

Original Article

## THE INFLUENCE OF EDUCATION OF DRUG INFORMATION BY PHARMACIST ON THE IMPROVEMENT OF KNOWLEDGE AND THERAPEUTIC TARGET TO TYPE 2 DIABETES MELLITUS OUTPATIENTS IN HOSPITAL

PUJI ASMINI

Department of Pharmacology and Clinical Pharmacy in the Faculty of Pharmacy, Universitas Muhammadiyah Surakarta, Solo, Indonesia  
Email: pujiasmini@ums.ac.id

Received: 25 Jun 2016 Revised and Accepted: 30 Jan 2017

### ABSTRACT

**Objective:** The study aims to determine the influence of education of drug information by the pharmacist on the improvement of knowledge and therapeutic target to type 2 diabetes mellitus outpatients in Dr. Moewardi Surakarta Hospital.

**Methods:** The research used the quasi-experimental method, repeated measure experiment design, pre-posttest design with the prospective patient data retrieval. 90 patients with type 2 diabetes mellitus were used as the subjects of the research divided into three groups (two test groups and one control group). In the test1 group, patients were educated about the drug information through leaflets and through oral explanation, the test 2 group through leaflets, and a control group through leaflets once at the beginning of the study. The study lasted for three months in which in every month fasting blood glucose levels (FBG) and blood glucose levels were analyzed within two hours after a meal (BG2PP) and given questionnaires knowledge to see the socio-demographic profile, knowledge, and blood glucose level of the patient. The data analysis used the statistical package for social sciences (SPSS) version 16 in the form of analysis Kolmogorov-Smirnov test and one-way anova test.

**Results:** The results showed that the education of the drug information by a pharmacist using leaflets and oral explanation in the test1 group was able to improve knowledge of type 2 diabetes mellitus outpatients in Dr. Moewardi Surakarta Hospital, in comparison to the leaflets giving information only to the test 2 group and control group. The education of drug information on the test 1 group was able to improve the patients' knowledge reaching 100%. Type 2 diabetes outpatients in the test 1 group could achieve a reduction in blood sugar levels, to the FBG level (136.47±36.08) mg/dl and BG2PP levels (193.43±58.21) mg/dl.

**Conclusion:** The education of drug information from the pharmacist had the influence to improves the knowledge and therapeutic target of type 2 diabetes mellitus outpatients in Dr. Moewardi Surakarta Hospital.

**Keywords:** Pharmacist education, Diabetes mellitus, Knowledge, Therapeutic targets

© 2016 The Authors. Published by Innovare Academic Sciences Pvt Ltd. This is an open access article under the CC BY license (<http://creativecommons.org/licenses/by/4.0/>)  
DOI: <http://dx.doi.org/10.22159/ijpps.2017v9i3.13682>

### INTRODUCTION

Diabetes is justly recognized as an emerging global epidemic, representing one of leading cause of morbidity and mortality worldwide [1]. The prevalence of diabetes mellitus in Indonesia in 2013 was 6.9 % of the total population, consist of 29.9% impair glucose tolerance and 36.6% impair fasting glycaemia [2]. Diabetes is a chronic illness that requires continuing medical care and patient self-management education to prevent acute complications and to reduce the risk of long-term complications. Diabetic care is complex and requires that many issues, beyond glycaemic control, be addressed. Type 2 diabetes is frequently not diagnosed until complications appear, and approximately one-third of all people with diabetes may be undiagnosed. The incidence of type 2 diabetes in children and adolescents has increased dramatically in the last decade [3].

