Indonesian Journal of Pharmacy

VOL 34 (4) 2023: 675–685 | RESEARCH ARTICLE

Evaluation of Factors Associated with Beliefs About Antidiabetic Medicine in Outpatients with Type 2 Diabetes in Vietnam

Thi Minh Hoa Nguyen[1#], Thi Kim Cuc Ngo[1,2#], Thi Thuy Nhi Tran[3] and Chuyen Le[1,2*]

1. Hue University of Medicine and Pharmacy, Hue University, 06 Ngo Quyen, Hue city, Thua Thien Hue, Vietnam, V-49000,
2. Hue University Hospital, Hue, Vietnam, 41 & 51, Nguyen Hue, Vinh Ninh, Thanh pho Hue, Thua Thien Hue, Vietnam
3. Lam Dong medical college, Lam Dong, Viet Nam, V-670000, Viet Nam

Article Info

Submitted: 04-02-2023
Revised: 20-07-2023
Accepted: 24-08-2023

*Correspondence
Chuyen Le

Email:
lchuyen@hueuni.edu.vn
lechuyen@huemed-univ.edu.vn

#Contributed equally
Thi Minh Hoa Nguyen
Thi Kim Cuc Ngo

ABSTRACT

Poor adherence to antidiabetic medication, which causes diabetes-related complications and increases medical burden, has been an important concern for both patients and physicians. Enhancing patients' beliefs about medicine can partially improve their non-adherence status to medications. The research evaluated the factors associated with beliefs about antidiabetic medicine in outpatients with type 2 diabetes at Hue University Hospital. A cross-sectional study was conducted on 396 outpatients diagnosed with type 2 diabetes mellitus at the Endocrinology Clinic at Hue University Hospital following the eligibility and exclusion criteria using convenient sampling method. We interviewed the patients using a questionnaire based on the Vietnamese version of the Beliefs about Medicines Questionnaire (BMQ-V) published by Dr. Nguyen Thang *et al.* Chi-squared, Fisher tests, paired sample t-tests, one-way ANOVA, Mann-Whitney test and Kruskal-Wallis were first used to determine variables associated with scores of BMQ-V and its subscale. Then Multivariate Regression Analysis was applied on those variables against scores of BMQ-V and its subscale. All data was analyzed using SPSS software version 20.0. The study was conducted on 396 patients with type 2 diabetes, with a median age of 66.9±13.7 years. According to the BMQ-V questionnaire, the participants' beliefs about medicine had a mean score of 50.3±8.1. Multivariate regression analysis revealed a statistically significant association between BMQ score and HbA1c control status, duration of diabetes, and home blood glucose monitoring ($p=0.001$; $p=0.003$; $p<0.001$). The diabetic patients with a longer disease duration (S-N: 9.1±3.5) had more trust in the effects of the medications on their health than that of patients with a shorter duration (S-N: 11.3±4.4), the patients with uncontrolled HbA1c levels (S-N:9.6±3.7) felt that taking antidiabetic medicines was more necessary than controlled group (S-N:10.9±4.4) with statistical significance. The group that regularly (>2 times/week) monitored blood sugar at home seemed to have a lot of concerns about harmful long-term effects as the mean scores on the Specific-Concerns, General-Overuse, and General–Harm subscales were significantly lower than those of other groups ($p<0.001$; $p=0.003$; $p=0.001$). Therefore, we need to improve patients' positive beliefs and gradually reduce their negative beliefs about medicines, raise the awareness of patients about monitoring their blood glucose at home, the long-term side effects of medicines, and change their lifestyle, thereby increasing medication adherence and improving treatment effectiveness.

Keywords: Medication adherence, type 2 diabetes mellitus, antidiabetics

INTRODUCTION

Diabetes mellitus is a common metabolic disorder in both developed and developing countries and it has become a significant medical and social problem (ADA, 2020). According to the World Health Organization (WHO), hyperglycemia is one of the top risk factors for premature death, ranking third after hypertension and tobacco use (International Diabetes Federation, 2017). Good blood glucose control can prevent complications, help patients still work normally, prolong life expectancy, and improve their quality of life. However, at least 45% of patients with T2DM do not achieve adequate glycemic control (HbA1c < 7%). One major contributing factor is poor adherence to medication (Polonsky & Henry, 2016). Various studies have explored adherence to antidiabetic medications with different results. In several studies conducted in the United Arab Emirates (UAE), Ethiopia and Uganda, and Kingdom of Saudi Arabia the prevalence of adherence to antidiabetic medications was about 85% (Abebaw *et al*., 2016; Alakhali, 2015; Arifulla *et al*., 2014; Bagonza *et al*., 2015). On the other hand, studies conducted in Cameroon and Switzerland showed lower prevalences, ranging from 40% to 52% (Aminde *et al*., 2019; Huber & Reich, 2016). This poses a serious public health problem, a significant financial burden on modern healthcare systems, and a major impact on clinical outcomes (Al-Temimi *et al*., 2021). Poor adherence to diabetes treatment leads to irreversible damage to patients and undue healthcare costs (Khunti, *et al*., 2017; Lê Thị Hương Giang & Hà Văn Như, 2013; Seuring *et al*., 2015). Efforts to explain and improve patient adherence to treatment are often ineffective, exacerbating the problem (Hugtenburg *et al*., 2013).

