

Adherence and Glycemic Control Among Type 2 Diabetes Mellitus Patients Using Antidiabetic Medication: A Cross Sectional Study on Population Registered in Sleman Health and Demographic Surveillance System

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Abstract

Aim: The aim of the study is to assess the impact of medication adherence to glycemic control and identify factors associated with medication adherence.

Methods: This cross-sectional study was conducted among 108 type 2 diabetes mellitus (T2DM) patients registered in Sleman Health and Demographic Surveillance System (HDSS).

Results: The results of the present study show that among the participants, 46 patients (42.6%) had high adherence, 37 patients (34.3%) had medium adherence, and 25 patients (23.1%) had low adherence. Eighty-two (75.9%) patients had duration of DM ≤ 10 years and 26 (24.1%) patients more than 10 years. There was a significant association between medication adherence level and duration of DM ($p < 0.05$). Good glycemic control was found to be higher among patients with high adherence level (60.9%) compared to medium (48.6%) and low (4.0%) adherence, and the differences statistically significant ($p < 0.05$).

Conclusion: Adherence to antidiabetic medication had a good impact to glycemic control and the adherence associated with duration of DM.

Keywords: adherence, antidiabetic, glycemic control, population

INTRODUCTION

Diabetes mellitus (DM) is a group of metabolic disorders characterized by hyperglycemia and abnormalities in carbohydrate, fat, and protein metabolism. The goals of antidiabetic treatment are ameliorated symptoms, reduce risk of microvascular and macrovascular complications, reduce mortality, and improve quality of life [1]. Approximately, there are 425 million of worldwide people or 8.8% of adults (aged 20-79 years) who are estimated to have DM. Following this, the number has increased to 451 million if the age is expanded to 18-99 years [2]. Besides, the mortality rate caused by DM in 2015 reached into 1.6 million [3]. The adherence towards the prescribes antidiabetic medications has been found to be crucial in achieving and maintaining glycemic control to prevent the complications associated with better clinical outcome [4-5].

In addition, the purpose of this study was to assess the impact of medication adherence to glycemic control and identify the factor associated with medication adherence among type 2 DM (T2DM) patients registered in Sleman HDSS. Hence, this study provides the latest population of health information especially about T2DM patients for the policy makers related to the institution in Sleman District.

MATERIALS AND METHODS

This cross-sectional study was conducted among patients with T2DM registered in Sleman HDSS in May 2019. Besides, non-pregnant adults who were diagnosed T2DM did not change treatment type during the 6 months preceding the survey. Owing to the fact that, they had a recent laboratory report on the glycemic value (glycemic

value was measured at least a month before interviews), a knowledge about hypoglycemia symptom, and a complete data from Sleman HDSS (age, gender, education, and cigarette smoking). Additionally, they were given the informed consents to participate including in this study. Likewise, the patients who died or moved domicile out of the district were excluded from this study.

Moreover, the study instrument consisted of three parts. The first part comprised baseline characteristic of participants. In the second part, it included about gathering the information about medication adherence profile with the aid of MMAS-8. As the third part, it incorporated the gathered information upon the hypoglycemia symptom.

In addition, MMAS-8 was used to measure level of adherence against Medication Adherence profile. MMAS-8 is an 8-item questionnaire with seven yes/no questions, and one question is answered on a 5-point Likert Scale. Regarding the scoring system for the MMAS, 8 means high adherence, 6-8 signifies as medium adherence, and under 6 score implies as low adherence [6]. Also, MMAS-8 questionnaire has been translated and employed for various diseases in Indonesia.

Furthermore, self-reported hypoglycemia symptoms were recorded after the patients were asked to read a list of hypoglycemia symptoms. The patients reported the frequency of hypoglycemia during the 6 months preceding the survey. Withal, hypoglycemia severity was categorized as mild, moderate, severe, and very severe in regards to American Diabetes Association Workgroup on Hypoglycemia [7]. In this paper, the group of hypoglycemia symptoms was divided based on the perceived interruption of activities. Therefore, there were

no or mild symptom (no activities interruption) and moderate or worse symptom (activities interruption) [8].

