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THE EFFECT OF ANDROID-BASED SELF CARE MANAGEMENT ON SELF EFFICACY AND CONTROL OF FASTING BLOOD SUGAR LEVELS OF PEOPLE WITH TYPE 2 DIABETES MELLITUS IN THE WORKING AREA OF THE TEMPEL SLEMAN HEALTH CENTER

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ABSTRACT

Controlling glycemic levels can be achieved through disciplined self-care management, which significantly enhances self-efficacy in individuals managing diabetes mellitus. This study examines the impact of an Android-based health mobile application on empowering type 2 diabetes sufferers, improving nursing services, and optimizing time and cost efficiency. The quasi-experimental research employed a randomized control trial design, conducted at the Tempel II Community Health Center in Sleman, Yogyakarta, from November to December 2023. The findings reveal that Android-based self-care management serves as an effective educational tool, leading to improved self-efficacy among participants. Key components include meal planning, which emphasizes the consumption of carbohydrates, vegetables, proteins, fats, and fruits, and regular physical activity exceeding 150 minutes. Notably, no significant differences were observed in pharmacological interventions. Evaluations indicated substantial improvements in self-efficacy and fasting blood sugar control post-intervention. Overall, the integration of self-care management across five pillars—education, blood sugar monitoring, nutritional therapy, physical exercise, and pharmacological adherence—demonstrated a significant positive effect on glycemic control in type 2 diabetes patients within the Tempel Sleman Community Health Center area.

KEYWORDS *Self-care management, Type 2 diabetes, Self-efficacy*

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INTRODUCTION

Diabetes Mellitus or commonly abbreviated as DM has been defined by the World Health Organization (WHO) in 1999 as a chronic metabolic disease or disorder characterized by high blood sugar levels which is usually accompanied by various disturbances in the metabolism of lipids, carbohydrates, proteins resulting from insufficiency of insulin function with multiple etiologies (Organization, 2021). Another definition mentions DM as a disorder in the body's metabolism characterized by persistent hyperglycemia. The disorder is the result of impaired insulin secretion, resistance to insulin peripheral action, or both (Andrade et al., 2015). DM is the main contributor to blindness, stroke, kidney failure, and limb amputation, especially the lower part (WHO, 2019). DM is also associated with reduced bone strength so that it triggers faster bone loss in sufferers (Picke et al., 2019).

Based on the latest report, in 2021 around 537 million adults in the age range of 20-97 years have diabetes. This number is predicted to continue to increase to 643 million in 2030 and 783 million in 2045. It was found that 3 out of 4 people with diabetes mellitus came from low- to middle-income countries (Intenational Diabetes Federation, 2017). Indonesia itself is the only country in Southeast Asia that is included in the top 10 countries with the 6th highest prevalence of DM in the world.

The number of DM sufferers in Indonesia reached 10.7 million people 5. This amount is based on data and criteria adopted from the American Diabetes Association (ADA) that a person is said to be diabetic if fasting blood sugar ≥ 126 mg/dL, or blood glucose 2 hours after loading ≥ 200 mg/dL, or blood sugar when ≥ 200 mg/dL accompanied by common symptoms of DM, namely frequent hunger, frequent thirst, frequent urination in large amounts, and weight loss. Yogyakarta is included in the 4 provinces with the highest prevalence of DM in Indonesia, which is 3.1%.

In general, there are two types of diabetes, namely type 1 and type 2. Type 1 diabetes (T1DM) is characterized by the autoimmune destruction of insulin-producing beta cells in the pancreas, resulting in absolute insulin deficiency. This diabetes accounts for about 5-10% of DM cases that occur. Type 2 DM (T2DM) accounts for nearly 90% of DM cases that occur, characterized by insulin resistance due to the body's reduced response to insulin. This condition causes insulin to be ineffective followed by increased insulin production but eventually decreases (Sinnott et al., 2017; S.-J. et al., 2017). T2DM is associated with an unhealthy diet, sedentary lifestyle, as well as genetics that determine an individual's susceptibility to T2DM.

In addition to DM sufferers who always increase in a short period of time, it is also known that DM can give rise to other diseases or complications. DM complications are divided into two, consisting of acute and chronic. Acute complications include diabetic ketoacidosis, hyperstellar hyperglycemic state, hypoglycemia, and chronic complications including microangiopathy, macroangiopathy and neuropathy. In 2017, DM disease ranked third as the highest death toll from non-communicable diseases in Indonesia (Patil et al., 2023; Zheng

et al., 2017, 2018). This explains that indeed the number of DM sufferers in Indonesia is increasing day by day.

In addition to blood sugar at any time, one of the ways to screen Diabetes Mellitus 7 patients is to do a fasting blood sugar check because it is considered quite effective in seeing patients and the blood sugar condition of Diabetes Mellitus 7 6 patients. The normal limit of fasting blood sugar levels is less than 100 mg/dl. Individuals with fasting blood sugar levels of 100 mg/dl to 125 mg/dl are called pre-diabetic, while individuals with fasting blood sugar levels of 126 mg/dl or higher can be said to have Diabetes Mellitus.

