Original Article

Medicine Prescribing Preference and Patient Adherence: Perspectives of Indian Medical Practitioners

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ABSTRACT

Background: Indian Pharmaceutical market is well known for generic medicines and the government also promotes them due to their affordability. These medicines are manufactured by big, medium and small size companies and their quality are generally checked by analytical methods though real evaluation of medicines can only be ensure by medical practitioners (MP) who prescribe them which is based on therapeutic responses and adverse effects they notice. Perspectives of MP about prescribed medicines, price, therapeutic responses, adverse effects and their awareness about different interactions are valuable and may initiate for better treatment and healthcare system. **Method:** A survey of 111 MP was conducted on one to one basis in a form of questionnaire. Frequency, percentage, Chi square and Friedman test were applied to check the association and rank between different attributes. **Results:** Branded generic is preferred over innovator branded generic and generic by 63.1% of MP because 64.9% believe it has good therapeutic response and 68% experienced it has mild adverse effects while only 0.9% assumed it has high adverse effect. Only generic considered as highly affordable but it is prescribed moderately or less preferably. Self study is the main source of medicine information for MP but all of them do not have excellent or good drug-drug and drug-food interactions knowledge. Patients only adhere to their 70-90%, 40-60% and 10-30% instructions according to 33.3%, 45.9% and 16.2% MP respectively. **Conclusion:** There is excessive demand of high quality generic products for better safety of patients irrespective of its affordability. Efficient training programs are required for some MP to improve average interactions knowledge. Patient non-adherence needs prior attention by implementing patient involvement in treatment decision and educating them.

Key words: Doctor, Generic, Healthcare, Medicine, Medical practitioner, Patient adherence.

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INTRODUCTION

Medicines are essential both to a country's economy and to the health of its people,[1] however their poor quality expand the burden of healthcare cost and even cause the morbidity and mortality.[2,3] Moreover, poor quality drugs influence the healthcare system and even drugs which

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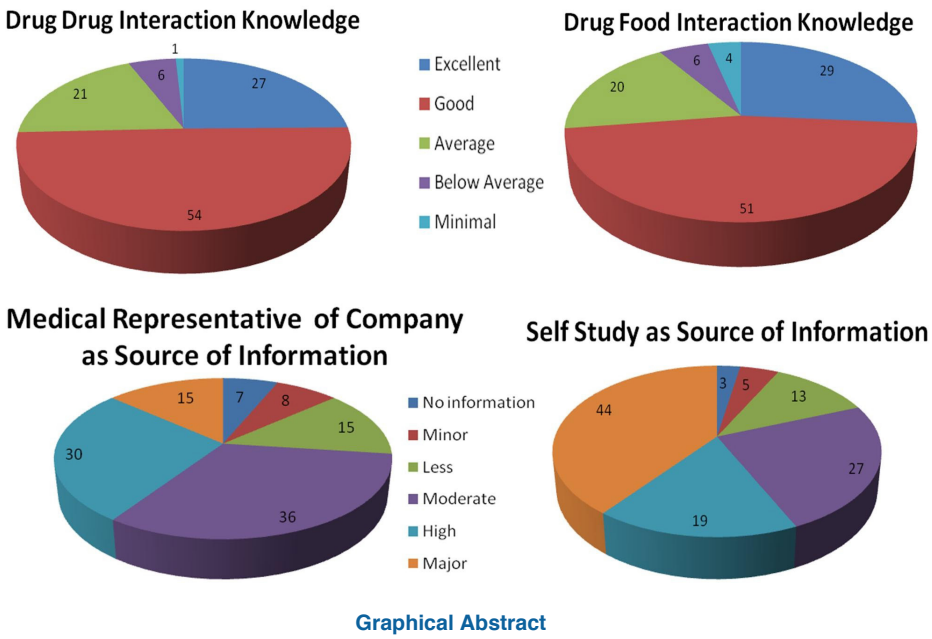