Diabetes patient education has long been recognised as a vital and integral component of successful diabetes care. However, complex and daily requirements such as medication taking and adjustment, self-monitoring of blood glucose, foot care, dietary modification and attendance for regular medical care place a psychological and financial burden on people with diabetes. Diabetes patient education for people with type 2 diabetes improves their knowledge and understanding [4]. Education involves enhancing skills and knowledge in order to bring about changes in related attitudes and behaviours [5]. Pharmacist are often called upon to provide education to patients and other health care providers about medications. Pharmacist process to improve continuity of care, outcomes, and outcome measures [6]. Patient education has been found to contribute to improving self-care and metabolic control of

patients with diabetes. A system such therapeutic outcome monitoring is a way for providing pharmaceutical care in an ambulatory setting that emphasize the role of the pharmacist in addressing a major cause of preventable drug-related morbidity [7]. In 2011, diabetes mellitus was in the fifth rank in the top 10 disease hospitalisation in Dr. Moewardi Surakarta Hospital. The data of diabetic patients in 2013 showed that there were 70 people per day. The patients were with a routine control and some are able to reach therapeutic targets, and some cannot reach therapeutic targets [8].

### MATERIALS AND METHODS

The research used a quasi-experimental study. The research has been approved by Medical and Health Research Ethics Committee (MHRC) Faculty of Medicine Gadjah Mada University-Dr Sardjito General Hospital. The design study was a repeated measure pre-posttest design involving three groups and conducting a series of tests on the test groups or the control group; both before and after the tests. The research was conducted on three groups. The groups comprised of test 1 group, test 2 group, and control group. Intervention given to the first group was about the education of drug information by pharmacists using leaflets and oral as the test 1 group. While other intervention were given in the test 2 group by using leaflet three times at the following study, and in the control group only using leaflet at the beginning study. This research was conducted in the outpatient pharmacy installation at Dr. Moewardi Hospital on June-August 2014. The subjects of this study were all patients diagnosed with type 2 diabetes mellitus with or without comorbidities illness, and routine visit once in a month. The instrument used in this study was a questionnaire of knowledge gained from a journal entitled "Evaluation of The Patient's Antidiabetic

Medication Counselling provided by Pharmacists in a Tertiary Health Care Setting in Nigeria [9]. The research observed the characteristics of socio-demographic and knowledge of drugs patient (information on which sources of drug information where patient purchased medicines, patients' knowledge of diabetes medicine's name, the goal of therapy, dosage/frequency therapy, side effects, duration of therapy, and patients's adherence).

The data analysis was presented in tables or diagrams and calculated the frequency and percentage of diabetic patients by sex, marital status, age, education level, occupation, duration of diabetes, and complication disease. The analysis of data on knowledge used the Statistical Package for Social Sciences (SPSS) version 16.0 and on patient knowledge, it used a 2-point likert scale, yes scored 2, no scored 1 and no response scored 0. The knowledge of diabetes mellitus drug measured from answers to questions on the questionnaire knowledge no. 4, 5, 6, and 7. An appropriate research was obtained by Onkoro *et al.* [9] included whether patients with type 2 diabetes know the name of the medicine, and the reason why taking medicine, the dosage or frequency of medicine's administration, and common side effects of the medicine. The level of knowledge of drugs was judged into two categories: know and do not know. The measurement was obtained from the answers to the questionnaire knowledge no. 4, 5, 6, 7, 8, and 9. Each answer of yes scored 2, no scored 1, and did not respond scored 0. The accumulated score was divided into categories into know and do not know. Patients with the category know is those obtaining a score of  $\geq 11$ , and the ones with the category do not know were those obtaining a score of  $< 11$ . The number of patients was categorized

into two aspects: know and do not know, numbered. Here, the statistical analysis used Kolmogorov-smirnov test to observe the differences in knowledge between groups in pre-post research. Data of blood sugar levels within 3 mo of the study, consisting of fasting blood sugar levels and two hours after eating were ratio scale, were analyzed using one-way anova test to see the differences in blood sugar levels between the groups.

## RESULTS

Knowledge questionnaire provided information about the characteristics of the subjects and the level of patients' knowledge about drugs. The study involved 90 type 2 diabetes mellitus outpatients and their demographic (table 1). This research was obtained from the mean age of our participants in the control group was 56.36 y old, test 1 group was 57.00 y old, and test 2 group was 58.13 y old. It was observed that most participants was female (60% in the control group, 46.7% in the test 1 group, 53.3% in the test 2 group), their most patient's occupation was a housewife (36.7% in all groups), and educated below senior high school (30% in the control group, 46.7% in the test 1 group, 56.7% in the test 2 group).

