



The Association Between Hopelessness and Medication Adherence among Type 2 Diabetes Mellitus Patients

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ABSTRACT

Optimal glycemic control and prevention of complications in Type 2 Diabetes Mellitus (T2DM) largely depend on patients' medication adherence. However, poor adherence remains a major challenge, and psychological factors such as hopelessness may contribute to this problem. This study aimed to examine the relationship between hopelessness and medication adherence among patients with T2DM. A quantitative cross-sectional study was conducted between July and August 2024 involving 73 T2DM patients at the Kalasan Public Health Center, Yogyakarta, selected through consecutive sampling. Hopelessness was assessed using the Beck Hopelessness Scale (BHS), while medication adherence was measured using the 8-item Morisky Medication Adherence Scale (MMAS-8). Data were analyzed using the Spearman rank correlation test. The prevalence of hopelessness was 17.8%, and 21.9% of participants demonstrated low medication adherence. A significant weak negative correlation was found between hopelessness and medication adherence ($\rho = -0.268$, $p = 0.022$), indicating that higher hopelessness was associated with lower medication adherence. These findings suggest that addressing hopelessness through psychological assessment and supportive interventions may improve medication adherence and contribute to better diabetes management among patients with T2DM.

INTRODUCTION

Diabetes mellitus is a growing global public health problem with an estimated 425 million people affected in 2018 and is projected to rise to 629 million by 2040 with increases particularly prevalent in developing countries (Demos *et al.*, 2020). Type 2 Diabetes Mellitus (T2DM) is a disorder of glucose metabolism marked by long-term high blood glucose levels. It is caused by a combination of insulin resistance and low insulin secretion (Garcia-Garcia *et al.*, 2020; (Algoblan, Alalfi and Khan, 2014). T2DM is by far the most common form of diabetes mellitus and accounts for ~90% of diabetes cases (Reed, Bain and Kanamarlapudi, 2021).

The primary goal of diabetes management is to control blood glucose levels within a normal range and prevent the development of diabetes-related complications, which can be achieved through diet, physical exercise, and oral hypoglycemic medication (Fujiwara *et al.*, 2019). Extensive scientific evidence demonstrated that high adherence to antidiabetic drugs is critical to maintain glycemic control among T2DM patients (Demos *et al.*, 2020). Adherence to anti-diabetic medications refers to the extent to which an individual's medication use behaviour coincides with medical advice, and persistence as the duration of time from initiation to discontinuation of therapies (Murwanashyaka *et al.*, 2022). *Poor medication adherence*

in T2DM patients is well documented to be very common and is associated with inadequate glycemic control; increased morbidity and mortality (Polonsky and Henry, 2016). Poor medication adherence leads to increased health care resource costs, including more frequent hospitalizations (Brunton and Polonsky, 2017). In developed nations approximately 50% of diabetic patients do not adhere to the recommended therapies (Demos *et al.*, 2020). Previous study consistently demonstrated non-adherence to medication among patients with diabetes (Murwanashyaka *et al.*, 2022; Sahoo *et al.*, 2022; Alsaidan *et al.*, 2023); and non-adherence compromises safety and treatment effectiveness, leading to increased morbidity and mortality rates. This contributes to significant direct and indirect costs in the healthcare system (Lee *et al.*, 2006; Hutchins *et al.*, 2011).

Hopelessness is an important psychological construct, defined as negative expectations regarding oneself and one's future life and a negative emotional state characterized by the lack of finding a solution for one's problems (Yip and Cheung, 2006; Balsamo *et al.*, 2020; Fitriawan *et al.*, 2023). It is a cognitive feature of negative view of the self, and of the self in relation to the world and in relation to the future. In his research focused on depression mood and suicidal behavior, (Beck *et al.*, 1974) observed that patients diagnosed with depressive disorders shared common cognitive features—a negative view of the self, and of the self in relation to the world and in relation to the future. He paid special attention to one of these cognitive features—a negative view of the self in relation to the future, by introducing the construct of “hopelessness”. Unlike depression, it is oriented towards the future as opposed to the present state (Beck *et al.*, 1974; Balsamo *et al.*, 2020). Hopelessness is negatively associated with lower resilience (Huen *et al.*, 2015), and psychological resilience plays a mediating role in the relationship between depression, diabetes distress, and treatment adherence (Wojujutari, Idemudia and Ugwu, 2024).

While extensive scientific evidence demonstrated the prevalence of depression among T2DM patients and its association with medication adherence (Gonzalez *et al.*, 2008; Yang *et al.*, 2023; Yorke *et al.*, 2023), currently there is limited literature regarding the prevalence of hopelessness among T2DM and whether or not hopelessness is significantly associated with adherence to antidiabetic medication. Born from the lack of evidence on these topics, our present study aimed to explore the prevalence of hopelessness among T2DM patients and its association with medication adherence.

