Characteristics				
	Gender	Female	204	64.4
		Male	113	35.6
	Age	18–25	152	47.9
		≥26	165	52.1
	Nationality	Saudi	262	82.6
		Non-Saudi	55	17.4
	Educational level	Secondary school and less	65	20.5
		University graduates	252	79.5
	Educational background	Health	102	32.2
		Science	76	24.0
		Linguistic and Business	112	35.3
		Others	27	8.5
	Healthcare background	Yes	59	18.6
		No	258	81.4
Socioeconomic characteristics				
	Marital status	Single	191	60.3
		married	126	39.7
	Geographical location	Central Region	137	43.2
		Eastern region	26	8.2
		North region	40	12.6
		Southern region	24	7.6
		Western region	90	28.4
	Number of family members	1–6	180	56.8
		More than 6	137	43.2
	Family income[a]	10,000 and less	150	47.3
		More than 10,000	167	52.7
	Employment status	Employed	121	38.2
		Unemployed	196	61.8
Health status				
	Chronic diseases	Yes	54	17.0
		No	263	83.0
	Use of medications for chronic diseases	Yes	46	14.5
		No	271	85.5
	Type of hospitals	private & public	52	16.1
		Private	132	41.0
		Public	133	41.3
	Insurance	Yes	139	43.2
		No	178	55.3
	Change of medications without consent	Yes	153	48.3
		No	164	51.7

[a] Saudi Riyals.

the mean scores for pharmacist, effectiveness, price, information, and confidence influencing domains for medicine selection were 3.64, 3.43, 3.68, 3.77, and 3.44, respectively. Doctors, pharmacists, efficacy, price, information, and confidence domains highly influenced approximately 45 %, 52 %, 43 %, 37 %, 46 %, and 54 % of participants, respectively (Fig. 1).

Most of the participants (46.7 %) cite official sources such as the Ministry of Health website as their primary source of medicine information. Healthcare professionals (43.2 %) and general internet search (41.2 %) are the second and third most common sources of medical information, respectively. Other sources of information about medicines used by participants included family and friends, educational backgrounds, and social media (Fig. 2).

3.2. Comparison of demographic characteristics with influencing domains

The educational background of the participants was found to be significantly associated with being influenced by the pharmacist (P = 0.049) and with the drug information (P = 0.045) while selecting the medicines. The geographical location of the participation was another independent factor that impacted the selection of medicines while being influenced by a pharmacist (P = 0.031), price (P = 0.034), available information (P = 0.002), and confidence based on earlier experience (P = 0.023) (Table 2). A significantly high percentage of the participants from the central, north, and southern regions were influenced by the selection of the medications. The role of doctors, pharmacists, perceived effectiveness, the role of price, availability of the information, and confidence in the drug were found to have a significant influence on the selection of the drugs (Table 3). The type of hospital is another significant factor (P = 0.008) that together with earlier experience influences the selection of the drug (Table 4).

3.3. Correlation of influencing domains

Price influence had the highest level of correlation with doctors' influence, followed by pharmacist, drug information, and confidence influence. The strongest correlation was between pharmacist influence and price, followed by doctor, effectiveness, information, and confidence. Interestingly, effectiveness was more closely related to price than other domains. The price domain was significantly and positively correlated with all other influence domains for medicine selection. All correlations between domains were significant at the P value 0.01 level (Table 5).

3.4. Multinomial regression analysis to determine the factors that impact the influencing domains

Participants who were employed (OR:3.029; P = 0.006; 95 %CI: 6.715–1.366), healthcare providers (OR:2.298; P = 0.043; 95 % CI:5.151–1.025) and had insurance coverage (OR:1.908; P = 0.017; 95 %CI: 3.245–1.122) had a greater influence on medication selection (Table 6). Participants from linguistic and business school educational backgrounds (OR:3.443; P = 0.022; 95 %CI: 9.950–1.191), those living in the northern region of Saudi Arabia (OR:3.174; P = 0.009; 95 %CI: 7.585–1.328), having chronic ailments (OR:3.863; P = 0.013; 95 %CI: 11.274–1.324), and possess insurance (OR:1.748; P = 0.039; 95 %CI: 2.971–1.028) had a higher chance of getting influenced by a pharmacist (Table 6). People who were married and lived in Saudi Arabia's southern region were influenced by perceived effectiveness when choosing medicine (Table 7). Participants from the Kingdom's northern region were found to be influenced by the price of the medicines, information about the medicines, and confidence based on previous experience (Table 8).