The glycemic control was classified as good if it met the glycemic target recommendations from ADA [9]. Diabetes is related to the complications including macro vascular (stroke, heart disease, diabetic ulceration) and micro vascular (neuropathy, nephropathy, and retinopathy) complications.

The data analysis was carried out using SPSS version 25 (IBM, Corp, Armonk, NY, USA). Besides, all obtained data were tabulated and presented descriptively. By using chi-square tests, it aimed to see the relationship between the variables of treatment type and medication adherence. Thus, *P* value of <0.05 was considered to be statistically significant.

The study was approved by the Institution Ethics Committee of Universitas Gadjah Mada prior to commencement. Besides, the permission was granted by Sleman HDSS. Written informed consent was obtained from study participants.

RESULTS

A total of 191 DM patients who registered in Sleman HDSS were only 108 patients who had fulfilled eligibility criteria. Demographic (age, gender, education level, cigarette smoking), clinical (duration of DM and diabetic complications), and treatment (number of antidiabetic drugs and hypoglycemia symptom) characteristic are shown in Table 1 in detail.

Table 1: Characteristic of the study population

Characteristic	n	%
Age		
< 65 years	74	68.5
≥ 65 years	34	31.5
Gender		
male	44	40.7
female	64	59.3
Education level		
low	87	80.6
high	21	19.4
Cigarette smoking		
no	95	88.0
yes	13	12.0
Duration of DM		
≤10 years	82	75.9
>10 years	26	24.1
Diabetic complications		
no complication	67	62.0
one complication	31	28.7
≥2 complications	10	9.3
Number of antidiabetic drugs		
one drug	43	39.8
two drugs	57	52.8
three drugs	8	7.4
Hypoglycemia symptom		
no	55	50.9
mild	30	27.8
moderate/ worse	23	21.3

The mean age was 60.8±8.8 years. Seventy-five patients (69.4%) were >65 years old, and 59.3% patients were female. Besides, 21% of patients had a high education level, 12.0% patients were smokers, 26% patients had duration of DM more than 10 years, 62.0% people had not diabetic complication, 65 patients consumed more than one antidiabetic drugs, and 50.0% patients never experienced to have hypoglycemia symptom.

Besides, some patients received one antidiabetic drug consisting metformin, sulfonylureas, rapid acting insulin, or premix insulin. For two antidiabetic drugs, some patients received combination of metformin and sulfonylureas or rapid acting insulin or long acting insulin or premix insulin, combination of acarbose with metformin or sulfonylureas or rapid acting insulin, and combination of sulfonylureas with rapid acting insulin. For three antidiabetic drugs, some patients received the combination of metformin with sulfonylureas and acarbose or rapid acting insulin and the combination of metformin with long acting insulin and rapid acting insulin or pioglitazone.

The proportion of elderly patients (>65 years) with high adherence level was found to be higher (50.0%) compared to the patients with lower age (39.2%). Besides, high adherence level to medication was found to be higher among male patients (50.0%) compared to female patients (37.5%). Also, high adherence level to medication was found to be higher among the higher education levels (52.4%) compared to the patients with low education (40.2%). High adherence level to medication was also found to be higher among non-smokers (43.2%) compared to the smokers (38.5%). The patients with a duration of DM >10 years (57.7%) were more adhere to their medication than those with DM ≤10 years (37.8%). Patient with no complication (46.0%) had higher adherence level than patients with the complications. Likewise, the patients who received three antidiabetic drugs (50.0%) had higher adherence level than those who received one or two antidiabetic drugs. Furthermore, the patients who never experienced hypoglycemia symptom (47.3%) had higher adherence level than those who experienced hypoglycemia symptom. There was only duration of DM which had significant association (*p*<0.05) with medication adherence level. Thus, the association among demography, clinical, and treatment factors with adherence level is shown in the Table 2.

Based on 108 subjects studied, 47 patients (43.5%) had good glycemic control, and 61 patients (46.5%) had poor glycemic control. There was a significant association (*p*<0.05) upon the medication adherence level with glycemic control. Besides, good glycemic control was found to be highest among patients with high adherence level (60.9%) followed by the medium (48.6%) and low (4.0%) adherence level. For more detailed information, it is presented in the Table 3.

