The Efficacy of Follow-up Phone Calls for Capillary Blood Glucose Lowering in Diabetic Patients in Primary Care Unit

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ABSTRACT

Objective: To study the effect of telephone call intervention on glycemic control in diabetic patients for 2 months

Materials and Methods: The quasi-experimental research included 130 Patients from January 2020 to March 2020 in primary care. The 115 patients were divided into 2 groups through a simple randomization process, 61 in experimental group and 54 in control group after exclusion. 115 Patients will be tested for Capillary blood glucose (CBG) level at a period of 0-month, 1-month and 2-months. CBG level were presented in mean ± SD, mean difference ± SD and analyzed by Independent t-test and Paired t-test.

Results: The phone call intervention can lower CBG level compared to the control group. Mean difference of CBG between 0 month and 2 months follow-up in phone calls group vs control group (-6.80 ± 4.86 vs -2.96 ± 4.82 mg/dL) and mean difference CBG level between 1 month and 2 months follow-up in phone calls group vs control group (-5.77 ± 4.09 vs -4.22 ± 5.10 mg/dL) but had no significant difference (p >0.05)

Conclusion: The follow-up phone calls can lower CBG level in the experimental group more than the control group, but there is no significant difference.

Keywords: Diabetes mellitus type 2; phone call; glycemic control (Siriraj Med J 2021; 73: 801-807)

INTRODUCTION

It is expected that Thailand will completely enter an aging society by 2022, and elderly people will account for 20 percent of all Thai population.[1] Non-communicable diseases (NCDs), such as diabetes and hypertension, would be an inevitable case for an aging society. Diabetes[2] is a condition that impairs the body cell's ability to convert sugar to energy which will be stored at liver, muscle and fat. These cause high blood sugar levels. Diabetes is currently a crucial non-communicable disease, and The World Health Organization (WHO) attaches great importance to the promotion, prevention and control of disease to avoid complications. In Western Pacific, it was found that there were 162 million patients with diabetes in 2019[3], and Thailand ranked fourth regionally, coming after China, Indonesia and Japan as there were 4.4 million patients with diabetes found in Thailand. According to Health Data Center[4] under the Department of Public Health, it was found that patients having well-controlled diabetes made up for only 28.32 percent (while the target proportion was 40 percent). In Nonthaburi Province, there were 45,457 patients with diabetes whereas only

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12,252 of them had well-controlled diabetes, accounting for 26.95 percent. In Bang Kruai District, there were 4,580 patients with diabetes whereas only 4,232 of them had well-controlled diabetes, accounting for 26.03 percent. In Bang Kruai Health Promoting Hospital, there were 401 patients with diabetes whereas only 100 of them had well-controlled diabetes, accounting for 24.94 percent. Without a good control of a blood sugar level, patients can suffer from the complications and premature death. Comparing to the previous years, it is found that incidence of diabetes increases in a wider age range. Furthermore, according to the data from National Economic and Social Development Board (NESDB) in 2008[5], it was found that in Thailand, for Out Patients Department (OPD), the average medical fee of diabetes was 1,173 Baht per patient whereas for In Department Patients (IPD), the average medical fee was 10,217 Baht per patient. The total average medical fee was 3,984 million Baht per year. Hence, if there are 3 million patients with diabetes receiving medical service from healthcare centers, it will cost 47,596 million Baht per year for medical fees.

Poor-controlled diabetes is caused by many reasons such as patient's lack of knowledge regarding of self-care or lack of awareness in danger and severity of diabetes. By these reasons, it results in discontinuity of medicine taking, missing doctor's appointments and inability to adjust eating or exercising habits, and this can lead to many complications such as chronic kidney disease (CKD), Diabetic Retinopathy (DR), Diabetic Ulcer and Cardiovascular Disease (CVD). These complications could worsen patient's quality of life as well as financial burdens.

