

## Telehealth DM Group Android Smartphones in Controlling Blood Sugar Levels in Patients with Type 2 DM

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### Abstract

Diabetes mellitus (DM) is a degenerative disease with an increasing number that continues to grow from year to year. Data from the International Diabetes Federation (IDF) shows that the prevalence of diabetes patients will increase to 84%, from 82 million to 151 million. Uncontrolled blood sugar levels can cause serious diseases that affect the heart, blood vessels, eyes, kidneys, and nerves. Aim: Knowing the effectiveness of the Telehealth DM Group application in controlling blood sugar levels in DM type 2 patients. Method: This study uses Research and Development (R&D) and quasi-experimental development methods with a pre-post control group design and uses a random sampling technique. Results: The Telehealth DM Group Smartphone Android application is feasible based on expert validation tests with marks of 93.33%. There is a difference in blood sugar levels before being given pre-intervention (219 mg/dl). After being given post-intervention (160 mg /dl) with a value of 0.002, the Telehealth DM Group application can control blood sugar levels of 58.6 mg/dl with a value of 0.004. Conclusion: Telehealth DM Group Android smartphones are effective as an educational and health service media in controlling blood sugar levels in patients with type 2 diabetes mellitus.

### Keywords

blood sugar; diabetes mellitus; , smartphone; telehealth; type 2



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## 1. INTRODUCTION

Diabetes mellitus is a chronic degenerative disease that is a severe problem in developed countries, with an increasing number from year to year (Wirda et al., 2019). Figures from the International Diabetes Federation (IDF) show that between 2017 and 2045, the prevalence of diabetes will increase to 84%. %, from 82 million to 151 million (Carracher et al., 2018).

Indonesia is the seventh largest country in the world after the state of Mexico, with diabetes rates reaching 10.7 million or (11.5%) and is expected to increase by 2030 to 13.7 million or (14.9%) in a year. This will get 16 .6 million or (18.2%) in 2045 (Haskas, Y., Rizkiani, I., & Restika, 2020). The 2020 Basic Health Research (Riskesdas) results show that compared to 2013, the prevalence of non-communicable diseases has increased. Based on blood glucose testing, most diabetes increased from 6.9% to 8.5%(PERKENI, 2021). It is estimated that the number of diabetics in Indonesia in the 20-79 age group will increase from 10 million in 2015 to 16.2 million in 2040. Based on this data, Indonesia will be ranked sixth globally in 2040 (Wahyudi, C. T., Ode, L., & Rahman, 2019).

The highest prevalence of diabetes mellitus in Indonesia is 3.6% in North Sulawesi Province, and the lowest is 0.8% in Lampung Province. The prevalence of diabetes in women under 65 years is higher than in men (Sumampouw, H. C., & Halim, 2019). The Indonesian Ministry of Health in 2019 stated that the prevalence of diabetes mellitus in West Java was ranked 17th out of 33 provinces in Indonesia, namely 1.7% in the 2018 Riskesdes (Pusdatin Kemenkes, 2020). Based on medical records, it was found that the number of patients with type 2 diabetes mellitus at the Panincong Health Center in Soppeng Regency in 2022 was 255 patients.

The International Diabetes Federation is right in saying that people with diabetes are at higher risk of many life-threatening and debilitating health conditions than people without diabetes. High blood sugar can cause serious illness that affects the heart, blood vessels, eyes, kidneys, and nerves. People with diabetes are also at a higher risk of infection. In most highly educated countries, diabetes is a major cause of cardiovascular disease, blindness, kidney failure, and lower limb amputation (Wirda et al., 2019).

Diabetes Mellitus contributes to the entire global economy and global health system economy. It is estimated that the cost of treating diabetes is US\$825 billion per year, most of which is the cost of treating diabetes complications. Indonesia has the potential to experience losses due to non-communicable diseases from 2012 to 2030, reaching US \$ 4.47 trillion. It can be seen from the claims submitted by BPJS in 2019

that the amount of health financing due to diabetes, including diabetes and its complications, is one of the biggest claims (Maharani, M. Y., Haryati, R. T. S., & Sukawana, 2018).