Controlling GDP is necessary for people with diabetes mellitus. There are several factors that affect the success of GDP control such as gender, age, education level, complications owned, comorbidities, and the use of antidiabetics. Efforts to control GDP can be carried out through self-care management that is disciplined so as not to aggravate the condition of the disease. Various other forms of effort can be done by dieting, adherence to medication consumption, increasing knowledge, and engaging in physical activity.

Self efficacy will affect the individual's attitude in caring for the disease suffered, a person with good self efficacy, then the person can confidently carry out better treatment and health improvement, on the other hand, if the individual has poor self efficacy, it will result in an individual's self-management pattern that is also poor in maintaining his health. Good self-efficacy affects the self-management of DM sufferers because sufferers have a good ability to improve their self-management by adhering to behaviors such as diet, physical exercise, medication, and blood sugar monitoring. This proves that the better the patient's self-efficacy, the better the patient's self-management (Fajriani & Muflihatin, 2021; Fitriani & Muflihatin, 2020; Riyadi & Khoiroh Muflihatin, 2021; Saqila & Muflihatin, 2021). Self efficay has a positive relationship in self-care for DM sufferers, where self-care is needed to maximize self-management of DM sufferers (Kav et al., 2015, 2017).

Good self efficacy is indicated by good self-care management. In this case, self-care management includes activities that include education, diet management, physical activity, blood sugar monitoring, pharmacological therapy or taking medication DM (Erida Silalahi et al., 2021; Handayani et al., 2019; Manuntung, 2020). The implementation of good self-care management will minimize the risk of complications so that it can maintain the quality of life of DM 2 81 patients. Self efficacy and good and successful self-management will be seen from fasting blood sugar levels which is one of the ways to screen for people with diabetes mellitus. Various interventions have been carried out to improve self-efficacy for type 2 DM patients. One of the interventions that has been proven to be able to increase self-efficacy by improving self-management of type 2 DM patients is by providing education and increasing knowledge.

Currently, human life can take advantage of various kinds of technology, including applications on software. Even a mobile app or also referred to as mobile apss (available on smartphones) can be used as one of the places to manage DMs. Smartphone apps can help people with Diabetes mellitus to control their health. The Health mobile application is very useful for empowering people with diabetes

mellitus, improving the quality of nursing services and being efficient in terms of time and cost (Mohammadzadeh et al., 2023; Nunes et al., 2019; Pires et al., 2020; Wang et al., 2022). Various self-care management activities such as diabetes mellitus treatment, physical exercise, diet management, and blood sugar control can be outlined in the android 82-based program. The existence of andorid-based self-care management in patients with type 2 diabetes can be used as creativity and development in an effort to reduce and prevent complications and mortality due to DM 18 disease.

Based on this description, the author wants to find out the effect of the androrid-based self-care management application on self-efficacy and blood sugar level control of patients with type 2 DM in an effort to maintain their health condition in an effort to maintain their health condition from the fasting blood sugar level. Researchers also want to find out whether the use of self-care management applications that can be accessed on Android by DM sufferers can help choose treatment plans and treatments independently for Type 2 DM sufferers.

Managing diabetes effectively requires diligent self-care practices, especially for people with Type 2 Diabetes Mellitus (T2DM), a growing health concern worldwide. Among the primary challenges faced by T2DM patients is maintaining stable blood glucose levels, which can be achieved through proper medication adherence, diet, physical activity, and regular blood sugar monitoring. Traditional methods of managing T2DM may not always yield the desired results, as they may not effectively engage patients in their care. Additionally, there is a gap in utilizing technology to enhance self-care management and improve patient outcomes. Despite the increasing prevalence of diabetes in regions such as Yogyakarta, patients often struggle to manage their condition effectively due to insufficient tools and guidance.

Recent studies have pointed to mobile health applications as a promising solution to empower patients in managing their condition. However, the effectiveness of such applications, particularly Android-based ones, in improving self-efficacy and controlling fasting blood sugar levels remains underexplored. The research focuses on how Android-based self-care management tools can impact patients' self-efficacy and blood sugar control, specifically for Type 2 DM patients in the working area of the Tempel Sleman Health Center. This exploration is critical in bridging the gap in diabetes management by incorporating technology-driven solutions to complement traditional healthcare services.

The urgency of this research stems from the rapid increase in Type 2 Diabetes Mellitus cases worldwide, particularly in countries with large populations like Indonesia. As diabetes continues to contribute to significant health complications and a growing mortality rate, it is crucial to explore more effective and accessible ways to manage the condition. Given the growing integration of mobile technologies in healthcare, understanding how Android-based applications can assist in self-care management is timely. This study addresses a critical need for innovative solutions that can empower diabetes patients to better manage their health, improve adherence to treatment regimens, and potentially reduce the burden of diabetes-related complications.

Several studies have examined the role of technology in enhancing self-care management for patients with Type 2 Diabetes. For instance, research by Karingga et al. (2023) highlighted the potential of mobile health applications in improving self-management behaviors by providing real-time feedback and educational resources. The study found that mobile apps significantly contribute to better glycemic control by facilitating adherence to diet, medication, and physical activity guidelines. Similarly, Sesaria et al. (2021) demonstrated that Android-based applications had a positive impact on self-efficacy, as patients felt more in control of their health and capable of managing their condition through continuous support and tailored interventions.