Table 1 also showed that most of the patients were married (90% in the control group and test 2 group, 100% in the test 1 group), overweight (40% in the control group, 30% in the test 1 group, 46.7% in the test 2 group), and having comorbidities illness (93.3% in the control group, 80% in the test 1 group, 83.3% in the test 2 group). Our subjects have been diagnosed with type 2 diabetes mellitus for more than 4 y. Patients also had co-morbidities illness, 93.3% in the control group, 80% in the test 1 group, and 83.3% in the test 2 group.

**Table 1: Demographic characteristic of subjects (n=90)**

No	Characteristic	Control (N=30)	Test group 1 (N=30) 2 (N=30)		Significance P
		n (%)	n (%)	n (%)	
1	Gender				*0.996
	Male	12 (40.0)	16 (53.3)	14 (46.7)	
	Female	18 (60.0%)	14 (46.7)	16 (53.3)	
	Age (years)				*0.223
40-49	4 (13.3)	3 (10.0)	2 (6.7)		
	50-59	17 (56.7)	16 (53.3)	15 (50.0)	
	60-65	9 (30.0)	11 (36.7)	13 (43.3)	
	mean $\pm$ SD	56,36 $\pm$ 5,85	57,00 $\pm$ 5,89	58,13 $\pm$ 4,98	*0.498
3	Duration of diabetes (years), mean $\pm$ SD	5.48 $\pm$ 3.8	4.73 $\pm$ 3.7	4.50 $\pm$ 2.29	
4	Employment status				*0.321
	Civil servant	6 (20.0)	3 (10.0)	6 (20.0)	
	Retired	7 (23.3)	8 (26.7)	11 (36.7)	
	Employee	3 (10.0)	3 (10.0)	1 (3.3)	
	Bussinesman	3 (10.0)	1 (3.3)	0 (0.0)	
	Trader	0 (0.0)	1 (3.3)	1 (3.3)	
	Farmer	0 (0.0)	1 (3.3)	0 (0.0)	
	Housewife	11 (36.7)	11 (36.7)	11 (36.7)	
5	Education status				*0.223
	Up to senior high school	6 (20.0)	6 (20.0)	7 (23.3)	
	Senior high school	15 (50.0)	8 (26.7)	6 (20.0)	
	Below to senior high school	9 (30.0)	14 (46.7)	17 (56.7)	
6	Marital status				*0.261
	Married	27 (90.0)	30 (100.0)	27 (90.0)	
	Single	0 (0.0)	0 (0.0)	1 (3.3)	
	Widow/er	3 (10.0)	0 (0.0)	2 (6.7)	
7	Body mass index				*0.287
	Underweight (<18,5)	1 (3.3)	0 (0.0)	0 (0.0)	
	Ideal (18,5-22,9)	8 (26.7)	5 (16.7)	5 (16.7)	
	In risk (23.0-24,9)	8 (26.7)	13 (43.3)	8 (26.7)	
	Overweight (25,0-29,9)	12 (40.0)	9 (30.0)	14 (46.7)	
	Obese (>30)	1 (3.3)	3 (10.0)	1 (3.3)	
8	Comorbidity				
	Yes	28 (93.3)	24 (80.0)	25 (83.3)	
	No	2 (6.7)	6 (20.0)	5 (16.7)	

\*p<0.005–significant, SD: standard deviation

In this research, our subject had diabetes comorbidities. In this research, patients diagnosed comorbid of type 2 diabetes mellitus with hypertension ( $\geq 20\%$ ) and neuropathy ( $\geq 20\%$ ). Following hypertension and neuropathy, dyslipidemia was also suffered by type 2 diabetes mellitus outpatients at 3.3%–16.67 %.