The poor quality of life causes the primary complications of diabetes. Complications in people with diabetes mellitus can result from not controlling blood sugar levels properly. Keeping the blood glucose level as close to normal as possible is necessary in controlling Type 2 DM to prevent complications. According to the consensus of the Indonesian Endocrinology Association, the control of Type 2 DM includes education, medical, nutritional therapy, physical exercise, and pharmacological therapy. (Perkeni, 2019) Given the ever-increasing number of diabetics, complications of diabetes through medical intervention are very important. We hope that the government and health authorities will educate patients so they can carry out medical care actively and independently (Maharani, M. Y., Haryati, R. T. S., & Sukawana, 2018).

Self-care management is the most crucial thing in diabetes control. Still, several problems have been mentioned in the literature. Namely, type 2 diabetes mellitus patients have low self-care management (Christiana, 2016). Low self-management in patients with type 2 diabetes mellitus is caused by many psychological factors. Low self-care levels will increase the incidence of complications. Many patients struggle to self-regulate, leading to poor blood sugar control. Based on the results of previous studies, only 20% of DM patients could apply self-care. This causes complications such as chronic kidney failure, retinopathy, neuropathy, and cardiovascular disease (Samsuri et al., 2022).

Various studies show that patient self-management of chronic disease treatment is generally low. Outpatient studies have shown that more than 70% of patients do not take the drug in the correct dosage. According to a 2020 World Health Organization report, in developed countries, the average proportion of chronic disease patients who adhere to long-term treatment is only 50%, even lower in developing countries (Tamat, S. R., & Keban, 2020).

Prevention efforts can be made to avoid the complications of diabetes mellitus, namely by carrying out diabetes management which consists of five pillars, namely monitoring blood sugar levels (monitoring), meal planning (diet), physical exercise (exercise), medical treatment with OHO or insulin, and counseling (education) (Amita et al., 2020).

Self-management in DM patients is important in controlling blood sugar levels and suppressing micro and macrovascular complications. Therefore, in this

modernization era, efforts are needed to help DM patients control their blood sugar levels, such as using technology to improve blood sugar control management, such as Telehealth (Ramlan et al., 2019). Telehealth is a technology-based method of providing nursing care, and this method helps improve health care remotely. This method is a communication method that depends on human factors, finance, and technology itself (Fadhila, R., & Afriani, 2019).

Technological developments that are happening at this time make people able to use smartphones to communicate every day. One of them is Android (Reflianto & Syamsuar, 2018). Android is an open-source platform developed by Google and has a wide variety of devices designed for touchscreen mobile devices such as phones and tablets. Indonesia alone has approximately 100 million Android users, and 32% of these 92 million users have accessed health applications (Hidayat et al., 2022). Android application-based media can increase patient interest and serve as a reminder of a stimulus to change behavior in the future. (Jamaluddin, 2020) Individual behavior is influenced by predisposing, enabling, and reinforcing factors. An Android smartphone app with a long-term impact on self-management can send automated messages as triggers for self-management. Therefore, it is necessary to have the ability to manage one's behavior. This ability is often referred to as self-management. Diabetes Independent Management Education (DSME) is a health education process for individuals or families to manage diabetes. DSME uses guidelines, counseling and behavioral interventions to increase knowledge about diabetes. In the health sector, information can be an important factor in people's lives, especially in accessing personal and family skills improvement services in diabetes management (Cahyanti et al., 2020).

Applications similar to telehealth on Google Playstore and Appstore have developed several internet-based applications related to diabetes mellitus that can be installed on smartphones, including Friends of Diabetes and Doctor of Diabetes. The drawbacks of each application are the large number of menu options that confuse the user, and there is no difference in the appearance of the interface and the features provided. There are no reminders to remind things such as time to take medication, check-up dates, etc. But there is no more specific application for the early prevention of type 2 Diabetes Mellitus.