Therefore, the researcher recognizes the significance of patient's awareness, and many relevant studies also indicate that many patients with diabetes lack a good understanding of their conditions. The researcher, hence, decides to study about the effect of follow-up phone calls for glycemic control of diabetic patient. Currently, there is an involvement of technology in a medical treatment to enhance its efficiency, and it is found that the majority of people carry mobile phones with them most of the time. This study is conducted to provide guidance in giving care to patients with diabetes and boosting patient's awareness of the disease, and this could encourage patients to adjust their habits and control their sugar blood level better. Furthermore, it could reduce patient's risks of having complications and enhance their living standards. It could also reduce expenses given by patients for receiving medical service and commuting to hospital, given by family to provide care for patients, given by hospitals to treat several different complications, and given by the nation to provide health welfare to patients. Accordingly, the aims of this study to investigate the efficacy of follow-up phone calls for Capillary blood glucose lowering in diabetic patients in primary care setting

MATERIALS AND METHODS

Study design & population

This study is quasi-experimental research with two groups of samples, and there is an application of Pretest-Posttest Design with nonequivalent groups. The samples include 130 patients with diabetes who were 30 years old and older and continually received medical service at Bang Kruai Health Promoting Hospital, Bang Kruai District, Nonthaburi Province between January 2020 and March 2020. The Inclusion Criteria include abilities in understanding Thai language and using phones as well as their voluntariness of consent to research. The Exclusion Criteria are participant's discontinuity in receiving medical treatment according to doctor's appointment, their withdraw from the research and ineligibility. Some participants might be found ineligible later because they fail to meet inclusion criteria, and this could result from participant's mistakes in giving information or researcher's errors.

Study size

Study size was estimate from the study of phone call intervention on glycemic control in diabetes patients.[6] The hypothesis is that patient's HbA1c level decrease by <7%. For the control group, it is 35.7%, while it is 60.9% in the phone call intervention group (p value <0.001), this is a two-sided experiment with type 1 error, significance at 5% and power at 80%. The sample size is calculated to be 122 participants, and 5 percent is calculated added in case of data loss. Therefore, the population was 130 participants divided by simple randomization into 65 participants in each intervention group and a control group.

Measurement and tools

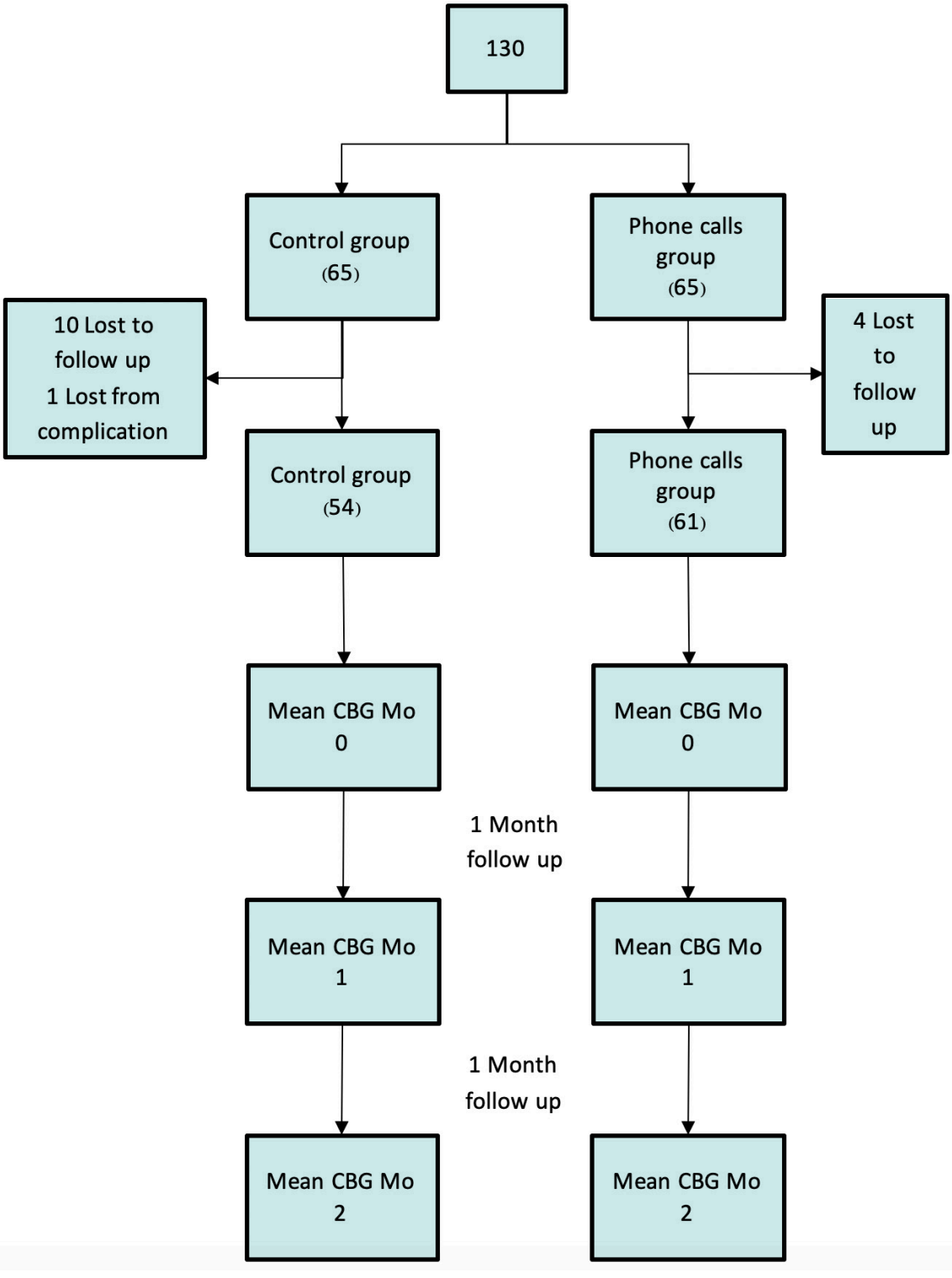
Measurement in this study consisted of a patient's general data record, including gender, age, education level, monthly income, chronic disease, height, weight, and body mass index (BMI), as well as a record of patient's CBG level and blood pressure noted at starting point (which will be referred as the 0 month) then one and two-month after that (or the 1 month and 2 months). This The participants were instructed to fast up to 8 hours before a blood test. This measurement was performed the same in both intervention and control groups.