Furthermore, a study by Lari et al. (2018) underscored the effectiveness of electronic health interventions in improving self-care activities for T2DM patients. The study revealed that patients using digital platforms for health education, including dietary guidelines and exercise routines, showed increased confidence in managing their diabetes. However, despite these findings, there remains a lack of research specifically evaluating the direct effects of Android-based self-care apps on fasting blood sugar control in real-world settings like those in the Tempel Sleman Health Center area.

Additionally, research by Franc et al. (2022) examined the role of self-care management in preventing the complications of T2DM, such as cardiovascular diseases and neuropathy. The study concluded that interventions promoting self-management behaviors, such as meal planning and blood sugar monitoring, significantly reduced the risks associated with diabetes. While this research emphasizes the importance of self-care, it does not fully explore the integration of mobile applications as a tool for enhancing these behaviors in everyday life.

While existing research supports the benefits of self-care management and mobile health applications in diabetes care, there is a notable gap in understanding how Android-based applications can specifically improve fasting blood sugar control and self-efficacy in T2DM patients. Most studies have focused on general diabetes management or have used other digital platforms, such as websites or tablet-based apps. This research seeks to fill this gap by evaluating the impact of Android-based applications in the context of self-care management, specifically targeting blood sugar control and self-efficacy in a clinical setting in Yogyakarta.

This study introduces a novel approach by focusing on the use of Android-based applications for diabetes self-care management in the working area of the Tempel Sleman Health Center. Unlike previous studies that predominantly used broader digital health interventions or non-Android-based platforms, this research specifically targets the effectiveness of mobile applications on Android devices, a widely accessible and user-friendly technology. The focus on self-efficacy, an essential factor in managing T2DM, alongside the control of fasting blood sugar levels, provides new insights into how digital tools can be integrated into routine diabetes care to promote long-term health outcomes.

The objective of this study is to evaluate the impact of Android-based self-care management applications on the self-efficacy and control of fasting blood sugar levels in Type 2 Diabetes Mellitus patients in the Tempel Sleman Health Center area. Specifically, the research aims to assess whether the use of an Android

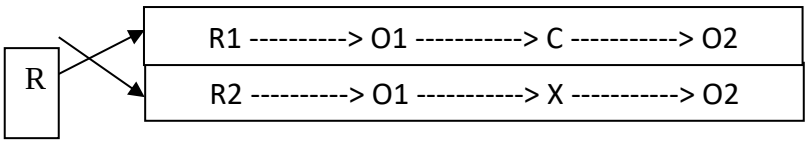
app can enhance patients' ability to manage their condition independently, improve adherence to treatment protocols, and achieve better glycemic control compared to traditional methods of care.

The findings of this study have several benefits for healthcare practitioners, patients, and policymakers. By demonstrating the effectiveness of Android-based self-care management tools, the research can inform the development of digital health interventions that support diabetes management. For patients, it offers a practical, accessible tool to manage their health and improve self-efficacy, potentially leading to better disease outcomes. For healthcare providers, the study provides evidence on the efficacy of digital interventions, which can be integrated into routine care. Policymakers can use these insights to promote the adoption of mobile health solutions in managing chronic diseases like Type 2 Diabetes, contributing to improved public health outcomes.

RESEARCH METHODS

Types and Design of Research

This study is a quasi-experimental research with a quantitative approach that uses a randomize control trial (pretest and posttest) with control group design. The purpose of this study is to determine the application of self-care management using an android-based application to self-efficacy and GDP control of Type 2 DM patients. The research design used is as follows:



Information:

R : Type 2 DM Sufferers
R1 : Type 2 DM Patient Control Group
R2 : Intervention Group for Type 2 DM Patients
O1 : Initial measurement (pretest) to find out the patient's self-efficacy score DM Type 2
O2 : Final measurement (posttest) to find out the patient's self-efficacy score DM Type 2
C : Intervention in the form of standard health center services using WhatsApp
X : Intervention in the form of the use of self-care management applications based on Android

RESULT AND DISCUSSION

Overview of self-care management in five pillars in patients with type 2 diabetes in the Working Area of the Tempel Sleman Health Center

1. Android-based counseling or education for people with type 2 diabetes mellitus in the Working Area of the Tempel Sleman Health Center

An overview of self-care management in the 5 Pillars of Type 2 DM Management for type 2 DM patients in the first Tempel Sleman Health Center Work Area is counseling or education. Android-based self-care management as an educational medium in the experimental group when the pretest is carried out and the control group when the pretest is carried out, there are changes in the pretest and posttest to increase self-efficacy with good criteria. The results provide an overview of the two groups after carrying out android-based self-care management as an educational medium has an increase in self-efficacy that is getting better.

Munir & Solissa's research showed that 35 people (85.4%) of patients had good self-efficacy. As for table 3, it shows that there are 34 people (85.4%) patients who have self-care with a good category. Based on the results of the study in table 4, patients who had good self-efficacy and self-care were 32 patients (91.4%), while patients who had poor self-efficacy and self-care were 4 patients (66.7%).

