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Effectiveness of Guided E-Booklet-Based Education on Self Care Behavior and Blood Sugar in Hospital X Bandung

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ABSTRACT
Diabetes mellitus is a metabolic disorder requiring patients to manage and stabilize their condition to prevent complications. Education using e-booklets can facilitate information access and blood sugar control. This study aimed to evaluate the effectiveness of e-booklet-based education on self-care behavior and blood sugar levels in diabetes mellitus patients. Conducted from June to August 2023 at X Hospital's internist clinic in Bandung, the research employed a quasi-experimental pre-test and post-test design with a control group. The study involved 126 respondents, with 63 in the intervention group and 63 in the control group, selected through purposive sampling. The intervention lasted 4 weeks, covering 8 materials with ongoing monitoring and active participation. Self-care behavior and random blood sugar levels were measured at the beginning and end of the study using the Summary Diabetes Self-Care Activity (SDSCA) questionnaire and blood glucose tests. The Wilcoxon test revealed significant differences in self-care behavior and blood sugar levels before and after the intervention ($p < 0.05$). The Mann-Whitney test showed significant differences between the intervention and control groups ($p < 0.05$). Multivariate analysis indicated that age, gender, education, disease duration, and e-booklet-based education accounted for 22.2% of the variance in self-care behavior and 30.6% in blood sugar levels. E-booklet-based education effectively improves self-care behavior and blood sugar control. The study recommends ongoing development and supervision to establish healthy habits and prevent complications.
Keywords: Blood Sugar, Diabetes Mellitus, E-booklet based education, Self-Care Behavior

INTRODUCTION

Diabetes mellitus is a group of metabolic diseases characterized by an increase in blood sugar levels caused by impaired insulin secretion, impaired insulin work or both (Emerson Edwards, 2021). The population of diabetes sufferers increases continuously every year and is one of the non-communicable diseases that contributes to quite a large death rate from 2000 to 2019 (SDGs Sustainable Development Goals, 2022). Based on

CDC data (2022), the incidence of diabetes in the United States is 37.3 million (11.3% of the US population), of which 28.7 million were diagnosed, including 28.5 million adults. According to data from the International Diabetes Federation (IDF), Indonesia is the country with the fifth largest number of diabetes sufferers in the world. There are 19.5 million Indonesians aged 20-79 years who suffer from this disease in 2021 (IDF Diabetes Atlas 10th Edition, 2021).

According to the Basic Health Research report (2018), the prevalence of diabetes in Indonesia is 10.9%, with West Java contributing 1.7% based on doctor's diagnosis for ages > 15 years (Smeltzer, 2010). Type 2 diabetes has no definitive cure; management involves a balanced diet, physical activity, medication consumption, and stress management (ADA, 2023). Hyperglycemia, or high blood glucose levels, can be caused by beta cell insufficiency, inadequate nutrition, lack of activity, or inadequate medication consumption (Coapstead & Banasik, 2013).

Unstructured interviews with nurses at Hospital Patients also admitted that they were lazy about following recommendations because the information was uninteresting or forgotten (Syahrul et al., 2022). Self-care, as a form of responsibility for one's own health, is important to prevent diabetes complications and must be developed independently by the patient (Alligood, 2017; Shrivastava et al., 2013).

The American Association of Diabetes Educators(AADE) has established AADE7 Self care behaviors as a reference for patient care and self-management education for diabetes patients (AADE, 2014). AADE7 self care consists of healthy eating, being active, monitoring, taking medication, problem solving, healthy coping, reducing risk. These 7 components are based on research conducted by Prabawati & Silalahi (2021). The results showed that self-care education is an effective program in improving the self-care behavior of diabetes mellitus patients and their blood glucose control. Effective self-care for diabetes patients has a very important role in controlling diabetes mellitus (Prabawati et al., 2021). The role of nurses in health efforts, namely promotion, is very necessary, in order to help patients improve their health and prevent complications.

