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ORIGINAL RESEARCH

Relationship Between Medication Literacy and Beliefs Among Persons with Type 2 Diabetes Mellitus in Guangdong, China

Sifen Jiang [1,]*, Zhuoqi Zhu [2,]*, Guisheng Liao [3,]*, Yanling Huang [1], Lichang Li [4], Kun Zeng [1]

[1]School of Nursing, Guangdong Pharmaceutical University, Guangzhou, People's Republic of China; [2]School of Public Health, Guangxi Medical University, Guangxi, People's Republic of China; [3]Emergency Outpatient, Dongguan Eighth People's Hospital, Dongguan, People's Republic of China; [4]Endocrinology Department, Dongguan Eighth People's Hospital, Dongguan, People's Republic of China

*These authors contributed equally to this work

Correspondence: Kun Zeng, School of Nursing, Guangdong Pharmaceutical University, No. 283, Jianghai Avenue, Haizhu District, Guangzhou City, Guangdong Province, 510310, People's Republic of China, Tel +86 13790300213, Email Zengkun660524@163.com

Purpose: To establish the relationship between medication literacy and medication beliefs among persons with type 2 diabetes mellitus (T2DM).

Patients and methods: A cross-sectional survey of 246 patients with T2DM was conducted between April and November 2022 at a tertiary hospital in Dongguan City, Guangdong Province, China. Subsequently, these patients were administered the General Information Questionnaire, the Chinese version of Medication Literacy Assessment Scale, and the Chinese version of Beliefs about Medicines Questionnaire-Specific via survey.

Results: The medication literacy score of patients with T2DM was 7.82±3.007, and the medication beliefs score was 2.26±4.011. The Pearson correlation analysis revealed a statistically significant but weakly positive correlation ($r = 0.271$, $P < 0.001$) between medication literacy and beliefs among patients diagnosed with T2DM. However, there was no significant correlation found between medication literacy and necessity ($r = -0.021$, $P > 0.05$), while a lowly negative correlation was observed between medication literacy and concerns ($r = -0.307$, $P < 0.001$). Moreover, the multiple linear regression analysis indicated that medication literacy, age, education level, and duration of medication usage were all significant factors influencing patients' medication beliefs (all $P < 0.05$). Together, these variables accounted for 15.3% of the total variance observed in the regression equation.

Conclusion: The study found a positive correlation between medication literacy and beliefs, and a negative correlation between medication literacy and concerns. These results indicate that enhancing medication literacy can improve medication adherence among individuals with T2DM by reducing concerns and strengthening medication beliefs.

Keywords: type 2 diabetes mellitus, T2DM, medication literacy, medication beliefs, medication adherence, correlation

Introduction

According to the 2021 data from the International Diabetes Federation,[1] approximately 537 million adults worldwide suffer from diabetes mellitus. Type 2 Diabetes Mellitus (T2DM) constitutes over 90% of the total diabetes mellitus population, and China has the most significant number of diabetes mellitus patients, with around 116 million cases. Patients with T2DM can suffer from various complications when their blood glucose is poorly controlled. These complications increase the mortality and disability rate and significantly reduce the patient's quality of life.[2] Medication is one of the most critical therapeutic measures for T2DM, and adherence to medication is essential for glycemic control. Good adherence is not only a critical factor in ensuring medication effectiveness but also lowers the risk of diabetic co-morbidities, death rates, and treatment costs.[3,4] However, research has found that the medication adherence of T2DM patients in China is not optimistic, with the rate of poor medication adherence ranging from 19.9%

to 77.68%.[5,6] Poor medication adherence endangers the patient's health and places a significant financial burden on the healthcare system;[7,8] improving patient adherence is critical.

