

IMPACT OF A PHARMACIST-LED PATIENT EDUCATION INITIATIVE ON GLYCEMIC CONTROL OF PATIENTS WITH TYPE 2 DIABETES MELLITUS: A SINGLE-CENTER EXPERIENCE IN WEST JAKARTA, INDONESIA

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ABSTRACT

Objective: This study aimed to evaluate the effect of the provision of drug-related information and patient education booklets on the hemoglobin A1c (HbA1c) levels of patients with type 2 diabetes mellitus.

Methods: This prospective study was conducted at the Kembangan Health Center, West Jakarta, Indonesia, from March to June 2017. A total of 30 patients were divided into two equal groups: In addition to routine treatment, patients in the intervention group received drug-related information and patient education booklet, while those in the control group received no additional intervention. The provision of drug information was through direct education as well as through telephone, short messages, and booklet. HbA1c level was measured as a surrogate measure of treatment adherence. HbA1c concentration was measured at baseline and 11 weeks after the intervention.

Results: Mean HbA1c level in the intervention group decreased from 8.05±0.91% at week 0 to 6.92±0.47% at week 11 after intervention ($p < 0.05$).

Conclusion: In this study, provision of drug information and patient education booklets helped to improve the patient compliance.

Keywords: Hemoglobin A1c, Patient adherence, Type 2 diabetes mellitus, Drug information, Booklet, Pharmacist.

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INTRODUCTION

Diabetes mellitus (DM) is a metabolic disorder characterized by high blood glucose levels caused by insufficient insulin. According to the International Diabetes Federation [1], the global prevalence of DM in 2014 was 8.3%, which corresponded to a caseload of 387 million patients. Globally, Indonesia has the seventh highest incidence of DM in the world after China, India, United States, Brazil, Russia, and Mexico. The estimated number of diabetic patients in Indonesia is 8.5 million [1].

DM necessitates long-term treatment which is typically complex. The treatment cost increases by 2–3.5 times in patients who develop complications. Optimal treatment compliance helps prevent disease progression. Poor disease management and low adherence lead to poor drug efficacy [2]. Monitoring of hemoglobin A1c (HbA1c) levels every 3 months helps monitor glycemic control to ensure treatment efficacy. High level of HbA1c reflects poor diabetic control owing to low adherence to treatment [3].

Education of patients about the management of DM was shown to lower the HbA1c level by 0.3–0.76% [4,5]. The purpose of this study was to assess the impact of pharmacist-led provision of drug-related information and patient education on treatment adherence by patients to achieve successful therapy. Insights gained from this study may help to improve the quality of life of patients with type 2 DM during management treatment and help improve the role of pharmacists in health service sector in Indonesia.

METHODS

Study design and subjects

This prospective study was conducted at a Health Center in the Kembangan District of West Jakarta from March to June 2017. The

study protocol was approved by the Ethical Committee for Health Study at the Faculty of Medicine of Universitas Indonesia before the start of the study. The study population comprised of 30 patients with type 2 DM who were prescribed oral antidiabetic drugs. Patients were divided into two groups: Intervention group received drug information and booklet, while the control group did not receive drug information and booklet. Each group consisted of 15 patients according to the total minimum sample [6]. The inclusion criteria were as follows: Patients aged >35 years who were diagnosed with type 2 DM at least 3 months before the start of the study. Patients who were receiving medicines such as birth control pills and herbal medicine and those on insulin therapy were excluded from the study. Patients in the intervention group received drug-related information at the time of dispensing of medicine by pharmacist as well as through phone call, short message service (SMS), and booklet. HbA1c levels were measured as a surrogate measure of patient adherence using Afinion™ AS100 Analyzer.