Research shows that digital technology can increase preventive interventions, flexibility in time and cost, and improve nursing practice (Mamt et al., 2021). E-books, as a low-cost medium that is easily accessible via smartphones, enable learning anytime and anywhere (Ishak, 2018). Research also shows that web and application-based education is effective in increasing knowledge and blood sugar control in type 2 diabetes patients (Min MSN, nd), and that social media such as WhatsApp has more impact on self-care behavior than lectures and booklets (Fitria et al. , 2021). With a simple and interactive format, the e-booklet helps patients understand and apply self-care independently. Based on the Self Care Deficit Theory by Dorothea Orem, educational support is important to prevent self care deficits and support effective self care (Alligood, 2017).

Based on researchers' observations, many diabetes sufferers do not understand how to manage their health condition, ignoring medication and diet. RS X Bandung has provided diabetes education through leaflets, lectures, radio and social media, but community participation is still low. The current education refers to 5 pillars, while the program to be tested refers to 7 pillars. This study aims to evaluate the effectiveness of guided e-booklet-based education on self-care behavior and blood sugar levels of diabetes patients at RS X Bandung. With the increasing number of diabetes sufferers and the need for long-term care, this study focuses on the effect of guided e-booklets, compared with existing educational methods, in improving self-care behavior and controlling blood sugar. This research uses a quasi-experiment design with pretest and posttest in the intervention and control groups, and is expected to provide benefits for patients, hospitals, educational institutions, and nurses, by improving the quality of education and reducing the risk of diabetes complications.

RESEARCH METHODS

This study aims to evaluate the effect of e-booklet-based education on self-care behavior and blood glucose levels in diabetes mellitus patients, by considering confounding variables such as age, education level, duration of diabetes, and information about DM. The research design used was a quasi-experiment pretest-posttest with a control group, where the intervention group received e-booklet-based education and the control group received standard education. The effectiveness of the treatment was assessed by comparing the pretest and posttest scores between the intervention group and the control group. The study population consisted of 126 diabetes mellitus patients at Hospital X, and samples were taken using a purposive sampling technique, consisting of 63 patients per group. The research was conducted at the Internal Medicine Clinic, RS Data collection tools include the SDSCA questionnaire, potential data collection tools, observation sheets, cellphones to access the e-booklet, glucometer, and the e-booklet itself. The data collection process includes preparation, implementation with a pretest, provision of educational material, and posttest after 4 weeks. Data analysis techniques include data processing by editing, coding, processing, and cleaning, as well as univariate, bivariate, and multivariate analysis using multiple linear regression and ordinal logistic regression to evaluate the relationship between variables. Classic assumption tests such as residual normality, heteroscedasticity, multicollinearity, linearity and autocorrelation were also carried out to ensure the quality of the regression model.

RESULTS AND DISCUSSION

A. Univariate Analysis of Descriptive Statistics

This descriptive statistical analysis describes characteristics including age, gender, education level, length of time suffering from DM, information about DM, and dependent variables which include self-care behavior and blood sugar at any time.

1. Frequency Distribution of Respondents Based on Age

Table 1. Frequency Distribution of Respondents Based on Age Intervention Group and Control Group

Age	Intervention Group		Control Group	
	Total Patients		Total Patients	
	N	%	N	%
26-35 Years	2	3.2	3	4.8
36-45 Years	4	6.3	6	9.5
46-55 Years	19	30.2	11	17.5
56-65 Years	23	36.5	21	33.3
>65 Years	15	23.8	22	34.9
Total	63	100	63	100

(Source: Primary Data, 2023)

The age characteristics of respondents showed that in the intervention group, the majority were aged 56-65 years (36.5%), while the control group was dominated by those aged >65 years (34.9%), indicating that the late elderly and seniors were at higher risk of developing diabetes mellitus compared to the age category. other. According to Ningrum et al. (2019), diabetes mellitus generally occurs over the age of 30 years with an increased risk at the age of 40-60 years due to increased insulin retention. Fahd Akram et al. (2020) added that those aged >40 years have a higher risk of developing diabetes, while a survey in Bali by Suastika (2009) showed that the prevalence of DM in the elderly was three times higher than in the younger age group, associated with a decrease in insulin sensitivity and glucose metabolism function. The International Diabetes Federation (IDF) (2020) reported that in 2019, there were 463 million people aged 20-79 years who had diabetes, equivalent to 9.3% of the population of that age, with prevalence expected to increase with age, especially in the Arab region -Africa and the West Pacific.