Graphical Abstract

have significant therapeutic effect can also lead to adverse or unwanted effect that may be lead to low or high risk.[4,5] Globally million of people are injured, disabled and even died because of medical error and among them disability is more common than death[6] and these errors can be diagnostic error, preventive error and treatment error or other error like lack of communication or instrument failure.[7] It indicates that medical practitioners (MP) play a vital role in society in diagnosing patients and treating them with medication. Therefore, well practice and copnsiderable knowledge is of the elemental significance to MP for their professional endeavor. According to World Bank report, India is the lower middle income country having population of 1252 million and out of it about 742 million people live on a daily cost of about 88 Indian Rupee (INR) and among them 296 million live on about 55 INR only.[8] Wealthy people have easy access to the high quality of healthcare benefits while poor and middle class are far away from it,[9–11] and the patients who adopt health care access in public sector found it to be of poor quality.[12] However, public healthcare is the only option specifically poor population can afford. Among various challenges to improve the healthcare system MP knowledge about medicine has principle concern. Prescribing appropriate and affordable medicines prior to the commencement of treatment ensures the safety and satisfaction of patient specifically poor patients. Like after diagnosis, only medicine play the role in mitigation, cure and prevention of disease or infection. Thus there must be some genuine sources of information about new medicines or new dosage form like medical representative (MR) of pharmaceutical company, conferences and workshops of pharmaceutical company or professional organization and self study etc. These sources have significant contribution in delivering important information related to medicine's therapeutic activity, side effect, adverse effect, interactions etc. and finally help MP in selecting the suitable medicine product. However, in India it is imprecise from the literature which sources are extensively used in practice.

Drug interaction with another drug or food may increase the action of main drug or make the drug less effective and can cause unexpected side effects.[13] Therefore, less or more awareness and knowledge of MP related to drug-drug (D-D) and drug-food (D-F) interaction during prescribing medicines can affect the treatment and ultimately influence the public health. Furthermore, high cost of healthcare and medicines affect lives of large number of poor population like cost of the medicine is highly affected by the market liberalization which proliferate the private sector.[12] In order to provide affordable medicine access to large population, Indian government always efforts to discontinue the unscrupulous practices of big pharmaceutical companies, who encourage the MP to prescribe their branded medicines over generic medicines. On one side government wants to bring down the prices of medicine in term of health care cost while on other side poor quality medicine exist in the market and on account of these, some negative consequences occur daily to the patient,[4,14] thus questions arise; Does survival need medicine quality or its affordability? Unfortunately both are prerequisite parallel.

Another major issue emerges from the patient side like with increasing chaotic burden of life, the willingness

and regularity of treatment schedules are reduced enormously among patients. This concept of treatment non adherence or treatment noncompliance has led to severe consequences of reduction in clinical benefit and increased risk of morbidity and mortality in the patients.[15] Therefore practicing medical profession is considered as the responsibility for overall clinical results so that quality of healthcare may improve in regular practice.

On such grounds this study was designed to determine the medicine prescribing preference by the MP and general criterion for their selection among Innovator Branded Generic (IBG), Branded Generic (BG) and Generic (G) products. Which one is more affordable to majority of Indians? What is the main source of medicine information to MP? How much do they evaluate themselves about drug–drug and drug-food interactions knowledge? And how many instruction followed by their all patients? This study aimed to get the perspectives of MP to explore the challenges for the regulatory authorities or government of India to mitigate and improve healthcare system and quality of medicines. A comprehensive discussion of these and several other trends revealed by the survey is included in this research article.

METHOD

This study was accomplished as a cross-sectional study of MP. We surveyed 111 MP from seven states of Northern India (Uttar Pradesh, Uttarakhand, New Delhi/Delhi, Haryana, Punjab, Himachal Pradesh and Jammu & Kashmir). They had one to more than ten years experience and different qualifications like M.B.B.S, B.D.S., M.D., D.M. etc. Medical practitioner having qualification in Unani and Ayurveda were also included in this study as they generally do practice with allopathic medicine; although they are not registered with Indian Medical Council. Selection of MP was random and they were specialized in different field like general physician, dentist, pediatricians, dermatologist and gynecologist etc.