**Table 2: Type of diabetes comorbidity**

Disease	Control (N=30) n (%)	Test 1 (N=30) n (%)	Test 2 (N=30) n (%)
Hypertension	8(26,7)	6(20,0)	8 (26,7)
Dyslipidemia	5(16,7)	5(16,7)	1(3,3)
Neuropathy	6(20,0)	6(20,0)	10(33,3)

In table 3 showed that one of the most widely prescribed drugs was anti-hypertensive drugs, particularly angiotensin receptor blocker class (43.3%). While neurotropic prescribed 80%.

In tabel 4, 100% of patients with type 2 diabetes obtained metformin, as the first drug of choice for treatment of diabetes mellitus type 2,

followed by acarbose (72%) and gliquidone (64%). Rapid insulin acting was prescribed at 61.1 %. In table 5, it was found that the largest percentage as a source of information medication, were physicians at 84.4%, followed by the pharmacist/pharmacist assistant with 3.3%, medical sales 2.2%, and no receiving information 9.9%.

**Table 3: The use of drug use for comorbidity of type 2 diabetes**

Drug	Control (N=30) N	Test1 (N=30) N	Test2 (N=30) N	Total (N=90) n (%)
Antihypertensive drug				39 (43.3)
ARB	15	9	15	
CCB	13	10	13	36 (40.0)
ACE-I	4	5	4	13 (14.4)
Diuretic	5	5	5	15 (16.7)
β Blocker	1	11	1	13(14.4)
Neurotropic	27	26	27	80 (88.9)
NSAID	12	9	12	33 (36.7)
Statin	9	6	9	24 (26.7)
Dopamine Antagonist	2	4	2	8 (8.9)
Nitrate	2	1	2	5 (5.5)
Antihistamine	3	2	3	8 (8.9)
Fibrate	2	1	2	5 (5.5)

ARB: Angiotensin receptor blocker, CCB: Calcium channel blocker, ACE-I: Angiotensin converting enzyme inhibitor, NSAID: Non-steroidal inflammatory drugs

**Table 4: Antidiabetic oral and injection**

Name of drug	Subject			
	Control (n=30)	Test 1 (n=30)	Test 2 (n=30)	Total (N=90) n (%)
Metformin	31	30	29	90 (100.0)
Acarbose	24	25	23	72 (80.0)
Gliquidone	22	20	22	64 (71.1)
Glimepirid	8	7	6	21 (23.3)
Pioglitazone	3	3	3	9 (10.0)
Rapid acting insulin	16	18	21	55 (61.1)
Long actinginsulin	3	7	6	16 (17.8)
Intermediate acting	3	3	3	9 (10.0)

**Table 5: Patient source for anti-diabetic information**

Question source	Total (N=90) n (%)
Who provide drug information?	
None	4 (4.4)
Physicians	76 (84.4)
Pharmacist/Pharmacist assistant	3 (3.3)
Medical Sales	2 (2.2)

Knowledge of type 2 diabetic mellitus outpatients at the beginning of the study is presented in table 6 including:

1. Knowledge of test 1 group, patients, understand on the purpose of drug, and the dose/frequency reached  $\geq 80\%$ , while they only understand on the side effects of drugs 50%.
2. Knowledge of control and test 2 group, patients, understand on the name of the drug, the purpose of treatment, and the dose/frequency reached  $\geq 90\%$ , while the patients who only understand the side effects of drug was still low (60%)
3. It was only 70% of patients in the test 1 group who know about the name of the drugs, otherwise 90 % in the control group and 83.3 % in the test 2 group.

In table 7, the influence of drug information education was analyzed by statistical analysis of the level of knowledge among groups of patients after intervention by using the Kolmogorov-Smirnov obtained by value  $p = 0.100$ . it can be concluded that there was no any significant difference between groups before and after the education of the drug information pharmacist ( $p > 0.05$ ). Based on the distribution of patient in each group, the test 1 group, show improvement knowledge from 56.7% up to 100%. Otherwise in the control group was only up 70% to 100% and in the test 2 group was only up 70 % to 90 %.