Materials used to collect data in this study were questionnaire and booklet [7]. The questionnaire consisted of a list of questions against which a respondent was required to indicate his response by means of a check (✓) mark in the available column; a space for short answers was also available for each question. Booklet used in this study was prepared by Puspitasari [8] and modified by Yuniarti [9] for patients with type 2 DM in Depok. The information in the booklet was provided in a manner that was easy to understand by an average patient. Information in the booklet included the types of DM, normal blood glucose level, symptoms, complications, medications, management, signs of hypoglycemia, routine monitoring, prevention, and management of diabetic foot.

Samples collection

Sample collection method used in this study was consecutive sampling method. During data collection pre- and post-intervention, the sample

of capillary blood was collected from all subjects by finger prick to measure the HbA1c level. The flow chart for group allocation and attrition among the subjects is found in Fig. 1.

Statistical analysis

Univariate analysis was used for descriptive data. Between-group differences were assessed using t-test. Distribution of variables was assessed using Shapiro-Wilk, and the bivariate analysis was performed according to the data distribution result. $p < 0.05$ were considered to be statistically significant difference. All analyses were performed on SPSS version 20 (IBM Corp., USA).

RESULTS

Study subject characteristic

Demographic and anthropometric characteristics of the patients are presented in Table 1, whereas clinical characteristics are presented in Table 2.

No significant difference was observed between the two groups with respect to the proportion of male and female patients. Basic Health

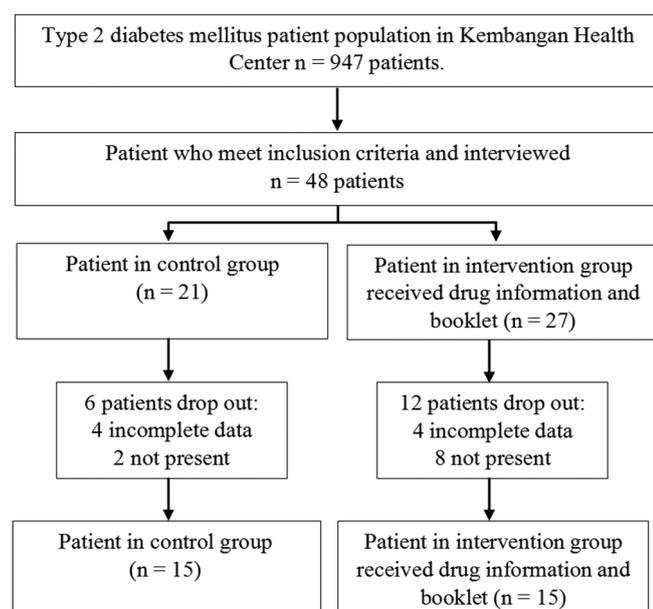


Fig. 1: Schematic illustration of the study design and patient-selection criteria

Research results showed that the prevalence of DM among women is higher than that in men [10]. This is consistent with the study by Irawan [11] which showed that the higher prevalence of DM in women is attributable to a higher risk of increase in body mass index (BMI) due to premenstrual syndrome which leads to accumulation of body fat [12].

No significant between-group difference was observed with respect to the age of patients ($p=0.713$) [13]. The average BMI in the two groups also showed no significant difference ($p=0.856$) [14]. However, a significant difference was observed with respect to education level of patients between the two groups ($p=0.048$). Individuals with high education level tend to be more aware and health conscious. The result was similar with the study of Presetiawati [15] which found that education level affects patient's adherence to medication. However, there was no significant between-group difference with respect to employment status.

No significant between-group difference was observed with respect to baseline FPG, 2-h PPG, systolic BP, diastolic BP, or duration of DM.

We also did not find a significant difference with respect to the number of oral antihyperglycemic drugs prescribed. Most patients in this study received a combination of two oral antidiabetic drugs such as metformin and acarbose. The two groups were also comparable with respect to drug dosage, form, and use of drugs for other conditions. Other drugs prescribed in this study population including simvastatin, bisoprolol, and valsartan did not affect HbA1c value. The intervention in this study for the patients did not improvise patients' knowledge on the side effect of the drugs. There were no correlation intervention group events of side effects. Flatulent was the most common side effect in this study population [16]. Keban reported that 70% of patients who receive acarbose developed diarrhea, nausea, vomiting, and flatulence [17]. According to Waspadji, flatulent was found in 50% of α -glycosidase inhibitor user [18]. A patient aged 63 years consumed metformin and glibenclamide had complaint of shaking and cold sweat which was a sign of hypoglycemia. Most likely, the hypoglycemia occurs caused by glibenclamide usage.

