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Factors affecting the essential medicine prescribing behavior among general practitioners in Beijing, China: a cross-sectional study with structural equation model

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Abstract

Background The aim of this study is to explore the influence of GPs'information, motivation and behavior skills on EM prescribing behavior in urban and suburban districts.

Method A cross-sectional study was conducted from June to November 2022 cross 3 urban districts and 4 suburban districts in Beijing. The structural equation model was used to analyze the factors influencing the essential medicine prescription behavior among general practitioners in urban and suburban districts.

Results A total of 511 valid questionnaires were collected. There was a statistically significant difference in mean scores for personal motivation and behavioral skills between urban GPs and suburban GPs. For urban GPs, the path analysis revealed that the social motivation had a direct effect on the essential medicine prescribing behavior ($\beta = 0.225$, $p < 0.05$). In contrast, for suburban GPs, both social motivation and personal motivation had a direct effect on the essential medicine prescribing behavior, respectively ($\beta = 0.175$, $p < 0.05$; $\beta = 0.193$, $p < 0.01$).

Conclusion Social motivation of urban GPs were positively and significantly associated with essential medicine prescribing behavior. Social motivation and personal motivation of suburban GPs were positively and significantly associated with essential medicine prescribing behavior. Therefore, various corresponding policies and measures should be developed to promote the National Essential Medicines Policy in China.

Keywords Essential medicine, Prescription behavior, General practitioners, Influencing factors, Structural equation model

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Background

Essential medicine (EM) defined as "those that satisfy the priority healthcare needs of the population" was proposed by the Word Health Organization (WHO) in 1975. EM is intended to be available within the context of functioning health systems at all times in adequate amounts, in the appropriate dosage forms, with assured quality and adequate information and at a price that the individuals can afford [1]. And it has been regarded as the most cost-effective element of public health after immunization and health-promoting behaviors such as regular exercise [2].

Market-oriented economic reforms, beginning in 1978, have weakened the public health insurance system and health delivery system in China. As a result, the problems of unaffordable basic medical services and medical impoverishment due to exorbitant healthcare costs have been getting worse across China [3]. To solve the problems, the Chines government launched the medical and pharmaceutical system reform in 2009, aiming to provide universal health coverage for all Chinese citizens by 2020 [4]. A pivotal component of this reform is the establishment of the National Essential Medicine Policy (NEMP), accompanied by the issuance of the National Essential Medicines List (NEML). The latest version of NEML was implemented in 2018 and it contains 417 types of chemical medicines and biological products, as well as 268 types of traditional Chinese medicines. This list contains both imported ang domestically produced drugs [5].

To control the price of medications and expand their coverage, the zero-make-up drug policy and national centralized drug procurement policy have been carried out [6, 7]. And previous findings suggested that the NEMP has already positively reduced patients' medication costs [8] and promoted the rational use of medication (prescribing based on the efficacy, safety, suitability and cost-effectiveness of medicines) [9].

With the ongoing development of the hierarchical diagnosis and treatment system, community health service centers (CHSCs) have become the important settings for implementing NEMP due to the increasing number of patients [10]. As the main undertaker of CHSCs, the prescribing behaviors of general practitioners (GPs) have a direct impact on the proportion of essential medicine (EM) prescriptions. As one of the earliest districts to implement the NEMP, government-run primary health care institutions were required to stock and prescribe EM preferentially in Beijing [11]. However, previous studies have revealed that the proportion of EM prescriptions written by GPs was significantly lower than the ideal standards of the WHO/INRUD indicators [12, 13]. Meanwhile, there are some obstacles encountered in implementing NEMP, such as the low knowledge level of EM among patient and a lack of awareness of the priority use of EM among physicians. Therefore, it is important to explore the influencing factors and key elements of the EM prescribing behavior among GPs.

A review has showed that the factors affecting GPs' prescribing behavior can be categorized into internal and external causes [14]. Some studies have focused on the external factors such as the health care policies and regulations, efficacy and safety of medicines and patients' medication preference [15, 16]. And some studies have concentrated on the internal factors including GPs' gender, education, experience, knowledge and attitude [17–19]. While, most studies were focused on only one aspect, rarely both external and internal.