Blood glucose levels were obtained every month containing the fasting blood glucose levels (FBG) and blood glucose levels within two hours after a meal (BG2PP). In table 8, showed that the education of drug information from the pharmacist in the test 1

groups can help patients with diabetes achieve better therapeutic outcomes rather than test 2 group and the control group. BG2PP and FBG level's patients in the test group 1 decreased significantly. Blood glucose level in type 2 diabetes outpatient in the test 1 group had a significant decrease in the fasting blood glucose from 177,27±68,86 drop to 136,47±36,08 (mg/dl) and blood glucose within 2 h after meal, 256,47±102,82 drop to 193,43±58,21 (mg/dl). While the level

of FBG and BG2PP in the test 2 group and control were only decreased slightly. The statistical analysis of the blood sugar glucose levels of patients between groups after being given intervention by using one-way ANOVA showed the value  $p = 0.404$  for FBG = 0.694 for BG2PP. Here, it can be concluded that there was no significant difference in blood glucose levels between groups before and after the education of drug information pharmacist.

Table 6: Knowledge on anti-diabetic's drug

Knowledge	Control (N=30)		Test 1 (N=30)		Test 2 (N=30)	
	Yes n (%)	No n (%)	Yes n (%)	No n (%)	Yes n (%)	No n (%)
Name of anti-diabetic	27(90.0)	3(10.0)	21(70.0)	9(30.0)	25(83.3)	5 (16.7)
Purpose of medication	29(96.7)	1(3.3)	26(86.7)	4(13.3)	30(100.0)	0 (0.0)
Dosage or frequency	29(96.7)	1(3.3)	24(80.0)	6(20.0)	28(93.3)	2 (6,7)
Side effect	18(60.0)	12(40.0)	15(50.0)	15(50.0)	18(60.0)	12(40.0)

Table 7: The effect of drug information education to patient's knowledge

Description/Phase	Control (N=30)	Test 1 (N=30)	Test 2 (N=30)	Significance P
1. Understand	Understand n (%)	Understand n (%)	Understand n (%)	0.100**
Baseline	21(70.0)	17(56.7)	21(70.0)	
Final follow up (after 3 mo)	30(100.0)	30(100.0)	27(90.0)	
2. Not understand	Not Understand n (%)	Not Understand n (%)	Not Understand n (%)	
Baseline	9(30.0)	13(43.3)	9(30.0)	
Final follow up (after 3 mo)	0(0.0)	0(0.0)	3(10.0)	

\*\*p<0.05 highly significant

Table 8: Blood glucose levels

Characteristic	Control group	Test 1	Test 2	P
	n = 30	n = 30	n = 30	
FBGbaseline, mean±SD (mg/dl)	176,83±71,86	177,27±68,86	172,73±73,72	
FBG final follow up (after 3 mo), mean±SD (mg/dl)	195,20±79,06	136,47±36,08	182,33±78,00	** 0,404
BG2PPbaseline, mean±SD (mg/dl)	245,80±103,08	256,47±102,82	245,13±89,28	** 0,694
BG2PP final follow up (after 3 mo), mean±SD (mg/dl)	246,27±101,98	193,43±58,21	243,00±97,74	

p<0.005-significant, SD: Standard deviation

## DISCUSSION

In this study, we demonstrated that type 2 diabetic outpatients had characteristic had a linear data with some previous studies. There was no statistically significant difference in all characteristic subjects among the groups ( $p>0.05$ ). In this research obtained data that type 2 diabetes mellitus outpatients had mean of age was at age 56,36±5,85 y old in the control group, 57,00±5,89 y old in the test 1 group, and 58,13±4,98 y old in the test 2 group. Duration of diabetes mellitus was in 5.48±3.8 y in control group, 4.73±3.7 y in the test 1 group, and 4.50±2.29 y in the test 2 group. Education status also showed that below senior high school (primary school and below) was prominent education among the subject about 30% in the control group, 46.7 % in the test 1 group, and 56.7% in the test 2 group. This observation was found to be similar made by Renuga *et al.* [10]. The mean age of test group 57±9.878 and control group was 57±9.438; the mean duration of diabetes mellitus in the control group 5.79±3.5 y; and the most education level of patients was 64% had done primary high school and below in control group and 51.5 % in the test group [10]. In our research obtained that most of type 2 diabetes outpatient had employed as a housewife at 36,7 % in all groups. A similar study Ramesh *et al.* [11] had observed that an occupation of subjects was mostly housewife at 37.4%. This research found that the most participant was overweight at 40 % in the control group, 30 % in the test 1 group, and 46.7 % in the test 2 group. Marhanis *et al.* [12] had observed that most participants was overweight (43.5%). In this research also showed that type 2 diabetes outpatients had diagnosed with complication at 93.3% in the control group, 80% in the test 1 group, and 83.3% in the test 2