A significant number of published reports on medication adherence have focused on the relationship between demographic, clinical, and adherence. However, it seems that most of the demographic and clinical variables are not significant in explaining adherence to medicines. As a result, many studies have focused on another approach that is related to behavioral factors and shows a good correlation between drug beliefs and patient adherence. Therefore, understanding patients' beliefs about medications and improving patient awareness in general can partially solve the non-compliance problem. (Izzah *et al*., 2013; Raniah *et al*., 2014; Vermeire *et al*., 2001)

The most widely used tool is the Beliefs about Medicines Questionnaire (BMQ) (Horne *et al*., 1999). Developed by Horne and colleagues as a method to assess the perception of medication, the BMQ has a theoretical and scientific basis, supported by numerous qualitative and quantitative studies. It aims to self-assess common beliefs about medicines for patients with chronic diseases, including diabetes (Horne *et al*., 1999). Around the world, there have been numerous studies evaluating beliefs in using antidiabetic medicines in patients with type 2 diabetes using the BMQ scale (Istilli *et al*., 2015; Jamous *et al*., 2014; Jimenez *et al*., 2017; Khdour *et al*., 2020; Supramaniam *et al*., 2019). A study noted that most participants agreed or strongly agreed that taking medication was necessary for their current health. However, more than half of the participants were concerned about taking their medicines regularly and becoming dependent on them. Multivariate analysis showed that patients who believed medications were necessarily had higher odds of being adherent. On the other hand, patients who had concerns about their drugs had lower odds of being adherent (Jamous *et al*., 2014). In Vietnam, there are limited studies that using the full BMQ questionnaire to assess the beliefs in using antidiabetic medicines in patients with type 2 diabetes. Studies have also not focused on assessing the impact of demographic, clinical and behavioral factors on patients' adherence. Therefore, we conducted the research "Evaluation of factors associated with beliefs about antidiabetic medicine in outpatients with type 2 diabetes in Vietnam".

MATERIALS AND METHODS

Study design

This descriptive cross-sectional study was conducted at the Endocrinology Outpatient Clinic of Hue University Hospital, a tertiary teaching hospital in Central Vietnam, between April 2021 and August 2022. Participants were approached and interviewed by the pharmacist using the convenient sampling method.

Study subject

The eligibility criteria for patients were: (1) being 18 years old or older; (2) being diagnosed with type 2 diabetes and not pregnant; (3) taking antidiabetic medicine for at least six months; (4) having information about glycated hemoglobin (HbA1C) test, and (5) being willing to participate in the research.

The exclusion criteria were: (a) having cognitive problems, (b) treating comorbidities that affect the glycemic control status (pancreatitis,

using glucocorticoids, etc.), and (c) serious acute diseases involving cardiovascular disease, myocardial infarction, surgery, cancer, etc. The sample size was calculated using this formula:

$n = (Z^2_{1-\alpha/21-\alpha/2}\, p\,(1 - p))/\, d^2$

n: predicted sample size, p: 0.5, d=0.05, $Z_{1-\alpha/2}$: 1.96 (95% confidence interval). The minimum sample size required from this formula is 385 patients.

Measurement instruments

The Beliefs about Medicines Questionnaire (BMQ) was developed by Robert Horne *et al*. (Horne *et al*., 1999; Jimenez *et al*., 2017). The complete version of the BMQ consists of an 18-item questionnaire divided into two sections: the BMQ-General comprises eight items subdivided into two scales (The General-Harm and the General-Overuse sub-scales), and the BMQ- Specific comprises ten items subdivided into two subscales (Specific-Concerns and Specific-Necessity scale). Both can be used in combination or separately. All items are rated on a 5-point Likert scale (1: strongly agree, 2: agree, 3: unsure sure, 4: disagree, and 5: strongly disagree) (Horne *et al*., 1999; Jimenez *et al*., 2017). Lower scores indicate stronger beliefs about the respective concepts in each subscale (Anghel *et al*., 2019; Sweileh *et al*., 2014).

The BMQ has been translated and adapted in several countries and validated in patients with asthma, diabetes, and psychiatric and cardiac disorders (Horne *et al*., 1999; Lavsa *et al*., 2011). This scale was translated into Vietnamese by Dr. Nguyen Thang (Nguyen *et al*., 2019) under the guidance of Beaton *et al*. (2000, 2007) according to standard forward and backward translation methods. Our version was also self-modified by authors comprising clinical pharmacists and endocrinologists following the version of Dr. Nguyen Thang to be suitable for the study's objectives. This Vietnamese version of the BMQ was used to assess the patients' medication beliefs in our participants. The questionnaire was pretested on a pilot group of 50 participants. The researchers collected feedback and adjusted the questionnaire to ensure it was internally consistent. Cronbach's α- value was 0.758 which is acceptable in exploratory research.

The following data was also collected: socio-demographic data (age, gender, level of education, location, etc.), lifestyle (exercise, diet, smoking, etc.), clinical profile of diabetes-related data (family history, duration of diabetes, comorbidities, etc.), results of blood glucose control level and treatment regimens.

Glycemic control targets according to the Standards of Medical Care in Diabetes, 2020 edition (American Diabetes Association (ADA)) were used as follows: in non-pregnant adult patients, the targets are fasting plasma glucose (FPG) within 80 - 130 mg/dL (4.40 – 7.15 mmol/l), and HbA1c <7%; in older adult patients with complex health issues (diagnosed diabetes for a long time, many comorbidities, histories of severe hypoglycemia): FPG within 90 - 150 mg/dL (5.0 – 8.3 mmol/l), HbA1c <8%. (ADA, 2020).

Ethics approval

The study was approved by the Scientific and Ethics Committee of Hue University of Medicine and Pharmacy (Document Number: H2021/232). The study was conducted in the spirit of respecting private information and the decision to join or not to join the study.