Considering the complexity of physician prescribing behavior [20], our research chooses information–motivation–behavioral skills (IMB) model as the theoretical framework, which incorporate both internal and external factors. The IMB model was first proposed by Fisher to promote and evaluate AIDS-risk behavior change in 1992 [21] and has been widely used in sociology and psychology. The IMB model includes three key elements: information, motivation, and behavioral skills. Information refers to the knowledge of behavior. Motivation is composed of personal motivation (individual attitude and beliefs regarding target behaviors) and social motivation (perceptions of social support for those behaviors). Behavioral skills consist of objective skills and self-efficacy for behaviors. And the IMB model was used in a county hospital to quantitatively analyze the drivers influencing physicians' EM prescribing behavior and it was shown that the IMB model had a good fitting and prediction effects [22]. Therefore, the IMB model can be applied to the field of EM prescribing behavior.

Previous study has emphasized the importance of geographical factors in influencing drug prescriptions. Therefore, the aim of this study is to explore the influence of GPs' information, motivation and behavior skills on EM prescribing behavior in different regions. It can help us figure out the key elements in the prescription of EM, in turn take evidence-based interventions to improve the implementation of NEMS in Beijing, China.

Methods

Participants and recruitment

Beijing totally includes 6 urban districts and 10 suburban districts. We carried out this cross-sectional study in 3 urban districts and 4 suburban districts of Beijing from June to November 2022 by a multistage stratified random sampling strategy. Stage One, the 16 districts were stratified based on the functional orientation of different districts.

The urban districts include the capital functional core areas (*Xicheng* and *Dongcheng*) and the city functional expansion areas (*Chaoyang*, *Haidian*, *Fengtai* and *Shijingshan*). The suburban districts include the new

area of urban development (*Tongzhou*, *Daxing*, *Shunyi*, *Changping*, and *Fangshan*) and the ecological conservation development area (*Mentougou*, *Huairou*, *Yanqing*, *Miyun* and *Pinggu*). Stage two, one district was selected from the capital functional core areas, and two districts were selected from the city functional expansion areas, the new area of urban development and the ecological conservation development area respectively by simple random sampling method. Stage three: 20% of CHSCs were selected from each sample district, and all GPs who met the inclusion criteria were included in this study (See Table 1 for the details). Inclusion criteria were as follows: (1) having independent prescribing rights, (2) working in the general practice clinic; (3) being willing to participate in this study. The exclusion criteria were GPs who have not worked at the present unit for more than 6 months for some reasons.

Data collection and quality control

In this study, all data were collected by a professional online survey service platform, 'Questionnaire Star'. And several measures were taken for quality control of the data collection. Firstly, to improve the cooperation of GPs, we sent the link of online questionnaire to the managers of CHSCs via WeChat (a mobile text and voice messaging communication service). And with the assistance of managers, GPs who met the inclusion criteria were all invited to participate in this anonymous online survey. Secondly, to ensure the validity of the data, three methods of data screening were used after questionnaire collection. The questionnaire with (1) response times less than 200 s, (2) the IP addresses not in Beijing, and (3) the same option selected for all questions was judged to be invalid and will be deleted.

Measurement

According to the IMB model, it is summarized into 3 categories: information, motivation, and behavioral skills. Information is defined as accurate behavior-specific knowledge. Motivation comprises personal motivation and social motivation. Personal motivation includes attitudes toward personal performance and the consequences of engaging in the behavior. The social motivation entails the perceptions of social support. Behavioral skills involve objective ability and self-efficacy concerning the performance of behavior [23]. Based on IMB model framework, the literature review and expert consultation, a self-designed questionnaire was developed according to the purpose of the survey (see supplementary material for details).

Table 1 Samples of CHSCs and GPs in Beijing districts

Type of district	Districts	No. of involved CHSCs*	No. of involved GPs
Urban districts	*Xicheng*	3	48
	Chaoyang	9	134
	Fengtai	5	81
Suburban districts	*Tongzhou*	5	53
	Fangshan	5	78
	Miyun	4	63
	Mentougou	2	54

*: The CHSCs are owned and managed by the People's Government of Beijing Municipality in our study

General information

The first part was to collect GPs' general information including gender, age, education level, professional title, work experience and average monthly income.

