



Project DiabEHT: An approach to improve self-care management of diabetes[☆]



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KEYWORDS

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Abstract

Objectives: To determine whether the project DiabEHT (Diabetic Electronic Health Tool) has significantly improved self-care management of participants with diabetes along with the aspects of general diet, physical activities, blood glucose monitoring, and foot-care; and their blood glucose level 6 weeks after the project implementation.

Methods: Pre-experimental, one group pretest–posttest research study was conducted among 30 participants medically diagnosed with Diabetes Mellitus regardless of type. The project which included weekly support group activities and lecture series on diabetes, installation and use of the DiabEHT mobile app, and diabooth in the health center was implemented for 6 weeks. Participants' blood glucose levels were obtained before the start of each weekly session for 6 weeks. A modified version of the "Summary of Diabetes Self-Care Activities (SDSCA)" measure was used to evaluate participants' self-care management before and after the intervention.

Results: After 6 weeks of project implementation, the participants have showed significant improvement on the following diabetes self-care activities: general diet ($P=0.000$), physical activities ($P=0.007$), blood glucose monitoring ($P=0.000$), and foot-care ($P=0.000$). Their blood glucose levels had also significantly reduced ($P=0.005$).

Conclusion: Indeed, the project had improved the diabetic participants' self-care management and compliance, and glycemic control. Nurses can take advantage of this innovation and consider integration into patient care. However, further studies are recommended to ensure sustainable incorporation and application into various settings.

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Introduction

Diabetes has soared to 422 million cases with 1.6 million deaths in 2018 globally.¹ In the Philippines, around 6 million has been diagnosed with diabetes in 2016 and the age-group affected becomes younger between 20 and 79 years old.² In 2018, the country has been considered the diabetes “hot spot” in the Western Pacific Region. This disease prevalence might increase to about 20%, causing mortality to more than 100, 000 affected Filipinos due to its complications by 2045, if nothing is done to curtail this alarming trend.³ In Iligan City, it has been among the top ten causes of mortality in 2016.⁴ It is considered the mother of many diseases as it causes various cardiovascular complications such as hypertension and stroke, kidney damage, blindness and amputation.⁵ However, with proper monitoring of blood glucose levels, healthy lifestyle and effective pharmacological treatment regimen these complications can be prevented.⁶

Medications will provide optimal benefit when patients comply with their regimen.⁷ However, patients often do not achieve sufficient health outcomes due to non-compliance.⁸ Few of the identified barriers to diabetes care were patient’s non-adherence to treatment regimen, their attitude, misconceptions and knowledge on diabetes. Individual culture, language, financial capacity, other existing diseases and psychosocial support also affect how they manage their condition.⁹ Studies in India also revealed that poor compliance was associated to undesirable attitude toward diabetes and lack of health information.^{10,11} Hence, good health education programs on diabetes especially at the grassroots and community level are needed. Increasing their knowledge is important however it must be applied to actual practice for the diabetic patient to successfully improve his condition.

Individuals who participate in the management of their disease have shown better progression and improvement of their diabetic condition.¹² Studies revealed that improving diabetic individual’s self-care practices prevents development of complications of the disease in the long-run.⁹ Self-care practices include activities such as eating right, engaging in physical exercises, timely blood sugar level monitoring, taking prescribed medications, and other desirable healthy behaviors.¹³ Yet doing all these everyday might be difficult for some as people may have a tendency to forget or be pre-occupied with other activities of daily living.⁹ This implies the need for ways and means that can support and facilitate the management, conduct, and completion of these tasks. Since these tasks are managed by the diabetics themselves, sometimes with their caretakers who are usually their families, reliable sources of diabetes self-care management are needed.