The intervention group received follow-up phone calls every two weeks, accounting for 4 times across the whole study period. mean CBG of both the phone calls and control groups were assessed and compared at 0-month, 1 month and 2 months.

The follow-up call consists of a procedure for asking about symptoms and details about taking medication.

Primary outcome was mean difference of CBG between 0-month, 1 month and 2 months and **secondary outcomes** were mean CBG at 0-month, 1 month and 2 months, mean systolic and diastolic blood pressure at 0-month, 1 month and 2 months, mean difference of systolic and diastolic blood pressure between 0-month, 1 month and 2 months.

Study Flow



Data analysis

The data are analyzed by statistical analysis software, approved and recorded in a form of file by the following statistical analysis software: Patient's general data are presented in number (percentage), mean ± standard deviation, median (inter quartile range), and the data are analyzed by Chi-square test, Independent t-test, Mann-Whitney U test. Patient's data of blood sugar level and blood pressure level (systolic and diastolic) are presented in mean ± standard deviation, and the data are analyzed by Independent t-test and Paired t-test.

Ethical statements

This study has been approved by the committee of research ethics regarding to human study of Nonthaburi Public Health Office. (The number of projects: 2/2563, certified at January 14, 2020).

RESULTS

Patient characteristics

A total of 115 diabetic patients between January 2020 and March 2020. 61 patients in phone call group and 54 patients in control group. Table 1 provides the demographic details and information of each group. After comparing between the two study groups, beyond the education level, there were no differences found related to patient characteristics and baseline clinical data including mean HbA1C, mean systolic blood pressure, mean diastolic blood pressure and mean LDL

TABLE 1. The general information of the sample size (N = 115).

	Phone calls n=61	Control n=54	p-value
Sex			
Male	21 (34.4)	16 (29.6)	0.583
Female	40 (65.6)	38 (70.4)	
Age (years old)	63.16±8.65	66.0±7.48	0.064
Educational Level			
None	2 (3.3)	3 (5.6)	< 0.05*
Pre-Primary School	9 (14.8)	20 (37.0)	
Primary School	17 (27.9)	6 (11.1)	
Pre-Secondary School	16 (26.2)	5 (9.3)	
Secondary School	11 (18.0)	13 (24.1)	
Bachelor degree	6 (9.8)	7 (13.0)	
Income (bath)	2,500 (700, 6,500)	2,350 (700, 7,000)	0.772
Hypertension	54 (88.5)	44 (81.5)	0.288
Height (cm.)	158.89±7.33	159.52±8.06	0.660
Weight (kg.)	69.28±17.29	68.70±15.19	0.849
BMI (kg./m.^{2})			
< 18.5	1 (1.6)	1 (1.6)	0.916
18.5 – 22.9	10 (16.4)	7 (13.0)	
23.0 – 24.9	14 (23.0)	15 (27.8)	
≥ 25	36 (59.0)	31 (57.4)	
HbA1c (mg%)	7.83±1.48	7.45±1.29	0.940
Systolic blood pressure (mmHg)	141.16±18.54	144.26±16.59	0.350
Diastolic blood pressure (mmHg)	74.10±11.16	73.85±10.97	0.905
LDL (mg/dL)	106.64±33.73	110.17±33.83	0.577

