

## ARTICLE INFORMATION

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## E-health education intervention to increase dietary adherence among diabetic ulcer patients

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### Abstract

**Background:** Preventing complications of diabetes mellitus requires medical treatment and education. Diabetic ulcer is one of the complications of diabetes mellitus due to traumatized nephropathy. E-health education innovation makes it easy for patients to access education on how to prevent complications from diabetes mellitus.

**Purpose:** Analyzing the effect of e-health education of diabetes mellitus based on the QR model website as a means of dietary compliance in grade 2 diabetic ulcer patients.

**Method:** Employing true experimental pre-test post-test design with control group design. It involved 30 participants who were divided into 2 groups through simple random sampling. Saphiro-Wilk was used for data normality test and Man-Whitney was used for hypothesis testing with score difference test. This research was conducted at the Anak Lanang Wound Care Center Clinic, Semarang.

**Results:** There was an increase in scores on dietary adherence between groups ( $64.13 \pm 2.82$  vs  $59.07 \pm 2.91$ ). Both groups experienced an increase in scores, but the increase was greater in the intervention group given e-health education of diabetes mellitus compared to the control group given the Booklet.

**Conclusion:** There is an effect of e-health education of diabetes mellitus on the level of dietary compliance in grade 2 diabetic ulcer patients.

**Suggestion:** Future researchers are expected to develop database instrumentation and educational content for patients with diabetes mellitus.

**Keywords:** Diabetes Mellitus; Diabetic Ulcer; Education; E-Health Education.

### INTRODUCTION

Non-communicable diseases (NCDs) have become a trend in the health world as the incidence rate has increased significantly and become a serious problem at the global level. Diabetes mellitus (DM) is ranked 6th in the world. DM disease occurs due to damage to the pancreas which causes impaired insulin secretion (American Diabetes Association, 2020). DM is caused by damage to the pancreas that leads to disruption of insulin secretion. Some studies show that the increase in the number of DM cases is triggered by unhealthy behaviors, for example due to lack of fruit and vegetable consumption, lack of physical activity, and unhealthy

lifestyles (smoking and alcohol) (Ministry of Health of the Republic of Indonesia, 2020).

The prevalence of DM in the world from 2019 reached 425 million people and is expected to increase in 2045 to 629 million people in adulthood, this figure shows a 4-fold increase from the number of 108 million from 1980. In line with the previous data, its prevalence in Southeast Asia was 82 million in 2017 and could increase to 151 million by 2045 (World Health Organization, 2018).

The death rate from DM reaches 1.6 million or 4% of the total deaths from non-communicable diseases in the world and 3% of all deaths.

Currently, the target achievement of WHO and IDF in controlling diabetes in the world is to reduce mortality by 25% to be achieved by 2025 (Cho, Shaw, Karuranga, Huang, Fernandes, Ohlrogge, & Malanda, 2018). This means that achieving the target of controlling and managing non-communicable diseases requires special handling. Many factors influence the success of the program, one of which is in community empowerment in an effort to increase awareness of healthy living behaviors (Pranandari, Arso, & Fatmasari, 2017).

The role of nurses as educators is needed to facilitate individuals or communities in healthy living behavior, so that triggers are needed for individuals or communities to grow from within themselves to behave healthily (Fahra, Widayati, & Sutawardana, 2017). It is expected that with awareness of healthy living behavior, there will be effective collaboration between government programs and communities in empowering the community to achieve the expected target of reducing morbidity and mortality in DM (Afelya, 2014). To change healthy living behavior, continuous health education is needed for people with DM. Health education is one of the pillars of DM management. There are five pillars of DM management, namely: health education, DM diet, exercise, DM medication and blood sugar control. One form of health education for DM patients is self-diabetes management education (SDME) (Rahmawati, Tahlil, & Syahrul, 2016).

Education is an effort to provide educational facilities to improve knowledge, skills and self-care abilities. Education in self-care can change a healthy lifestyle that can control blood sugar levels in people with DM (Fahra, et al, 2017). Patients with DM need continuous education because the disease is lifelong. The self-care assistance provided aims not only to meet the patient's self-care needs but also to help the patient become capable of caring for themselves independently (Clara, 2018). Previous studies with the results of self-care education have become a priority in DM management as a nurse intervention. Self-care is something that shows DM sufferers' concern for their health, therefore there will be a correlation in forming an independent person in meeting the self-care needs of DM sufferers carried out by nurses or individuals themselves to maintain health and well-being, according to their abilities (Noradina, Herlina, Mastari, & Bolon, 2022).

Education can be delivered by means of several types of media, such as printed media, electronic media, outdoor media and other media (Simanjuntak, Yuliati, Rizkillah, & Maulidina, 2022). Currently, education is more frequently provided through electronic media, one of which is the internet. The internet is an essential necessity for every individual to obtain all information (Oktorina, Sitorus & Sukmarini, 2019). Urban and rural communities use smartphones with very high frequency, therefore people can easily access information through the internet, including information about health education (Fahra, et al., 2017). This education is supported by smartphone devices to facilitate delivery, easy to remember, easy to carry, easy to share with everyone, and easy to use (Aisah, Ismail & Margawati, 2021).