Information

This part was to assess GPs' knowledge about EM including concepts of EM (items 1–10) and the identification of EM (items 11–30). Response options for each item were "Yes," "No," or "I don't know." The respondents will be coded as 1 for a correct answer and 0 for an incorrect or unknown answer. A higher total score indicates a higher level of knowledge.

Motivation

This part was to evaluate GPs' motivation for prescribing EM including personal motivation and social motivation.

Personal motivation: This part of the questionnaire consists of 4 items measuring individuals' attitudes toward NEMP and EM (e.g., PM1: Do you support the implementation of the NEMP in China? PM2: Do you agree that NEMP can promote the rational use of medicines? PM3: Do you agree that EMs are effective and safe? PM4: Do you agree that EMs can reduce the cost of healthcare for patients?).

Social motivation: This part of the questionnaire was used to understand the CHSCs, colleagues and patients support for prescription EM from the perceptions of GPs (e.g., SM1: Does your CHSCs require you to complete the task of the minimum requirement for the prescription of EMs? SM2: Would your colleagues be willing to prescribe EMs for patients? SM3: Would your patients be willing to use EMs that you recommend?).

Each item was scored on a 5-point Likert scale, ranging from 1(strongly disagree) to 5 (strongly agree).

Behavioral skill

This section of the questionnaire assessed GPs' objective skills and self-efficacy measured by five indexes (e.g., BS1: Can you acquire knowledge about EM timely? BS2: Can you access EM from the pharmacy timely during the prescription? BS3: Can you identify EMs correctly? BS4: Can you prescribe EMs according to *Guidelines and*

Formulary for Clinical application of national Essential Medicines? BS5: Can you communicate the right knowledge about EM to patients who are biased about it?).

The 5 items were measured by a 5-point Likert-type scale ranging from 1 to 5. Higher scores indicated more behavioral skills in prescribing EM.

Essential medicines prescribing behavior

The fifth part of the questionnaire was the essential medicine prescribing behavior of GPs, measured by participants' self-reported prescription proportion of EMs. The responses were given on a ten-point Likert scale, ranging from 1 to 10 (1=less than 40%, 2=over 40% and less than 45%, 3=over 45% and less than 50%, 4=over 50% and less than 55%,5=over 55% and less than 60%,6=over 60% and less than 65%,7=over 65% and less than 70%,8=over 70% and less than 75%,9=over 75% and less than 80%,10=over 80%). A higher score indicates better EM prescribing behavior among GPs.

Pilot study

Before the questionnaire was distributed, one pilot investigation was conducted. A total of 26 GPs from CHSCs were invited to complete the questionnaire and provide feedback on the readability, comprehensibility and the length of time to complete the questionnaire.

Data Analysis

General data analysis

The general information was analyzed by descriptive statistics, for example, continuous variables were described as mean with standard deviations (SD), and categorical variables were described as frequencies and percentages. Continuous variables were assessed by t-tests and categorical variables with chi-square test. The general data were analyzed using IBM Statistical Package for Social Science software program (IBM-SPSS) Version 26.0 for Windows.

Reliability and validity test of the questionnaire

Before evaluating the structural equation model, multiple measures of reliability and validity of items were computed. The Cronbach's alpha was used to assess the reliability of items. The Cronbach's alpha of all constructs was greater than 0.70, indicating adequate reliability. The confirmatory factor analysis (CFA) was used to verify the construct validity of the questionnaire. And convergent validity was examined using factor loading, composite reliability (CR) coefficients and average variance extracted (AVE). The factor loadings and AVE of the items should be higher than 0.50 and CR was greater than 0.70, demonstrating adequate convergent validity. In addition, discriminant validity was also assessed by comparing the square root of the AVE of each construct with the correlations between related constructs [24].