*Chi-square test, Independent t-test, Mann-Whitney U test

Capillary blood glucose level outcome

Table 2 The mean difference of CBG between 0 month and 2 months in 2 groups showed that the mean difference of CBG in the phone calls group was greater than in the control group with no significance (-5.77±4.09 vs -4.22±5.10 P=0.812). Likewise, the mean difference of CBG between 0 month and 1 months in 2 groups showed the same trend with no significance (-6.80±4.86 vs -2.96.22±4.82 P=0.577) but the mean difference of CBG between 1 month and 2 months in 2 groups showed that the mean difference of CBG in the phone calls group was less than in the control group (1.03±4.09 vs -1.26±5.10 P = 0.724).

Table 3 the mean CBG level at 0-month, 1-month and 2-months in the phone calls group was less than in the control group with no significance (**CBG M_0** 144.49±33.54 vs 149.13±35.31 P= 0.472, **CBG M_1** 137.69±37.35 vs 146.17±37.59 P= 0.228, **CBG M_2** 138.72±32.66 vs 144.91±36.11, P= 0.337).

Systolic blood pressure (SBP) outcome

Table 2 The mean difference of SBP between 0 month and 2 months in 2 groups showed that the mean difference of SBP in the phone calls group was lesser than in the control group with no significance (-9.33±1.64 vs -12.43±2.40 P=0.280). Likewise, the mean difference of SBP between 0 month and 1 months in 2 groups showed the same trend with no significance (-7.36±1.58 vs -11.44±2.55 P=0.166) but the mean difference of CBG between 1 month and 2 months in 2 groups showed that the mean difference of CBG in the phone calls group was greater than in the control group (-1.97±1.48 vs -0.98±2.04 P = 0.692).

Table 3 the mean SBP level at 0 month and 2 months in the phone calls group was less than in the control group with no significance (**SBP M_0** 141.07±17.14 vs 144.50±16.49 P= 0.227, **SBP M_2** 131.74±14.23 vs 132.07±14.59, P= 0.901) and the mean SBP level at 1 month the phone calls group was slightly greater than in the control group with no significance (**SBP M_1** 133.70±16.14 vs 133.06±13.55 P= 0.817)

Diastolic blood pressure (DBP) outcomes

Table 2 The mean difference of DBP between 0 month and 2 months in 2 groups showed that the mean difference of DBP in the phone calls group was greater than in the control group with no significance (-6.82±1.18 vs -5.91±1.43 P=0.622). Likewise, the mean difference of DBP between 0 month and 1 months in 2 groups showed the same trend with no significance (-3.57±1.16 vs -1.24±1.71 P=0.218) but the mean difference of CBG between 1 month and 2 months in 2 groups showed that the mean difference of CBG in the phone calls group was lesser than in the control group (-3.07±1.03 vs -4.67±1.56 P = 0.383).

Table 3 the mean DBP level at 0 month in the phone calls group was slightly greater than in the control group with no significance (**DBP M_0** 74.23±10.08 vs

TABLE 2. The comparation between Means of CBG level with blood pressure level (diastolic and systolic).

	Phone calls n=61	Control n=54	p-value
Mean Difference of CBG Level (mg/dL)			
Month 0 and 1	-6.80±4.86	-2.96±4.82	0.577
Month 1 and 2	1.03±4.64	-1.26±4.45	0.724
Month 0 and 2	-5.77±4.09	-4.22±5.10	0.812
Systolic blood pressure (mmHg)			
Month 0 and 1	-7.36±1.58	-11.44±2.55	0.166
Month 1 and 2	-1.97±1.48	-0.98±2.04	0.692
Month 0 and 2	-9.33±1.64	-12.43±2.40	0.280
Diastolic blood pressure (mmHg)			
Month 0 and 1	-3.75±1.16	-1.24±1.71	0.218
Month 1 and 2	-3.07±1.03	-4.67±1.56	0.383
Month 0 and 2	-6.82±1.18	-5.91±1.43	0.622

* Analyzed by Independent t-test, Paired t-test

TABLE 3. The comparison of CBG level with blood pressure level separated with systolic and diastolic blood pressure.