The survey instrument was a questionnaire conducted face-to-face consisting of several multiple choice questions about medicine prescribing preference, therapeutic response and adverse effects of three standards in market and their price views based on affordability and non affordability for a person living on a daily cost of INR 88. Study was mainly focused on prescribing preference among three standards which are IBG, BG and G products. IBG are the products by companies who have invented drugs and are highly involved in inventions, research and manufacturing, BG are the product by companies who are highly involved in research and manufacturing; and G are the products by companies who are only involved in manufacturing. Scale used for multiple choice questions were less, moderate and most preferable for prescribing preference; good, moderate, mild and poor for therapeutic response; none, mild, moderate, high and severe for adverse effects (scale degree mentioned in Table 1) and no idea, non affordable, moderate and affordable for price views of medicines. Self assessment of knowledge corresponding to D-D and D-F Interaction was also asked on scale as mention in Table 1.

Table 1: Scale for interactions and adverse effects

Scale for Drug-Drug Interactions and Drug-Food Interactions Knowledge
Minimal: aware of few side effects/adverse effects/interactions only as informed by the patient themselves
Below average: aware of at least two moderate interaction of each among all the prescribed drugs
Average: aware of at least five moderate interactions of each among all the prescribed drugs
Good: aware of all moderate and major interactions which are life threatening or require hospitalization but not addition of drugs in the prescription, or substitution of prescribed drug
Excellent: aware of all moderate and major interaction which are life threatening or require hospitalization or addition of drugs in the prescription, or substitution of prescribed drug
Scale for Adverse Effects
None: no adverse effect observed
Mild: require only substitution by new medicine product
Moderate: require high attention and addition of new medicines product and/or substitution by new medicines products
High: require immediate treatment
Severe: require immediate hospitalization

An ordinal scale question was asked for sources of medicine information. All MP were asked to rate medicine information sources like MR of pharmaceutical companies, conference/workshop/seminars of pharmaceutical companies, conferences/workshops/seminars of medical or paramedical professional organization and self study/knowledge on the scale of no information, minor, less, moderate, high and major. An interval scale question was queried about the percent of adherence to their instruction by their all visiting patients.

Data Analysis

Descriptive statistics were used to examine the perspective of the MP. The Chi-square test was used to examine the associations between the different attributes and Friedman test was used to determine the rank for source of medicine information. Statistical analyses were performed using the SPSS software, version 17.0, and statistical significance was assumed for p-value less than or equal to 0.05.

RESULTS

Out of 111 respondents, 47.7% were general physician and 26.1% were dentist. Among all 53.2% MP were having more than ten years of experience as Table 2 shows the sample profile of the survey respondents. On account of multiple option scale for three commercial standard medicine; IBG, BG and G; some of the respondent were not exclusively answered and they selected same option between two or three standards like some MP choose both IBG and BG as most preferable.

Table 2: Sample profile of medical practitioners, N=111

Demographic Variables		Frequency	Percent
Location	Uttar Pradesh	35	31.5
	Uttarakhand	4	3.6
	New Delhi/Delhi	21	18.9
	Haryana	2	1.8
	Punjab	2	1.8
	Himachal Pradesh	27	24.3
	Jammu and Kashmir	20	18.0
Qualification	M.B.B.S.	21	18.9
	M.D.	33	29.7
	M.S.	1	0.9
	B.D.S.	29	26.1
	B.U.M.S.	9	8.1
	B.A.M.S	11	9.9
	Higher Degree (DM, Mch, DNB etc)	4	3.6
	Others: M.D. in Ayurveda/Unani/ Dental	3	2.7
Specialization	Dentist	29	26.1
	Dermatologist	8	7.2
	Diabetologist	3	2.7
	ENT Specialist	1	0.9
	General Physici	40	36.0
	Gynaecologist	4	3.6
	Neonatologist	1	0.9
	Not Mentioned	13	11.7
	Opthalmologist	1	0.9
	Orthopedic	1	0.9
	Pediatrician	8	7.2
	Preventive Medi	1	0.9
	Radiologist	1	0.9
Practicing Experience	Up to 1 Year	8	7.2
	Up to 2 Year	20	18.0
	Up to 4 Year	7	6.3
	Up to 6 Year	4	3.6
	Up to 8 Year	10	9.0
	Up to 10 Year	2	1.8
	More than 10 Year	59	53.2