4. Discussion

This cross-sectional study sought to identify the factors influencing Saudi Arabians' choice between innovator and generic medications. The study's findings show that several independent variables contribute to the development of influence in the selection of medicines among study participants. The participants in the study were heavily influenced in their choice of medicines by the confidence they gained from prior experience using the specific medicines, either by themselves or by their families. The role of healthcare professionals, particularly pharmacists, is dominant in medicine selection, while the availability of medicines and perceived effectiveness are also important factors in medicine selection. While the cost of the medication does affect the choice of medication, it has less of an impact than the other influencing factors the study examined.

As noted above, confidence in the medicine based on experience has

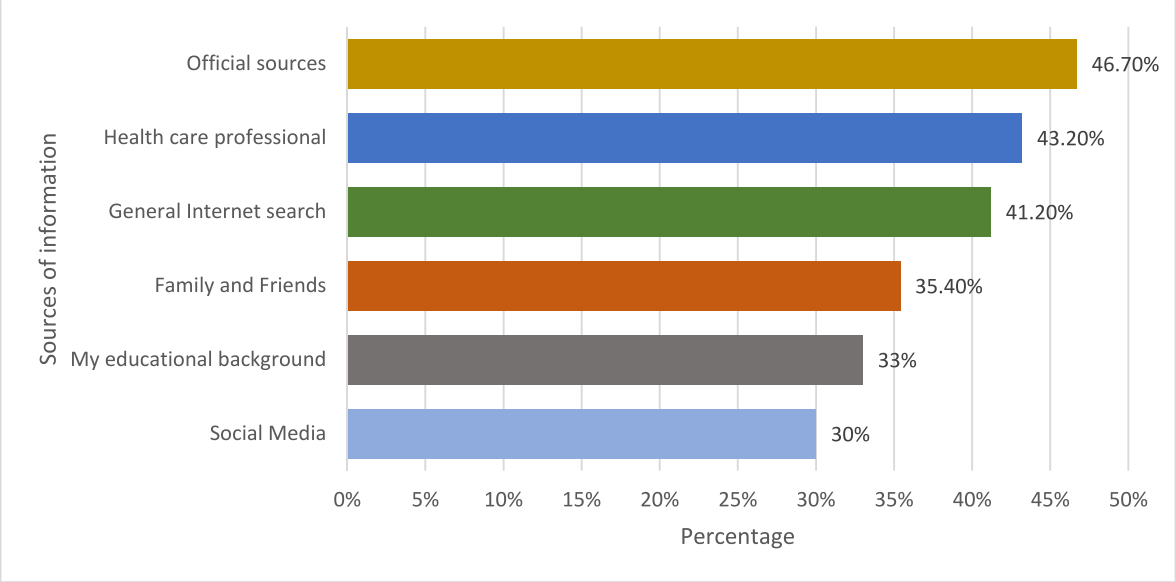

Fig. 2. Percentage distribution of different sources of information on drugs.

Table 2
Comparison of demographic characteristics of the participants with selection of medications, n (%).