2. Frequency Distribution Based on Gender

Table 2. Frequency Distribution Based on Gender

Gender	Intervention Group		Control Group		Amount	
	N	%	N	%	N	%

Man	29	46%	29	46%	58	46%
Woman	34	54%	34	54%	68	54%
Amount	63	100%	63	100%	126	100%

(Source: Primary Data, 2023)

The gender characteristics of the respondents showed that in the intervention and control groups, the number of female respondents was greater than male, with 34 respondents (54%) each. This finding is consistent with research by Prabawati & Natalia (2020) which reported that the majority of respondents were female (82.7%), as well as Fitriah (2009) who identified women as having a higher risk of diabetes mellitus than men, related to factors such as increased mass index. body, monthly cycle syndrome, and hormonal imbalance. In addition, research by Khan et al (2020) states that women have poor glycemic control and higher lipoprotein sensitivity to hormones than men. Even though women more often experience diabetes, they tend to have better self-care management than men, with women being more concerned about their health and trying to optimally self-care for their disease (Ningrum et al., 2019).

3. Frequency Distribution of Respondents based on Education Level

Table 3. Frequency Distribution Based on Education Level

Level of education	Intervention Group		Control Group		Amount	
	N	%	N	%	N	%
elementary school	-		2	3.2%	2	1.6%
JUNIOR HIGH SCHOOL	6	9.5%	3	4.8%	9	7.1%
SENIOR HIGH SCHOOL	25	39.7%	19	30.2%	44	35%
PT	32	50.8%	39	61.9%	71	56.3%
Amount	63	100%	63	100%	126	100%

(Source: Primary Data, 2023)

Based on the data, there were more respondents with a tertiary education level than others, namely 71 people (56.3%). In the intervention group, there were 32 respondents (50.8%) with a tertiary education level, while in the control group, there were 39 respondents (61.9%). This shows that the majority of respondents in this study have a good level of formal education. The level of education is an indicator that someone has taken formal education, but does not always reflect mastery of a field of knowledge. Good education often results in positive behaviour, including

receiving information regarding self-care management of diabetes mellitus. Patients with higher education generally have a better understanding of self-care management of diabetes mellitus and more often seek information about their disease through various media compared to those with low education (Ningrum et al., 2019).

4. Frequency Distribution of Respondents Based on Length of Suffering from DM

Table 4. Frequency Distribution Based on Length of Suffering from DM

Suffering from DM for a long time	Intervention Group		Control Group		Amount	
	N	%	N	%	N	%
< 5 Years	25	39.7%	29	46%	54	42.8%
≥ 5 Years	38	60.3%	34	54%	72	57.2%
Amount	63	100%	63	100%	126	100%

(Source: Primary data, 2023)

The characteristics of the duration of suffering from diabetes mellitus (DM) show that in the intervention group and control group, more respondents suffered from DM for ≥ 5 years, namely 38 respondents (60.3%) and 34 respondents (54%), respectively. Long-term diabetes mellitus is often accompanied by microvascular and macrovascular complications. Apart from that, long suffering from diabetes mellitus affects itmaintenancediabetes self-management, because sufferers with old diagnoses generally have a better understanding of the importance of diabetes self-management and are more active in seeking information related to diabetes care. Sufferers who have experienced this disease for a long time tend to be better able to accept and manage their disease, as well as adapting new lifestyles in their daily lives (Ningrum et al., 2019).