Medication beliefs are an individual's attitudes toward medication adherence's benefits and potential harms.[9] Beliefs about medication are a modifiable factor that significantly predicts adherence more than other social and clinical factors,[10,11] so identifying modifiable beliefs about medication may be an effective way to improve medication adherence. Horne created the Beliefs about Medicines Questionnaire (BMQ) in 1999.[9] The BMQ scale is divided into two subscales: Beliefs about Medicines Questionnaire-General (BMQ-G) and Beliefs about Medicines Questionnaire-Specific (BMQ-S). The BMQ-G assesses whether a person believes that taking medication in general is harmful (general harm) and that doctors overuse medication (general overuse). The BMQ-S assesses whether patients believe medications are necessary to maintain their current and future health (necessity) or whether they are concerned about the existing and potentially adverse consequences of medication use (concerns). Both of these subscales can be employed independently or jointly to assess the medication beliefs of patients with chronic ailments, and the BMQ-S has been considered to be a more reliable indicator of adherence than those from the BMQ-G.[12] The BMQ scale has been extensively utilized in China, particularly in chronic illnesses like diabetes, stroke, and rheumatoid arthritis. Its reliability and validity have been demonstrated to be satisfactory.[13]

Medication literacy, the capacity to receive, effectively comprehend, and correctly process critical pharmacological information to make informed decisions,[14] can also predict how well patients will take their medications.[15] Professor Sauceda and his team at the University of Texas created a single-dimensional Medication Literacy Assessment in English and Spanish (MedLitRxSE).[16] The tool above aims to evaluate patients' medication literacy levels by measuring their ability to read, understand, calculate, and deal with medication-related issues. Zheng has translated and adapted the scale into Chinese and validated it for use in Chinese patients, demonstrating good applicability.[17]

Current studies on medication literacy and beliefs in China have primarily focused on investigating the current situation and influencing factors.[18,19] Some scholars have found that medication literacy among Chinese patients with chronic diseases is intermediate; gender, education level, annual income, disease duration, social support, the number of medications and health problems significantly influence medication literacy.[20,21] Jiang conducted a study on 180 elderly patients with T2DM and discovered that the participants' necessity beliefs were 21.87±2.15, concerns beliefs were 19.78 ±2.41, and that both could have a significant impact on medication adherence, with concerns beliefs having a more substantial influence.[22] According to studies, elements like education level, family income, and disease duration can affect patients' beliefs about medication.[19,23]

Medication literacy and beliefs are significant predictors of patient medication adherence. However, few studies have examined the influence of medication literacy on beliefs among T2DM patients or the relationship between the two. Therefore, this study takes medication literacy and beliefs in patients with T2DM as an entry point to explore the current situation and analyze the relationship between them. The study's findings will serve as a dependable scientific guide for improving medication adherence in T2DM patients.

Materials and Methods
Participants

T2DM patients were chosen for this study from the outpatient and inpatient departments of a tertiary hospital in Dongguan City between April 2022 and November 2022. Eligible patients, either outpatients or inpatients, were selected for the study through convenience sampling. The inclusion criteria were: ① age≥ 18 years; ② patients who met the diagnostic criteria for T2DM according to the World Health Organization (WHO);[24] ③ a history of at least three months of diabetes mellitus, excluding newly diagnosed patients; ④ take at least one hypoglycemic agent orally, including using insulin injections; ⑤ sign informed consent and voluntarily participate in this study. The exclusion criteria were: ① the presence of acute and severe diseases; ② the presence of severe mental disorders, intellectual disabilities, or language communication disorders; ③ currently or previously engaged in medical work.

Sample Size Calculation

In estimating the sample size, the primary reference is the sample estimation method of Castro and Kendall, which ensures that the sample size reaches at least 10–15 times the number of variables.[25] There were 15 variables in this study; considering the validity of the questionnaire during the survey process, another 10% enlarged the sample size, and 165-248 patients should be collected to meet the needs. A total of 250 questionnaires were distributed in this study since four patients had problematic answers, of which 246 were considered valid, resulting in a valid return rate of 98.4%.