Telehealth is a communication tool to improve health information and provide comprehensive health services that can reach more areas in Indonesia. The technology-based telehealth concept will facilitate public access to comprehensive health services (Raafi et al., 2021).

Previous research revealed telehealth was used to treat pulmonary, musculoskeletal, and neurological cases in foreign countries. The results of implementing telehealth are the same or even more satisfying than face-to-face services in general. However, the sample of previous studies was small, and there was no ongoing evaluation. Whereas in Indonesia, it has been developed by the Ministry of Health since 2012 and in collaboration with third parties. The application is called *Telemedisin Indonesia (TEMENIN)*. Still, its use is constrained by a lack of understanding of the use of technology and an understanding of the urgency of using telehealth (Lubis, 2021). A 4-week DSME intervention study at Hamparan Health Center Perak increased self-efficacy in patients with type 2 diabetes. In this study, the DSME components taught during DSME to DM patients were basic knowledge about DM, management of nutrition/diet, exercise or physical activity, foot care, foot exercise, and stress. While administering DSME, researchers explored the knowledge the patient already had and the treatment that had been carried out. Still, this research could only be done via WhatsApp, and the results were less effective than the Telehealth DM Group (Marbun et al., 2021).

Another study found that increased use of technology in diabetes care improves communication between caregivers and patients. Social media technology is developing rapidly. Recent developments in mobile health services (mHealth) have created new opportunities to enhance self-management of T2D through tools that support a healthy diet, exercise, and follow-up access to medical services. One such innovative model includes an integrated system that connects patients to their support network via smartphone (Mufidah et al., 2021). However, despite the insights from research showing that multimedia education, including smartphone, text messaging, and telephone-based education, is effective in improving medication adherence and self-care after PCI procedures, no medical chat media was used in this study. This requires patients to routinely consult doctors online (Apriyani et al., 2021).

This study aimed to determine the effectiveness of the Telehealth DM Group application in controlling blood sugar levels in type 2 DM patients. The benefits of the Telehealth DM group Android smartphone as a monitoring medium to control blood sugar in type 2 DM patients can overcome this complex problem. Telehealth is not limited to space and time, so time and cost efficiency can be minimized. Seeing the potential of telehealth groups based on android smartphones as a medium for controlling blood sugar in type 2 DM patients, it is very interesting to conduct further research to find out whether telehealth group DM android smartphones are effective in controlling blood sugar levels in type 2 DM patients.

## 2. METHODS

This study uses research and development (R&D) methods. The R&D method is a step to develop new products or improve existing products so that they can be considered. This research and development method is used to manufacture products and test product effectiveness. The research and development process consists of five main steps: Data collection, model design, expert validation and verification, model testing, and model results (Prof. Dr. Sugiyono, 2019).

The experiments in this study used a quasi-experimental design, a pre-study design, and a control group. This study presents an Android Telehealth DM Group smartphone intervention to monitor and control blood glucose levels in type 2 DM patients.

The analysis is carried out computerized and carried out by the researchers themselves, using a parametric test and nonparametric test used to determine changes in value pre-test to post-test and to find out interventions that affect reducing blood sugar levels in respondents with diabetes mellitus. The stages of analysis in this study were as follows: Conducting a data normality test using the Shapiro-Wilk because the respondents were less than 50. From the data normality test, the data were not normally distributed, using the Wilcoxon test to test the average pre-post intervention and control blood sugar levels. The evaluation stage data uses the Mann-Whitney test because the data is not normally distributed.

## 3. FINDINGS AND DISCUSSION

### 3.1. *Application Feasibility Test*

Table 1. Application Feasibility

Test	Results	Information
Functionality	90%	Very good
usability	89%	Well
efficiency	100%	Very good
Maintainability	94.44%	Very good

Table 1. From the calculation above, the overall feasibility percentage results show that the "telehealth DM group" application is very well used.