Correlation with HbA1c level

Type 2 DM patient's adherence towards HbA1c value after given drug information and booklet

At the beginning of the study, the average HbA1c in the intervention group was $8.05 \pm 0.91\%$. After receiving drug-related information and booklet (week 11), the average HbA1c level in the intervention group decreased to $6.92 \pm 0.47\%$, which corresponds to a decrease of $1.13 \pm 0.62\%$ from the baseline value. In a study by Puspitasari in

Table 1: Demographic and anthropometric characteristics of patients

Characteristics	Control group (n=15)	Intervention group (n=15)	p
Gender			0.107 ^a
Women	13 (86.67)	12 (80)	
Men	2 (13.33)	3 (20)	
Age (years)	55.73 \pm 9.44	59.73 \pm 9.47	0.926 ^a
Height (cm)	157.6 \pm 7.45	156 \pm 7.27	0.557 ^c
Weight (kg)	59.47 \pm 8.02	59.47 \pm 11.21	1.000 ^c
Body mass index (kg/m ²)	23.98 \pm 3.09	23.72 \pm 4.70	0.856 ^c
Education			0.048 ^a
Low (never attended school)	12 (80)	10 (66.67)	
Middle (Middle-Senior high school)	3 (20)	3 (20)	
High (University)	0	2 (13.33)	
Employment status			0.1000 ^a
Employed	3 (20)	4 (26.67)	
Unemployed	12 (80)	11 (73.33)	

Data presented as n (%) or average \pm standard deviation. ^aPearson's Chi-square test, ^bMann-Whitney test, ^cUnpaired t-test

Depok, provision of drug information booklet to diabetic patients decreased HbA1c value by 1.6±0.55% [8,16]. Another study by Keban revealed that provision of counseling by pharmacist may also reduce HbA1c value (decrease of 1.76±0.24%) [17]. In the control group, the average HbA1c level at baseline was 7.40±0.96% which showed a slight increase to 7.50±0.97% at week 11. The between-group difference with respect to the decrease in HbA1c level was statistically significant (paired t-test; p=0.001). The decrease of HbA1c value was found 40% in control group and 93.33% in the intervention group [19,20]. These findings imply that provision of drug-related information and booklet to type 2 DM helped to improve patients' adherence as reflected by the decrease in HbA1c level (Figs. 2 and 3, Tables 3-5).

DISCUSSION

This study indicates that pharmacists can play a key role in improving treatment compliance among patients with type 2 DM by interventions, such as provision of drug information, booklet, and follow-up reminders through SMS. Our findings are consistent with those of a study by Puspitasari [8]. We believe that providing drug information and patient education booklet in this intervention was a complete combination. Patient education about diabetes and the treatment has been shown to improve glycemic control, reduce the risk of hypoglycemia, and reduce treatment cost [21]. Involvement of pharmacists plays a vital role in the management of therapy and helps to improve the clinical outcomes [22]. Provision information related to drugs and other