In terms of most preferable medicines 21.6%, 63.1% and 19.8% MP prescribe the IBG, BG and G respectively, while as less preferable medicines 28.8%, 4.5%, 41.4% MP prescribe IBG, BG and G respectively as shown in Figure 1. 59.5% and 64.9 % MP considered IBG and BG respectively as showing good therapeutic response (TR) while G has good TR according to only 15.3% MP as depicted in Figure 2.

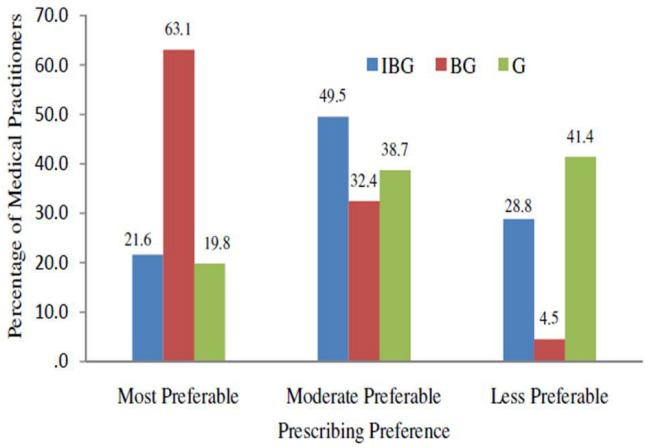

Figure 1: Prescribing preference of IBG, BG and G medicines by medical practitioners

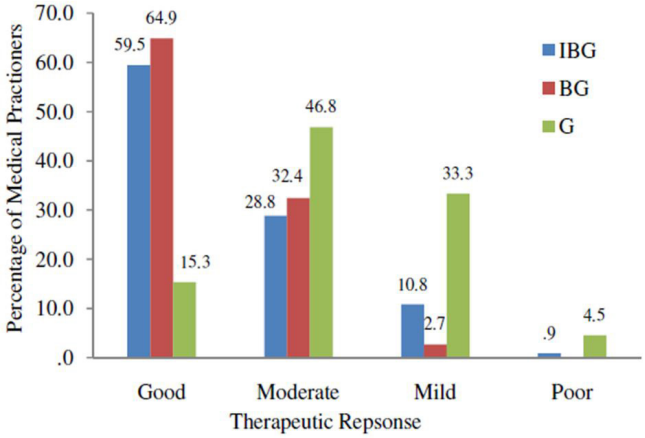

Figure 2: Therapeutic responses views on IBG, BG and G medicines by medical practitioners

A chi-square test was performed to determine the association between qualification and medicine prescribing preference of IBG, BG and G medicines. It was found that there was significant association between qualification and IBG, BG and G preference as in all cases $p < 0.05$. Out of 21 M.B.B.S., IBG, BG and G standards are most preferred by 19.0%, 47.6% and 23.8% MP, and same three standards are moderately preferred by 52.4%, 42.9% and 33.3% MP while less preferred by 28.6%, 9.5% and 42.9% MP respectively. Out of 33 M.D., IBG, BG and G standards are most preferred by 48.5%, 69.7% and 15.2% MP, and same three standards are moderately preferred by 42.4%, 30.3% and 21.2% MP whereas less preferred by 9.1%, 0% and 63.6% MP respectively. Out of 29 B.D.S., IBG, BG