#	Characteristics	Influence of doctor		Influence of Pharmacist		Influence of Perceived Effectiveness		Influence of Price		Influence of available information		Confidence due to experience	
		High	Low	High	Low	High	Low	High	Low	High	Low	High	Low
	Gender	0.814*		0.907*		0.478*		0.904*		0.204*		0.481*	
	Female	94 (46)	110 (54)	107 (53)	97 (47)	86 (42)	118 (58)	76 (37)	128 (63)	100 (49)	104 (51)	106 (52)	98 (48)
	Male	50 (44)	63 (56)	58 (51)	55 (49)	53 (47)	60 (53)	43 (38)	70 (62)	47 (42)	66 (58)	64 (57)	49 (43)
	Age	0.369*		0.073*		0.735*		0.817*		0.260*		0.218*	
	18–25	65 (43)	87 (57)	71 (47)	81 (53)	65 (43)	87 (57)	56 (37)	96 (63)	65 (43)	87 (57)	76 (50)	76 (50)
	>26	79 (48)	86 (52)	94 (57)	71 (43)	74 (45)	91 (55)	63 (38)	102 (62)	82 (50)	83 (50)	94 (57)	71 (43)
	Nationality	0.457*		0.658*		0.553*		1.00*		1.00*		1.36*	
	Saudi	122 (47)	140 (53)	138 (53)	124 (47)	117 (45)	145 (55)	98 (37)	164 (63)	122 (47)	140 (53)	146 (56)	116 (44)
	Non-Saudi	22 (40)	33 (60)	27 (49)	28 (51)	22 (40)	33 (60)	21 (38)	34 (62)	25 (45)	30 (55)	24 (44)	31 (56)
	Educational level	0.780*		0.330*		1.00*		0.317*		0.267*		0.889*	
	Secondary school and less	31 (48)	34 (52)	30 (46)	35 (54)	28 (43)	37 (57)	28 (43)	37 (57)	26 (40)	39 (60)	34 (52)	31 (48)
	University graduates	113 (45)	139 (55)	135 (54)	117 (46)	111 (44)	141 (56)	91 (36)	161 (64)	121 (48)	131 (52)	136 (54)	116 (46)
	Educational background	0.114*		**0.049****		0.113*		0.33*		**0.045****		0.305*	
	Health	40 (39)	62 (61)	52 (51)	50 (49)	36 (35)	66 (65)	42 (41)	60 (59)	53 (52)	49 (48)	50 (49)	52 (51)
	Science	31 (41)	45 (59)	36 (47)	40 (53)	38 (50)	38 (50)	20 (26)	56 (74)	27 (36)	49 (64)	39 (51)	37 (49)
	Linguistic and Business	61 (55)	51 (45)	68 (61)	44 (39)	55 (49)	57 (51)	47 (42)	65 (58)	58 (52)	54 (48)	68 (61)	44 (39)
	Others	12 (44)	15 (56)	9 (33)	18 (67)	10 (37)	17 (63)	10 (37)	17 (63)	9 (47)	18 (57)	13 (48)	14 (52)

**P* value calculated by Pearson Chi-Square Test, ***P* value less than 0.05.

the highest influence on choosing the drug. Therefore, providing good knowledge and information to patients helps improve the accessibility to the right medications. Information from pharmaceutical companies increases awareness of available medicines on the market (Davari et al., 2018). Almost 50 % of the participants agreed to refer to official sources of information, including governmental agencies and international health agencies, to get the correct information.

In Quintal and Mendes (2012) research on medicine use and pharmacists' counseling, it was observed that the lack of information received by the user, the lack of a prescription, and the absence of confidence in generic medicines were the main reasons for the underuse of generic drugs. However, after recognizing the specific knowledge about price and having better knowledge about generic drugs, users had a higher preference for purchasing them. In our study, 80 % believe that generic drugs are cheaper, but only 76 % preferred brand-name drugs, which is like an earlier study (Keenum et al., 2012). The study by Keenum et al. (2012) found that there was variation in beliefs and practices. This variation was attributed to the infrequent discussion of generic substitution by doctors and pharmacists. Other studies have attributed this to a variety of factors, including branded drug advertising and patient socioeconomic status (Kohli and Buller, 2013 Feb 1). The inclination towards branded medications could potentially stem from past unfavorable encounters or advice from the physician (Yousefi et al., 2015). The outcome of the study demonstrates the significant role of healthcare professionals in the decision-making process of the Saudi Arabian population regarding the selection of medications. The role of a pharmacist and physicians are considered the main factors affecting drug choice, which plays a critical role in using generic or originator

Table 3
Comparison of socioeconomic characteristics of the participants with selection of medications, n* (%).