5. Frequency Distribution of Respondents Based on the opportunity to get information about DM

Table 5. Frequency Distribution Based on Information About DM

Information about DM	Intervention Group		Control Group		Amount	
	N	%	N	%	N	%
Once	56	88.9%	59	93.7%	115	47.6%
Never	7	11.1%	4	6.3%	11	52.4%
Amount	63	100%	63	100%	126	100%

(Source: Primary Data, 2023)

Based on the table above, it can be seen that in the intervention and control groups, 56 respondents (88.9%) and 59 respondents (93.7%) respectively had received information about diabetes mellitus (DM). The majority of respondents got information through health workers, such as doctors, nurses and nutritionists, through direct explanations, doctor's notes and leaflets from hospitals. Knowledge about DM is important in the concept of self-care because it allows individuals to evaluate and carry out necessary interventions to prevent long-term complications. Research by Hailu et al. (2019) supports that information about diabetes can improve self-care management, reduce the risk of complications, and increase patients' ability to care for themselves.

6. Frequency Distribution of Respondents Based on Self-care Behavior of DM Patients Before and After E-Booklet-based Educational Intervention

Table 6. Frequency Distribution of Respondents Based on Self-care Behavior of DM Patients Before and After E-Booklet Based Educational Intervention

***Self-care behavior*DM patients**	**Intervention Group**				**Control Group**			
	Pre		**Post**		**Pre**		**Post**	
	N	**%**	**N**	**%**	**N**	**%**	**N**	**%**
*Self-care*Good	42	66.7%	61	96.8%	46	73%	43	68.3%
*Self-care*Not good	21	33.3%	2	3.2%	17	27%	20	31.7%
Amount	63	100%	63	100%	63	100%	63	100%

(Source: Primary Data, 2023)

Based on the data above, before the e-booklet-based educational intervention, self-care behavior in the intervention and control groups was mostly in the good category, respectively 42 respondents (66.7%) and 46 respondents (73%). After 4 weeks of intervention, the intervention group showed a significant increase in self-care behavior, from 42 respondents to 61 respondents (96.8%), while the control group experienced a decrease, from 46 respondents (73%) to 43 respondents (68.3%). Self-care behavior includes the management of diabetes mellitus, including treatment and prevention of complications, which has an impact on controlling blood sugar levels and preventing complications (AADE7, 2014). E-booklet-based education is designed to influence individuals in managing diabetes through electronic media, as described by Notoadmojo (2012), and is recognized by the ADA as important for improving blood glucose levels and reducing complications. The self-care theory by D. Orem (2017) also supports the importance of self-care to maintain health. In this study, respondents who were given the e-booklet intervention did not experience

hyperglycemia or hypoglycemia, indicating the effectiveness of the self-care management taught.

7. Frequency Distribution of Respondents Based on Blood Sugar Before and After E-Booklet Based Educational Intervention

Table 7. Frequency Distribution of Respondents Based on Blood Sugar Before and After E-Booklet Based Educational Intervention

When blood sugar	Intervention Group				Control Group			
	Pre		Post		Pre		Post	
	N	%	N	%	N	%	N	%
Normal	38	60.3%	58	92.1%	43	68.3%	27	42.9%
Diabetes	25	39.7%	5	7.9%	20	31.7%	36	57.1%%
Amount	63	100%	63	100%	63	100%	63	100%

(Source: Primary Data, 2023)

Based on the table above, before e-booklet-based education, blood sugar levels in the intervention and control groups were mostly in the normal category, respectively 38 respondents (60.3%) and 43 respondents (68.3%). After e-booklet-based education, blood sugar in the intervention group increased to 58 respondents (92.1%), while the control group experienced a decrease, with 36 respondents (57.1%) being in the diabetes category. Temporary blood sugar, which measures blood glucose levels without fasting (Perkeni, 2021), showed significant changes in the intervention group after receiving e-booklet-based education. This shows the great impact of the intervention in glycemic control. This education includes components of AADE7 self-care behaviors, such as healthy eating, physical exercise, blood sugar monitoring, foot care, pharmacological therapy, and problem solving. Research by Ji Min et al. (2020) shows that DSMEs using SMS and applications are effective in controlling blood sugar levels, proving that interactive educational methods such as e-booklets are better in controlling blood glucose. Interactive education helps patients control blood sugar levels and prevent complications.