Statistical Analysis

All data were analyzed using SPSS software version 20.0. Continuous variables were expressed as mean ± standard deviation if normally distributed, and median and interquartile range in case of having non-normal distribution. Discontinuous variables were described as percentages. Chi-squared tests were used to determine the association between the variables. With normally distributed variables, paired sample t-tests were used to compare two mean values for two correlated samples. One-way ANOVA tests were used to determine whether there were any statistically significant differences between the mean values of many independent samples. With non-normally distributed variables: the Mann-Whitney test and Kruskal-Wallis test will be utilized respectively to replace them. Regression analysis was used to assess the relationship between a dependent variable and one or more independent variables.

RESULTS AND DISCUSSION

Demographic baseline data and clinical characteristics of the participants

Three hundred and ninety-six outpatients were included in the study, of whom the median age (±SD) was 66.9 ± 13.7 years. The proportion of females in the study was 57.6%. The majority (75%) of the participants underwent regular periodic health examinations.

Table I. Baseline data of participants (N = 396)

Characteristics		Number (%)
Age (year old)	18-<60	119 (30.1)
	≥60	277 (69.9)
	Median ±SD	66.9 ±13.7
	Min – max value	25 - 93
Gender	Male	168 (42.4)
	Female	228 (57.6)
Occupation	Employed	131 (33.1)
	Retired or staying at home	265 (66.9)
Level of education	High school diploma or below	243 (61.4)
	High school or above	153 (38.6)
Location	Urban areas	219 (55.3)
	Rural areas	177 (44.7)
Lifestyle	Alone	10 (2.5)
	With family	386 (97.5)
Periodic health examination	No	99 (25.0)
	Yes	297 (75.0)
Exercise	< 3 times a week	111 (28.0)
	3-5 times a week	99 (25.0)
	>5 times a week	186 (47.0)
Diet	On a diet	295 (74.5)
	Vegetarian	7 (1.8)
	Normal	94 (23.7)
Smoking	Never	262 (66.2)
	In the past	100 (25.2)
	Still smoking	34 (8.6)
Drinking alcohol	Never	256 (64.6)
	In the past	91 (23.0)
	Still drinking	49 (12.4)

The proportion of participants who exercised regularly, had dietary, were non-smokers and non-drinkers, were 47%, 74.5%, 66.2%, and 64.6%, respectively (Table I).

About half of the patients had diabetes for over ten years, and 27% of respondents had no positive family history of diabetes, most (94.7%) of patients had comorbidities, of which hypertension accounted for 75.3%. These results were similar to studies in Brazil and Egypt (Istilli *et al*., 2015; Salama & Saudi, 2020). At the time of the study, the patients' average fasting blood glucose level was 10.3 ± 4.1 mmol/L, with 20.7% of the patients reaching the target fasting blood glucose index. The mean HbA1c value in the study was 8.7 ± 2.1%. Thus, most patients in the study did not achieve FPG and HbA1c targets (Table II). In our study, there were five groups of medications used to treat type 2 diabetes: biguanide (metformin), sulfonylurea, DPP-4 inhibitor, SGLT2 inhibitor and insulin. The percentage of patients using metformin in the study was 81.6%. A combination of insulin therapy and oral medications was also prescribed to a significant proportion of patients (38.9%). By the time the ADA 2015 was published, this view was completely changed after many experimental studies proving that it was completely reasonable to combine metformin into a multi-medication insulin regimen and reduce the amount of insulin the patient needs (American Diabetes Association, 2015) (Table II).

The patients' medication beliefs according to the BMQ-V questionnaire

The mean score of the BMQ-V questionnaire of the study was 50.3 ± 8.1. Patients' beliefs about using medicine play an important role in the use of medicine to treat diseases, and beliefs about medicine significantly affect their attitudes and adherence to medication use (Horne *et al*., 1999).

Table II. Baseline data of medical condition of participants (N = 396)

Characteristics		Number (%)
Duration of diabetes	< 5 years	79 (20.0)
	5-10 years	111 (28.0)
	> 10 years	206 (52.0)
Family history related to diabetes	No	289 (73.0)
	Yes	107 (27.0)
Comorbidity	Yes	375 (94.7)
	Hypertension	298 (75.3)
	Dyslipidemia	192 (48.5)
	Cardiovascular diseases	100 (25.3)
	Hepatic disease	31 (7.8)
	Kidney disease	103 (26.0)
Self-Monitoring of Glucose	> 2 times a week	56 (14.1)
	1-2 times a week	110 (27.8)
	Never/ Rarely	230 (58.1)
HbA1c (%)	Uncontrolled	322 (81.3)
	Controlled	74 (18.7)
	Median ± SD	8.7 ± 2.1
	Min – max value	6.5 - 28.6
FPG	Uncontrolled	314 (79.3)
	Controlled	82 (20.7)
	Median ± SD	10.3 ± 4.1
	Min – max value	4.1 - 36.9
Antidiabetic medication regimen	Oral only	204 (51.5)
	Insulin only	38 (9.6)
	Oral + insulin	154 (38.9)
Class of diabetic medications	Biguanide (Metformin)	323 (81.6)
	Sulfonylurea	193 (48.7)
	DPP-4 inhibitor	55 (13.9)
	SGLT-2 inhibitor	19 (4.8)
	Insulin	192 (48.5)