Analysis of structural equation model (SEM)

The structural equation model (SEM) was used to analyze the relationship between information, motivation, behavioral skills and EM prescribing behavior. And to explore the path differences between urban and suburban districts, this study employed SEM to conduct separate analyses for each group.

Model fit

The CFA and SEM were conducted by IBM SPSS Amos 24.0. As the data was not multivariate normally distributed, the bootstrap procedure (2000 resamples) was used in our study. And we used chi-square/degree of freedom (χ^2/df), goodness-of-fit index (GFI), comparative-fit index (CFI), root mean square error of approximation (RMSEA) and standardized root mean squared residual (SRMR) to examine the model fit. The reference values for every fitness index were χ2/df<3, CFI>0.9, GFI>0.9, RMSEA<0.08, and SRMR<0.08 [25, 26].

Result

Demographics of respondents

A total of 532 questionnaires were collected, of which 511 (96.1%) were valid. The sample size meets the structural equation modeling study [27]. There were 263 (51.5%) GPs from urban districts and 248 (48.5%) GPs from suburban districts. As shown in Table 2, the respondents had a mean age of 40.3±8.9 years, and 72.4% were female. Nearly 73% had a bachelor's degree, 51.5% were attending physicians and 68.3% had incomes less than 10,000 yuan.

Scores of observable variables

The total score of GPs' knowledge in urban and suburban districts was 20.27±2.57 and 20.71±3.15 (P=0.008). The average score for personal motivation, social motivation and behavioral skills among urban and suburban GPs were as follows: the scores for personal motivation among urban and suburban GPs were 4.10±1.02 and 4.31±0.84, respectively (P=0.012); the scores for social motivation among urban and suburban GPs were 4.25±0.65 and 4.35±0.66 respectively (P=0.074); the scores for behavioral skills among urban and suburban GPs were 4.08±0.63 and 3.96±0.64 respectively (P=0.042). The scores of observable variables in different groups are shown in Table 3.

Confirmatory factor analysis

The results of the CFA indicated good to adequate model fit: χ^2=85.996, df=69, χ2/df=1.246, GFI=0.980; CFI=0.996; RMSEA=0.022.

Table 2 Demographics characteristics of participants

Characteristic	Urban	Suburban	Overall
	M ± SD/*N*(%)	M ± SD/*N*(%)	M ± SD/*N*(%)
Age, years	42.1 ± 8.2	38.4 ± 9.3	40.3 ± 8.9
Years of practice	15.5 ± 9.7	15.2 ± 9.1	15.3 ± 9.4
Gender			
Male	66(25.1)	75(30.2)	141(27.6)
Female	197(74.9)	173(69.8)	370(72.4)
Highest education level			
Junior college degree or below	22(8.4)	43(17.3)	65(12.7)
Bachelor's degree	180(68.4)	192(77.4)	372(72.8)
Master's degree or above	61(23.2)	13(5.2)	74(14.5)
Professional title			
Practicing physician or below	23(8.7)	86(34.7)	109(21.3)
Attending physician	160(60.8)	103(41.5)	263(51.5)
Associate chief physician	71(27.0)	50(20.2)	121(23.7)
Chief physician	9(3.4)	9(3.6)	18(3.5)
Personal monthly income (yuan)			
5000~9999	199(75.7)	150(60.5)	340(68.3)
10000~14999	57(21.7)	94(37.9)	151(29.5)
15000~19999	6(2.3)	4(1.6)	10(2.0)
≥ 20,000	1(0.4)	0(0.0)	1(0.2)

Table 3 Descriptive statistics for observable variables between urban and suburban GPs