Aside from the conventional diabetes education, the use of smartphones and mobile applications has significantly improved health care delivery.¹⁴ Locally, no mobile app for diabetes is yet available that fits the common needs and self-care practices of Filipinos with diabetes. Globally, a lot of diabetes apps are accessible on App Store, Playstore and Google and the number continues to grow. Most of them however have subscription fees. Evaluating few of the most frequently downloaded apps, namely, Glucose Buddy Diabetes Tracker, Diabetes Connect, One Drop, and Diabetes and Diet Tracker, revealed lacking features that would

probably improve self-care management skills and increase diabetic individual’s compliance to their treatment regimen. Such features that were highly associated with declined self-care management were lack of knowledge on foot care, oral hygiene, medication, glucose testing and data keeping. These were addressed and included in the mobile application created by the researchers called “DiabEHT”; which stands for Diabetic Electronic Health Tool. The application provided features such as Blood Glucose Monitoring tool, Health Education on medications, proper nutrition, hygiene, foot care and Alarm feature for their medications.

Mobile technologies have the potential to improve individual’s management of their diabetes as it gives individualized support through media and other applicable mobile apps.^{14,15} Moreover, it has been predicted that by 2018, the number of people using mobile apps on diabetes will increase to 24 million.¹⁶ Hence, the research team conducted the project DiabEHT that included weekly support group activities and lecture series on diabetes, installation and use of the DiabEHT app, and diaboath in the health center to facilitate compliance and improve self-care management of participants with diabetes in barangay Sta. Felomina, Iligan City.

Method

Research design

This study’s research design was pre-experimental, specifically the one group pretest–posttest. It was employed to determine significant improvement of participants’ self-care management along the aspects of general diet, physical activities, blood glucose monitoring, and foot-care before and 6 weeks after the project implementation. Medication compliance was excluded among the variables since almost half of the participants were prescribed with injectable drugs which they cannot afford and thus cannot comply. Most of them were only taking oral maintenance drugs. Only oral Metformin drug was distributed for free during the project implementation provided by the local government unit through the DOH Region 10, as one of the stakeholders of the project.

Population and study setting

The project was implemented in barangay Sta. Felomina of Iligan City, Philippines. Out of the 44 barangays, it has the second biggest number of diabetic clients in Iligan City in 2017. Purposive sampling was used to determine the 30 participants of the research project. They were medically diagnosed with Diabetes Mellitus regardless of type, aging 18–60 years old. He or she, and/or any of their care takers, had any of the following: smartphones, android phones or tablets; and agreed to install and use the DiabEHT application. The participants and/or their care takers had joined the orientation on the project mechanics especially on how to use the mobile app. They were present and participated during the entire 6 weeks of project implementation.

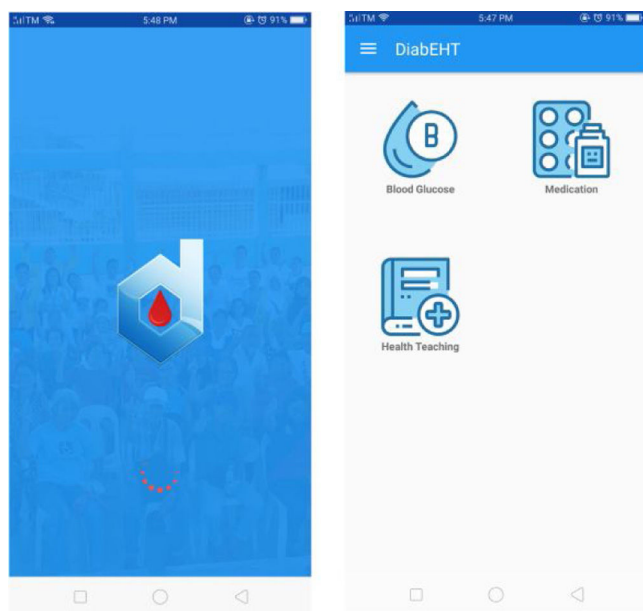


Figure 1 Loading display and main menu of the DiabEHT mobile application.

Source: Author.