### 3.2. Homogeneity Test

Table 2. Homogeneity Test

Variable	intervention	Control	p.s
	group	Group	
	Mean±Sd	Mean±Sd	
GDS	219.00±77.48	199.13±60.80	0.72

Table 2 shows that the mean blood sugar levels in the intervention group and the control group before treatment were statistically the same or homogeneous because the sig value was  $0.72 > 0.05$

### 3.3. Normality Test

Table 3. Normality Test

GDS (Blood Sugar During)		p.s	Information
Intervention	Pre-test	0.00	Abnormal
	Post-test	0.005	Abnormal
Control	Pre-test	0.005	Abnormal
	Post-test	0.108	Normal

Table 3 shows that the significant value of the Intervention Group and control groups is that the  $p < 0.05$  is based on the Shapiro-Wilk test, so it can be concluded that the data is not normally distributed.

### 3.4. Test the Effectiveness of the Application

Table 4. Application Effectiveness Test

Variable	Group	Pre	Post	Delta ( $\Delta$ )	P
		test	test		
		Mean±SD	Mean±SD		
GDS	Intervention	219.00± 77,48	160.40 ± 35,57	58.6± 53.99	0.002*
	Control	199.13± 60,80	242.53 ± 78.00	43.40 ± 97.81	0.088*
	Delta ( $\Delta$ )	19.86± 93.42	82.13± 77.29		
	P	0.272	0.003	0.004	

Table 4 shows the results of the variable pair data effectiveness test that the GDS in the intervention group showed a change in the mean value in the intervention group of 160.40 with a p-value of 0.002, meaning that using the telehealth application. The dm group was influential in educating so it could reduce blood sugar levels. In contrast, the control group experienced an increase in blood sugar of 242.53 with a p-value of 0.088, meaning that the leaflet media was ineffective in controlling blood sugar. The results of the effectiveness test for unpaired data on the pre-test variable with a p-value of 0.272 ( $p > 0.05$ ) and a post-test variable value of 0.003 ( $p < 0.05$ ). This means the DM group telehealth application is more effective in lowering blood sugar than leaflet media.