group. It is supported by previous studies, by Sesilia *et al.* [13] showed that type 2 diagnosed with complication at 79.75%.

Based on this research, the most of comorbid disease to diabetes mellitus are hypertension at 26.7% in the control group, 20% in the test 1 group, and 26.7% in the test 2 group. Followed by neuropathy and dyslipidemia. Sharad *et al.* [14] had observed that most of the subject had hypertension as comorbid illness (38.12%) at most. Diabetic complication are the challenges associated with diabetes in the form of micro, and macrovascular complication includes retinopathy, nephropathy and neuropathy whereas macrovascular complication includes coronary artery disease, peripheral vascular disease, and cerebrovascular events [15]. Type 2 diabetes and hypertension are commonly co-occurring conditions, approximately 70% of patients with type 2 diabetes are diagnosed with hypertension. Both conditions gradually damage vascular system, and when left unmanaged can result in debilitating long-term complication including cardiovascular disease, neuropathy, kidney damage, and retinopathy [16].

Antihypertension drugs prescribed in this research are angiotensin receptor blocker class (ARB) 43.3%, calcium channel blockers (CCB) 40%, diuretic 16.7 %,  $\beta$ -blocker 14.4 %, and angiotension converting enzyme (ACE) inhibitors 14.4%. Initial hypertension therapy with diabetes may be with ACE inhibitors, ARB,  $\beta$ -blocker, or diuretics. Particularly, ACE inhibitors and ARBs are considered first-line therapy for the prevention of and progression of nephropathy (ADA). In line with Supratim *et al.* [17] showed (ACE) inhibitors and ARB's were prescribed in 45% patients with diabetes and 21% in

diabetes associated nephropathy. CCB's was prescribed in 60% patients with diabetes and 95% in diabetes associated nephropathy.

The research found that the 100% type 2 diabetes mellitus patients were prescribed metformin. Similar with Yasser *et al.* [18] obtained that metformin monotherapy are effective as an initial treatment of newly diagnosed diabetic patients, in the national diabetic center/University of Al Mustansiriyah, Iraqi. Metformin had a significant reduction effect on three groups, had a significant reduction in HbA1C and also a significant reduction in cytokines in three dose in different percent. Besides metformin, acarbose was used for patients with type 2 diabetes those were for 72 people (80 %). In type 2 diabetic patients, acarbose should be the preferred monotherapy for early disease stages with high postprandial blood glucose levels to enable patients to benefit from its pronounced effect on postprandial blood glucose [9]. In advanced type 2 diabetes, acarbose can be combined with all other antidiabetic agents and has favorable effects on the side effects of other drugs, such as body weight increase or hypoglycemic episodes. Antidiabetic therapies with a strong impact on fasting blood glucose should be preferred in combination [19]. Insulin therapy is indicated in the treatment of type 2 diabetes for initial therapy of severe hyperglycemia, after the failure of oral agents, or during perioperative or other acute hyperglycemic states [20]. As indicated by haghghatpanah *et al.* [21] intensive glycemic control by insulin therapy may help to delay or prevent the progression of diabetic macrovascular and microvascular. The correct dosage of insulin could lower HbA1C levels to reach therapeutic targets. The combination with insulin is the most potent treatment for lowering blood glucose levels.