If people with diabetes believe that medication has a negative effect on the body, the likelihood of adherence to medication will be lower. Most studies on medication adherence have concluded that negative beliefs about medication are a substantial barrier (Gatti *et al*., 2009; Sirey *et al*., 2013; Sweileh *et al*., 2014). Therefore, trust in medication and adherence to treatment are closely related. The mean score of each opinion ranges from 2 to 3 points, with question Q15 being the highest point (4 ± 1.2), showing that most of the patients in the study did not agree to stop taking the medicine for a short time. However, the majority of respondents agreed that their future health would depend on antidiabetic medicine, with the lowest mean score being 1.8 ± 0.9 points (Table III). With the maximum score of each of the General - Overuse and General - Harm subscales of 20 points, the mean scores in our study were 12.9 ± 2.9 and 13.1 ± 3.1, respectively. This shows that the patients in the study moderately believed that doctors were less likely to overprescribe medications and did not have more negative opinions about treatment medications. With the maximum score of each of the Specific-Necessity and Specific-Concerns subscales of 25, the mean score of the patient's rating was 9.8 ± 3.9 and 14.5 ± 3.8, respectively. This shows that patients believed that the use of diabetes medications was essential for their health, and patients were less concerned about the adverse consequences of the medication, and the patients believed the medications had few harmful long-term effects and that the use of the medications had little negative effects on their lives. Our results differ from those of Ngo VM, Bui THD, and Sweileh (Ngô VM & Bùi THD, 2021; Sweileh *et al*., 2014).

Table III. Assess the patients' medication beliefs according to the BMQ-V questionnaire.

BMQ-V	Mean (SD)
BMQ-V Specific-Necessity (S-N)	**9.8 (3.9)**
Q1. My health at present depends on my medicines	2.1 (1)
Q2. My life would be impossible without my medicines	2 (1)
Q3. Without my medicines I would be very ill	2.1 (1.1)
Q4. My health in the future will depend on my medicines	1.8 (0.9)
Q5. My medicines protect me from becoming worse	2 (1)
BMQ-V Specific-Concerns (S-C)	**14.5 (3.8)**
Q6. Having to take medicines worries me	3.1 (1.1)
Q7. I sometimes worry about long-term effects of my medicines	2.9 (1.2)
Q8. My medicines are a mystery to me	2.4 (1.2)
Q9. My medicines disrupt my life	3.2 (1.1)
Q10. I sometimes worry about becoming too dependent on my medicines	2.9 (1.1)
BMQ-V General-Overuse (G-O)	**12.9 (2.9)**
Q11. Doctors use too many medicines	3.8 (1.2)
Q12. Natural remedies are safer than medicines	3 (1.2)
Q13. Doctors place too much trust in medicines	3 (1)
Q14. If doctors had more time with patient, they would prescribe fewer medicines.	3.1 (1)
BMQ-V General-Harm (G-H)	**13.1 (3.1)**
Q15. People who take medicines should stop their treatment for a while every now and again	4 (1.2)
Q16. Most medicines are addictive	3 (1)
Q17. Medicines do more harm than good	3 (1)
Q18. All medicines are poisons	3 (1)
Total	**50.3 (8.1)**

These studies showed that the use of diabetes medicines was necessary for patients; however, patients also expressed high anxiety about antidiabetic medicine use because diabetes medication must be used regularly, on time, at the right dose, making patients more dependent on the medicines (Ngô VM& Bùi THD, 2021; Sweileh *et al*., 2014). Research in Palestine and Egypt showed that patients expressed strong beliefs about the need for the medication and concerns about the side effects of the medication (Khdour *et al*., 2020; Salama & Saudi, 2020). Raza's study (2020) in Pakistan reported results similar to our study on the Specific-Concerns subscale and different from our study on the Specific-Necessity subscale - which showed lower expectations on medications (Raza *et al*., 2020).

The reason for the difference may be that our patients had a relatively high rate of comorbidities (94.7%), so they had to use both antidiabetic medications and medications for other diseases. Therefore, taking medicines was a daily routine for them. They did not have to worry about taking them all the time, did not feel uncomfortable using them, and thought that taking medicines for patients with diabetes was necessary. The educational level of the patients in the study was quite low, with 61.4% attending secondary school or lower. Besides, Vietnamese people in general and the patients in the study, in particular, do not have the habit of learning about the medication that they are using. They mostly only follow the doctor's prescription, so most of the patients in the study reported that they still did not fully understand the medications they were taking (Table III).

Correlation between characteristics and beliefs about the medicine of participants

The mean scores of the BMQ-V between men and women (p=0.004), employed or stay-at-home groups (p=0.012), and educational levels (p=0.007) were found to have statistically significant differences. The scores of Specific - Concern and General - Harm were also found to have significant differences between subjects in the occupational group, education level and nutritional regimen ($p < 0.05$).

Table IV. Correlation between demographics and beliefs about the medicine of participants