The application of self-care management is used through an android-based application for Type 2 DM sufferers. Applications in this study include the display of gender, age, height and weight so that the characteristics of the user can be known. The android-based application used also has a feature to provide education in the form of tips for DM sufferers. The education provided has several menus/features including food menus, physical exercise, and drug consumption. Food menu tips contain information on carbohydrate sources for users, activity & exercise tips contain drinking arrangements in exercise sessions and medication consumption.

Previous research has also developed interactive services and product designs based on Android apps for people with diabetes. The existence of this innovation can provide input for health policies related to non-communicable diseases (NCDs), especially DM. The development of DM early detection applications on smartphones can affect the prevention of type 2 DM through the promotion of a healthy lifestyle and special attention is paid to the prevention of DM 88 complications.

Information and Communication Technology (ICT) can provide monitoring systems with the help of interactive smart apps such as smart phone apps that provide real-time monitoring to users, suggestions and also provide statistical reports to show health progress. In the research conducted, it was shown that the applications to analyze the features provided and the feasibility of these applications to be a powerful interactive system for continuous monitoring and support for people with diabetes89. In a research study, the android-based "Melpredia" application can improve prediabetes self-care management in preventing diabetes mellitus by utilizing educational menus, meal planning, physical activity, and reminders to use the 90 app.

Self-management programs include healthy eating, periodic blood sugar monitoring, drug therapy and adaptive coping skills are currently often socialized to increase the awareness and ability of DM clients in caring for themselves but until now there is still a lack of compliance related to self-management in DM clients, one of which is in the form of non-compliance with dietary recommendations which is also associated with low self-efficacy, namely lack of confidence in the ability to regulate and perform an action at a specified level. Self-

efficacy is one of the constructions in Social Cognitive Theory (SCT) which is considered important in DM self-management because interventions related to dietary behavior and self-confidence are related to compliance and have an impact on better glycemic control. Self-efficacy is in the form of confidence in one's ability to complete a task. Self-efficacy is related to the selection of tasks, training, persistence, effort, and achievement while expectation of results is in the form of confidence about the expected results of a behavior.

Research by Hofmann et al and Murray et al. suggested that the HeLP-Diabetes internet-based self-management intervention showed no significant differences were found in emotional distress or self-efficacy. Qualitative data found that participants reported increased self-efficacy and support, better management of low mood, greater awareness of diabetes, and more serious treatment of the condition. Participants can also make improvements to their eating habits, exercise routine, and medical management. Some negative experiences associated with the use of interventions were mentioned including feelings of guilt for not using the intervention as suggested or not making a change in behavior. However, having access to HeLP-Diabete can help improve glycemic control.

2. Overview of Blood Sugar Level Examination of Type 2 DM Patients in the Working Area of the Tempel Sleman Health Center.

An overview of the results of the examination is known as the GDP value of type 2 DM patients in the Tempel Sleman Health Center Working Area. The results of the GDP value in the experimental group when the pretest was carried out mostly experienced prediabetes, while after the intervention, the results of the postes measurement decreased the normal GDP value. The control group when the pretest was carried out mostly experienced prediabetes, while after the intervention, the results of the postes measurement experienced a decrease in the normal GDP value. These results indicate a change in the decrease in GDP value in both the experimental and control groups. These results provide an overview of changes in GDP value, there is a tendency for the experimental group to experience more GDP decline than the control group.

Uncontrolled blood sugar levels in the body can cause various complications in people with type 2 diabetes, one of the complications that often occurs is macroangiopathy, which is a complication in large blood vessels that affects changes in blood pressure. Research by Setiawan & Salbiah 96 showed that as many as 18 people (30%) of respondents had normal blood sugar levels. Respondents who had hyperglycemia blood sugar levels were 42 people (70%). In this study, the percentage of hyperglycemic blood glucose levels was higher, which indicates that the respondents are still not able to make appropriate efforts in controlling their blood sugar levels.

Research conducted by Wibowo et al showed that the characteristics of people with diabetes mellitus who examined themselves at the Orlin Media clinic in 2016 based on the fasting glucose examination in table 2 showed that 23 people (20.7%) with diabetes mellitus were in the good category (20.7%), 14 people in the moderate category (12.6%), and 74 people (66.7%) in the bad category.

Uncontrolled blood glucose levels in patients with diabetes mellitus will cause various complications, both acute and chronic. At very high blood glucose levels (at KAD 300-600 mg/dL, at SHH 600-1200 mg/dL), acute complications patients are usually unconscious with high mortality rates, and acute complications such as macroangiopathy, heart disease, stroke, diabetic retinopathy (about the retina of the eye) and diabetic nephropathy (about the kidneys), eyes, glaucoma, decreased sense of smell, susceptibility to tuberculosis (TB), and diabetic feet/ulcers (diabetic foot). Therefore, it is very important for patients to monitor their blood glucose levels on a regular basis.

3. Overview of the feeding plan of medical nutrition therapy in patients with type 2 DM in the Working Area of the Tempel Sleman Health Center.