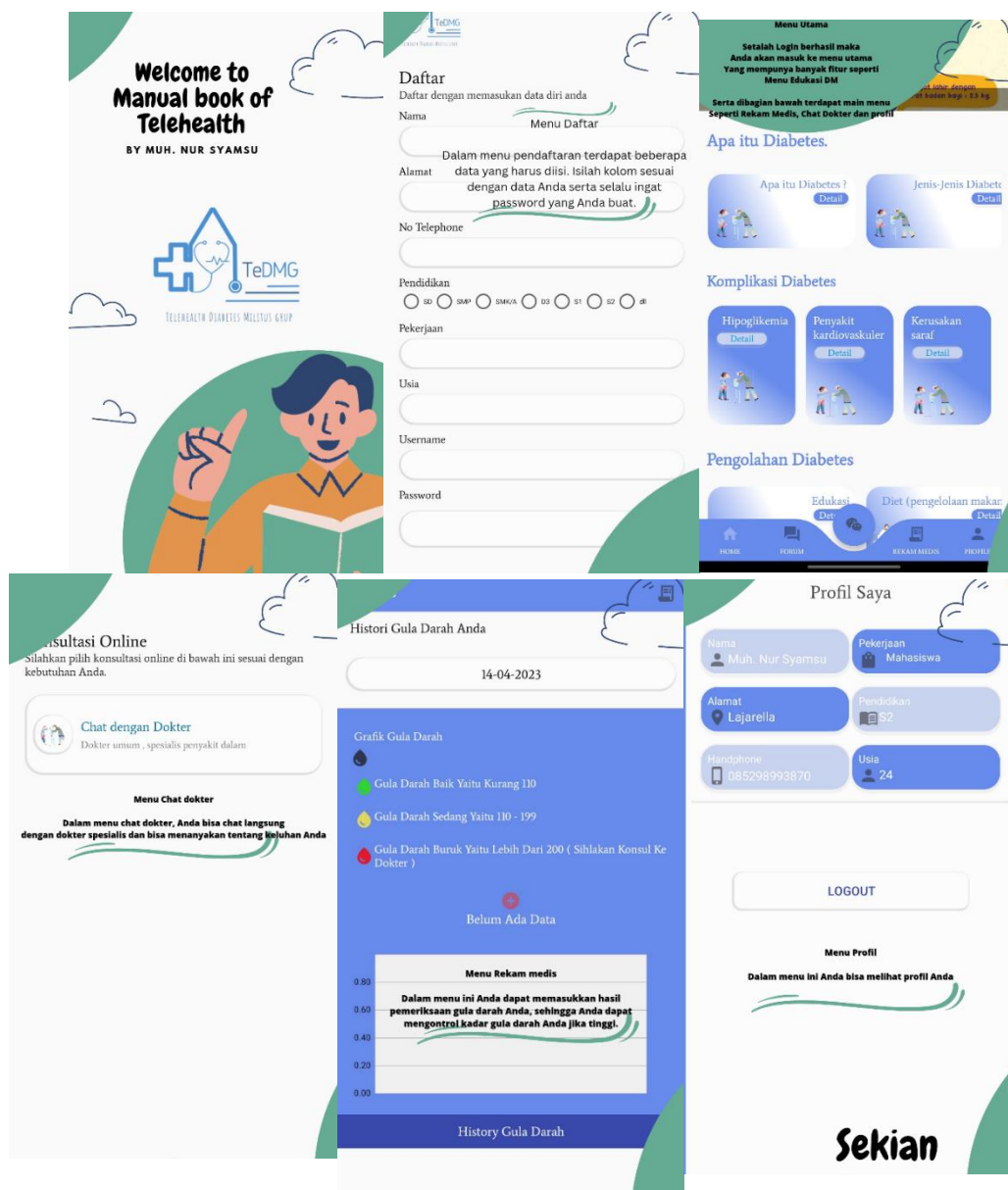


Figure 1. Telehealth DM Group application



The Feasibility of Android Smartphone-Based DM Group Telehealth in Controlling Blood Sugar Levels in Type 2 DM Patients Based on Expert Validation Test Nursing information technology continues to experience development to date. The nursing information system is not only a place to store data but from the evaluation process to the evaluation process can be used (Warren et al., 2018). Currently, the Android system is widely used in the development of health applications because the use of the Android system facilitates information availability, use, and learning - criteria that a health application must meet, 41% of 26 smartphone users in Indonesia (Handayani et al., 2018).

The development of diabetes self-management training is part of the progress of information technology in health services. Diabetes self-management training conducted by researchers called Telehealth DM Group on an Android smartphone is an application that has undergone development stages regarding the provisions of ISO 9126 concerning functionality, efficiency, and maintenance tests. All levels are achieved with an average value of 93.33 with a value of "very good."

Regarding material, the material included in the DM Group Telehealth application passed the Material Appearance Test conducted by two Material Expert Validators and received a score of 90% in the Very Good category. The use of smartphones in the development of information technology also needs to find applications in the medical field. Research shows that Android mobile phone applications can be useful in all aspects of human life in treating PTM, especially DM (Srof & Velsor-Friedrich, 2016).

The DM Telehealth Group application is an Android application specially designed to help people with diabetes improve their understanding of diabetes and apply it at home. This application contains educational management, nutrition, physical activity, and medical management materials, equipped with an explanatory video function as the main independent activity at home. The DM Telehealth group application is an Android application that can be installed on a mobile phone.