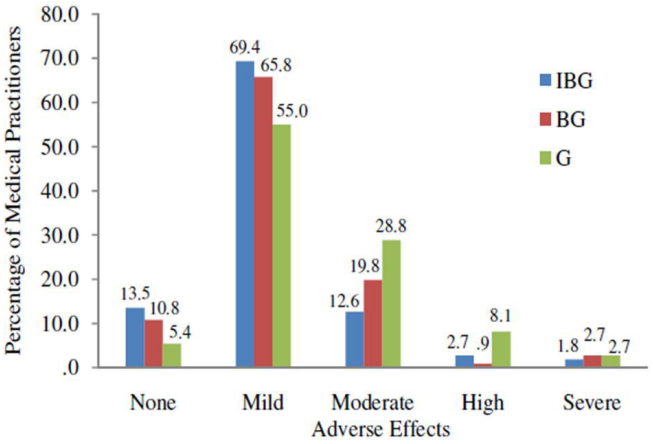

Figure 3: Adverse effects views on IBG, BG and G medicines by medical practitioners

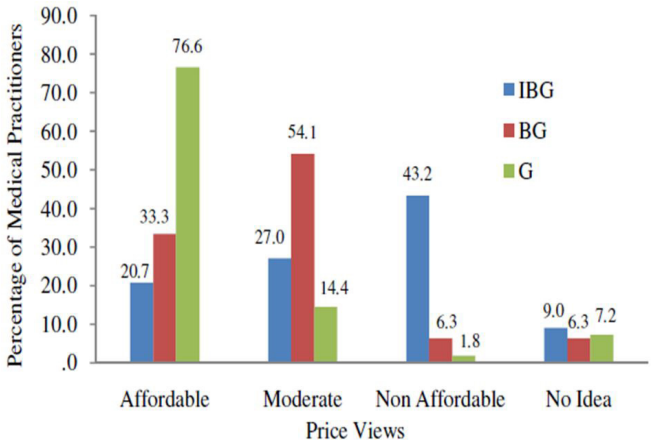

Figure 4: Price views on IBG, BG and G medicines by medical practitioners

and G standards are most preferred by 6.9%, 86.2% and 0% MP, and same three standards are moderately preferred by 55.2%, 13.8% and 75.9% MP while less preferred by 37.9%, 0% and 24.1% MP respectively. Out of 9 B.U.M.S. that is Unani practitioners, IBG, BG and G standards are most preferred by 0%, 44.4% and 66.7% MP, and same three standards are moderately preferred by 33.3%, 55.6% and 11.1% MP while they are less preferred by 66.7%, 0% and 22.2% MP respectively. Out of 11 B.A.M.S. that is Ayurvedic practitioners., IBG, BG and G standards are most preferred by 0%, 36.4% and 45.5% MP, and same three standards are moderately preferred by 54.52%, 45.5% and 36.4% MP whereas they are less preferred by 45.5%, 18.2% and 18.2% MP respectively.

Chi-square test between prescribing preference and adverse effect of three tested standards shows no association as $p>0.05$ in all cases. However, significant association found between prescribing preference and therapeutic response of BG X^2 (4, N=111) = 21.751, $p<0.05$ and G X^2 (6, N=111) = 19.486, $p<0.05$ but no association in case of IBG X^2 (6, N=111) = 14.068, $p>0.05$.

Concern to adverse effects (AE), 69.4%, 65.8% and 55% MP considered IBG, BG and G having mild AE respectively; and 2.7%, 0.9% and 8.1% believed IBG, BG and G having high AE respectively as depicted in Figure 3. As their price concern results shows that 20.7%, 33.3% and 76.6% MP believe that IBG, BG and G are affordable to the people who live on a daily cost of 88 INR. IBG, BG and G has moderate price for same people according to 27%, 54.1%, 14.4% MP respectively as illustrated in Figure 4.