Methods

Two scales and a questionnaire were utilized in the present study. The General Information Questionnaire covered sociodemographic data (such as gender, age, and education level) as well as clinical indicators (such as duration of medication usage, classification of drugs, and the existence of chronic complications of diabetes).

The current study adopted the Chinese version of Medication Literacy Assessment Scale;[17] the test-retest reliability of the scale stands at 0.885, while the split-half reliability stands at 0.840. The scale consists of 14 items, with 1 point for each item answered correctly and 0 points for incorrect answers; the maximum score for the scale is 14 points; higher scores indicate superior medication literacy. A score ranging from 0 to 3 is considered low medication literacy; 4 to 10 denotes moderate medication literacy; and a score exceeding 10 points represents high medication literacy. The Cronbach's alpha coefficient for the scale in this study was 0.691.

Tang and her team translated and revised the BMQ-S, creating the Chinese version of Beliefs about Medicines Questionnaire-Specific.[26] The content validity index for each item ranged from 0.857 to 1.000, with an average content validity index of 0.980. This version effectively assesses patients with T2DM and was utilized in the present study. The Chinese version of BMQ-S comprises two dimensions, necessity and concerns, with five items each. The scale uses a 5-point Likert scoring system, ranging from 1 point for "strongly disagree" to 5 points for "strongly agree." Each dimension has a maximum score of 25 points, indicating an escalation in the patient's perceived level of necessity or concerns with increasing scores. According to the formula "medication beliefs score = total necessity score minus total concerns score", a positive score indicates that the advantages or necessity of medication are more significant than any potential drawbacks or concerns. The Cronbach's alpha coefficient for the scale in this study was 0.733.

Data Collection

The participants were meticulously selected by the specified inclusion and exclusion criteria (consecutive sampling) until the desired sample size was reached. Before distributing the questionnaires, the objectives and significance of the study were clearly explained to the participants. Additionally, the participants were requested to provide their understanding and cooperation by signing the informed consent form. The investigator distributed the questionnaires and provided standardized instructions for their completion. The questionnaires were distributed, collected on-site, and promptly checked by the investigator to address missing responses. This approach led to a high questionnaire recovery rate and increased efficiency.

Statistical Analysis

Statistical analysis was performed using IBM SPSS Statistics 26.0. The mean ± standard deviation was used to express measurement data that followed a normal distribution, while frequency and percentage were used for count data. The study employed an independent sample t-test to compare two groups and utilized one-way ANOVA analysis to compare multiple groups. Pairwise comparisons between groups were performed using the LSD method. Pearson correlation was employed to evaluate the association between medication literacy and beliefs, and multiple linear regression analysis was used to determine the factors influencing medication beliefs. A statistically significant difference was considered as $P < 0.05$. Additionally, Cronbach's alpha coefficient was used to determine the internal consistency and reliability of the Chinese version of BMQ-S and MedLitRxSE.[27]

Results

Patient Characteristics

Of the 246 patients with T2DM, 125 were male, 51.2% of individuals were over 60 years old, the average education level was junior high school or below (71.1%), the majority of occupations were inactive (jobless or retired) (65.9%), 30.9% had been taking their medications for more than ten years, and 37.4% had taken at least three different medications. Table 1 contains the remaining characteristics.

Table 1 Distribution of Patients According to Sociodemographic and Clinical Characteristics (N=246)

Variable		Number (n)	Percentage (%)
Gender	Male	125	50.8
	Female	121	49.2
Age	<60 years	120	48.8
	≥60 years	126	51.2
Education level	Junior high school and below	175	71.1
	High school/Special secondary/Technical school	51	20.7
	College and above	20	8.2
Marriage	No spouse (unmarried/divorced/widowed)	45	18.3
	Married	201	81.7
Occupation	In-service	51	20.7
	Run the business/Self-employed	26	10.6
	Farmer	7	2.8
	Retired/Jobless	162	65.9
Health insurance type	Free medical expenses	7	2.8
	Urban medical insurance	151	61.4
	Rural medical insurance	80	32.5
	Private expense	8	3.3
Monthly per capita household income	<3000 RMB	79	32.1
	3000–5000 RMB	104	42.3
	>5000 RMB	63	25.6
Ability to pay medical expenses	Fully payable	169	68.7
	Reluctant/difficult to pay	77	31.3
Residence	City	51	20.7
	County/Town	140	56.9
	Countryside	55	22.4
Duration of medication usage	<5 years	140	56.9
	5–10 years	30	12.2
	>10 years	76	30.9

(*Continued*)

Table 1 (Continued).