Table 2: Association between demography, clinical, and treatment factors with adherence level

Factor	Adherence level [n, (%)]			p-value
	Low (n=25)	Medium (n=37)	High (n=46)	
Age				
< 65 years	20 (27.0)	25 (33.8)	29 (39.2)	0.158
≥ 65 years	5 (14.7)	12 (35.3)	17 (50.0)	
Gender				
male	11 (25.0)	11 (25.0)	22 (50.0)	0.545
female	14 (21.9)	26 (40.6)	24 (37.5)	
Education level				
low	22 (25.3)	30 (34.5)	35 (40.2)	0.234
high	3 (14.3)	7 (33.3)	11 (52.4)	
Cigarette smoking				
no	21 (22.1)	33 (34.7)	41 (42.3)	0.592
yes	4 (30.8)	4 (30.8)	5 (38.5)	
Duration of DM				
≤10 years	23 (28.0)	28 (34.1)	31 (37.8)	0.024*
>10 years	2 (7.7)	9 (34.6)	15 (57.7)	
Complication				
no complication	14 (20.9)	21 (32.2)	32 (46.0)	0.369
one complication	9 (29.0)	12 (38.7)	10 (32.2)	
≥ 2 complications	2 (20.0)	4 (40.0)	4 (40.0)	
Number of antidiabetic drugs				
one drug	12 (27.9)	15 (31.3)	16 (47.8)	0.335
two drugs	11 (19.3)	20 (35.1)	26 (45.6)	
three drugs	2 (25.0)	2 (25.0)	4 (50.0)	
Hypoglycemia symptom				
no	12 (21.8)	17 (30.9)	26 (47.3)	0.786
mild	10 (33.3)	9 (30.0)	11 (36.7)	
moderate/worse	3 (13.0)	11 (47.8)	9 (39.1)	

*Chi-square test

Table 3: Impact of adherence level on glycemetic control

Adherence level	Glycemetic control [n, (%)]		p value
	Poor (n=61)	Good (n=47)	
Low	24 (96.0)	1 (4.0)	0.000*
Medium	19 (51.4)	18 (48.6)	
High	18 (39.1)	28 (60.9)	

*Chi-square test

DISCUSSION

Through all participants, 46 patients (42.6%) had high adherence, 37 patients (34.3%) had medium adherence, and 25 patients (23.1%) had low adherence. As the results, those included the inconsistent results. Elsous *et al.* mentioned that the least percentages of patients 58.0% had high adherence, 39.5% had medium adherence, 2.5% had low adherence [10]. In another earlier study, Shaimol *et al.* stated that the least percentages of patients (21.8%) had high adherence, 35.3% of patients had medium adherence, and 43% of patients had low adherence [11]. Regarding the difference results, it was likely due to differences in awareness about importance of medication adherence.

In addition, the patients with longer duration of DM had a significant association ($p < 0.05$) with higher level of medication adherence. This result mentioned was in line with Arifulla *et al.* [12] and Waari *et al.* study [13]. This finding could be associated with the progression of the disease which increased the number and dosage of

medications required to achieve the optimal glycemetic control. Therefore, the patients' attitude towards the related medications might change to be more adherently. Moreover, the patients with high medication adherence had a good glycemetic control and the otherwise patients with low medication adherence had a poor glycemetic control. There was a significant association ($p < 0.05$) between medication adherence level and glycemetic control. However, introducing methods to improve the patients' adherence to antidiabetic medication could help attaining optimal glycemetic control to prevent diabetic complications [14-15].

As the limitation of this study, not all patients measured HbA1C as a gold standard because of unavailability measurement of HbA1C service in their health care. Most of them measured fasting blood glucose.

The results of the study cannot be generalized to other populations. This study provides the latest health information especially about T2DM patients on Sleman

HDSS population that can be used by the policy makers related to the institution in Sleman District to make further health policies.

CONCLUSION

Adherence to antidiabetic medication has a good impact to glycemic control and the adherence associated with duration of DM.

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AUTHORS' CONTRIBUTION

All authors have contributed to this study.

CONFLICT OF INTEREST

They have no conflict of interest.

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