On applying Friedman test for source of medicine information ranking, MP ranked their self study at one; conferences, seminars and workshops by paramedical and professional Organization stand on second; conferences, seminars and workshops of pharmaceutical companies stand on third and information from MR of pharmaceutical company was on fourth rank as shown in Table 3.

Table 3: Source of information ranking by Friedman test, N=111

Source of medicine information	Friedman Mean Rank	Rank in Importance
Medical Representatives of Pharmaceutical Companies	3.20	4
Conferences, Workshop and Seminars of Pharmaceutical Companies	3.25	3
Conferences, Workshops and Seminars of Medical or Paramedical Professional Organizations	3.29	2
Self study and knowledge	3.77	1

Among all 24.3% and 26.1% MP describe themselves having excellent knowledge of D-D Interaction and D-F interaction respectively. Majority of them that is 50.5% have good knowledge of D-D interaction and 46.8% have good knowledge of D-F Interaction as shown in Figure 5. While there are 18.9% and 18% MP having only average D-D and D-F interaction knowledge respectively. And 5.4% and 5.4% have below average knowledge in both interactions. With chi-square test it was found in both cases there was no significant association between practicing experience and D-D interaction knowledge, X^2 (24, N=111) = 18.750, $p>0.05$ and D-F interaction knowledge, X^2 (24, N=111)=18.197, $p>0.05$. Even qualification of MP with D-D and D-F interaction knowledge showed no significant relationship X^2 (28, N=111)=31.999, $p>0.05$ and X^2 (28, N=111)=17.439, $p>0.05$ respectively. An interesting observation with Friedman test it was observed that the MP who have excellent knowledge in both D-D and D-F

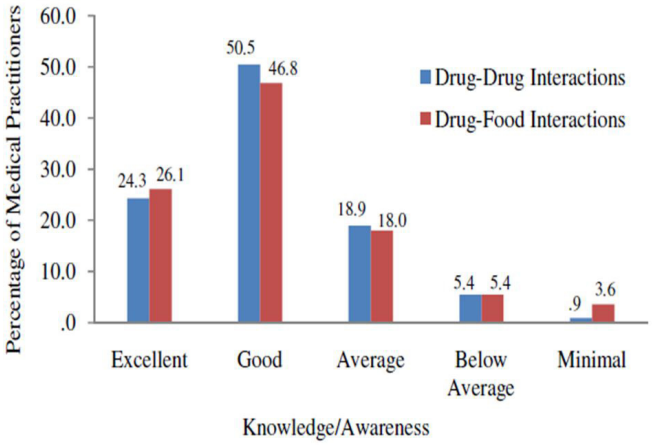

Figure 5: Medical practitioner's self assessed knowledge and awareness for drug-drug and drug-food interactions

interaction they ranked MR of pharmaceutical company at first as their source of medicine information.

For determining the patient adherence to MP's instruction, result shows that only one MP said that all his patients follow his 100% instructions; whereas 33.3%, 45.9%, 16.2% said their all patients follow their 70-90%, 40-60% and 10-30% instructions respectively, while 3.6% said their all patient do not follow any instruction.

DISCUSSION

Based on perspectives of MP this study adds to scaling evidence of the need for medication prescribing pattern and required interventions for improving the quality of medicines, and patient adherence and upgrading the knowledge of MP. Over the years India is producing BG and G medicine and some foreign multinational companies also manufacturing the generics known as IBG. In order to afford medication under healthcare cost by majority of Indian population; government promotes the G medicines over BG and IBG.

MP prefer BG as most prescribing standard. The reason may be their moderate to good therapeutic response and moderate to mild adverse effect. It shows better therapeutic response than IBG and G and less adverse effect than IBG and G. One half of MP considered as it has moderate price and one third MP believe it is affordable to more than 59% of Indian population. IBG is the moderately preferred by half of the MP as favorably it has moderate to good TR and mild to none AE although unfavorably its moderately preference may be because of non affordability to the visiting patient of MP.