#	Characteristics	Influence of doctor		Influence of Pharmacist		Influence of Perceived Effectiveness		Influence of Price		Influence of available information		Confidence due to experience	
		High	Low	High	Low	High	Low	High	Low	High	Low	High	Low
	Marital status	0.565*		0.251*		0.356*		1.000*		0.567*		0.490*	
	Married	84 (44)	107 (56)	94 (49)	97 (51)	88 (46)	103 (54)	72 (38)	119 (62)	86 (45)	105 (55)	99 (52)	92 (48)
	Single	60 (48)	66 (52)	71 (56)	55 (43)	51 (41)	75 (59)	47 (37)	79 (63)	61 (48)	65 (52)	71 (56)	55 (44)
	Number of family members	1.000*		0.257*		0.495*		0.314*		0.256*		0.069*	
	1–6	82 (46)	98 (54)	99 (55)	81 (45)	82 (46)	98 (54)	65 (36)	115 (64)	78 (43)	102 (57)	69 (58)	68 (42)
	More than 6	62 (45)	75 (55)	66 (48)	71 (52)	57 (42)	80 (58)	54 (40)	83 (60)	69 (50)	68 (50)	65 (47)	72 (53)
	Family income[a]	0142*		0.370*		0.174*		1.000*		0.056*		0.652*	
	10,000 and less	75 (50)	75 (50)	74 (49)	76 (51)	72 (48)	78 (52)	56 (37)	94 (63)	61 (41)	89 (59)	78 (52)	72 (48)
	More than 10,000	69 (41)	98 (59)	91 (54)	76 (46)	67 (40)	100 (60)	63 (38)	104 (62)	86 (52)	81 (48)	92 (55)	75 (45)
	Employment status	0.489*		0.563*		0.487*		0.633*		1.00*		0.728*	
	Employed	58 (48)	63 (52)	60 (50)	61 (50)	50 (41)	71 (59)	43 (36)	78 (64)	56 (46)	65 (54)	63 (52)	58 (48)
	Un-employed	86 (44)	110 (560	105 (54)	91 (46)	89 (45)	107 (55)	76 (39)	120 (61)	91 (46)	105 (54)	107 (55)	89 (45)
	Geographical location	0.316*		**0.031****		0.060*		**0.034****		**0.002****		**0.023****	
	Central Region	61 (45)	76 (55)	71 (52)	66 (48)	55 (40)	82 (60)	49 (36)	88 (64)	66 (48)	71 (52)	69 (50)	68 (50
	Eastern Region	9 (34)	17 (65)	13 (50)	13 (50)	9 (35)	17 (65)	8 (31)	18 (69)	8 (31)	18 (69)	12 (46)	14 (54)
	North Region	23 (58)	17 (42)	29 (73)	11 (27)	22 (55)	18 (45)	24 (60)	16 (40)	28 (70)	12 (30)	31 (78)	9 (22)
	Southern Region	13 (54)	11 (46)	14 (58)	10(42)	16 (67)	8 (33)	9 (38)	15 (62)	13 (54)	11 (46)	14 (58)	10 (42)
	Western Region	38 (42)	52 (58)	38 (42)	52 (58)	37 (41)	53 (59)	29 (32)	61 (68)	32 (36)	58 (64)	44 (49)	46 (51)

*P value calculated by Pearson Chi-Square Test, **P value less than 0.05. [a]Saudi Riyals.

Table 4
Comparison of health status background with a selection of medications.