The DM Group telehealth application attracts attention directly and voluntarily so that the message is more interesting and easily understood by respondents. The app's "Meal Management" menu feature provides textual information about the proper diet to treat diabetes. In addition, the DM Group's remote health application includes diabetes education videos to increase patient understanding more quickly because the community absorbs information through the five senses. The sense that conveys the most information to the brain is sight. About 75-87% of human

information is captured or transmitted through sight, 13% through hearing, and the remaining 12% is transmitted through other senses.

Education affects the process of knowledge. The higher his knowledge, the easier for him to get information. Knowledge is closely related to education because highly educated people are expected to have a broader knowledge base. The higher the level of knowledge, the easier it is to get information. The more information he has, the less information, on the contrary, hinders the development of his attitude toward the newly introduced values (Yunitasari et al., 2019).

Knowledge can influence attitudes, in this case, the respondent's knowledge after receiving the intervention. This knowledge will lead the respondent to determine attitudes, think and try not to get sick or reduce the disease's condition. If the respondent's inside is good, a supportive attitude should follow this, and vice versa. Knowledge and attitudes are not directly related to one's behavior. Various factors can influence behavior change. Internal factors or factors that come from within the individual respondents include knowledge, intelligence, emotional perception, and motivation from individuals to want to change for the better (Kunaryanti et al., 2018).

Basic knowledge about DM in people with DM includes information about management and preventive measures to avoid long-term complications of DM. The knowledge gained by people with Diabetes Mellitus is expected to minimize complications of the disease in the future. Efforts to educate DM sufferers can increase sufferers independence in carrying out self-care properly. Improving the quality of life of DM patients is influenced by treatment success. Compliance is the patient's behavior in managing diabetes medication, such as diet, accuracy of taking medication, and exercise. Compliance with managing diabetes mellitus is an effort to control blood sugar or the complications it causes (Lestarina, 2017).

This diet effectively lowers blood sugar in people with diabetes because after participating in this research, people with diabetes will know better what foods are recommended, limited, and avoided, their body's calorie needs, and how to prepare the correct daily menu. The stimulation of the effect of providing education through the DM group telehealth application is an example of stimulation within the scope of the social environment where respondents can easily obtain information about diabetes mellitus through applications provided by researchers.

This study has the same results as related studies. Smartphone use helps manage blood glucose and glycated hemoglobin levels. Nurses and health workers can use smartphones to help control blood glucose and glycated hemoglobin levels through education and self-monitoring of the condition of diabetes patients. Apart from

education in the form of material in this application, there is also education in the form of videos with various educational videos, including the course on DM disease, nutritional therapy, sports management, or physical activity. Moving actively can be the next pillar of success in treating diabetes mellitus. Regular exercise plays an important role in regulating blood sugar in the body. Exercise 3-5 times a week for 30-45 minutes for 150 minutes/week. Don't forget to break between activities more than two days in a row. It is also advisable to check blood sugar before exercising. If the blood sugar is  $<100$  mg/dL, the patient must consume carbohydrates first. However, if the level is  $> 250$  mg/dL, it is recommended to postpone physical activity (Aprina et al., 2018).

Remember that although daily activities are recommended, they do not count as exercise. Exercise is needed to maintain fitness, lose weight, and improve insulin sensitivity so that blood sugar control can be improved. The recommended physical exercise is moderate-intensity aerobic exercise such as brisk walking, leisurely cycling, jogging, and swimming. Whereas for people with diabetes without contraindications, it is recommended to do strenuous exercise 2-3 times/week according to the doctor's instructions. It should be noted that the exercises performed should be adjusted to the patient's age and physical fitness status. For people with diabetes, sometimes, diet and exercise are not enough to control blood sugar levels in the body of people with diabetes. If it's like this, the doctor will usually prescribe medication. Also, the drug will usually be given in conjunction with a diet and exercise program. This is done to control the body's blood sugar level to a normal threshold (Wahyuni, 2016).