METHOD

Study design

Observational analytic study with quantitative approach and cross-sectional design was conducted to investigate the association between hopelessness and medication adherence among type 2 diabetes mellitus (T2DM) patients.

Study setting and periods

This study was conducted at Kalasan public health center in Sleman Regency, Special Region of Yogyakarta Province, Indonesia. The data were collected from July until August 2024.

Sample size calculation and sampling technique

We calculated the minimum sample size for this study using G*Power software version 3.1.9.7 intended to calculate sample size required for statistical test bivariate: normal model with the assumption of two tailed, $\alpha=0.05$, power level=0.95, and an correlation coefficient=0.405 obtained from previous study (Das *et al.*, 2013), which the minimum sample size was 73.

Consecutive sampling technique was used to recruit the participants. The inclusion criteria were: patients who were clinically diagnosed with type 2 diabetes mellitus (T2DM), received oral antidiabetic medication, understood Indonesia language, were able to read and write, and were voluntarily willing to participate as study participants. Patients who did not complete the informed consent form were excluded from the study.

Instruments

Self-administered validated instruments in the Indonesian language were used to measure research variables and were divided into 3 sections : 1). sociodemographic questionnaire, 2). Beck Hopelessness Scale (BHS), 3). The 8 Item of Morisky Medication Adherence Scale (MMAS-8).

In the second section, the Beck Hopelessness Scale (BHS) was used to determine hopelessness among T2DM patients. The BHS is standardized self-rated instrument developed by Beck *et al.* that widely used to assess the level of hopelessness (Beck *et al.*, 1974). This instrument consists of 20 question items and each item has a dichotomous answer: true or false. There are 11 items with negative statements (items 2, 4, 7, 9, 11, 12, 14, 16, 17, 18, 20) scored as follows: true (1 point) and false (0 points). There are 9 items with positive statement (items 1, 3, 5, 6, 8, 10, 13, 15, 19) scored as follows: true (0 points) and false (1 point). The total BHS score ranges from 0-20 and higher scores indicate greater hopelessness (Balsamo *et al.*, 2020). The BHS had a cut-off point of 9 to determine hopelessness. Based on this cut-off point, if the BHS total score obtained by participants was ≥ 9 , they were considered as hopeless (Huen *et al.*, 2015; Tin *et al.*, 2015; Fitriawan *et al.*, 2023). The Indonesian version of BHS is considered a valid instrument, Cronbach's $\alpha = 0.918$, indicating high internal consistency (Hutajulu, Djunaidi and Triwahyuni, 2021).

In the third section, medication adherence was determined using Morisky Medication Adherence Scale-8 (MMAS-8). The MMAS-8 assess the patient's experiences with medications during the 2 weeks prior to answering the questionnaire (Olagbemide *et al.*, 2021). It is an eight item scale scored as follows: Items 1–4 and 6–8 are reverse-coded, i.e., a NO is scored 1 and YES is scored 0. Item 5 is direct coded a NO is scored 0 and a YES is scored 1 while item 8 has five options scored in a negative direction from 1 (always) to 5 (never). Item 8's score is further divided by 5 when calculating a summated score. The total MMAS-8 score has a range of 0–8. Based on the total MMAS-8 score obtained by the patients, the medication

adherence level were categorized as low (≤ 6), moderate (>6 to <8), and high (8) medication adherence (Janežič, Locatelli and Kos, 2017; Olagbemide *et al.*, 2021). In this study, content validity was used to evaluate the validity of Indonesian version of MMAS-8 to measured medication adherence among T2DM patients, and 2 expert (1 internist and 1 medical surgical nurse specialist) participated in the evaluation of each of the questionnaire items. In this study, the MMAS-8 had I-CVI of 0.875, suggesting that this instrument is valid (Yusoff, 2019). In this study, the internal reliability of MMAS-8 had a Cronbach's $\alpha=0.83$, suggesting high internal reliability.

Ethical consideration

Ethical clearance was obtained from the Health Research Ethics Committee, Politeknik Kesehatan Tanjung Karang, Indonesia (ethical number: 453/KEPK-TJK/VI/2024). Before the data collection, detailed research information was provided to the participants and the informed consent was obtained from them before commencing the study. The participant's identity and their data were kept confidential throughout the study, with only the researcher having access to the study data.

RESULT

Sociodemographic characteristic of the study participants

The sociodemographic characteristics of T2DM patients who participated in this study are shown in Table 1. Most of the T2DM patients were female ($n=42$; 57.5%) and elderly with an age ≥ 60 years ($n=41$; 56.2%). Based on the education background, the majority of the T2DM patients graduated from the university ($n=29$; 39.7%), suggesting a high education background. Most of the T2DM patients had a monthly income between IDR 1-2 million ($n=19$; 26.2%). Most of the participants had been diagnosed with T2DM between 1-5 years ($n=29$; 39.7%) and had received antidiabetic medication for 1–5 years ($n=30$; 41.1%). 16.4% of the T2DM patients reported that they were smoking.