B. Bivariate Analysis

Bivariate analysis in this study was carried out to determine differences in self-care behavior of DM patients, blood sugar levels before and after being given an E-Booklet-based educational intervention and to determine differences in self-care behavior of DM patients, blood sugar levels between the intervention group and the control group.

1. Differences in self-care behavior of DM patients and blood sugar levels before and after intervention in the intervention group

Table 8. Differences in Self-care Behavior of DM Patients Before and After E-Booklet Based Educational Intervention

***Self-care behavior*DM patient**	**Before Intervention**		**After Intervention**		**p value**
	N	**%**	**N**	**%**	
*Self-care*Good	42	66.7%	61	96.8%	*0,000*
*Self-care*not good	21	33.3%	2	3.2%	
Amount	63	100%	63	100%	

(Source: Primary Data, 2023)

Based on the table above, the difference in self-care behavior of DM patients before and after the e-booklet-based educational intervention shows a value of p = 0.000, which means there is a significant difference (p < 0.05) in the self-care behavior of DM patients before and after the intervention. Self-care behavior is an individual's responsibility for their health and involves managing diabetes mellitus through treatment and prevention of complications, with the aim of controlling blood sugar levels and improving quality of life (Alligood, 2017; AADE7, 2014). Guided e-booklet-based education, which covers seven important components in self-care behaviors, namely healthy eating, exercise, monitoring glucose levels and feet, pharmacological therapy, problem solving, healthy coping, and risk reduction, is designed to influence individuals through electronic media (Notoadmojo, 2012). This research confirms that education using e-booklets, which involves interactive learning via video and audio, improves patient understanding and self-care behavior, in accordance with research by Min MSN (2020) and Fitri et al (2018), which shows that interactive media such as e-booklets -booklets and WhatsApp Groups are more effective in increasing knowledge and self-care behavior than traditional methods. Respondents of good age and education, as well as access to e-booklet-based education, demonstrated positive changes in diet, exercise, and stress management, and reported that concise, easy-to-understand educational material, as well as motivational support, increased their enthusiasm for maintaining health and blood sugar stability. This proves that providing e-booklet-based education can make DM patients carry out good self-care behavior, thereby helping DM patients to prevent long-term complications from occurring.

Table 9. Differences in Blood Sugar Levels Before and After E-Booklet Based Educational Intervention

When blood sugar	**Before Intervention**		**After Intervention**		**p value**
	N	**%**	**N**	**%**	
Normal	38	60.3%	58	92.1%	*0,000*

Abnormal	25	39.7%	5	7.9%
Amount	63	100%	63	100%

(Source: Primary Data, 2023)

Based on the table above, the difference in blood sugar before and after the e-booklet-based educational intervention shows a value of p = 0.000 (p < 0.05), which means there is a significant difference in blood sugar levels before and after the intervention. Temporary blood sugar, which is the blood glucose level without fasting (Perkeni, 2021), in the intervention group increased from 60.3% to 92.1%, indicating a large impact of the e-booklet-based educational intervention in glycemic control. Education that includes the components of AADE7 self-care behaviors—such as healthy eating, physical exercise, blood sugar monitoring, and pharmacological therapy—can help keep blood sugar under control, thereby preventing long-term complications. This finding is in line with research by Ji Min et al. (2020), which shows the effectiveness of SMS-based DSME and applications in controlling blood sugar levels. In contrast, research by Prabawati & Silalahi (2021) found no difference in blood glucose levels when using booklet education, but this research proves that e-booklets are more effective in controlling blood sugar than other methods. Interactive and interesting e-booklet-based education has been proven to help patients control blood sugar levels and prevent diabetes complications.