Variable		Number (n)	Percentage (%)
Classification of drugs	1	75	30.5
	2	79	32.1
	≥3	92	37.4
Chronic complications of diabetes	No	160	65.0
	Yes	86	35.0

Medication Literacy and Beliefs Scores of T2DM Patients

Among 246 patients with T2DM, the mean medication literacy score was 7.82±3.007. Specifically, 8.9% of the patients had low medication literacy, 72.4% demonstrated moderate medication literacy, and 18.7% exhibited high medication literacy. The medication beliefs score of T2DM patients was 2.26±4.011, with a total score of necessity being 18.30 ±2.958 and a total score of concerns being 16.04±3.747. The patient necessity scores exceeded the concerns scores, indicating a positive attitude towards medication adherence. Participants perceived the benefits of complying with the prescribed medication regimen to outweigh the potential harm.

Univariate Analysis of Medication Beliefs in Patients with T2DM

As indicated in Table 2, the findings of the univariate analysis revealed that age, education level, duration of medication usage, and the existence of chronic complications of diabetes were statistically significant in the outcomes of medication beliefs. The study results indicated that higher medication beliefs scores were associated with older age, higher educational levels, longer medication usage duration, and the presence of chronic complications in patients.

Table 2 Univariate Analysis of Medication Beliefs in Patients with T2DM (N=246) Unit: Score

Variable		Medication Beliefs Score	t/F	P
Gender	Male	2.46±4.101	0.762	0.447
	Female	2.07±3.924		
Age	<60 years	1.69±4.075	−2.202	0.029
	≥60 years	2.81±3.888		
Education level	Junior high school and below	1.87±3.890	4.274	0.015
	High school/Special secondary/Technical school	2.75±3.643		
	College and above	4.45±5.186*		
Marriage	No spouse (unmarried/divorced/widowed)	2.71±4.388	0.826	0.409
	Married	2.16±3.927		
Occupation	In-service	2.45±4.614	0.819	0.484
	Run the business/Self-employed	1.12±2.861		
	Farmer	2.00±3.512		
	Retired/Jobless	2.40±3.987		

(*Continued*)

Table 2 (Continued).

Variable		Medication Beliefs Score	t/F	P
Health insurance type	Free medical expenses	5.43±5.192	2.427	0.066
	Urban medical insurance	2.46±4.102		
	Rural medical insurance	1.58±3.710		
	Private expense	2.62±2.774		
Monthly per capita household income	<3000 RMB	1.68±3.685	1.338	0.264
	3000–5000 RMB	2.42±3.943		
	>5000 RMB	2.73±4.469		
Ability to pay medical expenses	Fully payable	2.45±4.074	1.075	0.284
	Reluctant/difficult to pay	1.86±3.865		
Residence	City	3.08±4.386	1.583	0.207
	County/Town	2.18±3.921		
	Countryside	1.73±3.832		
Duration of medication usage	<5 years	1.69±3.682	5.208	0.006
	5–10 years	1.90±3.872		
	>10 years	3.47±4.414*		
Classification of drugs	1	1.96±4.473	0.310	0.733
	2	2.42±3.740		
	≥3	2.38±3.865		
Chronic complications of diabetes	No	1.81±3.937	−2.468	0.014
	Yes	3.12±4.031		

Notes: bolded variable: $P < 0.05$; *Compared with stratum 1, $P < 0.05$.