Table 1. Sociodemographic characteristic of the participants ($n=73$)

Sociodemographic profiles	n	%
Age (years)		
35-59	32	43.8
≥ 60	41	56.2
Sex		
Male	31	42.5
Female	42	57.5
Level of education		
Elementary school	15	20.5
Junior high school	9	12.3
Senior high school	20	27.5
Higher education / University	29	39.7
Monthly income (IDR/Indonesian Rupiah)		
< 1 million	21	28.7
1-2 million	19	26.2
2-3 million	15	20.5
3-4 million	12	16.4

> 5 million	6	8.2
Length of disease		
< 1 years	16	21.9
1-5 years	29	39.7
6-10 years	17	23.3
≥ 11 years	11	15.1
Length of medication		
< 1 years	18	24.6
1-5 years	30	41.1
6-10 years	16	21.9
≥ 11 years	9	12.4
Smoking		
Yes	12	16.4
No	61	83.6

Hopelessness among T2DM patients

The Beck Hopelessness Scale was used as an instrument to assess hopelessness among T2DM patients. Hopelessness among T2DM patients based on BHS was shown in Table 2. Our study elucidated that 13 (17.8%) of T2DM patients felt hopeless, suggesting a low prevalence of hopelessness among T2DM patients.

Table 2. Hopelessness among T2DM patients (n=73)

Hopelessness	BHS total score	n	%
Yes	≥9	13	17.8
No	0-8	60	82.2

Medication adherence among T2DM patients

Medication adherence was determined using the Morisky Medication Adherence Scale-8 (MMAS-8). The level of medication adherence among T2DM patients based on MMAS-8 was shown in Table 3. According to MMAS-8, high medication adherence was found only among 28 subjects (38.4%) in our setting.

Table 3. Medication adherence among T2DM patients

Adherence	MMAS-8 total score	n	%
High	8	28	38.4
Medium	>6 to <8	29	39.7
Low	≤6	16	21.9

Correlation between hopelessness and medication adherence among T2DM patients

The correlation between hopelessness and medication adherence among T2DM patients was analysed using Spearman's rank tests, and the results were shown in Figure 1.

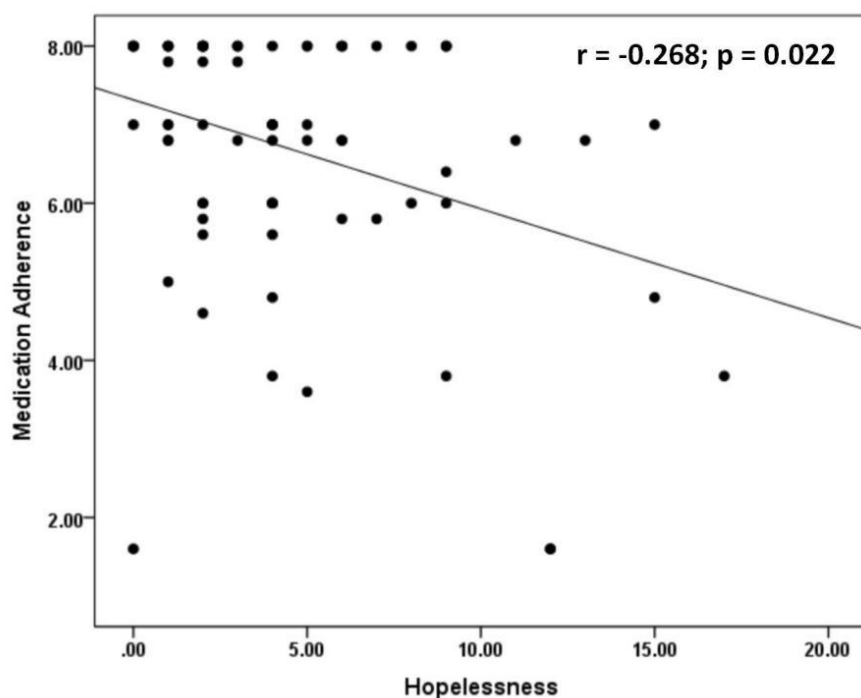


Figure 1. hopelessness had a significant weak inverse correlation with medication adherence among T2DM patients ($p = 0.022$; $r = -0.268$).

The Spearman's rank test results demonstrated a significant inverse and weak correlation between BHS score and MMAS-8 score ($p = 0.022$; $Rho = -0.268$). This result indicates the significant inverse correlation between hopelessness and medication adherence among T2DM patients. The diabetic patients with higher hopelessness levels were more likely to have lower medication adherence. In other hand, diabetic patients with lower hopelessness level were more likely to have higher medication adherence.