This study shows majority of the MP considered G medicine as most affordable medicine than BG and IBG. However, majority of MP do not prefer to prescribe G may be due to moderate to poor therapeutic response and moderate to high adverse effect. With comparison to IBG and BG, more MP reported moderate and high adverse effect with G medicine in which high attention and addition and/or substitution of new medicines product is required and sometimes require immediate treatment. Generally G is less preferable by MP and the reason may be their poor therapeutic response or high adverse effect as reported by more MP and where it is moderate preferable it is may be because of the financial status of the visiting patients. More research has to be done to uncover the real cause.

Generic medicines competition and low price can significantly be a factor in affordability in low-income countries.[1] In this study MP's perspectives show that G medicines are most affordable to 742 million Indian who live on a daily cost of 88 INR, whereas more MP considered BG as moderately affordable and some believe it as affordable while more MP believe IBG as non-affordable and some think moderately affordable to the same population. Although G substitution and competitive tendering has made a positive impact on hospital budget but this should be complemented with improved strategies of patient safety that prevents costs of medication errors.[14] As general tendency except poor people, patient do not compromise with quality of medicine against price thus government has to take more stringent action for those generic products which are of low quality and cease them before they enter in to market or unapproved them.

Statistically there was significant association between MP's qualification and their prescribing preference for three market standards. Large number of M.B.B.S and M.D. most preferably prescribe BG, moderately prescribe IBG and less preferably prescribe G. While large number of B.D.S most preferably prescribe BG, moderately prescribe G and less preferably prescribe IBG. Majority of B.U.M.S. practitioners most preferably prescribe G, moderately prescribe BG and less preferably prescribe IBG, whereas B.A.M.S. practitioners most preferably prescribe G, moderately prescribe IBG and less preferably prescribe BG.

In order to confront the poor medicine existence, patient non-adherence and improve healthcare services, we found five main areas that need urgent attention and efforts. First, the MP need to render close attention to financial and nonfinancial outlook when making prescribing decisions for individual patients. Their most prescribing preference is for BG, and moderate to less preference to G. As per their perspectives generic bear not equivalent quality as BG and IBG in terms of therapeutic response, so government has

to take better steps to improve the quality of G medicines. Only in such a way the vision of better healthcare with affordable price can be accomplish, alternatively it directly or indirectly affects the public health and ultimately reduces the economic growth of India.

Second, high and severe AE of IBG and G are disclosed by some MP, additionally G have high AE responded by somewhat more MP. In general it may be because of poor quality or medication errors which can increase the risk of adverse events, increased length of hospital stay, increased healthcare costs and ultimately increase the morbidity and mortality.[16-19] Thus, proper reporting of AE or Adverse drug reactions (ADR) should be achieved with the help of regulatory authorities, pharmaceutical companies, healthcare professionals and academicians and therefore an initiative has been taken by the Indian government as Pharmacovigilance Programme of India (PvPI) to monitor the ADRs and make awareness among the health care professionals.[20] The only need of the hour is to report every observed AE or ADR to the PvPI.

Third, medical or sales representative are often source of medicine information to MP in developing countries.[21] However, this study reveals that self study is the major source of medicine information and MR of pharmaceutical company stand on fourth rank. It implies that MP believe more on their self study and knowledge. It may be because of several studies showed that medicine information by MR in form of promotional material contain inaccuracies.[21] And if it is true in our case then pharmaceutical companies must strive to convey accurate and genuine information along with the price of medicine. However, an interesting result observed from this study that the MP who have excellent knowledge of D-D and D-F interactions their main source of medicine information was MR of pharmaceutical company. Other sources of information have also significant role in their medicines knowledge.