Correlation Analysis of Medication Literacy and Beliefs in T2DM Patients

Based on the findings of this study (Table 3), among T2DM patients, a statistically significant but weakly positive correlation was observed between medication literacy and beliefs scores ($r = 0.271$, $P < 0.001$). However, there was no significant correlation between medication literacy scores and necessity ($r = −0.021$, $P > 0.05$). On the other hand, a lowly negative correlation was observed between medication literacy and concerns ($r = −0.307$, $P < 0.001$).

Analysis of Factors Influencing Medication Beliefs in Patients with T2DM

The independent variables considered for multiple linear regression analysis were age, education level, duration of medication usage, presence of chronic complications of diabetes, and medication literacy scores; the medication beliefs scores served as the dependent variable. The factors assigned in the multiple linear regression model were as follows: age: <60 years = 1, ≥60 years = 2; education level: junior high school and below = 1, high school/special secondary/technical school = 2, college and above = 3; duration of medication usage: <5 years = 1, 5–10 years = 2, >10 years = 3; chronic complications of diabetes: no = 1, yes = 2; the medication literacy was substituted into the original values.

The multicollinearity test in this study showed that all VIFs were less than 5, considering there was no multicollinearity between the independent variables. The findings revealed that age, education level, duration of medication usage, and medication literacy accounted for 15.3% of the variance in medication beliefs within this population (Table 4).

Table 3 Correlation Analysis of Medication Literacy and Beliefs

	Medication Literacy	Medication Beliefs	Necessity	Concerns
Medication literacy	1			
Medication beliefs	0.271**	1		
Necessity	−0.021	0.455**	1	
Concerns	−0.307**	−0.711**	0.302**	1

Notes: **Correlation is significant at the 0.01 level (two-tailed).

Table 4 Multiple Linear Regression Analysis of Factors Influencing Medication Beliefs in Patients with T2DM (N=246)

Variable	B	SE	β	t	P	VIF
Constant	−6.265	1.329		−4.712	<0.001	
Medication literacy	0.380	0.084	0.285	4.534	<0.001	1.144
Age	1.204	0.506	0.150	2.380	0.018	1.154
Education level	0.903	0.398	0.142	2.266	0.024	1.134
Duration of medication usage	0.606	0.303	0.136	2.000	0.047	1.345
Chronic complications of diabetes	1.070	0.551	0.127	1.942	0.053	1.245

Notes: Bolded variables: $P < 0.05$; $R^2 = 0.170$, adjusted $R^2 = 0.153$, $F = 9.859$, $P < 0.001$.

A high score of medication belief significantly was correlated with older age, a high level of education, a longer duration of medication usage, and higher medication literacy. Furthermore, the results of the multiple linear regression analysis for necessity and concerns in T2DM patients revealed that age significantly influenced necessity ($\beta = 0.163$, $P < 0.05$), while concerns was affected by education level ($\beta = −0.150$, $P < 0.05$).

Discussion
Current Status of Medication Literacy in Patients with T2DM

The mean medication literacy score for 246 patients was 7.82±3.007, indicating an intermediate level of their ability to comprehend drug-related knowledge and make informed medication decisions. Among the participants, 8.9% had low medication literacy, 72.4% showed moderate medication literacy, and 18.7% exhibited high medication literacy. In contrast, Liu found that patients with T2DM had a medication literacy score of 9.44±3.28, with 95.0% of the participants demonstrating a moderate or adequate level of medication literacy, significantly surpassing the results of the present study.[28] This discrepancy could be attributed to the higher proportion of older and less educated participants in our study. The higher medication literacy scores in this study, compared to Qiao's study on patients with coronary artery disease, may be attributed to variations in medication literacy influenced by the study population, diseases, and commonly used medications.[20]