Characteristics		BMQ-V	S-N	S-C	G-O	G-H
		p=0.004[a]	p=0.985	p=0.008[b]	p=0.06[b]	p=0.009[b]
Gender	Male	48.8 (9)	9.9 (4)	13.9 (3.8)	12.5 (3.1)	12.5 (3.3)
	Female	51.3 (7.1)	9.8 (3.8)	14.9 (3.8)	13.2 (2.8)	13.4 (2.9)
		p=0.012[c]	p=0.272	**p=0.005[d]**	**p=0.029[d]**	**p=0.027[d]**
Occupation	Employed	46.4 (8.7)	10.5 (3.6)	12.1 (3.1)	11.9 (2.5)	11.8 (3.7)
	Retired or staying at home	51.9 (7.6)	10.1 (3.9)	14.7 (3.6)	13.6 (3)	13.5 (3.1)
		p=0.007[b]	p=0.065[b]	**p=0.002[b]**	p=0.137[b]	**p<0.001[b]**
Level of education	High school diploma or below	51.1 (7.6)	9.6 (3.9)	14.9 (3.8)	12.5 (3.1)	13.5 (3)
	High school or above	49 (8.6)	10.2 (3.8)	13.8 (3.7)	13.2 (2.8)	12.3 (3.3)
		p=0.758	p=0.811	p=0.965	p=0.738	p=0.829
Location	Urban areas	50.2 (8.5)	9.8 (3.6)	14.5 (3.8)	12.9 (2.9)	13 (3.3)
	Rural areas	50.4 (7.5)	9.9 (4.2)	14.4 (3.9)	13 (3)	13.1 (3)
		p=0.731	p=0.762	p=0.628	p=0.342	p=0.271
Lifestyle	Alone	49.4 (8.4)	10 (3.3)	15.2 (4.6)	12.2 (2.7)	12 (3.1)
	With family	50.3 (8.1)	9.8 (3.9)	14.4 (3.8)	12.9 (2.9)	13.1 (3.1)
		p=0.903[b]	p=0.931[d]	p=0.919[d]	p=0.666[d]	p=0.883[d]
Periodic health examination	No	50.4 (8.1)	9.9 (4.1)	14.4 (4.1)	13 (3.1)	13.1 (3.4)
	Yes	50.2 (8.1)	9.8 (3.8)	14.5 (3.7)	12.9 (2.9)	13 (3.1)
		p=0.617	p=153	p=0.139	p=0.077	p=0.355
Exercise	< 3 times a week	50.7 (7.9)	9.2 (3.4)	15 (4.1)	13.1 (2.7)	13.4 (3.2)
	3-5 times a week	49.6 (7.4)	10.2 (3.7)	14.1 (3.5)	12.4 (3.1)	13 (2.9)
	>5 times a week	50.3 (8.5)	10 (4.2)	14.4 (3.8)	13.1 (3)	12.9 (3.2)
		p=0.731[c]	**p=0.035[a]**	**p=0.036[a]**	p=0.354[a]	p=0.595[a]
Diet	On a diet	50.1 (8.1)	9.7 (3.9)	14.2 (3.8)	13 (3)	13.1 (3.1)
	Vegetarian	51.1 (6.7)	13.3 (3.2)	13.1 (3.8)	11.9 (2.1)	12.9 (2.9)
	Normal	50.8 (8)	10 (3.9)	15.3 (3.7)	12.7 (2.8)	12.8 (3.2)
		p=0.241	p=0.424	p=0.588	p=0.597	**p=0.011**
Smoking	Never	50.8 (7.5)	9.7 (3.8)	14.6 (3.8)	13 (2.9)	13.4 (2.9)
	In the past	49.4 (8.8)	10.3 (4.2)	14.1 (3.9)	12.6 (2.8)	12.3 (3.4)
	Still smoking	49.2 (9.6)	9.3 (3.8)	14.5 (4.1)	13 (3.6)	12.5 (3.4)
		p=0.067	p=0.436	p=0.089	p=0.349	**p=0.006**
Drinking alcohol	Never	50.9 (7.4)	9.7 (3.8)	14.8 (3.8)	13.1 (2.9)	13.4 (3)
	In the past	49.5 (8.1)	10 (4.1)	14.1 (3.6)	12.8 (2.9)	12.7 (3.2)
	Still drinking	48.3 (10.7)	10.5 (4)	13.5 (4.1)	12.3 (3.3)	11.9 (3.4)

[a]Independent Samples t-Test; [b] Independent-Samples Mann-Whitney U Test; [c]OneWay ANOVA; [d]Independent-Samples Kruskal-Wallis Test

In addition, the General - Harm score among patients with unhealthy lifestyles such as smoking and drinking was also significantly higher than in the group who had never used them (Table IV).

The mean Specific-Necessity score of patients with diabetes duration of over ten years was lower than that of patients with a shorter duration of the disease with a statistically significant difference. This proves that the longer patients have diabetes, the better they understand the medicines they are using, so the more trust they have in the positive effects of the medications on their health, and the more they perceive the need for the medication to maintain their good health. (Table V).

The patient's glycemic control status and confidence were also associated, with the mean score of Specific-Necessity belief in patients achieving HbA1c control (< 7%) being 10.9 ± 4.4, higher than that of patients without HbA1C control (≥ 7%), being 9.6 ± 3.7. The difference was statistically significant ($p < 0.05$). Thus, the group of patients who did not achieve good HbA1c levels (<7%) felt that taking antidiabetic medicines was more necessary than in the control group (Table V).

Table V. Correlation between medical conditions and beliefs about the medicine of participants