The results of this study indicate that the feasibility of telehealth applications in the DM group is under diabetes self-management guidelines, but further clarification and improvement are still needed in the future. Self-management is an individual's attempt to regulate and control their behavior. Through personal self-management, a person can train to evaluate, manage, monitor, and be responsible for himself (Pusdatin Kemenkes, 2020).

Differences in blood sugar levels before and after using the telehealth DM group application based on an Android smartphone. There was a difference in diabetes blood sugar levels between the intervention and control groups. The results showed that with the Wilcoxon Test, blood sugar data before and after being given the telehealth DM group application in the Intervention and Control groups had significant differences in blood sugar levels where the change in mean value in the intervention group was 160.40 with a p-value of 0.002 meaning that by using the telehealth application DM group is effective in educating so it can reduce blood sugar levels

while the control group experienced an increase in blood sugar of 242.53 with a p-value of 0.088 meaning that leaflet media is not effective in controlling blood sugar (Fottrell et al., 2019).

The results of this study show that blood sugar data before and after being given the DM group telehealth application in the intervention group that there is an average difference between the pre-test and post-test results before and after the use of the DM telehealth application in the intervention group with the number of sig. Smaller than 0.05 or  $p < 0.05$  so that in making a decision, it can be said that the hypothesis is accepted, meaning that there is an effect of the DM group telehealth application on blood sugar in both the intervention group (Warren et al., 2018).

The results of a similar study conducted by Dita and Agus also showed a significant effect of telenursing on patients' blood sugar levels ( $P=0.000$ ). The intervention group was more significant than the control group. (Amita et al., 2020)

The results of this study were also supported by research conducted by Rahmawati, who applied telenursing to families of Type 2 DM patients. The result was that telenursing increased the value of support for families of Type 2 DM sufferers who underwent therapy. And Patimah's research results also show the effectiveness of telenursing on satisfied blood sugar levels in Type 2 DM patients (Rahmawati et al., 2018)(Patimah, Iin, 2018).

And other studies say that there is an influence of smartphone use on blood glucose and glycated hemoglobin levels. Smartphones in managing type 2 diabetes mellitus can help lower blood glucose and glycated hemoglobin levels more than conventional methods (Azizah et al., 2019).

The Effectiveness of Android Smartphone-Based Telehealth DM Group in Controlling Blood Sugar Levels in Type 2 DM Patients. The results of pre-test and post-test blood sugar research in patients within one month. The difference in blood sugar levels before and after being given the telehealth dm group application in the intervention group and leaflets in the control group.

Based on the results of the Mann-Whitney unpaired data effectiveness test, the pre-test variable had a p-value of 0.272 ( $p > 0.05$ ), and the post-test variable value was 0.003 ( $p < 0.05$ ). This means the DM group telehealth application is more effective in lowering blood sugar than leaflet media. The results of the effectiveness test of unmatched data change value ( $\Delta$ ) pre-post test with a p-value of 0.004 ( $p < 0.05$ ), which means that there is a significant change in decreasing blood sugar levels in the control and intervention groups with a difference ( $\Delta$ ) in the intervention group of 58.6 and the intervention group experienced an increase in blood sugar of 43.40.

The results of a similar study show that there is an effect of health education through the healthy greetings application for DM self-management behavior in the city of Bengkulu, so it is hoped that the healthy greetings application can be used as media education to improve online-based diabetes self-management so that the wider community can access it, not only for sufferers DM in Bengkulu city (Hanifah et al., 2019).

As well as research results The use of smartphone technology tools (smartphones) can serve as a tool to improve health outcomes through applications that contain health information related to diabetes mellitus, diabetes prevention educational videos, glucose control modality therapy videos, pokemon go games to increase physical activity, dietary guidelines healthy for weight control according to BMI, menu profile history of diabetes mellitus. And research The use of telehealth is very effective in-home care services. This will achieve independent, effective, and efficient health along with the development of technology and information (Andriyanto & Hidayati, 2018)(Istifada et al., 2017). And it is supported by research that says the management of non-smartphone diabetes patients and using smartphone applications has significant benefits in helping to improve blood sugar and HbA1c results in diabetes patients by improving health information, increasing medication adherence, helping to improve access to health services and monitoring physical activity for diabetes mellitus patients. Various interventions such as mobile health applications (m-health), sms, booklets and peer support need to be adapted and implemented in Indonesia. Recommendations for further research are to see the effectiveness and benefits of complementary treatments for diabetes mellitus patients, especially those from Indonesia (Sesaria et al., 2021).