Medication literacy is an essential consideration in the development, implementation, and evaluation of medication adherence interventions. Jiang conducted an analysis of the correlation between medication literacy and treatment adherence in diabetic patients, revealing a positive association.[29] This suggests that improving medication literacy in diabetic patients can enhance treatment adherence. Zhang's research revealed a positive correlation between medication literacy and quality of life among hypertensive patients.[30] Higher levels of medication literacy promote doctor-patient

communication, increase understanding of the disease and medication, enhance medication adherence and safety, and improve self-management skills, ultimately leading to an enhanced quality of life.[30,31]

A systematic review has identified patients' age and education levels as the most common demographic factors influencing medication literacy.[32] As age increases, elderly patients' comprehension, attention, and memory decline to varying degrees, coupled with a greater number of prescribed medications and complex medication regimens, leading to their limited knowledge about medication management.[33] People with low levels of education have difficulty understanding treatment regimens during the diagnosis and treatment of disease, do not understand the proper use of medications, and are more inclined to have lower levels of medication literacy.[33] Additionally, inadequate provision of comprehensive information about relevant medications by healthcare professionals and the inability of patients to accurately comprehend and disregard information about medications are vital factors contributing to low medication literacy.[34] Patients with lower medication literacy demonstrate inadequate self-administration behavior in medication therapy, including medication errors, self-medication abuse, and overdose use.[32] These behaviors diminish the effectiveness of medications, raise the risk of adverse drug reactions, and ultimately jeopardize the patient's health.[35] Interventions to improve patient medication literacy are critical to ensure medication safety. Li conducted a 12-week interactive medication literacy intervention for coronary artery disease patients; significant improvements were observed in patients' medication skills, literacy, self-efficacy, and medication safety behaviors as a result of the intervention.[36]

Current Status of Medication Beliefs and Their Influencing Factors in Patients with T2DM

The Necessity-Concerns Framework (NCF), derived from the Health Belief Model, has demonstrated utility in elucidating the rationales behind individual nonadherence to medication.[10] This model posits that an individual's adherence to medication is contingent upon a balance between the imperative for medication to ameliorate health and concerns regarding potential adverse effects of medication. Necessity beliefs are considered to positively influence individuals' medication adherence, while concerns beliefs are believed to negatively impact individuals' adherence to medication.

The current study observed patients exhibit a medication beliefs score of 2.26±4.011, which exceeded the outcomes of the research by Pan.[37] This disparity may be attributed to the fact that the population in the latter research comprised individuals with chronic co-morbidities who suffered from multiple chronic diseases and had relatively intricate medication regimens, posing greater challenges during the medication process. Consequently, their concerns surpassed necessity, while their medication beliefs were more vulnerable to compromise. In this study, the patients exhibited lower medication beliefs scores than those observed in the study of Parkinson's disease (PD) patients.[38] The difference could be explained by the fact that PD is a chronic, progressive, and incurable neurodegenerative condition requiring heavy reliance on medications to manage symptoms, unlike diabetes, which can be controlled with diet and exercise in its early stages. Consequently, individuals with PD tend to hold stronger beliefs about medication usage. A comprehensive meta-analysis of 96 peer-reviewed studies, encompassing over 24,000 patients from 18 countries with 24 long-term conditions, revealed a significant association between non-adherence to medication and patients' beliefs about medicines.[39] Further research indicated that excellent medication adherence is positively associated with stronger necessity and weaker concerns.[40] Wu's study showed that increased general harm beliefs directly reduce medication adherence and also have an indirect effect on adherence through self-efficacy.[41] Additionally, Horne proved that significant concerns beliefs were linked to worsening disease activity, clinical status, and poor quality of life in rheumatoid arthritis patients.[42]