Characteristics		BMQ-V	S-N	S-C	G-O	G-H
		p=0.033[a]	**p<0.001[a]**	p=0.944[a]	p=0.076[a]	p=0.676[a]
Duration of diabetes	< 5 years	52.1 (8.6)	11.3 (4.4)	14.6 (4.5)	13.4 (3)	12.8 (3.4)
	5-10 years	50.7 (7.9)	10.3 (3.8)	14.5 (3.5)	12.7 (2.8)	13.3 (3.3)
	> 10 years	49.3 (7.8)	9.1 (3.5)	14.4 (3.8)	12.8 (2.9)	13 (2.9)
		p=0.446[b]	p=0.788[d]	p=0.678[d]	p=0.975[d]	p=0.103[d]
Family history related to diabetes	No	50.1 (7.9)	9.8 (3.8)	14.5 (3.8)	12.9 (2.9)	12.9 (3.1)
	Yes	50.8 (8.6)	10.1 (4.2)	14.4 (3.8)	12.9 (3)	13.5 (3.1)
		p=0.768[a]	p=0.932	p=0.168	p=0.826	p=0.218
Comorbidity	No	49.8 (8.9)	9.5 (3.1)	13.4 (3.9)	13 (3.1)	13.9 (3.2)
	Yes	50.3 (8)	9.9 (3.9)	14.5 (3.8)	12.9 (2.9)	13 (3.1)
		p<0.001[a]	p=0.057[c]	**p<0.001[c]**	**p=0.003[c]**	**p=0.001[c]**
Self-Monitoring of Glucose	> 2 times a week	46.4 (7)	10.5 (3.1)	12.6 (3.2)	11.7 (2.7)	11.6 (3.2)
	1-2 times a week	50.1 (7.5)	9.8 (3.8)	14.2 (3.6)	13 (2.9)	13.1 (3.1)
	Never/ Rarely	51.3 (8.3)	9.7 (4.1)	15 (3.9)	13.1 (2.9)	13.4 (3.1)
		p=0.001	**p=0.04**	p=0.102	p=0.069	p=0.096
HbA1c (%)	Uncontrolled	49.6 (7.8)	9.6 (3.7)	14.3 (3.9)	12.8 (3)	13 (3.1)
	Controlled	53.1 (8.4)	10.9 (4.4)	15.2 (3.5)	13.5 (2.6)	13.5 (3.5)
		p=0.103	p=0.337	p=0.273	p=0.496	p=0.411
FPG	Uncontrolled	49.9 (8.2)	9.7 (3.8)	14.4 (4)	12.8 (2.9)	13 (3.2)
	Controlled	51.6 (7.2)	10.2 (4)	14.9 (3.2)	13.2 (2.9)	13.3 (3)
		p=0.005	**p<0.001**	**p=0.031**	p=0.118	p=0.188
Antidiabetic medication regimen	Oral only	51.1 (8.3)	10.7 (4.2)	14.8 (3.9)	12.8 (2.8)	12.9 (3.2)
	Insulin only	46.6 (8.3)	8.9 (3)	13.1 (3.3)	12.2 (3.2)	12.3 (3.3)
	Oral + insulin	50 (7.4)	9 (3.4)	14.4 (3.8)	13.2 (2.9)	13.4 (3)

[a]Independent Samples t-Test; [b] Independent-Samples Mann-Whitney U Test; [c]OneWay ANOVA; [d]Independent-Samples Kruskal-Wallis Test

The group of patients who never or rarely monitored their blood glucose at home had the highest mean scores on the Specific-Concerns, General-Overuse, and General – Harm subscales, indicating that the patients in this group had the least concern about adverse medication reactions, as well as the strongest belief that doctors were not over-prescribing them and did not think the medications were harmful. The group with the lowest Specific-Concerns, General-Overuse, and General-Harm scores was the group that regularly (>2 times/week) monitored blood sugar at home, having the most insufficient confidence among other groups. They believed that antidiabetic medicines had harmful long-term effects, medications were overprescribed and sometimes patients should stop treatment (Table V). The multivariable linear regression model reported that the patient's self-management of blood sugar, the duration of diabetes, and the glycemic control status were statistically significantly associated with the BMQ score (Table VI). Our study's data were collected using a cross-sectional survey. Therefore, it is only for evaluation purposes, and there were no interventions on research subjects to change patients' beliefs, improve treatment adherence, and contribute to helping patients achieve the best treatment effect. However, the results of the study can be considered the basis for further studies.

With the results of this study, we would like to propose carrying out further research in the future, combined with interventions to improve patients' trust in using medications, and prospective follow-up for a period of 3 months, 6 months, or longer. Strengthening the coordination of clinical pharmacists with physicians is necessary to improve their positive beliefs and gradually reduce their negative beliefs about medicines, thereby increasing medication adherence, and improving disease treatment effectiveness. Intervention programs need to be developed to bring more knowledge to patients, to ensure they are fully equipped with the knowledge and to avoid unnecessary worries, which will reduce patient adherence to treatment.

Table VI. Factors associated with beliefs about the medicine of participants (Multivariate Regression Analysis)

Characteristics	Raw regression coefficients (95%)	p	Adjusted regression coefficient (95%)	p
Gender				
Male	1		1	
Female	2.5 (0.9-4.1)	0.002	2.8 (-0.1-5.6)	0.055
Level of education				
High school diploma or below	1		1	
High school or above	-2.1 (-3.7 – -0.5)	0.01	-0.7 (-2.5-1.03)	0.42
Blood glucose controlled (HbA1c)				
Uncontrolled	1		1	
Controlled	3.5 (1.5 – 5.5)	0.001	3 (0.9-5.1)	**0.005**
Duration of diabetes				
>10 years	1		1	
< 5 years	2.7 (0.6-4.8)	0.011	2.8 (0.7-4.8)	**0.008**
5-10 years	1.4 (-0.5 - 3.2)	0.152	2.1 (0.2-3.9)	**0.03**
Drinking alcohol				
Never	1		1	
In the past	-1.4 (-3.3 – 0.5)	0.154	1.2 (-1.8-4.1)	0.447
Still drinking	-2.6 (-5.1 – (-0.2))	0.036	1.1 (-2.3-4.5)	0.528
Self-Monitoring of Glucose				
> 2 times a week	1		1	
Never/ Rarely	4.9 (2.6-7.2)	<0.001	4 (1.6 – 6.3)	**0.001**
1-2 times a week	3.8 (1.2-6.3)	0.004	3.8 (1.3-6.3)	**0.003**
Occupation				
Employed	1		1	
Retired or staying at home	4 (0.9-7.1)	0.012	2.2 (-1.1 – 5.5)	0.191
Antidiabetic medication regimen				
Oral only	1		1	
Insulin only	-4.5 (-7.3 – (-1.8))	0.001	-3 (-6.2-0.1)	0.061
Oral + insulin	-1.1 (-2.8 – 0.6))	0.194	0.2 (-1.7-2)	0.871

CONCLUSION

Patients' beliefs about medicine is an important role, in this study patients believed that using antidiabetics was necessary for health and had no more negative opinions about medicines. However, the pharmacist needs to raise the awareness of patients about monitoring their blood glucose at home, the long-term side effects and how to manage them.