#	Characteristics	Influence of doctor		Influence of Pharmacist		Influence of Perceived Effectiveness		Influence of Price		Influence of available information		Confidence due to experience	
		High	Low	High	Low	High	Low	High	Low	High	Low	High	Low
	Chronic diseases	0.097*		0.387*		0.613		0.145		0.990		0.481	
	Yes	19 (35)	35 (65)	31 (57)	23 (43)	22 (41)	32 (59)	25 (46)	29 (54)	25 (46)	29 (54)	32 (59)	22 (41)
	No	125 (48)	138 (52)	134 (51)	129 (49)	117 (45)	146 (55)	94 (36)	169 (64)	122 (46)	141 (54)	138 (53)	125 (47)
	Use of medications for chronic diseases	0.059*		0.632*		0.338		1.00		0.750		0.524	
	Yes	15 (33)	31 (67)	22 (48)	24 (52)	17 (37)	29 (63)	17 (37)	29 (63)	20 (43)	26 (57)	27 (59)	19 (41)
	No	129 (48)	142 (52)	143 (53)	128 (47)	122 (45)	149 (55)	102 (38)	169 (62)	127 (47)	144 (53)	143 (53)	128 (47)
	Type of hospitals	0.246*		0.133*		0.514		0.222		0.285		**0.008****	
	Private &public	24 (46)	28 (54)	24 (46)	28 (54)	25 (48)	27 (52)	19 (37)	33 (63)	19 (37)	33 (64)	24 (46)	28 (54)
	Private	53 (40)	79 (60)	63 (48)	69 (52)	53 (40)	79 (60)	43 (33)	89 (67)	65 (49)	67 (51)	61 (46)	71 (54)
	Public	67 (50)	66 (50)	78 (59)	55 (51)	61 (46)	72 (54)	57 (43)	76 (57)	63 (47)	70 (53)	85 (64)	48 (36)
	Insurance	0.112*		0.429*		0.650		0.816		0.185		1.000	
	Yes	69 (50)	70 (50)	76 (55)	63 (45)	63 (45)	76 (55)	51 (37)	88 (63)	60 (43)	79 (57)	75 (54)	64 (46)
	No	75 (42)	103 (58)	89 (50)	89 (50)	76 (43)	102 (57)	68 (38)	110 (62)	87 (49)	91 (51)	95 (53)	83 (47)

*P value calculated by Pearson Chi-Square Test, P value less than 0.05.

Table 5
Pearson correlation analysis of influencing domain for the selection of drugs.

	Doctor Influenced status	Pharmacist Influence status	Effectiveness Influence status	Price Influence status	Information Influence status	Confidence Influence status
Doctor Influenced status	1	0.356**	0.343**	0.379**	0.270**	0.264**
Pharmacist Influence status	0.356**	1	0.288**	0.392**	0.272**	0.260**
Effectiveness Influence status	0.343**	0.288**	1	0.405**	0.275**	0.299**
Price Influence status	0.379**	0.392**	0.405**	1	0.363**	0.420**
Information Influence status	0.270**	0.272**	0.275**	0.363**	1	0.307**
Confidence Influence status	0.264**	0.260**	0.299**	0.420**	0.307**	1

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

Table 6
Association of factors with doctor and pharmacist's influence on selection of drugs by Multinomial regression analysis.

Characteristics	Variables	Doctor Influenced status[a]				Pharmacist Influenced status[a]			
		P value	AOR	95 % Confidence Interval for AOR		P value	AOR	95 % Confidence Interval for AOR	
				Lower Bound	Upper Bound			Lower Bound	Upper Bound
Gender	Male	0.656	0.883	0.510	1.529	0.880	**1.042**#	0.609	1.786
	Female	Ref							
Age	18–25	0.072	**0.468**#	0.205	1.070	0.080	0.492	0.222	1.089
	>26								
Nationality	Saudi	0.234	**1.559**#	0.750	3.240	0.954	**1.021**#	0.497	2.099
	Non-Saudi	Ref							
Marital status	Married	0.822	0.921	0.452	1.879	0.257	**1.508**#	0.741	3.068
	Single								
Educational level	Secondary school and less	0.572	**1.225**#	0.606	2.476	0.737	**1.129**#	0.557	2.285
	University	Ref							
Educational background	Health	0.200	**0.482**#	0.158	1.472	**0.035***	**3.413**	1.092	10.666
	Science	0.564	0.729	0.249	2.132	0.171	**2.192**#	0.713	6.742
	Linguistics and Business School	0.525	**1.381**#	0.510	3.736	**0.022***	**3.443**	1.191	9.950
	Others	Ref							
Geographical location	Central Region	0.590	**1.177**#	0.649	2.134	0.149	**1.546**#	0.855	2.795
	Eastern Region	0.482	0.706	0.267	1.863	0.585	**1.298**#	0.509	3.307
	North Region	0.203	**1.711**#	0.748	3.910	**0.009***	**3.174**	1.328	7.585
	Southern Region	0.379	**1.564**#	0.577	4.238	0.114	**2.269**#	0.821	6.271
	Western Region	Ref							
Number of family members	1–6	0.804	**1.069**#	0.629	1.818	0.057	**1.680**#	0.985	2.865
	More than 6								
Family income	10,000 SAR and less	0.131	**1.481**#	0.890	2.465	0.237	0.735	0.441	1.225
	More than 10,000 SAR	Ref							
Employment status	Employed	**0.006***	**3.029**	1.366	6.715	0.670	**1.174**#	0.560	2.461
	Unemployed	Ref							
Health care provider	Yes	**0.043***	**2.298**	1.025	5.151	0.195	0.601	0.279	1.297
	No	Ref							
Chronic disease	Yes	0.376	0.650	0.250	1.688	**0.013***	**3.863**	1.324	11.274
	No	Ref							
Use of medication for chronic disease	Yes	0.440	0.669	0.241	1.856	**0.019***	**0.265**	0.088	0.803
	No	Ref							
Type of hospital	Private &public	0.516	0.791	0.390	1.604	**0.047***	**0.481**	0.234	0.990
	Private	0.122	0.631	0.352	1.132	**0.012***	**0.472**	0.262	0.850
	Public	Ref							
Insurance	Yes	**0.017***	**1.908**	1.122	3.245	**0.039***	**1.748**	1.028	2.971
	No	Ref							