The results of the present study evinced that patients' total score of medication beliefs and necessity increased with age, which is congruent with the findings of Brazilian scholars.[7] This may be attributed to increased demand for hypoglycemic drugs as patients age, given that they experience difficulty controlling their blood glucose levels via diet and exercise. Furthermore, education level was also found to be one of the determinants of patients' medication beliefs, as lower education levels were associated with a weaker capacity to acquire medication knowledge and a lack of accurate information regarding medications, ultimately leading to heightened medication apprehension and negative medication beliefs.[23] Additionally, patients with a longer duration of medication usage exhibited higher medication beliefs scores, possibly because such patients had more time and opportunities to receive education about the disease and

medication from healthcare professionals throughout long-term medication usage, culminating in a correct apprehension of the significance of hypoglycemic drugs for current and future health. Besides the factors examined in this study, Horne's research revealed that environmental factors, such as the presence of social support and the quality of communication with healthcare providers, had an impact on perceptual factors (beliefs).[43] Consequently, favorable environmental factors are conducive to patients developing positive beliefs about medication use.

Italian researchers have classified patients into four distinct subgroups, taking into account their attitudes towards the necessity and concerns associated with medication use: Skeptical (low necessity and high concerns), Ambivalent (high necessity and high concerns), Indifferent (low necessity and low concerns), and Accepting (high necessity and low concerns). They also found that individuals in the Accepting group exhibited the highest adherence to medication, whereas those in the Skeptical group demonstrated the lowest adherence.[44] In this study, a score of 15 on the subscale was used as the threshold for categorizing necessity or concerns as high or low, and patients were also categorized into four groups: Skeptical (3.7%), Ambivalent (62.6%), Indifferent (7.7%), and Accepting (26.0%) (Figure 1). The percentage of participants in the high necessity and high concerns (Ambivalent) group was higher in this study compared to the study by Khdour.[45] This discrepancy could be attributed to the older age and generally low educational level of the subjects in this study, which led to a greater perceived necessity and concerns about medication use. The study findings indicate that patients generally held positive attitudes towards the necessity of medication use. However, they also expressed concerns about the potential adverse effects of hypoglycemic drugs and the impact of medication adherence on their daily lives. Evidence suggested that participants in the Ambivalent group were more receptive to behavioral change, indicating that the chances of successful intervention implementation may increase with positive attitude changes.[46] Therefore, it is crucial to proactively identify factors influencing concerns beliefs and implement targeted interventions. These interventions may include improving patient medication instruction, emphasizing medication importance, and correcting adverse perceptions to reduce concerns and enhance medication adherence.

Medication Literacy Affects Beliefs of T2DM Patients

The correlation analysis for this study showed that medication literacy was not substantially connected with necessity in individuals with T2DM; however, it was negatively connected with concerns and positively associated with medication beliefs. Regression analysis revealed that medication literacy significantly influences patients' medication beliefs ($\beta = 0.285$, $P < 0.001$). Therefore, the study revealed that medication literacy primarily influenced patients' concerns and subsequent medication beliefs, aligning with previous findings by Visscher and Kale,[47,48] who identified a correlation between low levels of health literacy and heightened medication concerns. Patients with low medication literacy lack the knowledge and access necessary to understand medication principles, resulting in high concerns and a limited
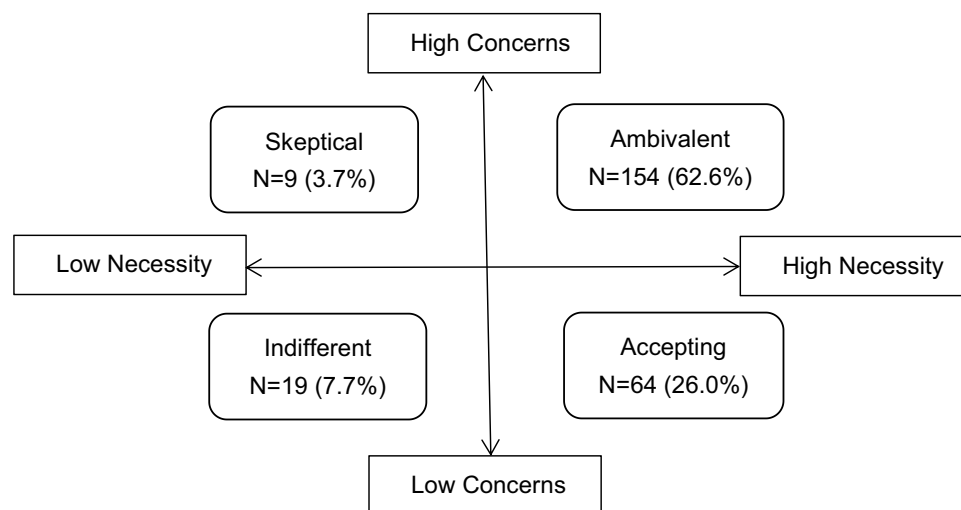