Table 2: Baseline clinical characteristics of study subjects

Characteristic	Control group (n=15)	Intervention group (n=15)	p
Fasting blood glucose (mg/dL)	174.53 ± 58.94	164.60 ± 48.01	0.561 ^a
2 h postprandial blood glucose (mg/dL)	255.00 ± 89.44	263.53 ± 65.39	0.384 ^a
Blood pressure			
Systolic (mmHg)	122.67 ± 11.00	126 ± 6.32	0.432 ^a
Diastolic (mmHg)	77.33 ± 9.61	82.67 ± 5.93	0.129
DM duration (Years)			0.338 ^b
<1	2 (13.33)	4 (26.67)	
1-5	8 (53.33)	6 (40)	
>5	5 (33.33)	5 (33.33)	
Concurrent disease			0.099 ^b
Present	12 (80)	13 (86.67)	
Absent	3 (20)	2 (13.33)	
Total antidiabetic oral (Types)			0.830 ^b
1	1 (6.67)	1 (6.67)	
2	12 (80)	13 (86.67)	
3	2 (13.33)	1 (6.67)	
Drug usage			0.690 ^b
Appropriate	10 (66.67)	11 (73.33)	
Inappropriate	5 (33.33)	4 (26.67)	
Other drug prescribed			0.666 ^b
Yes	11 (73.33)	12 (80)	
No	4 (26.67)	3 (20)	
Side effects			0.690 ^b
Yes	4 (26.67)	5 (33.33)	
No	10 (66.67)	9 (60)	

Data presented as n (%) or average±standard deviation. ^aMann-Whitney test, ^bPearson's Chi-squared test, DM: Diabetes mellitus

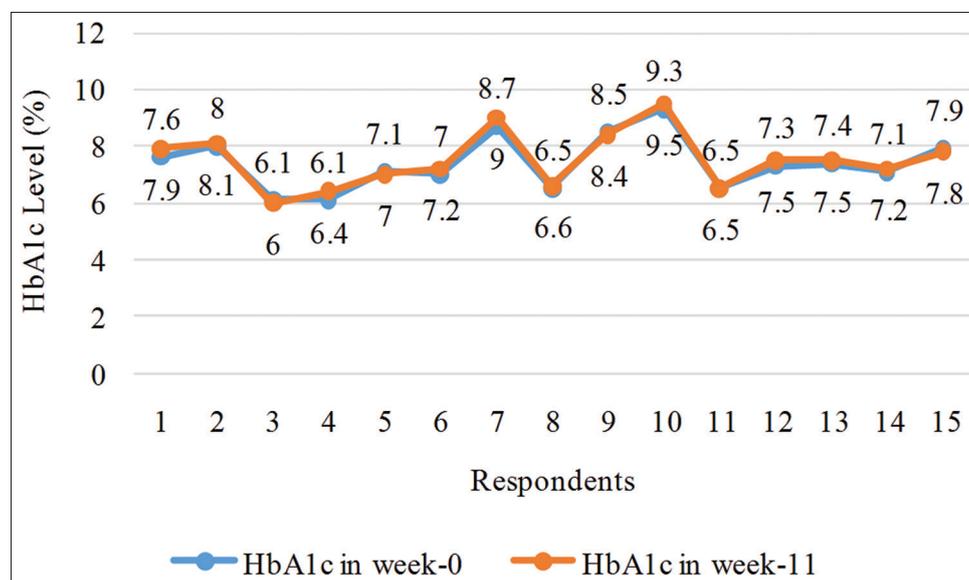


Fig. 2: Pre- and post-intervention hemoglobin A1c level of individual patients in the control group

aspects of treatment boosts self-efficacy and improves quality of life and BMI of diabetic patients [23]. However, the education material should be tailored according to the patients' condition.

Therefore, drug information and booklet are effective interventions to increase patient adherence. Suppapatiporn *et al.* found that pharmacist consultation during each visit can increase the effectiveness of blood glucose control program [24]. As against random blood glucose test, HbA1c levels are not affected by short-term changes in blood glucose levels caused by eating, exercise, or intake of medicines. The average HbA1c level among patients in Kembangan Health Center

was categorized as quite good (7.40% and 8.05% in the control and intervention groups, respectively). This may reflect the role played by the pharmacist at the Kembangan Healthcare Center in West Jakarta during the monthly consultation program. However, another study should be performed with a larger sample size that represents the total population of type 2 DM patients treated at the Kembangan Health Center in West Jakarta. Further research should be conducted to compare the effectiveness of education media by providing drug information and booklet along with other educational media to increase patient adherence.