Research Intervention (Project DiabEHT)

The project was funded by Unilab Foundation, in collaboration with MSU-IIT, DOH Region 10, the local government units and several non-government organizations. It was implemented on June 22 and ended on July 27, 2018, every Fridays 8:30–10:30 AM, for a total of 6 weeks. It has 3 main components: Diabetic Electronic Health Tool (DiabEHT) app, weekly support group activities and lecture series, and diabooth. The mobile app was designed to run for android users only particularly android 5.0 from Lollipop to Oreo. Alpha and beta testing of the application were done to test its usability before the actual project implementation. Its content validity was also determined by selected Diabetologists in Iligan City. A screen shot of the loading display and Main Menu of the app is shown in Fig. 1. The weekly DiabEHT Support Group is geared with 15 min exercise, blood glucose monitoring, lectures or workshops, and de-stressing activities. The topics for the lecture series included: DiabEHT app use orientation, diabetes (types, disease process, etc.), blood glucose monitoring, eating right (applicable diet) and applicable physical activities, consultation and medication, and lastly hygiene, footcare and woundcare. The diabooth serves as an inquiry station and provides Information, Education and Communication (IEC) materials and other free services such as BP monitoring and blood glucose testing.

Data collection

The mobile application and modified questionnaires were the research instruments validated and used by the team to gather data. The app was designed with the following features: (1) blood glucose monitoring tool, (2) medication

alarm, (3) health education on diet, exercise, foot care and oral hygiene, (4) random notification, and (5) data bank. It was created to reinforce diabetic participants' knowledge on self-care management acquired from the series of lectures conducted by the team for 6 weeks. It also contains data bank of the patient's weekly blood glucose monitoring results. A modified version of the "Summary of Diabetes Self-Care Activities (SDSCA)" measure was used to collect data to evaluate participants' self-care management level along with the aspects of general diet, physical activities, blood sugar monitoring, and foot-care before and after the project implementation.¹⁷

Data analysis

Data were analyzed using Statistical Package for the Social Sciences (SPSS) Statistics 24. Frequency counts and percentages were used to quantitatively describe the responses given by the participants. Arithmetic mean was used to determine the average value of the dependent variables, the participants' blood glucose levels and their responses on each question on self-care management along the aspects of diet, physical activities, blood-sugar monitoring, and foot-care before and after the project implementation. Lastly, the significant improvement or difference in their level of self-care management as well as blood glucose levels before and after the project implementation were determined using paired dependent *T*-test.

Ethical aspects

The researchers ensured that the ethical protocol was followed before and during the data gathering process. Data gathering and intervention started after the approval of the College Research and Ethics Committee (CREC). This study utilized participants who agreed to be part of the research project after voluntarily signing the informed consent form given during the orientation. The participants were assured that the data collected will be treated with full confidentiality and that it cannot be disclosed elsewhere, except for the intended study and will not be used against them.

Results

The research project benefitted a total of 75 diabetic individuals of barangay Sta. Felomina. However, only 30 were able to complete the 6-week project implementation due to work and other personal appointments which are in conflict with the weekly lecture series done every Fridays. Those other 45 diabetic individuals were able to visit and avail of the diabooth services and used the app, but were not able to attend the weekly lecture series regularly thus were excluded in the pretest and posttest. Majority (77%) of the actual 30 participants of the study were females. Males comprise only 23%.

Table 1 portrays whether the difference in the participants' level of self-care management before and 6 weeks after the project implementation is significant. Data showed that the posttest measurements have increased compared to pretest indicating increased diabetes self-care management

Table 1 Significant difference in the participants' self-care management level before and after the intervention.

Variables	Mean		T-test (Dependent samples)	P value	Remarks
	Pre-test	Post-test			
Diet	16.44	22.15	-5.162	.000	Significant
Physical activities	7.08	9.77	-2.933	.007	Significant
Blood sugar monitoring	.42	5.58	-4.482	.000	Significant
Foot-care	6.00	8.58	-4.072	.000	Significant

Source: Author.

Table 2 Significant difference in the participants' blood glucose level before and after the intervention.

Variable	Mean		T-test (Dependent samples)	P value	Remarks
	Pre-test	Post-test			
Blood sugar level	2.13	1.67	3.051	.005	Significant

Source: Author.

level after 6 weeks of implementation. The difference in the participants' self-care management level along the aspects of general diet (T -test = -5.162, P = 0.000), physical activities (T -test = -2.933, P = 0.007), blood sugar monitoring (T -test = -4.482, P = 0.000), and foot-care (T -test = -4.072, P = 0.000) before and 6 weeks after is significant. This implies that the intervention has significantly improved diabetic participants' compliance to self-care activities.