2. Differences in Self-care Behavior of DM Patients and Current Blood Sugar Levels in the Intervention Group and Control Group

Table 10. Differences in self-care behavior of DM patients in the intervention group and control group

	Intervention Group		**Control Group**		**P value**
	N	**Mean**	**N**	**Mean**	
Self-care behavior	63	72.50	63	54.50	*0,000*
When blood sugar	63	79.00	63	48.00	*0,000*
Amount	126		126		

(Source: Primary Data, 2023)

Based on the table above, the difference in self-care behavior and blood sugar in diabetes mellitus (DM) patients between the intervention group and the control group shows a value of p = 0.000 (p < 0.05), which means that Ha6 is accepted and there is a significant difference between the two groups. Self care behavior reflects individual responsibility in managing diabetes mellitus, including treatment and prevention of complications, with the ultimate goal of controlling blood sugar levels and preventing long-term complications (Alligood, 2017). There are seven important

components in self-care behaviors, including healthy eating, exercise, monitoring glucose levels and foot conditions, pharmacological therapy, problem solving, healthy coping, and risk reduction (AADE7, 2014). Temporary blood sugar, which is the blood glucose level measured at any time without fasting (Perkeni, 2021), together with self-care behavior, is used as a measuring tool in this research. Findings showed significant differences in self-care behavior and instantaneous blood sugar levels between the intervention and control groups, indicating the effectiveness of the intervention in improving diabetes management and glycemic control.

C. Multivariate Analysis

Multivariate analysis in this study used the ordinal logistic regression test. Ordinal logistic regression in this study aims to determine the feasibility of the model, the magnitude of the contribution given by the independent variables simultaneously to the dependent variables, the magnitude of the influence of each independent variable partially on the dependent variables, the magnitude of the influence of the independent variables simultaneously on the dependent variables. and the independent variable which has the greatest influence on the dependent variable.

1. Feasibility of Model Fit

Table 11. Feasibility test of Fit Model Self-care behavior for DM Patients

Test results	-2 Log Likelihood	Sig.
Intercept Only	91,773	
Finals	60,186	0.001

(Source: Primary Data, 2023)

Based on table 5.5.1.1 of the feasibility of model fit on the dependent variable self-care behavior of DM patients, a -2 log likelihood reduction was obtained from 91,773 to 60,186 after the e-booklet based educational intervention was carried out. Statistically, it can be concluded that the model with independent variables (age, gender, education level, duration of suffering from DM, information about DM and e-booklet-based educational interventions) is good and suitable to be used to change the self-care behavior of DM patients, but it can still change because the p value <0.05.

Table 12. Feasibility Test for Temporary Blood Sugar Fit Model

Test results	-2 Log Likelihood	Sig.
Intercept Only	123,298	0,000
Finals	77,191	

(Source: Primary Data, 2023)

Based on table 5.5.1.2 of the feasibility of the fit model for the variable blood sugar at any time, a decrease of -2 log likelihood was obtained from 123,298 to 77,191 after the e-booklet-based educational intervention was carried out. Statistically it can be concluded that the model with independent variables (age, gender, education level, duration of suffering from DM, information about DM and e-booklet based educational interventions) is good for use for changes in blood sugar levels over time, but can still change due to the value $p < 0.05$.

2. Test the Whole Model

Table 13. Overall Test of Dependent Variable Model

Dependent Variable	Test results	
	Chi-square	**P value**
Self-care behavior	53,378	0.498
When blood sugar	64,776	0.161

(Source: Primary Data, 2023)

Based on table 13, it shows that all dependent variables have a p value > 0.05 so the probability value is significant. So the e-booklet-based education model cannot reject the null hypothesis, namely that the e-booklet-based education model is appropriate or compatible with the empirical data.

The e-booklet-based education model is suitable for use in improving self-care for DM patients. According to the researchers, this model is suitable and suitable for use because several things include using e-booklets for DM patients who can easily access information related to their disease, equipped with interesting information and videos and pictures making it easier for DM patients to digest and understand the contents of the material provided. given. In addition, patients stated that they were greatly helped by the e-booklet provided. This is supported by previous research conducted by Ishak (2018) that the use of e-books is an instrument known for its low cost, because it can be accessed only from a smartphone, can be carried anywhere, making it easier for readers to learn anywhere, besides that, e-books books can last forever with an unchanged format.