[a] The reference category is 2 (low influence); *Significantly impacting the doctor/pharmacist's influence; #non-significantly impacting the doctor/pharmacist's influence; AOR. Adjusted odds ratio.

counterparts. Many of our study participants were influenced by pharmacists and physicians, respectively, in selecting the drug. Our findings are like those of another study (Aronsson et al., 2001) that emphasizes the importance of raising awareness among healthcare professionals to promote the use of generic medications in the public.

The socioeconomic factor was the primary determinant of the preference for buying generic drugs (Guttier et al., 2017; Aronsson et al., 2001), and there is a strong dynamic relationship between consumer trust and product loyalty (Alhabeeb, 2007), where consumers' confidence in the characteristics of the product—particularly those related to knowledge about generic drugs—plays a significant role in their product choice. There were no differences in preference for generic versus branded drugs or influencing domains based on age. In terms of education, those educated in non-health science fields such as linguistics and business administration were more influenced by pharmacist and physician perspectives on generic and branded drugs.

People's employment is an important factor in the formation of opinions and independent thoughts. Furthermore, they have easy access to healthcare information and understand the appropriate individuals who could be sought while developing their opinions. Our findings indicate that the odds of a doctor's influence on medication selection are more than three times higher in employed participants than in unemployed participants. These findings are consistent with another study that found that work can have a positive effect on health in terms of developing the right opinions and effortlessly implementing them (Urtasun and Nunez, 2018).

There is a strong association between people living in the central region and their drug selection preferences. We assume that most of the participants chosen to represent the central region are Riyadh City residents. They have demonstrated a high level of awareness and decision-making abilities because of their educational and scientific backgrounds. This is like a study done in Brazil, where they found that people living in the cities have more ability to select medications (Guttier et al., 2015). Since Saudi Arabia has no strong policy to decide on generic and innovator/branded drugs, our study will serve as preliminary information. This will help policymakers develop strategies to promote rationalized medications in society. Thus, raising awareness of the quality of generic drugs among healthcare professionals and consumers is the best approach, especially since a physician has no direct pecuniary incentives to choose less expensive products or, overall, to inform himself or herself about generic alternatives. Patient access to harmless and profitable treatment can become a main priority in the healthcare system. Overall, the growth of generic products depends on the regulator's decisions to promote the use of this safe and effective product.

Although this study was conducted countrywide, one of its limitations is the small sample size. This is mostly due to the study's topic,

Table 7
Association of factors with Effectiveness and Price's influence domains on selection of drugs by Multinomial regression analysis.