For people with diabetes, promotive and preventive activities must be carried out with effective public relations and education because diabetes education is an activity aimed at controlling blood sugar to prevent diabetes mellitus (Shubbrook et al., 2017).

The International Diabetes Association believes that to prevent complications or further diabetes, health education about diabetes self-management behavior is very important (Lari et al., 2017).

Choosing the right way to implement self-directed health education is critical from the perspective of beneficiaries, time availability, and health promotion personnel. Promotive and preventive efforts must be carried out with effective outreach and education through public health intervention strategies related to diabetes and diabetes mellitus because diabetes and diabetes education are activities to prevent complications due to uncontrolled blood sugar (Elliot & Sammons, 2016).

Health education methods currently exist through discussions, presentations, and illustrations. Nurses need special attention in carrying out their duties as educators so that they can take advantage of technological developments, especially the use of Android-based applications as teaching tools. Obtain health disease management information. The DM Remote Health Group application is part of developing innovative media in the health sector, especially in treating diabetes. This training is a form of intervention to improve diabetes self-management by lowering blood sugar. The DM group telehealth application menu feature consists of five pillars of diabetes mellitus management, including the diabetes education menu, self-check blood sugar education, and education on physical exercise and good food for type 2 DM.

The DM group telehealth application also has chat or consultation features with a doctor who WhatsApp will directly link. You can directly communicate with the doctor and control blood sugar levels remotely. This application also has a feature for discussing with nurses, but this discussion feature is still unstable and needs further development. Another goal of this research is to reduce inequality in health education by applying interdisciplinary knowledge between politics and digital technology. This strategy is more effective and cost-effective than conducting a thorough health examination. Methods implemented through personal mobility systems are more effective in meeting the need for lifestyle changes and preventing the burden of chronic disease worldwide because they have not resulted in effective remedies. Health does not limit distance and time. This is supported by further research, especially the development of other applications (Kao & Liebovitz, 2017).

Diabetes education is necessary to keep blood sugar under control. The 30-day average blood glucose is the most important factor. The 30-day average blood glucose accounts for 50%. Therefore, a training program of at least 30 days is required to keep the GDS under control.

Launching an Android app-based intervention helps manage diabetes, facilitates glucose monitoring, and allows people with diabetes to upload monitoring data so doctors can adjust doses or medications. Using Android-based electronic media to send text messages with a diabetes self-management program showed a significant decrease in blood sugar compared to the control group.

The results showed that the Android Telehealth DM Group mobile application affected blood sugar levels in people with diabetes. This is because information and communication technology development encourages better self-management in people with diabetes. Innovative strategies are needed to improve diabetes self-management, but their implementation presents several obstacles due to the diversity

of community characteristics and other demographic and regional conditions.

#### 4. CONCLUSION

Intervention for Diabetics with Telehealth DM Group Supports Android Smartphone Applications to Control Blood Sugar Effectively. It can be concluded from the explanation of this study that the DM group android smartphone telehealth application is feasible to use based on the results of the feasibility expert test with a result of 94.41%. There is a difference in the average results before and after the test before and after using the telehealth application in the diabetes group, with a pre-test blood glucose level of 219.00 and 160.40 after the test with a p-value of 0.002. In the control group, the pre-test blood sugar level was 119.13, and the post-test was 242.53, with a p-value of 0.088. The telehealth DM group android smartphone application effectively controls blood sugar levels with a decrease of 58.6 mg/dl with a p-value of 0.004.

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