Fourth, medical practitioners are the key assets of healthcare system. They need to have the contemporary knowledge and needs to know about new medicines, all kinds of interactions and recent medical research updates, so as to help patient with most efficient treatment. This study shows that not all MP have excellent or good knowledge of D-D and D-F interactions. As intervention, efficient training programs are required for some medical practitioners to improve their average interaction knowledge level to excellent, while in recent years the standard of patient care is improved because of the relation between more and less experienced MP. Currently MP are professionally dedicated towards education contribution and training of less experienced medical MP. The knowledge and skills are passed on from more to less experienced MP.

And fifth, this study reveals that majority of the patients do not follow the MP's instruction sincerely and there are very few who fully adhered to all instructions. Healthy discussion of treatment schedules between patient and health care provider is quoted with the term 'concordance' and it should be ideally promoted while prescribing. The process of concordance should not be limited just to prescribe medicines but also to gain patient support that will ultimately increase patient compliance.[22] There are numerous reasons for the non-adherence but patients relationship and communication with the health care provider are the most important factor for the same.[15] More than half of MP considered that their all patient follow their about 50% instructions only. As intervention, such poor condition would be better if Indian regulatory authorities would have encouraged and accentuated patient involvement in treatment decisions. Undertaking such activity MP should be able to manage complex situation, which usually is uncertain and where errors can have fatal outcomes. These skills are usually achieved by meticulous training, where knowledge and performance are tested. Simultaneously patients should also trust the knowledge and judgment of MP. They should let MP decide and take decisions on their disease and treatment. MP must also explain to them everything about the disease or condition namely causes, preventions, risks and scepticism of various test and treatments. Another way to improve the healthcare is thorough the pharmaceutical care that is to provide adherence interventions under the responsibility of pharmacist to monitor and optimize patients' needs and pharmacological treatment.[23,24] Such services are on demand to upgrade the healthcare system which ultimately boosts the patients' health and quality of life. Moreover, various other challenges are yet confronted to deliver the universal healthcare in India.

CONCLUSION

This study extracted several facts regarding MP's outlook and awareness of these attributes may help regulatory bodies as interventions for improving the health policies, drug price control and quality of medicines. Organizing futuristic training programs for more awareness of drug-drug and drug-food interactions to MP in view of better patients' quality of life would be more constructive. Source of information for medicine use is very important for medical practitioners and they must aware of all major and moderate drug-drug and drug-food interactions for better safety of patients. Therefore MP must be committed for

patients' drug regimen and be very attentive when making drug prescription. Not only poor quality of medicines or less awareness of drug-drug and drug-food interactions make the healthcare system miserable but patients' non adherence to treatment also has major contribution. Non-adherence to medication is a considerable issue which is concomitant for patients and healthcare system. Strengthening and endorsing patient involvement in treatment decisions and enhances patient education by medical or drug regulatory authorities may improve the adherence and healthcare outcomes. Policies and strategies based on such medical practitioner's perspectives are necessity for improving and making better healthcare system.

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CONFLICT OF INTEREST

No conflict of interest to report.

ABBREVIATIONS

MBBS:	Bachelor of Medicine-Bachelor of Surgery
MD:	Doctor of Medicine
MS:	Doctor of Surgery
BDS:	Bachelor of Dental Surgery
BAMS:	Bachelor of Ayurvedic Medicine and Surgery
BUMS:	Bachelor of Unani Medicine and Surgery
DM:	Doctorate of Medicine
MCH:	Master of Chirurgiae, DNB: Diplomate of National Board

Highlights of Paper

- Branded generic medicines are most preferred by medical practitioners.
- Generic medicines are most accessible to majority of population.
- Branded generics are of better quality than generic products.
- Self study is the major source of medicine information to practitioners.
- Patient non-adherence is one of the major cause of poor public health.

Author Profile

- **Ahmed Nawaz Khan:** Is an Assistant Professor at Jaypee University of Information Technology, Waknaghat. He has Master of Pharmacy degree and Post Graduate Diploma in Pharmaceutical Regulatory Affairs. He is keenly interested in promoting and protecting the public health. His research work includes quality profiling of market products to explore spurious and substandard medicines.

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