Characteristics	Variables	Effectiveness Influenced status[a]				Price Influenced status[a]			
		P value	AOR	95 % Confidence Interval for AOR		P value	AOR	95 % Confidence Interval for AOR	
				Lower Bound	Upper Bound			Lower Bound	Upper Bound
Gender	Male	0.537	0.844	0.494	1.443	0.799	0.930	0.535	1.619
	Female	Ref							
Age	18–25	0.380	0.703	0.320	1.544	0.789	**1.117**#	0.496	2.518
	>26	Ref							
Nationality	Saudi	0.874	**1.060**#	0.517	2.171	0.477	0.766	0.367	1.598
	Non-Saudi	Ref							
Marital status	Married	**0.027***	**2.231**	1.095	4.546	0.363	**1.405**#	0.675	2.923
	Single	Ref							
Educational level	Secondary school and less	0.805	**1.092**#	0.544	2.193	0.168	**1.652**#	0.809	3.374
	University	Ref							
Educational background	Health	0.793	0.862	0.284	2.615	0.324	**1.764**#	0.571	5.449
	Science	0.346	**1.682**#	0.571	4.959	0.894	0.926	0.299	2.866
	Linguistics and Business School	0.273	**1.759**#	0.641	4.826	0.286	**1.761**#	0.622	4.981
	Others	Ref							
Geographical location	Central Region	0.775	**1.089**#	0.606	1.958	0.491	**1.239**#	0.673	2.282
	Eastern Region	0.527	0.733	0.280	1.918	0.834	0.898	0.329	2.449
	North Region	0.130	**1.869**#	0.831	4.204	**0.003***	**3.585**	**1.560**	**8.238**
	Southern Region	**0.030***	**3.084**	1.113	8.546	0.860	**1.098**#	0.389	3.099
	Western Region	Ref							
Number of family members	1–6	0.087	**1.588**#	0.935	2.697	0.988	**1.004**#	0.584	1.726
	More than 6								
Family income	10,000 SAR and less	0.482	**1.196**#	0.726	1.969	0.936	0.979	0.584	1.640
	More than 10,000 SAR	Ref							
Employment status	Employed	0.808	0.914	0.441	1.891	0.212	0.618	0.290	1.316
	Unemployed	Ref							
Health care provider	Yes	0.523	**1.289**#	0.592	2.803	0.563	**1.256**#	0.580	2.717
	No	Ref							
Chronic disease	Yes	0.512	**1.376**#	0.530	3.574	**0.012***	**3.710**	**1.331**	**10.343**
	No	Ref							
Use of medication for chronic disease	Yes	0.359	0.620	0.223	1.722	0.092	0.385	0.127	1.168
	No	Ref							
Type of hospital	Private &public	0.937	**1.029**#	0.511	2.070	0.466	0.763	0.369	1.578
	Private	0.328	0.750	0.422	1.335	0.090	0.599	0.331	1.084
	Public	Ref							
Insurance	Yes	0.494	**1.197**#	0.715	2.005	0.556	**1.174**#	0.688	2.003
	No	Ref							

[a] The reference category is. 2 (low influence); *Significantly impacting the domain of perceived effectiveness's/price; #non-significantly impacting the domain of perceived effectiveness's/price; AOR. Adjusted odds ratio.

since the majority of people are unaware of the distinction between generic and innovator medicines, making it difficult for them to participate. There is a possibility of understanding bias because the questionnaire was self-administered and snowball sampled, and the researchers were not charged with ensuring that participants understood the questions. However, we attempted to address this concern by conducting a pilot study among several community sections.

5. Conclusion

The study shows that healthcare professionals, medication costs, perceived efficacy, and information availability possess significant impacts on the Saudi Arabian population's choice of medications. Several influencing domains are correlated with factors such as location, educational background, and status of chronic illness. Government regulation is required to promote rational medicine selection and make high-quality medications more affordable for all consumers. In addition to public awareness campaigns, healthcare professionals should help to implement the generic medication policy. Finally, patients must be guided by the healthcare system when transitioning from branded or innovative medications to generic drugs.

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CRediT authorship contribution statement

Othman AlOmeir: Writing – original draft, Resources, Project administration, Formal analysis, Data curation, Supervision, Conceptualization. **Mansour Almuqbil:**Visualization, Methodology, Formal analysis, Data curation, Funding acquisition, Conceptualization.**Asmaa Hussam Alsawadi:** Writing – original draft, Resources, Formal analysis, Data curation, Conceptualization. **Alaa Mohamed Genedy:** Writing – review & editing, Validation, Supervision, Resources, Data curation, Conceptualization. **Ashwag fawaz Almutairi:**Writing – original draft, Visualization, Supervision, Project administration, Formal analysis. **Hams Talal Alaydaa:** Writing – original draft, Visualization, Methodology. **Saleh A. Alanazi:** Writing – original draft, Visualization, Supervision, Project administration, Formal analysis.**Numan Alabdan:** Writing – original draft, Visualization, Project administration, Formal analysis. **Meshal Alshakrah:** Writing – original draft, Validation, Resources, Formal analysis, Data curation, Conceptualization.**Rafiulla Gilkaramenthi:** Writing – original draft, Validation, Resources, Formal