Overview of the meal plan for medical nutrition therapy for patients with type 2 DM in the Working Area of the Tempel Sleman Health Center. Respondents often dominated carbohydrate consumption in both control groups The source of carbohydrates consumed was white rice, dominating the majority of respondents often consuming vegetables. The majority of respondents consumed 2 glasses of mustard greens with the same percentage of good often consuming protein. The majority of vegetable protein sources are tempeh, the majority of animal protein sources are chicken meat. Consume fat sources of fat come from cooking oil 1/2 tablespoon with percentage, consumption of fruits. The fruits consumed are papaya dominating and salak fruit.

The results showed that there was a significant difference in the planning of medical nutrition therapy meals in the intervention group and the control group after being given the Self Care Management intervention with android application media in type 2 DM patients and it can be interpreted that the use of android-based media as a Self Care Management media can significantly improve the planning of medical nutrition therapy meals compared to using WhatsApp group media.

Prevention efforts that can be made to avoid the occurrence of complications of diabetes mellitus are by managing diabetes which consists of five pillars, namely monitoring blood sugar levels (monitoring), meal planning (diet), physical exercise (exercise), treatment with OHO. or insulin, and counseling (education). This meal plan (diet) is effective in lowering blood sugar in diabetics because after participating in this study, diabetics will know more about what foods are recommended, restricted, and avoided, the body's calorie needs, and how to prepare the correct daily menu.

Agastiya et al. concluded from their research that the application of digital educational media in the form of telehealth can provide positive self-management results in type 2 DM patients with full support from their family or peers during the implementation of telehealth. Shin et al. mentioned that digital technology offers an interesting solution to overcome the challenge of involving family members in caring for patients. Through this digital media, families can more easily access information about patient care and facilitate working families who may not have enough time to search for health information on a paper-based basis.

4. Description of physical activity or physical exercise in patients with type 2 DM in the Tempel Sleman Health Center Work Area.

The description of patients who do physical activity or physical exercise in the category is very frequent in both groups. Physical activity was carried out on Mondays and Thursdays, the majority of respondents did physical activity with a duration of more than 150 minutes. The majority of respondents chose to do jogging activities. The results of the study found that there was a significant difference in the variables of physical activity or physical exercise in the intervention group and the control group after being given a Self Care Management intervention with android application media in type 2 DM patients and it was interpreted that the use of android-based media as a Self Care Management media could significantly increase physical activity or physical exercise compared to using whatsapp group media.

Physical exercise or leg exercises in DM patients aim to improve blood circulation and increase blood sugar use in muscle tissue as well as control blood sugar levels. According to Nasution et al., there are two factors that cause type 2 diabetes mellitus, namely factors that cannot be modified such as age, gender, and genetics. Next there are factors that can be modified, namely diet, smoking, hypertension and obesity, stress, physical activity and alcohol consumption. The treatment of diabetes mellitus consists of 2 types, namely non-pharmacological interventions that focus on lifestyle management such as an appropriate diet and increased physical activity. The management of diabetes mellitus begins by implementing a healthy lifestyle in the patient's diet and activity pattern with the aim of balancing the action of the hormone insulin so that normal blood glucose levels can be achieved, which can subsequently minimize – prevent the occurrence of disorders in blood vessels and nerve function which further improves the quality of life and activity.

The findings are in line with the research of Putri et al explaining that the management of type 2 diabetes can be carried out with several core activities, namely the provision of materials related to diabetes diet, physical activity, and monitoring blood sugar levels, then there are relaxation activities with song guessing games. The entire material is adjusted to the DM management pillar material, especially the education pillar. The material presented by the presenter could be conveyed well and received a good response from the participants. It is evidenced by the enthusiastic participants asking various questions during the discussion session.

Exercise is necessary to maintain fitness, lose weight, and increase insulin sensitivity so that blood sugar control can be improved. Recommended physical exercise is moderate-intensity aerobic exercise such as brisk walking, leisurely cycling, jogging, and swimming. Meanwhile, for diabetics 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 must be adjusted to the patient's age and physical fitness status. For diabetics, sometimes diet and exercise alone are not enough to control blood sugar levels in the body of diabetics. If it is like this, usually the doctor will prescribe medicine.

Diet and exercise programs support to control the body's blood sugar levels to normal thresholds. Research by Agustini et al revealed that physical exercise is an important part of the main pillar of diabetes. During physical exercise, muscles become more active and membrane permiability occurs as well as increased blood flow so that more capillary membranes are exposed and more insulin receptors are activated and there is a shift in the use of ener-gy by muscles derived from fatty acid sources to the use of muscle glucose and glycogen.

5. Overview of pharmacological interventions for people with type 2 DM in the Working Area of the Tempel Sleman Health Center

Overview of pharmacological interventions for patients with type 2 diabetes in the Working Area of the Tempel Sleman Health Center, most of the respondents who took medication were very regular in consuming drugs in the intervention group and control group. The drug consumed is metformin, the dose of the drug consumed as much as 500 mg dominates. The time to take medication dominates the morning time. This study found that there was no significant difference in pharmacological intervention variables or drug consumption in the intervention group and the control group after being given a Self Care Management intervention with android application media in type 2 DM patients. This means that the use of android-based media and the use of whatsapp group media as a Self Care medium have the same ability to improve pharmacology or drug consumption.