3. Pseudo R-Square Test

The Pseudo R-Square test based on Cox and Snell was carried out to determine the magnitude of the contribution made by the independent variables (age, gender, education level, duration of suffering from DM, information about DM and e-booklet-based educational interventions) simultaneously to changes in self-care behavior. and blood sugar when DM patients. The Cox and Snell values can be seen in table 14 below:

Table 14. Pseudo R-Square Test of Dependent Variable

Dependent variable	Cox and Snell values
Self-care behavior	0.222
When blood sugar	0.306

(Source: Primary Data, 2023)

4. **Test Parameters Estimates**

Table 15. Test Parameters Estimate for Independent Variables on Self-care Behavior of DM Patients

Independent Variable	Estimate	P value
Coefficient	-3,098	0.001
Coefficient	-2,729	0.001
Control group	-2,729	0.001
Intervention group	0	0.001
Age1	-1,300	0.301
Age2	0.029	0.977
Age3	1,401	0.149
Age4	0.127	0.856
Age5	0	
Gender1	0.104	0.855
Gender2	0	
Education1	19,494	-
Education2	1,085	0.409
Education3	1,186	0.093
Education4	0	-
Long suffering from DM1	-1,186	0.235
Suffering from DM2 for a long time	0	
Information about DM1	-0.363	0.551
Information about DM2	0	-

(Source: Primary Data, 2023)

The table above shows that e-booklet-based education has a significant effect on blood sugar with a p value <0.05, which shows a positive impact on self-care behavior of diabetes mellitus (DM) patients, while confounding variables such as age, gender, education level, suffering from DM for a long time, and information about DM did not show a significant influence on self-care behavior. Field research revealed that the majority of respondents were aged 56-65 years, an age where insulin

resistance increases which makes them susceptible to DM, consistent with research by Ningrum (2019) which shows that the risk of DM increases with age. However, age did not have a significant effect on self-care of DM patients in this study, in line with Akram et al (2020) who also found that age was not significantly related to lifestyle compliance in DM patients. Gender, education, information about DM, and duration of suffering from DM, which theoretically influence self-care behavior, did not show a significant influence in this study, supporting the findings of Akram et al (2020) that these factors do not influence lifestyle adherence in DM patients. ..

Table 16. Test Parameters Estimate for Independent Variables on Temporary Blood Sugar

Independent Variable	Estimate	P value
Coefficient	-3,042	0,000
Coefficient	-3,085	0,000
Control group	-3,085	0,000
Intervention group	0	0,000
Age1	0.700	0.614
Age2	-0.787	0.402
Age3	-1,048	0.143
Age4	-0.897	0.152
Age5	0	
Gender1	0.687	0.168
Gender2	0	
Education1	-19,447	-
Education2	-0.389	0.717
Education3	-0.506	0.351
Education4	0	-
Long suffering from DM1	0.354	0.616
Suffering from DM2 for a long time	0	
Information about DM1	-0.471	0.496
Information about DM2	0	-

Table 16 shows that e-booklet-based education has a significant influence on instantaneous blood sugar levels with a p value < 0.05, while independent variables such as age, gender, education level, duration of suffering from DM, and information about DM do not show a significant influence on instantaneous blood sugar levels with a p value > 0.05. This research data shows that age, gender, education level, duration of suffering from DM, and information about DM do not affect blood sugar

levels at any time, in line with research by Boku & Aprilia (2019) which also found that there was no significant relationship between age and gender and blood sugar levels of DM patients. Although Ningrum (2019) noted a higher risk for DM in people over 40 years of age and female, and data from the Ministry of Health's Pusdatin (2020) showed an increase in DM cases in women, the results of this study are not consistent with these findings. Education, which is considered to influence the incidence of DM, as explained by the Indonesian Ministry of Health's Pusdatin (2020), also did not show a significant influence in this study. Researchers suggest the need for further studies with measurements of fasting blood sugar levels or HbA1c and a larger number of respondents.