Table 8
Association of factors with Drug information and Confidence influencing domains on selection of drugs by Multinomial regression analysis.

Characteristics	Variables	Information Influenced status[a]				Confidence Influenced status[a]			
		P value	AOR	95 % Confidence Interval for AOR		P value	AOR	95 % Confidence Interval for AOR	
				Lower Bound	Upper Bound			Lower Bound	Upper Bound
Gender	Male	0.585	**1.160**#	0.681	1.979	0.437	0.806	0.468	1.388
	Female	Ref							
Age	18–25	0.295	0.653	0.294	1.450	0.325	0.671	0.303	1.486
	>26	Ref							
Nationality	Saudi	0.482	**1.290**#	0.634	2.627	0.485	**1.293**#	0.629	2.659
	Non-Saudi	Ref							
Marital status	Married	0.725	**1.135**#	0.559	2.304	0.210	**1.584**#	0.772	3.252
	Single	Ref							
Educational level	Secondary school and less	0.831	0.926	0.459	1.872	0.606	**1.202**#	0.597	2.422
	University	Ref							
Educational background	Health	0.368	**1.671**#	0.546	5.111	0.836	0.889	0.293	2.699
	Science	0.750	0.835	0.276	2.529	0.736	**1.204**#	0.409	3.550
	Linguistics and Business School	0.466	**1.468**#	0.523	4.124	0.258	**1.794**#	0.651	4.942
	Others	Ref							
Geographical location	Central Region	0.096	**1.656**#	0.915	2.999	0.572	**1.185**#	0.658	2.135
	Eastern Region	0.478	0.700	0.261	1.874	0.814	0.894	0.353	2.263
	North Region	**0.002***	**3.888**	1.655	9.131	**0.005***	**3.749**	**1.505**	**9.339**
	Southern Region	0.070	**2.517**#	0.929	6.822	0.247	**1.811**#	0.663	4.951
	Western Region	Ref							
Number of family members	1–6	0.246	0.731	0.430	1.242	**0.006***	**2.127**	**1.241**	**3.644**
	More than 6	Ref							
Family income	10,000 SAR and less	0.109	0.661	0.398	1.096	0.444	0.819	0.491	1.366
	More than 10,000 SAR	Ref							
Employment status	Employed	0.727	**1.142**#	0.542	2.403	0.309	**1.471**#	0.699	3.099
	Unemployed	Ref							
Health care provider	Yes	0.931	**1.034**#	0.481	2.225	0.183	**1.712**#	0.776	3.780
	No	Ref							
Chronic disease	Yes	0.684	**1.222**#	0.467	3.199	0.473	**1.435**#	0.535	3.848
	No	Ref							
Use of medication for chronic disease	Yes	0.484	0.693	0.248	1.934	0.981	**1.013**#	0.354	2.896
	No	Ref							
Type of hospital	Private &public	0.213	0.630	0.304	1.303	**0.033***	**0.463**	**0.228**	**0.942**
	Private	0.358	**1.312**#	0.736	2.340	**0.004***	**0.421**	**0.233**	**0.760**
	Public	Ref							
Insurance	Yes	0.850	0.951	0.564	1.605	0.124	**1.513**#	0.892	2.566
	No	Ref							

[a] The reference category is. 2 (low influence); *Significantly impacting the domain of drug information and Confidence's influence; #non-significantly impacting the domain of drug information and Confidence's influence; AOR. Adjusted odds ratio.

analysis, Data curation, **Syed Mohammed Basheeruddin Asdaq:** Writing – Review and editing, Supervision, Software, Resources, Project administration, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Naira Nayeem:** Writing – original draft, Visualization, project management, Methodology.

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