Latent variables	Urban	Suburban	t value	*P*
Observable variables	Mean ± SD	Mean ± SD		
Knowledge	20.27 ± 2.57	20.71 ± 3.15	-1.753	0.080
Personal motivation				
PM1	4.11 ± 1.31	4.37 ± 1.09	-2.413	0.016
PM2	4.03 ± 1.17	4.26 ± 1.04	-2.284	0.023
PM3	3.90 ± 1.11	4.20 ± 1.04	-3.106	0.002
PM4	4.20 ± 1.16	4.35 ± 1.04	-1.528	0.127
Social motivation				
SM1	4.40 ± 0.75	4.38 ± 0.73	0.307	0.759
SM2	4.29 ± 0.71	4.40 ± 0.70	-1.898	0.058
SM3	4.06 ± 0.82	4.27 ± 0.79	-2.983	0.003
Behavioral skills				
S1	4.10 ± 0.79	3.97 ± 0.77	1.953	0.051
S2	4.37 ± 0.68	4.09 ± 0.76	4.363	0.000
S3	4.19 ± 0.80	4.00 ± 0.75	2.782	0.006
S4	3.84 ± 0.80	3.79 ± 0.74	0.739	0.460
S5	3.88 ± 1.10	3.96 ± 1.01	-0.828	0.408

S: standard deviations

The Cronbach's α of the questionnaires ranged from 0.826 to 0.933. The CR of all constructs was above 0.7, ranging from 0.853 to 0.937. Our data showed that the factor loadings of all items were large than 0.5 except item S5, and the AVE exceeded 0.5 for all constructs, detailed in Table 4. Although the factor loading of item S5 was below the threshold of 0.5, the CR and AVE values of three dimensions were above the established criteria. Given the significance of this item, it was retained after the research group discussion.

Table 4 The reliability and validity of the questionnaire

Latent variables	Factor Loading	Cronbach's α	CR	AVE
Observable variables				
Personal motivation		0.933	0.937	0.788
PM1	0.763			
PM2	0.940			
PM3	0.915			
PM4	0.921			
Social motivation		0.842	0.859	0.674
SM1	0.725			
SM2	0.945			
SM3	0.777			
Behavioral skills		0.826	0.853	0.547
S1	0.855			
S2	0.769			
S3	0.836			
S4	0.709			
S5	0.460			

Note: AVE: average variance extracted; CR: construct reliability

Table 5 Discriminant validity of the questionnaire

Latent variable	Latent variable		
	Personal motivation	Social motivation	Behavioral skills
Personal motivation	0.888		
Social motivation	0.360***	0.821	
Behavioral skills	0.273***	0.625***	0.740

Note: (a) The figures above the diagonal are $\sqrt{AVE}$ (in bold), and the other matrix entries represent the correlation coefficients of each latent variable

(b) *** $p<0.001$

To assess discriminant validity, we compared the square root of the AVE of each construct with the correlation between related constructs. The square roots of the AVEs on the diagonal were larger than the inter-construct correlations outside the diagonal of the matrix, suggesting adequate discriminant validity, detailed in Table 5.

Multigroup comparisons analysis

To explore whether the paths are different in urban and suburban GPs, we tested separately in each group by SEM.

From the path of the urban GPs model (Fig. 1), social motivation had a direct effect on essential medicine prescribing behavior (β=0.225, $p<0.05$). Additionally, the effect values of information and social motivation on behavioral skills were 0.192 ($p<0.01$) and 0.625 ($p<0.001$), respectively. The fit indices of the model were $\chi^2=83.821$, df=69, $\chi^2/df=1.215$, GFI=0.960; CFI=0.993;