On the aspect of participants' blood glucose levels, as depicted on Table 2, participants' posttest results are lesser than the pretest which indicates that their blood sugar levels have declined 6 weeks after the intervention. The t -test value of 3.051 and P value of 0.005 which is less than 0.01 indicated that the difference in their blood glucose reading before and 6 weeks after is significant. This means that project DiabEHT has significantly reduced their blood sugar and improved participants' glycemic control. These results imply that the project appears to be effective in facilitating participants in managing their diabetes.

Discussion

Project DiabEHT was especially designed and developed to fit the self-care practices of Filipinos with diabetes. The project made use of health education, community resources and technology to improve self-care management of patients with diabetes. This approach includes (1) weekly support group activities and lecture series, (2) use of the DiabEHT app, and (3) availability of diabooth in the health center, had strengthened and improved self-care management of the participants with diabetes and facilitated compliance. Indeed, strategies that are patient-centered and empower patients to decide for themselves on their treatment goals, and other daily diabetes self-care activities are more effective in helping patients self-manage their condition. These interventions need to fit patient's culture, lifestyle and values.¹⁸ Moreover, interventions that encourage psychosocial support from others facilitate better health outcomes in diabetic patients.¹⁹

Behavioral modifications especially adherence to prescribed diet is difficult for Filipinos due to their food choice of rice and carbohydrate-rich foods, which should be reduced or replaced in a diabetic diet.²⁰ However, results of this study indicated that the project in general, with health education on diet, reinforced by the use of DiabEHT app, with available IEC materials at the diabooth, has improved diabetic individuals' compliance to proper diet. This is in consonance with the results of a study of Juul et al.²¹, that the provision of useful health information coupled with factors that motivate patient autonomy are essential in enabling patients to follow recommended diabetic diet.

Along the aspects of physical activities, participants were noted to have increased physical activity after the intervention. On the aspect of blood sugar monitoring, before the project, only those who have funds and resources for glucose testing are able to monitor their blood glucose. Others who don't have the means have to leave their sugars unmonitored. The research project, with its diabooth, has provided the community available and accessible resources for blood glucose testing such as glucometers and strips, rendered by the barangay health workers. This explains the participants' improved compliance to blood glucose monitoring. Moreover, the participants were taught during the lecture and workshop series how to self-monitor their glucose levels using glucometer and strips. The project, with its mobile application indeed supports individualized management of exercise and testing of blood sugar levels.²² Furthermore, self-management enhancement and diabetes care provided through smartphones produce improved autonomy, compliance to care, and better health outcomes in diabetic patients.²³

On the aspects of foot-care, project DiabEHT has improved participants' foot-care practices after the intervention. The lecture series has provided participants education on basic foot and nail care which are necessary to reduce the risk of injuries that can result to diabetic foot.²⁴ It followed the international guidelines on foot management, focused on basic prevention of foot complications and

treatment of foot ulcers in patients with diabetes mellitus.²⁵ The DiabEHT app has also provided participants daily and timely reminder of these foot-care activities.

The project has also reduced participants' blood glucose levels. This study reveals that this approach can efficiently facilitate achievement of the crucial goal of diabetes management which is attaining optimal blood sugar control while minimizing hypoglycemic events. The results are similar to that of GEM. It is also a patient-centered approach for newly diagnosed type 2 diabetic patients and seems effective in reducing glucose level taken hours after meals. Likewise, it has three components that focused on (1) replacement of foods with high glycemic index to low, (2) augmentation of physical exercise, and lastly (3) regular monitoring of blood sugar levels.²⁶

In the advent of technology and rising popularity of smartphones, Nurses can take advantage of this innovation and consider integration into patient care. Collaboration between local government units and non-government organizations is evident in this study and has contributed to the success of the project. Hence, this approach can be considered and incorporated by the concerned government and non-government agencies in planning for healthcare strategies and intervention in managing diabetes and curtailing its complications. However, further studies are recommended to ensure sustainable incorporation and application into various settings. Lastly, medication compliance should also be assessed for future studies, as well as other health-relevant clinical outcomes.

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