CONCLUSION

A booklet can play a key role in improving treatment compliance among patients with type 2 DM. Provision of drug information and booklet were found effective in decreasing HbA1c level from 8.05±0.91 to 6.92±0.47 with delta HbA1c 1.13±0.62 and helped to increase the treatment adherence among patients with type 2 DM at the Kembangan Health Center, West Jakarta. Therefore, drug information and booklet are effective interventions to increase patients' adherence.

Table 3: The average difference between HbA1c levels at week 0 and week 11 in each study group

Group	Average±SD (%)		Delta	p
	Week-0	Week-11		
Control (n=15)	7.40±0.96	7.50±0.97	-0.1±0.01	0.653 ^a
Intervention (n=15)	8.05±0.91	6.92±0.47	1.13±0.62	0.000 ^a

SD: Standard deviation ^aPaired t-test

Table 4: Average HbA1c level in control group at week 0 and week 11 according to the level of glycemic control

HbA1c level	Week 0		Week 11		Delta
	Average±SD	n (%)	Average±SD	n (%)	
Controlled (≤7)	6.375±0.18	4 (26.66)	6.5±0.36	5 (33.33)	
Uncontrolled (>7)	7.90±0.77	11 (73.33)	8.01±0.76	10 (63.33)	
Decreased				6 (40)	
Consistent				3 (20)	
Increased				6 (40)	
Total	7.49±0.96	15 (100)	7.50±0.97	15 (100)	-0.01

HbA1c: Hemoglobin A1c, SD: Standard deviation

Table 5: Average HbA1c level in intervention group at week 0 and week 11 according to the level of glycemic control

HbA1c level	Week 0		Week 11		Delta
	Average±SD	n (%)	Average±SD	n (%)	
Controlled (≤7)	6.63±0.35	3 (20)	6.48±0.26	7 (46.66)	
Uncontrolled (>7)	8.40±0.40	12 (80)	7.3±0.17	8 (53.33)	
Decreased				14 (93.33)	
Consistent				1 (6.67)	
Increased				-	
Total	8.05±0.91		6.92±0.47		1.13

HbA1c: Hemoglobin A1c, SD: Standard deviation

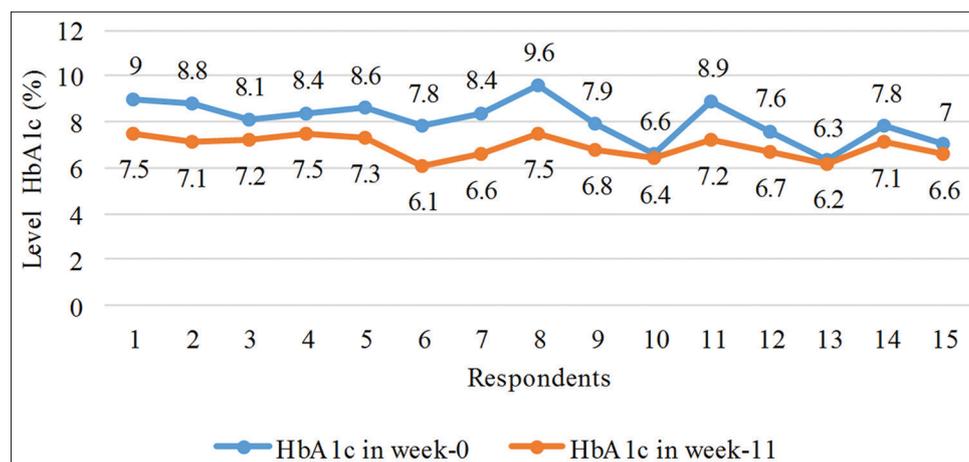


Fig. 3: Pre- and post-intervention hemoglobin A1c levels of individual patients in the intervention group

CONFLICTS OF INTEREST

The authors declare that there are no conflicts of interest in this study.

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