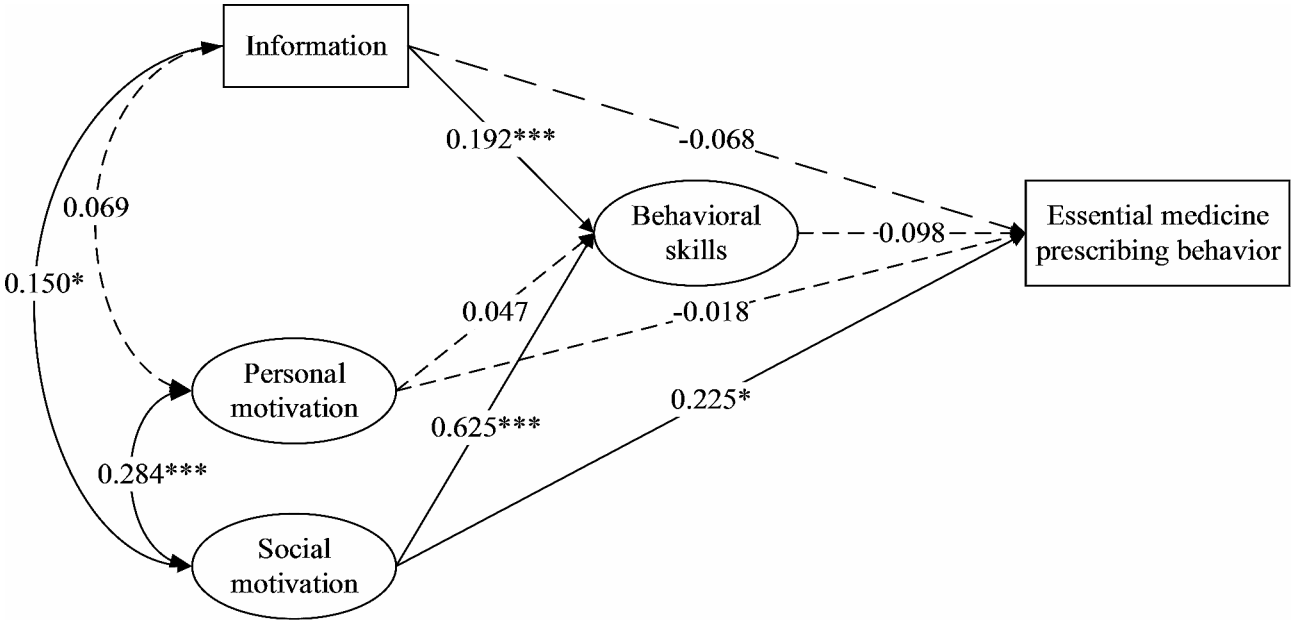

Fig. 1 Path of the structural equation model of urban district group
Note: (a)In the figures, bold lines indicate "significant" and dotted lines indicate "non-significant."
(b)*** $p<0.001$ ** $p<0.01$ * $p<0.05$