ACKNOWLEDGEMENTS

This research was supported by Hue University's grant. All authors declare that they have no conflicts of interest in relation to this work. Thi Minh Hoa Nguyen, Thi Kim Cuc Ngo, Thi Thuy Nhi Tran and Chuyen Le designed the study. Thi Minh Hoa Nguyen, Thi Thuy Nhi Tran contributed to acquisition of data. Thi Minh Hoa Nguyen, Thi Kim Cuc Ngo, Chuyen Le contributed to analysis of interpretation of data. Thi Kim Cuc Ngo, Chuyen Le contributed to drafting the article. All authors contributed to critically revising the article.

REFERENCES

Abebaw, M., Messele, A., Hailu, M., & Zewdu, F. (2016). Adherence and Associated Factors towards Antidiabetic Medication among Type II Diabetic Patients on Follow-Up at University of Gondar Hospital, Northwest Ethiopia. *Advances in Nursing*, *2016*, 1–7. https://doi.org/10.1155/2016/8579157

ADA. (2020). *Standards of medical care in diabetes*. *45*, 270.

Alakhali, K. (2015). Description Of Patients' Compliance In Aseer Region, Kingdom Of Saudi Arabia. *Indonesian Journal Of*

Pharmacy, *26*(4), 228. https://doi.org/10.14499/indonesianjpharm26iss4pp228

Al-Temimi, A. A., Krishnan, S., Kaur Sandhu, A., & Sajid Ali Bangash, N. (2021). Medication Nonadherence: Implications for patient health outcomes in pharmacy practice. *Indonesian Journal of Pharmacy*, 416–428. https://doi.org/10.22146/ijp.2236

American Diabetes Association. (2015). *Standards of medical care in diabetes*. *45*.

Aminde, L. N., Tindong, M., Ngwasiri, C. A., Aminde, J. A., Njim, T., Fondong, A. A., & Takah, N. F. (2019). Adherence to antidiabetic medication and factors associated with non-adherence among patients with type-2 diabetes mellitus in two regional hospitals in Cameroon. *BMC Endocrine Disorders*, *19*(1), 35. https://doi.org/10.1186/s12902-019-0360-9

Anghel, L. A., Farcas, A. M., & Oprean, R. N. (2019). An overview of the common methods used to measure treatment adherence. *Medicine and Pharmacy Reports*. https://doi.org/10.15386/mpr-1201

Arifulla, M., John, L. J., Sreedharan, J., Muttappallymyalil, J., & Basha, S. A. (2014). Patients' Adherence to Anti-Diabetic Medications in a Hospital at Ajman, UAE. *Malays J Med Sci*, *21*(1), 44–49. https://doi.org/PMC3952347

Bagonza, J., Rutebemberwa, E., & Bazeyo, W. (2015). Adherence to anti diabetic medication among patients with diabetes in eastern Uganda; a cross sectional study. *BMC Health Services Research Volume*, *15*(1), 1–7. https://doi.org/DOI 10.1186/s12913-015-0820-5

Gatti, M. E., Jacobson, K. L., Gazmararian, J. A., Schmotzer, B., & Kripalani, S. (2009). Relationships between beliefs about medications and adherence. *American Journal of Health-System Pharmacy*, *66*(7), 657–664. https://doi.org/10.2146/ajhp080064

Horne, R., Weinman, J., & Hankins, M. (1999). The beliefs about medicines questionnaire: The development and evaluation of a new method for assessing the cognitive representation of medication. *Psychology & Health*, *14*(1), 1–24. https://doi.org/10.1080/08870449908407311

Huber, C. A., & Reich, O. (2016). Medication adherence in patients with diabetes mellitus: Does physician drug dispensing enhance quality of care? Evidence from a large health claims database in Switzerland. *Patient Preference and Adherence*, *10*, 1803–1809. https://doi.org/10.2147/PPA.S115425

Hugtenburg, J., Vervloet, M., Van Dijk, L., Timmers, L., & Elders. (2013). Definitions, variants, and causes of nonadherence with medication: A challenge for tailored interventions. *Patient Preference and Adherence*, 675. https://doi.org/10.2147/PPA.S29549

International Diabetes Federation. (2017). *IDF Diabetes Atlas*. https://diabetesatlas.org/upload/resources/previous/files/8/IDF_DA_8e-EN-final.pdf

Istilli, P. T., Pereira, M. C. A., Teixeira, C. D. S., Zanetti, M. L., Becker, T. A. C., & Marques, J. V. P. (2015). Treatment adherence to oral glucose-lowering agents in people with diabetes: Using the Brief Medication Questionnaire. *J Diabetes Nurs*, *19*(9), 340–348.