	Phone calls n=61	Control n=54	p-value
CBG Level (mg/dL)			
0 month (CBG M_0)	144.49±33.54	149.13±35.31	0.472
1 month (CBG M_1)	137.69±37.35	146.17±37.59	0.228
2 months (CBG M_2)	138.72±32.66	144.91±36.11	0.337
Systolic blood pressure (mmHg)			
0 month (SBP M_0)	141.07±17.14	144.50±16.49	0.227
1 month (SBP M_1)	133.70±16.14	133.06±13.55	0.817
2 months (SBP M_2)	131.74±14.23	132.07±14.59	0.901
Diastolic blood pressure (mmHg)			
0 month (DBP M_0)	74.23±10.08	74.19±11.13	0.982
1 month (DBP M_1)	70.48±9.51	72.94±14.21	0.271
2 months (DBP M_2)	67.41±9.13	68.28±10.70	0.640

74.19±11.13 P= 0.982) and the mean DBP level at 1 month and 2 months the phone calls group was lesser than in the control group with no significance (**DBP M_1** 70.48±9.51 vs 72.94±14.21 P= 0.271, **DBP M_2** 67.41±9.13 vs 68.28±10.70, P= 0.640)

DISCUSSION

Before the study, there was no difference in the average of blood sugar level (mg/DL) of phone calls and control groups (p>0.05). However, when comparing the average of blood sugar levels (mg/DL) recorded in the 0 month and 1 month, it was found that the phone calls group's average blood sugar level decreased by a more substantial amount than that of the control group (-6.80±4.86 vs -2.96±4.82, p value = 0.577). Comparing the average of blood sugar levels (mg/DL) in the 0^{th} and 2^{nd} months, it was similarly found that the intervention group's average blood sugar level decreased by a more substantial amount than that of the control group (-5.77±4.09 vs -4.22±5.10 p value = 0.812). Therefore, it could be concluded that there is clinical significance of the intervention group who received follow-up phone calls. This corresponds with Naeti Suksomboon's study[6] which conducted a systematic review and meta-analysis of follow-up phone calls as a way to control blood sugar levels, and it was found that follow-up phone calls might not be more effective in helping controlling blood sugar levels when comparing to those who were not given follow-up phone calls. However, it is still beneficial for people living in a country with small to medium incomes.

The reason why there was no statistical significance between two groups of the participants in the mentioned study might be because of too small sample size, insufficient time of research, too short time of phone calls, insufficient information instructed to patients via phone calls, infrequent phone calls or a lack of other media to follow up patients. These reasons might result in inefficiency in controlling of blood sugar levels. According to the study of Rattanaporn Jeerawattana[7], with motivation-promoting activities and diabetes-instructing trainings before giving the participants phone calls, it was found that the intervention group's average blood level decreased more significantly than that of the control group (11.43±1.92 vs 7.29±1.32 P<0.001). Likewise, according to Bogner's study[8], the overall phone calls given to participants were two times, and they lasted for 15 minutes, and this also included three direct talks which lasted for 30 minutes, given during three-month period. The findings indicated that the intervention group can control their blood sugar levels more effectively than the control group do (Achieved HbA1c <7%: 67 participants (60.9%) vs 25 participants (35.7%), p value <.001).

Currently, technology plays a crucial role in people's life and most people are able to use phones for communicative purposes. The researcher, therefore, aims that this study could be guidance of how to provide

more effective treatments to patients. Nevertheless, there are some limitations including insufficient samples and limited time for phone calls. Also, three-month period for follow-up might be insufficient, so the findings indicate no statistical significance. This study covers patients from only one medical center, so it might not be able to represent overall populations. However, since the findings illustrate that the intervention group has a more efficient control of blood sugar levels than the control group, the researcher would suggest that there should be an increase of study populations, areas and time period. Also, there should be some adjustments of the directions for follow-up phone calls, such as an increase in contents or time period. This would help follow-up phone calls to work more effectively.

CONCLUSION

This quasi-experimental study's results show that follow-up phone calls can assist patients with diabetes to control their blood sugar levels more effectively than the control group, but there is no statistical significance. Further studies may be needed for more explicit data.

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