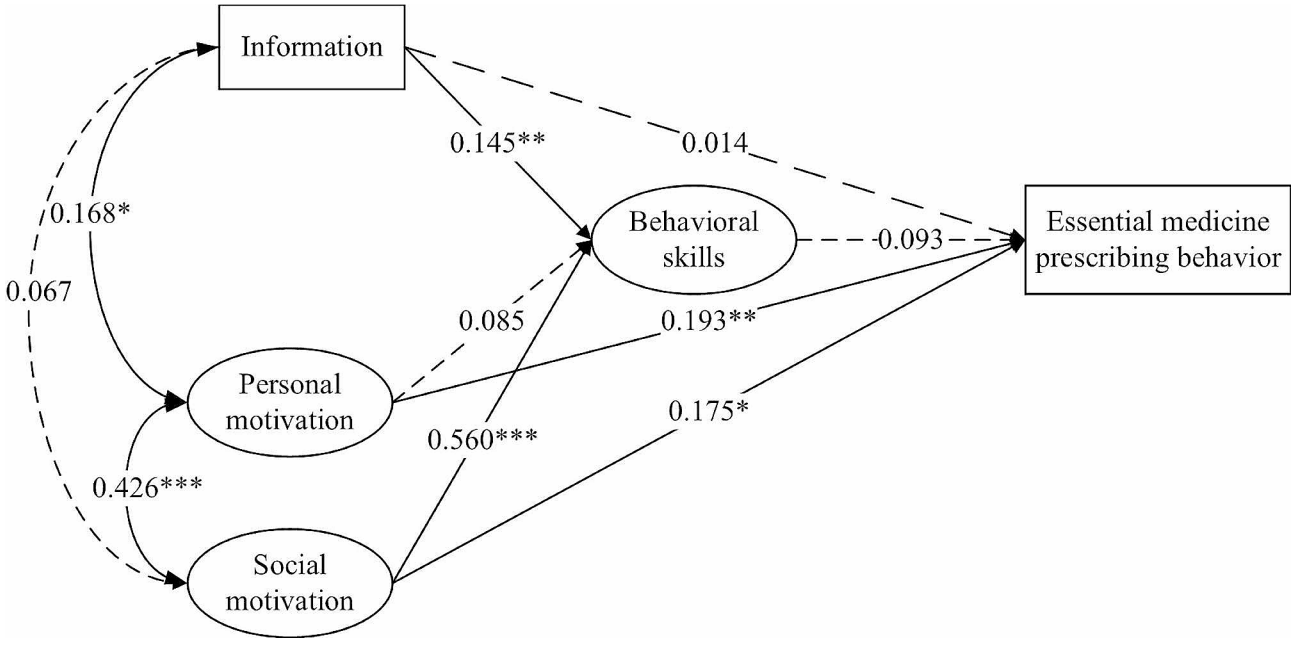

Fig. 2 Path of the structural equation model of suburban district group
Note: (a)In the figures, bold lines indicate "significant" and dotted lines indicate "non-significant."
(b)*** $p<0.001$ ** $p<0.01$ * $p<0.05$

RMSEA=0.029. The results indicate that the fit indices of the model of the urban district group fit well.

From the path of the suburban GPs model (Fig. 2), social motivation and personal motivation had a direct effect on essential medicine prescribing behavior, respectively (β=0.175, $p<0.05$; β=0.193, $p<0.01$). Additionally, the effect values of information and social motivation on behavioral skills were 0.145 ($p<0.01$) and 0.560 ($p<0.001$), respectively. The fit indices of the model were $\chi2=90.625$, df=69, $\chi2/df=1.313$, GFI=0.962; CFI=0.991; RMSEA=0.036, which indicate a good mode fit of the suburban district group.

Discussion

In this study, we used the IMB model as the theoretical framework to explore the mechanisms of EMs prescribing behavior among GPs. The reliability and validity test yielded favorable results, indicating the high stability of the questionnaire. And the fit indices for both groups demonstrated a strong model fit, suggesting that the IMB model is well positioned to explain the sample data.

The average score of the variable 'SM3' indicated that suburban patients were more likely to use EMs recommend by GPs compared to urban counterparts. Although this question viewed from GPs' perspective, it was also somewhat reflective of the patient's willingness, as GPs were more understanding of their own patients' preferences. Similar findings were reported in previous study in Australia [28]. It may be related to the patients' income level and categories of health insurance. The relatively inexpensive of EMs due to national control, make them particularly popular with low-income patients in suburban areas. Currently, the main categories of medical insurance are Urban Employee Basic Medical Insurance (UEBMI) for urban population, and Urban-Rural Resident Basic Medical Insurance (URRBMI) for suburban population. Although there is large discrepancy in reimbursement ratio between UEBMI (high) and URRBMI (low) in Beijing, discrepancy in the reimbursement ratio for EMs and Non-EMs is small. Compared to patients with URRBMI , most patients with UEBMI do not consider the original price of drugs as the first principle of drugs selection, due to lower out-of-pocket expenses after reimbursement. A study conducted in Sweden found that patients accepted medication substitution more frequently when the average saving per substitution was high [29]. Therefore, increasing the reimbursement rate for EMs may be an effective way to incentivise patients to choose EMs.

The finding indicated that GPs exhibit low attitudes towards the efficacy and safety of EMs, basing on the average score of personal motivation. Although EMs are approved for their bioequivalence to the original medicine, they are not necessarily therapeutically equivalent to original medicines [30], making physicians question their effectiveness and safety. A previous study has identified that the efficacy and safety of medication as significant factors influencing physicians' prescribing behavior [17]. Therefore, on one hand, it is necessary to reinforce GPs' trust in EMs; on the other hand, the government should accelerate the promotion of consistency evaluation of EMs and releasing the results in a timely.