Izzah, Z., Suprapti, B., Aryani, T., Budiatin, A. S., Rahmadi, M., Hapsari, P. P., Ramadiani, F., Shinta, D. W., & Andarsari, M. R. (2013). *Diabetes Support Groups Improve Patient's Compliance and Control Blood Glucose Levels*. *2*.

Jamous, R. M., Sweileh, W. M., & Taha, A. S. E. D. A. (2014). Beliefs about medicines and self-reported adherence among patients with chronic illness: A study in Palestine. *Journal of Family Medicine and Primary Care*, *3*(3), 224. https://doi.org/10.4103/2249-4863.141615

Jimenez, K., Vargas, C., Garcia, K., Guzman, H., Angulo, M., & Billimek, J. (2017). Evaluating the Validity and Reliability of the Beliefs About Medicines Questionnaire in Low-Income, Spanish-Speaking Patients With Diabetes in the United States. *The Diabetes Educator*, *43*(1), 114–124. https://doi.org/10.1177/0145721716675740

Khdour, M. R., Awadallah, H. B., Alnadi, M. A., & Al-Hamed, D. H. (2020). Beliefs About Medicine and Glycemic Control Among Type 2 Diabetes Patients: A Cross-Sectional Study in West Bank, Palestine. *Journal of Primary Care & Community Health*, *11*, 215013272097191. https://doi.org/10.1177/2150132720971919

Khunti, K., Seidu, S., Kunutsor, S., & Davies, M. (2017). Association Between Adherence to Pharmacotherapy and Outcomes in Type 2 Diabetes: A Meta-analysis. *Diabetes Care*, *40*(11), 1588–1596. https://doi.org/doi:10.2337/dc16-1925

Lavsa, S. M., Holzworth, A., & Ansani, N. T. (2011). Selection of a validated scale for measuring medication adherence. *Journal of the American Pharmacists Association*, *51*(1), 90–94. https://doi.org/10.1331/JAPhA.2011.09154

Lê THG, & Hà VN. (2013). Thực trạng và một số yếu tố liên quan đến tuân thủ điều trị bệnh đái tháo đường típ 2 của người bệnh đang điều trị ngoại trú tại bệnh viện 198 năm 2013. *Y Học Thực Hành*, *11*, 93-97.

Ngô VM, & Bùi THD. (2021). Niềm tin vào thuốc của người bệnh đái tháo đường týp 2 điều trị ngoại trú tại Bệnh viện Đại học Y Thái Bình năm 2020. *Tạp Chí Y Học Dự Phòng*, *31*(8), 40–47.

Nguyen, T., Cao, H. T. K., Quach, D. N., Le, K. K., Au, S. X., Pham, S. T., Nguyen, T. H., Pham, T. T., & Taxis, K. (2019). The Vietnamese Version of the Brief Illness Perception Questionnaire and the Beliefs about Medicines Questionnaire: Translation and Cross-cultural Adaptation. *Tropical Medicine & International Health*, *24*(12), 1465–1474. https://doi.org/10.1111/tmi.13312

Polonsky, W., & Henry, R. (2016). Poor medication adherence in type 2 diabetes: Recognizing the scope of the problem and its key contributors. *Patient Preference and Adherence*, *Volume 10*, 1299–1307. https://doi.org/10.2147/PPA.S106821

Raza, S., Iqbal, Q., Haider, S., Khalid, A., Hassali, M. A., & Saleem, F. (2020). Beliefs about medicines among type 2 diabetes mellitus patients in Quetta city, Pakistan: A cross-sectional assessment. *Journal of Public Health*, *28*(3), 277–283. https://doi.org/10.1007/s10389-019-01046-8

Salama, H. M., & Saudi, R. A. (2020). Effect of patients beliefs about medications on adherence to drugs in diabetic patients attending family medicine outpatient clinic in Ismailia, Egypt. *Journal of Diabetes & Metabolic Disorders*, *19*(2), 951–958. https://doi.org/10.1007/s40200-020-00587-0

Seuring, T., Archangelidi, O., & Suhrcke, M. (2015). The Economic Costs of Type 2 Diabetes: A Global Systematic Review. *PharmacoEconomics*, *33*(8), 811–831. https://doi.org/10.1007/s40273-015-0268-9

Sirey, J. A., Greenfield, A., Weinberger, M. I., & Bruce, M. L. (2013). Medication Beliefs and Self-Reported Adherence Among Community-Dwelling Older Adults. *Clinical Therapeutics*, *35*(2), 153–160. https://doi.org/10.1016/j.clinthera.2013.01.001

Supramaniam, P., Aisyah, A., & Chong, L. (2019). Reliability and validity of Beliefs on Medicine Questionnaire (BMQ) in diabetes mellitus patients: Malay Translated Version. *International Journal of Scientific and Research Publications (IJSRP)*, *9*(2), 66–73. https://doi.org/10.29322/IJSRP.9.02.2019.p8609

Sweileh, W. M., Zyoud, S. H., Abu Nab'a, R. J., Deleq, M. I., Enaia, M. I., Nassar, S. M., & Al-Jabi, S. W. (2014). Influence of patients' disease knowledge and beliefs about medicines on medication adherence: Findings from a cross-sectional survey among patients with type 2 diabetes mellitus in Palestine. *BMC Public Health*, *14*(1), 94. https://doi.org/10.1186/1471-2458-14-94

Vermeire, E., Hearnsh, H., Royen, P. V., & Denekens, J. (2001). Patient adherence to treatment: Three decades of research. A comprehensive review. *Journal of Clinical Pharmacy and Therapeutics*, *26*(5), 331–342. https://doi.org/10.1046/j.1365-2710.2001.00363.x