Patients with diabetes mellitus need to be given an understanding of the importance of complying with treatment to stabilize blood sugar levels in order to suppress complications that will occur, so that people obey the recommendations given by health workers in daily life. Pillar of Diabetes Mellitus in terms of drug consumption, patients take medication according to the recommendations of health workers. Pillar of Diabetes Mellitus in terms of monitoring blood sugar levels, patients routinely check their blood sugar according to the schedule determined by health workers.

Pharmacological therapy is given along with eating arrangements and physical exercise (healthy lifestyle). Pharmacological therapy consists of oral drugs and injectable forms. Premixed insulin combination therapy with biguanid is a therapy that has shown a lot of success in therapy. A study by Agustini et al related to the consumption of DM drugs, showed that most of the respondents 199 (82.9%) consumed the drug every day. From this data, it can be concluded that respondents have implemented the fourth pillar well. Regular behavior of taking anti-diabetic drugs is one of the efforts to control blood glucose control or complications that can be caused. If DM sufferers do not comply in carrying out the treatment program that has been recommended by doctors or other health workers, it will be able to worsen their disease condition.

Evaluation of changes in self-efficacy in patients with type 2 diabetes mellitus after using android-based self-care management for type 2 DM patients in the Tempel Sleman Health Center Working Area

The findings of the study showed that there was a significant difference in values (p=0.000), in the control group and the intervention group. This shows that

the provision of Self Care Management with or without android application-based media can both significantly increase self-efficacy, but when viewed from the mean value, it is found that in the intervention group the increase in the mean value is higher than the mean value in the control group, this shows that the provision of Self Care Management with android-based media significantly increases self efficacy compared to whatsapp media Group.

The findings of the study are in line with the research of Harmiardillah showing that the level of self-efficacy of the treatment group before the intervention of the majority of respondents (66.7%) was in the category of moderate self-efficacy, while after the intervention the majority of respondents (77.8%) were in the category of good self-efficacy. The self-efficacy level of the control group before the intervention was in the category of moderate self-efficacy, while after the intervention the majority of respondents (51.9%) remained in the category of moderate self-efficacy. Self-efficacy is an important component to achieve a behavioral change obtained through the process of psychological self-regulation.

A research study that corroborates the findings conducted by Amelia showed that the self-care behavior of type 2 diabetes mellitus in Binjai was significantly influenced by self-efficacy ($\rho = 0.000$). The results of this study are also in line with Akoit 118's research, that there is a relationship between self-efficacy and self-care behavior $\rho=0.036$). Self-efficacy is very important in the treatment of diabetes mellitus with good self-efficacy or self-confidence, people with diabetes mellitus are able to carry out self-care activities so that blood sugar levels are possible to remain within normal limits.

Self efficacy of DM type 2 patients in the Working Area of the Tempel Sleman Health Center. Self-efficacy in the experimental group and control group when the pretest was carried out, there were changes in the pretest and postes increased with supporting criteria. The results give an idea that both groups have an increase in self-efficacy changes, which means that they are getting better. Self-efficacy is a belief in self-ability that is able to encourage patients to maintain diabetes mellitus self-care behavior so that patients are able to manage self-care in implementing diabetes mellitus self-care.

Self-efficacy is a form of health behavior that is formed within a person which is influenced by two main factors, namely stimulus factors from outside a person and factors from within the person concerned. Self-efficacy has a very important role in changing a person's health behavior. Self-efficacy is closely related to adherence, including dietary adherence to diabetes. The better the self-efficacy a person has, the better the health behavior.

Clinical trial of self-efficacy to find out how much effect the treatment using android 126-based media is. The clinical trial compared the experimental group which is the provision of self-care management based on android applications with WhatsApp group media as a control to increase self-efficacy. The two self-care management were given for 1 month, the effect size value obtained showed that the intervention carried out by the researcher had an effect on fasting self-efficacy by 0.48 or 48%.

Clinical trials by calculating how much treatment tested provides improvement compared to control, namely by calculating relative risk reduction (RRR) of 0.28 KE can reduce failure by 28% compared to KK, and calculating absolute risk reduction (ARR), which is the difference in the proportion of cure or failure between the treatment and control groups is obtained at 0.13, meaning the difference in KE failure compared to KK is 13%. The calculation then continued with NNT (number needed to treat) and was 8, meaning that only 8 people were needed to be given KE for 1 month to be able to avoid 1 person from poor self-efficacy. NNH indicates the number of patients who must be treated to obtain an additional 1 good outcome or avoid 1 failure, while NNH NNH (number needed to harm) means the number of patients treated to add 1 person to an unwanted effect is 127. The results of the NNH analysis obtained a value of 8, meaning that 8 KE patients are needed for 1 month to add 1 person to obtain good self-efficacy side effects.

The use of smartphone technology tools, especially android applications, can function as a tool to improve health outcomes through applications that contain health information related to diabetes mellitus, diabetes prevention education videos, glucose control modality therapy videos, pokemon go games to increase physical activity, guidelines for healthy eating for weight control according to BMI, diabetes mellitus history menu profiles. And research The use of telehealth is a very effective home care service. This will realize independent, effective, and efficient health in line with the development of technology and information.