5. Determining the Odd Ratio Value of Self-care behavior of DM patients and Current Blood Sugar

Based on mathematical calculations, self-care behavior and blood sugar in diabetes mellitus (DM) patients showed significant results between the intervention and control groups. For self-care behavior, the Z value is calculated using the formula Z = -3.098 + (0 x Group) + (0.127 x age) + (0 x Gender) + (1.085 x Education) + (0 x Length of DM) + (0 x Information about DM). With variable substitution, Z6 becomes 0.42, while Z69 becomes -6.086. The P value is calculated using the formula P = 1/(1 + e^(-z)), resulting in P6 = 0.4 and P69 = 0.002. The Odd Ratio is calculated as P/(1-P), with Odd Ratio 6 = 0.67 and Odd Ratio 69 = 0.002, indicating a comparison of 335. This shows that respondents in the intervention group have a tendency to increase self-care behavior 335 times greater than those in the group. control. In the case of instantaneous blood sugar, the Z calculation is carried out using the formula Z = -3.042 + (0 x Group) + (-0.787 x age) + (0 x Gender) + (-0.389 x Education) + (0 x DM duration) + (0 x Information about DM). Variable substitution produces Z6 = -6.968 and Z69 = -5.911. The P value is calculated using the formula P = 1/(1 + e^(-z)), resulting in P6 = 0.99 and P69 = 0.99. The Odd Ratio is calculated as P/(1-P), with Odd Ratio 6 = 99 and Odd Ratio 69 = 99, indicating a comparison of 1. This indicates that respondents in the intervention group have a chance of 1 time or 100% better than the control group in reducing blood levels. when blood sugar. However, transient reductions in blood sugar may not be completely appropriate for measuring glycemic control in DM.

6. Test Parallel Lines

Table 17. Parallel Lines Test Self-care behavior

Model	-2log likelihood
Null Hypothesis	60,186
General	60,186

(Source: Primary data, 2023)

The table above shows that the -2 log likelihood values are the same. This explains that the e-booklet based educational model used is appropriate or appropriate.

Table 18. Temporary Blood Sugar Parallel Lines Test

Model	-2log likelihood
Null Hypothesis	77,191
General	77,191

The table above shows that the -2 log likelihood values are the same. This explains that the e-booklet-based education model used is appropriate or suitable.

D. Research Limitations

Research Limitations include several important aspects. First, researchers cannot directly monitor the implementation of respondents' self-care behavior, such as healthy eating patterns, physical activity, foot monitoring, handling hyperglycemia and hypoglycemia, and controlling stress. Second, the time to complete the intervention was delayed in some patients due to illness and difficulty accessing educational links. Third, measuring blood sugar levels uses instant blood sugar, which is not recommended compared to HbA1c, which takes longer. Fourth, education is provided in stages, and not all confounding variables from self-care behavior are studied. Implications Research shows its impact on nursing care, nursing education, and nursing research. In nursing services, this research emphasizes the role of nurses as educators to maintain the self-care behavior of diabetes patients, as a preventive measure against complications, and innovation in health education using e-booklets as media. For nursing education, the results of this study show the effectiveness of e-booklets in increasing self-care behavior and reducing blood sugar levels, as well as adding educational methods for diabetes patients. For nursing research, this study offers evidence of the effectiveness of e-booklets as an educational intervention and can serve as a basis for evidence-based practice.

CONCLUSION

Based on researchers' observations, many diabetes sufferers at Hospital X Bandung still do not understand how to manage their condition, and do not comply with medication and diet. Even though there are various educational methods such as leaflets, lectures, radio and social media, public participation is still limited, and existing educational materials only refer to 5 pillars, while the new program will use 7 pillars. This study aims to evaluate the effectiveness of guided e-booklet-based education in

improving self-care behavior and controlling blood sugar levels in diabetes patients at RS X Bandung. Considering the increasing number of diabetes sufferers and the need for long-term care, this study uses a quasi-experiment design with pretest and posttest in the intervention and control groups, and is expected to provide significant benefits for patients, hospitals, educational institutions and nurses in improving the quality of education and reduces the risk of diabetes complications.

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