The finding suggested that social motivation plays a vital role in the EMs prescribing behavior among GPs in both urban and suburban districts, considering social motivation directly influenced EM prescribing behavior and behavioral skill. Our previous qualitative research has also demonstrated that social motivation has significant impact on the EM prescribing behavior among GPs [15]. While the results were different from the study in the county hospitals [22]. There may be two main reasons. Firstly, different from county hospitals, patients with chronic non-communicable diseases always were diagnosed in higher-level hospitals and referred to CHSCs for long-term management by GPs. Most of these patients refill their medications for once a month and have a strong autonomy in CHSCs [31]. To reduce the conflict between doctors and patients, GPs empower patients with more choice of medicines (such as non-EMs). Therefore, patient acceptance of EMs is crucial to EMs prescribing behaviors of GPs. Secondly, as an important performance indicator of GPs, the regulation of EM prescribing ratio in CHSCs can influence GPs' prescribing behavior. The average score of variable 'SM1' suggested that GPs were strictly required to complete the prescribing ratio of EM in CHSCs. The salaries for GPs will suffer if their prescribing ratios are not met.

This study emphasized the importance of GPs' geographical in influencing EMs prescribing behavior. Different from urban GPs, the suburban GPs' prescribing behavior of EM has been modified by both personal motivation and social motivations. It is suggested that the impact of personal motivation may be moderated by social motivation, indicating that personal motivation positively affects EM prescribing behavior with adequate social support. The score of personal motivation showed that suburban GPs had more positive attitudes towards EMs than urban GPs. This difference may explain why personal motivation significantly influences the suburban GPs' prescribing behavior of EM. Previous studies have shown that the continuous training program can change their attitude toward drugs selection [32–34], in turn affect prescribing behavior. Therefore, there is an urgent need for training in knowledge related to essential medicines, such as the content of the national essential medicines catalogue, policies and norms on the use of essential medicines, clinical application skills and the concept of rational use of essential medicines.

Limitation

This study has some limitations. Firstly, as this study relied on GPs self-report on the measurement of EMs prescribing behavior and social motivation, the findings may be subject to social desirability bias and recall bias. For future research, we will consider using objective metrics to measure prescribing behavior. Secondly, this study was used psycho-behavioral theory (IMB model) as a theoretical framework to explore the relationship between information, motivation, behavioral skills and prescribing behavior, and failure to consider the impact of patients' condition, which may cause deviation in the results.

Conclusion

The structural equation model developed in this study better reflected the influence mechanisms of information, personal motivation, social motivation and behavior skills on GPs' prescribing behavior of EM. The model for urban GPs identified significant positive relationships between social motivation and EM prescribing behavior. The mode for suburban GPs revealed significant positive relationships between both social motivation and personal motivation with EM prescribing behavior. And no significant mediating effect of behavioral skill was found. Therefore, based on the findings of this study, various corresponding policies and measures should be developed, including accelerating the promotion of consistency evaluation of EMs, increasing the reimbursement ratio of EMs, enhancing GPs' attitudes and beliefs toward EMs through comprehensive training, and improving patients' attitudes towards EMs by providing various forms of regular education.

Abbreviations

χ^2/df	Chi-square/degree of freedom
AVE	Coefficients and average variance extracted
CFA	Confirmatory factor analysis
CFI	Comparative-fit index
CHSC	Community health service centers
CR	Composite reliability
EM	Essential medicine
GFI	Goodness-of-fit index
GP	General practitioners
IMB	Information–motivation–behavioral skills model
NEMP	National Essential Medicine Policy (NEMP)
RMSEA	Root mean square error of approximation
SEM	Structural equation modeling
SRMR	Standardized root mean squared residual
WHO	Word Health Organization

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s12875-024-02556-5.

Supplementary Material 1

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Author contributions

XLC and ZWF and QL and HL and SS and JD contributed to the conception and design of this study. XLC and ZWF were involved in data collection. XLC and QL and HL analyzed and interpreted the data. The manuscript was drafted by XLC and edited by SS and JD. All authors read and approved the final manuscript.

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Data availability

The datasets generated and/or analyzed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate

This study was approved by the Medical Ethics Committee of Capital Medical University, Beijing, China (no. Z2023SY064). All methods were carried out in accordance with relevant guidelines and regulations. Informed consent was obtained from all the participants. And all participant information was kept confidential.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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