The discussion is related to self-efficacy in the self-management of DM patients, consisting of diet, physical activity, glycemic control, medication, and foot care. Self-efficacy is an important thing that must be possessed by DM patients, especially in self-management related to their diseases. The recommendation and implications for nursing are to improve self-efficacy as one of the 87 nursing self-interventions. Nurses can start the nursing process by assessing the patient's level of self-efficacy, then continue by providing education related to DM self-management as an intervention that can be integrated into nursing services. Self-efficacy is useful for predicting the improvement of self-management. Individuals who have good efficacy will try to achieve specific goals despite facing obstacles. Several studies have shown that diabetes self-management education programs based on the theory of self-efficacy can improve self-management and can delay the onset of complications from the patient's condition.

Evaluation of fasting blood sugar level control in patients with type 2 diabetes mellitus after using android-based self-care management for type 2 DM patients in the Tempel Sleman Health Center Working Area

The control of fasting blood sugar levels in patients with type 2 diabetes mellitus after using android-based self-care management for type 2 DM patients in the Tempel Sleman Health Center Working Area decreased from before and after treatment. This shows that the provision of android-based Self Care Management is more effective in reducing the GDP value compared to Self Care Management using whatsapp group media. The GDP value in the experimental group when the

pretest was carried out most of them experienced prediabetes after the intervention was carried out, the results of postes measurement experienced a decrease in normal GDP values. The control group when the pretest was carried out mostly experienced prediabetes and diabetes, while after the post-test measurement was carried out, there was a decrease in the normal GDP value. These results indicate a change in the decrease in GDP value in both the experimental and control groups.

These results provide an overview of changes in GDP value, the presence of a small number of experimental groups experienced more decreases in GDP value than the control group. Significant intervention and control group (p=0.000), this shows that the provision of self care management media based on android applications and whatsapp group media can both significantly increase self-efficacy. The feasibility of the diabetes care application is based on the results of the study, it is found that the diabetes care application still needs to be improved. Self-care management in patients with type 2 diabetes is aimed at controlling blood glucose levels to minimize complications due to diabetes mellitus.

This is in line with Franc, et al., arguing that diabetes self-management has been considered as a diabetes treatment and is believed to have an important influence in preventing microvascular and macrovascular complications. Self-management includes diabetes education, healthy diet, physical activity, medication, and the use of devices in monitoring by using patient data to adjust drug administration, in terms of preventing, detecting, dealing with acute and chronic complications, coping with psychosocial problems, and problem solving.

Diabetes mellitus, a chronic metabolic disorder characterized by elevated blood sugar levels, presents a unique challenge to the elderly population. As we age, a person's body undergoes various physiological changes that can make it difficult to manage diabetes. With the increasing elderly population in the world, the importance of effective diabetes control in elderly patients has become very important. This demographic faces an increased risk of complications associated with diabetes, including cardiovascular disease, neuropathy, kidney dysfunction, and vision impairment. The effect size test was to find out how much the effect of treatment in Self Care Management using android-based media to increase GDP. Based on the interpretation of the effect size obtained, it shows that the intervention carried out by the researcher has an effect on fasting blood sugar levels of 0.60 or 60% between 0.51-1.00.

Clinical trials by calculating how much treatment tested provides improvement compared to control, namely by calculating relative risk reduction (RRR) of 0.15 KE can reduce failure by 15% compared to KK, and calculating absolute risk reduction (ARR), which is the difference in the proportion of cure or failure between the treatment and control groups is obtained at 0.05, meaning the difference in KE failure compared to KK is 5%. The calculation is then continued with NNT (number needed to treat) of 20, meaning that 20 people are needed who are given KE for 1 month to be able to avoid 1 person from high fasting blood sugar. The NNH calculation of 20 means that the number of patients treated to add 1 person has an unwanted effect of 127. The results of the NNH (number needed to harm) analysis obtained a value of 20, meaning that 20 KE patients are needed

for 1 month to add 1 person to obtain the side effects of low fasting blood sugar levels with good self-efficacy.

Self-management is an integral part of diabetes control. Self-care diabetes management can effectively reduce the risk of DM patients to the incidence of coronary heart complications, in addition to self-care can also control normal blood sugar levels, reduce the impact of problems due to DM, and reduce the mortality rate due to DM. Self-care carried out by DM sufferers includes diet or diet management, exercise, monitoring blood sugar levels, medication, and diabetic foot care.

The Effect of Android-Based Self Care Management on Self Efficacy and Control of Fasting Blood Sugar Levels of People with Type 2 Diabetes Mellitus in the Working Area of the Tempel Sleman Health Center

Data on self-efficacy owned by type 2 DM patients were obtained through measurements using the SDSCA-I Summary of Diabetes Self-Care Activities Indonesian Version questionnaire instrument which was carried out within 14 days. The description of the results of the study in the previous chapter shows that there is a significant influence of self-care management using android-based DM application media in the intervention group and whatsapp group media in the control group on the self-efficacy of type 2 DM patients. This shows that both the media used, both android-based DM application media and whatsapp group media, can increase the self-efficacy of type 2 DM patients.

Other research also shows that it is in line with the results of this study where the use of whatsapp-based Self Care Management has an influence on increasing self-efficacy owned by type 2 DM patients. Research by Komang (2019) shows similar results where the use of self-care management based on android applications has a significant influence on increasing self-efficacy owned by type 2 DM sufferers.