Clear and accurate information related to the use of medication could be obtained from health professionals, capable of improving knowledge in therapy. In this research, showed that type 2 diabetic outpatients obtained the drug information from a physician at 76%. Ashry *et al.* [22] also obtained that physician was the most common source of medication information.

The most knowledge of patient is the purpose of medication. This research was linear with research conducted by Ramesh *et al.* [11], showed that 76.2 % patient know the reason to take medication. Otherwise, the lowest knowledge of the patient was a side effect of medicine. In this research, the patient's knowledge level was only low in the knowledge of side effects. After being given an explanation at the beginning of the meeting, the patient understands about the drug name, the reason for taking the drug, dose or frequency, side effects of medication, and forget to take medication. It is related to Gad *et al.* [22] observed that patient did not receive a medication's instructions from a physician about 78.5%; otherwise, physicians provide instruction's medication about the name of the medication (70.5%), dosage (80.3%), and duration of each medication intake (82.9%). In our study, the education of drug information by pharmacist could improve knowledge about drug's name, target, dose/frequency, and side effects. In the end of the study, type 2 diabetic outpatient understood the knowledge of the drug at 90%-100%.

The influence of drug information education to knowledge enhancement was analyzed by statistical analysis showed that there was no any significant difference between groups before and after education of the medication information pharmacist ( $p>0.05$ ), but based on amount of patient in each group, the test 1 group, show improvement knowledge from 56.7% up to 100% (table 7). This is consistent with the previous studies by Renuga *et al.* [10] on the last follow-up, the knowledge, attitude, and practice's score was increased for both the groups but the improvement was significantly higher for the intervention group patients when compared to the control group due to continuous patient counselling.

In table 8, it can be concluded that the education of drug information from the pharmacist in the test 1 groups can help patients with diabetes achieve better therapeutic outcomes rather than the test 2 group and the control group. BG2PP and FBG level's patients in the test group 1 decreased significantly. Although, the statistical analysis of the blood sugar glucose levels of patients between groups after being given intervention by using one-way anova concluded that

there was no significant difference in blood glucose levels between groups before and after the education of a drug information by the pharmacist ( $p>0.05$ ). Base on decreasing level of blood glucose in each group, patient in the test 1 group show a significant decrease in the fasting blood glucose from 177,27±68,86 to 177,27±68,86 (mg/dl) and blood glucose within 2 h after meal, 256,47±102,82 to 193,43±58,21 (mg/dl). A similar study was conducted by Ramesh *et al.* [11] assessed improvement in the capillary blood glucose (CBG) level after the patient education. The significant improvement seen in the test group due to the practice the recommended lifestyle modification and self-management strategies.

## CONCLUSION

Based on the research, there was a significant influence of drug information education by a pharmacist to type2 diabetes mellitus outpatients in Dr. Moewardi Surakarta Hospital. The education could improve knowledge and achieve the therapeutic targets in the test 1 group, which was given the drug information using the media of leaflets and oral education by a pharmacist. The influence of education of drug information in the test 1 group could improve patients' knowledge by 100 % and achieved a therapeutic outcome. Outcome of therapy in the test 1 group decreased, either on the fasting blood glucose (FBG) or in blood sugar 2 h after a meal (BG2PP), with the initial levels of FBG (177.27±68.86) mg/dl; BG2PP (256.47±102.82) mg/dl, decreased to FBG (136.47±36.08) mg/dl; BG2PP levels (193.43±58.21) mg/dl