DISCUSSION

This study was conducted to measure adherence to medications among T2DM patients and assess the correlation between hopelessness and medication adherence.

Our study demonstrated that high medication adherence was found only among 28 (38.4%) of T2DM patients who participated. Consistent with our finding, (Sahoo *et al.*, 2022) found that only 34.14% of T2DM patients had good medication adherence (Sahoo *et al.*, 2022). (Alsaidan *et al.*, 2023) found that only 30.8% of patients with T2DM were highly adherent to the medications prescribed by doctors, and 21.5% had low medication adherence (Alsaidan *et al.*, 2023). AlQarni *et al.*, (2019). reported that only 35.8% of diabetes patients were highly adherent to medications (AlQarni *et al.*, 2019). A study by (Murwanashyaka *et al.*, 2022). in 2022 also reported that a higher proportion of participants had poor adherence practices (Murwanashyaka *et al.*, 2022). A study by (Venkatesan, Dongre and Ganapathy, 2018) found 45.4% of subjects with poor adherence (Venkatesan, Dongre and Ganapathy, 2018). Contrarily, the

study by (Sharma *et al.*, 2023) found that 79.5% of diabetic patients had a high adherence to treatment (Sharma *et al.*, 2023). Another study by (Demos *et al.*, 2020). reported that 75% of diabetic patients had good medication adherence (Demos *et al.*, 2020). Differences in rates of medication adherence may be attributed to various study settings, sociodemographic variables, and tools used (Sahoo *et al.*, 2022). A meta-analysis study reported that adherence to diabetic medicine ranged from 38.5% to 93.1%.

Hopelessness is an important psychological construct, defined as negative expectations regarding oneself and one's future life and a negative emotional state characterized by the lack of finding a solution for one's problems (Yip and Cheung, 2006; Balsamo *et al.*, 2020; Fitriawan *et al.*, 2023). It is a cognitive feature of negative view of the self, and of the self in relation to the world and in relation to the future. Our study elucidated that based on BHS, only 13 (17.8%) of participants had a hopelessness, suggesting low prevalence of hopelessness among T2DM patients in our study setting.

Our study demonstrated a significant inverse and weak correlation between hopelessness and medication adherence among T2DM patients. Our finding suggesting that the diabetic patients with higher hopelessness levels were more likely to have lower medication adherence. In other hand, diabetic patients with lower hopelessness level were more likely to have higher medication adherence. Our finding consistent with previous study that reported the negative association between hopelessness and medication adherence (Kargin, Ersöğütçü and Aslanoğlu, 2021). Chronic illness management required patient planning, time, and motivation. hopelessness may impair self-care of chronic illness by adversely effecting memory, energy, and executive function. Moreover, hopelessness associated may decrease motivation to care for chronic illness (Katon, 2011). A systematic review by (DiMatteo, Lepper and Croghan, 2000) and colleagues found that comorbid depression in patients with chronic medical illness decreased adherence to self-care regimens by threefold (DiMatteo, Lepper and Croghan, 2000). Studies in patients with diabetes have shown that depression adversely effects adherence to diet, exercise regimens, cessation of smoking, and taking the three key diabetes control medications as prescribed; oral hypoglycemics, antihypertensives, and lipid control medications (Lin *et al.*, 2004). In other study, hopelessness may lead to unstable of blood glucose and physical problems as a result of complications of DM-2. Additionally, it affects the psychosocial situation. Therefore, it is important for nurses to concern about hopelessness condition in DM-2 to prevent of unstable of blood glucose level (Destanti and Susanti, 2017). Hopelessness also negatively associated with resilience (Huen *et al.*, 2015), and psychological resilience plays a mediating role in the relationship between depression, diabetes distress, and treatment adherence (Wojujutari, Idemudia and Ugwu, 2024).

However, our current study possessed several limitations that should be considered. First, our study was performed using cross-sectional design, meaning that our study only demonstrated association but not causality effect. Second, the study participants was recruited using consecutive sampling, a type of non-

probability sampling, hence limiting the generalizability of our finding. Third, since self-administered questionnaires was used as the study instrument, our study was prone to recall bias and social desirability bias.

CONCLUSION

Our present study provides evidence regarding the low prevalence of hopelessness and low medication adherence among T2DM patients. Moreover, our study demonstrated that hopelessness had a significant weak inverse correlation with medication adherence among T2DM patients. Our findings highlight the poor medication adherence as a critical issue that potentially impedes the successful glycemic control among T2DM patients. Our findings also highlight hopelessness as an important psychological construct among T2DM patients. Assessments of medication adherence among T2DM should be performed on a regular basis to detect those who have poor adherence. Our findings also support the development of more proactive interventions to ameliorate hopelessness and increase medication adherence among T2DM patients.

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