Self efficacy is the confidence possessed by patients in maintaining or improving their medical condition. The self-efficacy value in the results of this study showed that there was no difference between the intervention group and the control group where both had a significant influence. However, based on the comparison of the delta values of each group and the results of statistical tests, there was a significant difference between the intervention group and the control group. This shows that the provision of self care management based on the android application has a more significant influence in increasing the self-efficacy of type 2 DM patients compared to whatsapp media even though basically the use of this media also increases self-efficacy.

The results of this study are reinforced by a similar study, namely by Sesaria et al., 2021 showing clearer results where the use of Self Care Management as an application media can better meet aspects such as education, exercise and diet, stress management, and medication compliance patterns. These four aspects are aspects that must exist in a Self Care Management management media, which in this study is more found in android-based applications than in whatsapp groups.

Similar results are shown by the research of Lari et al (2018) which states that the provision of electronic media-based education is significantly able to

increase self-efficacy. Providing education using electronic media in the form of telephones can provide support to individuals, resulting in a feeling of being listened to and understood by patients and can increase confidence if done well. Patients' ability to control self-care can be improved through patient empowerment. This can increase self-efficacy and reduce the feeling of pressure possessed by the patient.

Self efficacy is an important determinant in physical activity behavior, so the process of education and health promotion is something that must be considered in the management of a disease. The application in this study has been equipped with various features that will bring users to further study related to diseases and various information about type 2 DM. This exploration is a response to the promotion carried out through an application about Type 2 DM disease. In addition to the implementation of promotions, this application also pays attention to good and easy-to-understand content, communication, and lifestyle monitoring carried out during daily life, thereby increasing the self-efficacy of Type 2 DM patients. Karingga et al (2023) found that telehealth is indeed a very positive thing in efforts to increase the use of electronic media, especially for type 2 DM patients, which in this study is manifested in an android-based application.

The effect of android-based DM applications as a medium for Self Care Management (Diabetes self management education) on GDP (Fasting Blood Sugar) in type 2 DM patients. Fasting Blood Sugar (GDP) data was obtained by taking blood samples during pre and post tests, namely within 14 days or two weeks. The results of the previous chapter have shown that there is a decrease in the GDP rate in the intervention and control groups. The decrease in GDP in the control group was not significant, while a significant average decrease was seen in the intervention group. This shows that there is a difference, where the use of android-based applications as a medium for Self Care Management is more effective in reducing GDP compared to only whatsapp groups in type 2 DM patients.

Other research also states that the use of smartphone applications should be more effectively used as a medium for Self Care Management, one of which is to reduce GDP levels in Type 2 DM patients. This can be based on more comprehensive media when Self Care Management is carried out using an application, because it contains 4 guidelines, namely education, eating and exercise management, stress management, and medication compliance in accordance with previously carried out education.

DM management through Self Care Management has been researched to significantly reduce blood sugar levels in type 2 DM patients. GDP is the basis for the detection and control of blood sugar conditions in patients with type 2 DM. Research also uses a lot of blood sugar indicators to see how much Self Care Management media or other interventions affect patient management control.

DM management requires intensive efforts to be able to provide maximum results, which is characterized by good blood sugar control from DM patients. Research conducted by Umaroh (2017) revealed that Self Care Management as a management medium is an effective medium for patients because it contains

various educational sessions, administration, brief communication, and monitoring of its implementation.

Cotter et al (2014) revealed that the implementation of electronic interventions is able to help DM management. In most implementations of electronic interventions, it was found that the majority of media were focused on the blood glucose monitoring process, which allowed data to be uploaded and downloaded so that doctors and health workers could help adjust the therapy provided. The use of smartphone-based application media has been proven to be more effective as a medium for Self Care Management in Type 2 DM patients. Technology has become a tool that supports self-management of care in DM patients by increasing access to good information or education, improving quality of life, and reducing treatment costs.

CONCLUSION

This study examines the impact of Android application-based Self Care Management on self-efficacy and blood sugar level control in Type 2 Diabetes Mellitus (DM) patients within the Tempel Sleman Health Center Working Area. Respondents who received education through WhatsApp and other media showed a significant increase in self-efficacy. The results indicated that the intervention group experienced a more substantial decrease in fasting blood sugar levels (GDP) compared to the control group, highlighting the effectiveness of the Android-based method in managing Type 2 diabetes. Additionally, assessments of meal planning and physical activity revealed positive outcomes, with the intervention group showing better meal planning and more physical activity, surpassing the recommended 150 minutes per week. These improvements underscore the role of Android-based media in encouraging healthy behavior changes in people with DM.

Although no significant differences in pharmacological interventions were observed between the two groups, the overall findings confirm that Android app-based Self Care Management enhances self-efficacy and effectively controls fasting blood sugar levels. This approach has the potential to become a superior method for managing Type 2 DM, helping patients avoid complications associated with the disease. The implementation of the five pillars of self-care management—education, examination, meal planning, physical activity, and medication management—demonstrates a positive impact on the health of diabetics, emphasizing the value of digital health interventions.

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