Figure 1 Distribution of the beliefs and attitudes of patients toward medication.

understanding of medication-related information. As medication concerns can affect patients' decisions regarding self-management and health promotion, special attention should be given to patients with low medication literacy.

The Knowledge-Attitude-Behavior Model (KAB Model) suggests that accumulating health-related knowledge can lead to changes in health-related beliefs, which can influence health behaviors.[49] Medication literacy is necessary for patients to properly understand their medications and treatments, and when patients have the correct knowledge of their medications and treatments, they influence their medication beliefs and treatment decisions.

According to the Hierarchical Model of Medication Adherence (HMMA), medication adherence follows a five-level model. The first four tiers encompass health literacy, illness beliefs, medication beliefs, and self-efficacy, with medication adherence as the ideal behavior at the top of the model.[50] The model suggests that individuals should have sufficient health literacy before their beliefs are influenced, and only when the first three tiers reach a certain level will patient self-efficacy play the greatest role in medication adherence. Good health literacy is essential for patients' medication adherence, and medication literacy is an important aspect of health literacy in the pharmacy field. In conclusion, medication literacy plays a pivotal role in shaping patients' medication beliefs and, consequently, their medication adherence, thereby directly impacting the effectiveness of diabetes management.

Limitations

Moreover, there are certain limitations to this study. Initially, the study population's scope is limited, limiting the study's conclusion. Secondly, this cross-sectional study can merely analyze the factors related to medication beliefs but not the causal relationship. Finally, factors such as medication literacy, age, education level, and duration of medication use account for only 15.3% of the total variability. The remaining variability may be attributed to other factors not included in the analysis. In future research, it is important to explore additional factors that may influence patients' medication beliefs in order to fully explain the variations observed. Additionally, conducting longitudinal studies can help investigate whether there is a causal relationship between medication literacy and beliefs.

Conclusion

This study revealed a positive correlation between medication literacy and medication beliefs, a negative correlation with concerns, and no correlation with necessity. Participants generally exhibited moderate medication literacy but also expressed ambivalence in their beliefs. Additionally, those with low literacy levels tended to have higher concerns scores. These findings underscore the significance of integrating medication literacy into patient education and intervention strategies. Enhancing medication literacy can positively impact medication beliefs, alleviate concerns, and ultimately improve medication adherence and health outcomes.

Abbreviations

T2DM, Type 2 Diabetes Mellitus; WHO, World Health Organization; MedLitRxSE, Medication Literacy Assessment in English and Spanish; BMQ-G, Beliefs about Medicines Questionnaire-General; BMQ-S, Beliefs about Medicines Questionnaire-Specific; NCF, The Necessity-Concerns Framework; KAB Model, The Knowledge-Attitude-Behavior Model; HMMA, The Hierarchical Model of Medication Adherence.

Ethics Approval

This study was conducted under the Declaration of Helsinki. The Dongguan Eighth People's Hospital Ethics Committee reviewed and approved this study (approval number: LL2022053001). Following a concise overview of the study's background, purpose, investigation, as well as associated risks and benefits, participants willingly provided their informed consent. Throughout the research, strict confidentiality measures were implemented to safeguard all patient-related information.

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Disclosure

The authors report no conflicts of interest in this work.

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