## CONFLICT OF INTERESTS

Declared none

## REFERENCES

1. Konstatenos P, Marciej B, Michael E, Nikolas P, Dimitrios P. Complication of diabetes. *J Diabetes Res* 2015;1-5. <http://dx.doi.org/10.1155/2015/189525>
2. Anon. Diabetes study and analysis. Data and Information Center of Indonesian Ministry of Health; 2014. p. 2-4.
3. Anon. Standards of medical care in diabetes. *Diabetes Care* 2005;28 Supp 1:4-36.
4. Colagiuri R, Griffith R. National evidence-based guideline for patient education in type 2 diabetes The University of Sydney: Commonwealth of Australia; 2009.
5. Melanie JR. The pharmacist is talking with patients, a guide to patient counselling. British Columbia: William and Wilkins Waverly Company; 1997. p. 105-6.
6. Patricia A, Richard C, Ken H, Jeannell M, Darryl R. The pharmacist's role patient safety. Illinois: Department of Publication Joint Commission Resources; 2007. p. 1-17.
7. Andrew LW. Managing the patient with type II diabetes. Maryland: Aspen Publishers, Inc; 1997. p. 45-7.
8. Anon. Dr Moewardi Surakarta annual report in 2013. Data and Information Center of Dr Moewardi Surakarta Hospital; 2014. p. 3-7.
9. Okoro RN, Ngong CK. Evaluation of patient's antidiabetic medication counseling provided by a pharmacist in a tertiary health care setting in Nigeria. *Int Res J Pharm* 2012;3:319-23.
10. Renuga E, Ramakrisnan SR, Vanitha RN, Thennasrasu P, Kannan G. Impact of continuous patient counselling on knowledge, attitude, and practice and medication adherence of diabetic patients attending outpatient pharmacy services. *Asian J Pharm Clin Res* 2016;9:364-9.
11. Ramesh A, Somashekar MA. Influence of structured patient education on therapeutic outcomes in diabetes and hypertensive patients. *Asian J Pharm Clin Res* 2010;3:174-8.
12. Marhanis SO, Kong LS. Diabetes knowledge and medication adherence among geriatric patient with type 2 diabetes mellitus. *Int J Pharm Sci* 2014;6:103-6.
13. Sesilia AK, Devi M. Antidiabetic drug use evaluation and drug-related problems (DRPs) in type 2 diabetes mellitus outpatient at Jakarta Hospital (abstract for II-Indonesian Conference on Clinical Pharmacy). *Asian J Pharm Clin Res* 2016;9:1-8.
14. Sharad T, Jayesh KR, Kajor S. Assesmet of the quality of life in patients of type 2 diabetes using the diabetes-39 questionnaire. *Innovare J Health Sci* 2016;4:3-5.

15. Deepraj P, Karthika P. Diabetes mellitus and its complications: a review. *Int J Curr Pharm Res* 2012;4:12-7.
16. Cara D, Erinmacpherson, Julie R. Effectiveness of telephone-delivered interventions for increasing physical activity levels in persons with type 2 diabetes or hypertension: a systematic review. *J Crit Rev* 2015;2:6-11.
17. Supratim DALU. Antihypertensive drug use in patients having comorbid diabetes: cross-sectional prescription pattern study in a tertiary care hospital. *Asian J Pharm Clin Res* 2010;3:43-5.
18. Yasser MK, Abbas MR, Saba HM. The effect of metformin on cytokines in Iraqi patients with type 2 Diabetes. *Innovare J Medical Sci* 2013;1:4-10.
19. Cristop R, Gabriele M. Critical evaluation of the role of acarbose in the treatment of diabetes: patient consideration. *Dovepress J* 2012;5:357-67.
20. Richard JM, Michael LA. Type 2 diabetes mellitus: update on diagnosis, pathophysiology, and treatment. *JCE and M* 2009;8:1165-71.
21. Mohamad H, Grish T, Ateendra J, Surulivelrajan M. Study on prescribing pattern of anti-diabetic drugs among type 2 diabetes patients with complication in South Indian Teaching Hospital. *Asian J Pharm Clin Res* 2016;9:194-7.
22. Ashry G, Saud A, Mohammed S, Ali A, Azzam A, Meshari A, *et al.* Physicians's instructions to patients regarding medications in Saudi University Hospital. *Sci Res* 2015;7:1441-7.

**How to cite this article**

- Puji Asmini. The influence of education of drug information by the pharmacist on the improvement of knowledge and therapeutic target to type 2 diabetes mellitus outpatients in the hospital. *Int J Pharm Pharm Sci* 2017;9(3):199-204.