From the description above, researchers are interested in developing e-health education of diabetes mellitus media based on the QR model website as a means of dietary compliance, at the Anak Lanang Wound Care Center Clinic, Semarang.

## RESEARCH METHOD

This research was conducted at the Lanang Children's Wound Care Center Clinic, Semarang City. The research design used a True Experiment with pre-test and post-test Randomized control group. The sample consisted of 30 participants who were divided into 2 groups, namely the treatment group and the control group, the treatment group was given intervention in the form of barcoded placards in accessing the E-health education of diabetes mellitus website to get information and instructions via digital audio visual while the control group was given intervention in the form of a booklet containing instructions and knowledge about DM and its treatment in manual form.

The questionnaire consisted of 18 questions with 4 checklist options related to dietary compliance in diabetic ulcer patients, namely the accuracy of eating schedules, eating patterns, or the type of food consumed. The checklist columns were classified as "never" the value is 1, "rarely" the value is 2, "often" the value is 3, and "always" the value is 4, so that the accumulated score for each questionnaire will get a ranging values of 1 – 72 points. The data for filling out the questionnaire before the intervention was used as pre-test data, and the data for filling out the

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questionnaire after the intervention was used as post-test data. Data collection after the intervention was carried out every 3 days, then data analysis after 7 days of intervention was categorized as post-test data 1, and data analysis after 14 days was classified as post-test data 2. Data normality test using Saphiro-Wilk and hypothesis testing with score difference test using Man-Whitney was used to

analyze the dietary compliance between before (pre-test) and after intervention (post-test) in the experimental group and control group. This research has received permission and recommendations from the Health Research Ethics Committee of the Ministry of Health Semarang Health Polytechnic as of letter number 0740/EA/KEPK/2023, 5 June 2023.

## RESEARCH RESULTS

**Table 1. Characteristics of Participants (N=30)**

Variables	Dietary Compliance		p-Value
	Treatment (n=15)	Control (n=15)	
<b>Age (Mean±SD) (Range) (Year)</b>	(57.1±3.021)(52-62)	(56.8±3.489)(52-64)	0.751
<b>Gender (n/%)</b>			
Male	6/40.0	5/33.0	0.478
Female	9/60.0	10/67.0	
<b>Education (n/%)</b>			
Junior High School	3/20.2	8/53.2	0.369
Senior High School	7/46.8	4/26.6	
University	5/33.0	3/20.2	
<b>Occupation (n/%)</b>			
Unemployment/Retired	3/20.2	4/26.6	1.000
Housewife	5/33.0	4/26.6	
Private Employee	3/20.2	4/26.6	
Government Employee	4/26.6	3/20.2	

The results in table 1 show that for the age variable, the experimental group and the control group obtained a p-value of 0.751, where the age of the experimental group participants had a mean data of 57.1 and a standard deviation of 3.021 in the age range 52 – 62 years and the age of the control group participants had a mean data of 56.8 and a standard deviation of 3.489 in the age range 52 – 64 years.

And for the gender variable, the experimental group and the control group got a p-value of 0.478, where in the experimental group the male gender was 40.0% and the female gender was 60.0%, while in the control group the male gender was amounted to 33.0% and the female gender was 67.0%.

Furthermore, for the education variable between the experimental group and the control group, the p-value was 0.369, where the education of the

experimental group, which was junior high school, was 20.2%, that of senior high school was 46.8%, and that of college students was 33.0%, while in the junior control group high school was 53.2%, senior high school was 26.6%, and college was 20.2%

Furthermore, for the occupation variable between the experimental group and the control group, the p-value was 1,000, where for the type of work of participants in the experimental group who were unemployed/retired it was 20.2%, for housewives it was 33.0%, and for private employees it was 20.2%, and those who are government employees were 26.6%, while in the control group those who are unemployed/retired were 26.6%, those who are housewives were 26.6%, those who are private employees were 26.6%, and those who are government employees were 20.2%.

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**Table 2. Dietary Compliance Scores (N=30)**

Dietary Compliance (18 – 72)	Treatment (n=15)	Control (n=15)	Z	P
	Mean±SD	Mean±SD		
Pre-test	49.27±6.08	47.93±2.54	-0.583	0.560*
Post-test 1	56.00±5.74	52.93±4.26	-1.340	0.180*
Post-test 2	64.13±2.82	59.07±2.91	-3.947	0.001*
Δ Pre-test – Post-test 1	6.73±3.84	5.00±2.72	-1.151	0.250*
Δ Post-test 1 – Post-test 2	8.13±4.08	6.13±3.73	-1.496	0.135*
Δ Pre-test – Post-test 2	14.87±4.74	11.13±3.20	-2.336	0.019*

\*Mann Whitney

Table 2 shows the results of the Mann Whitney test. The pre-test data obtained a p-value of 0.560 from the score data shown in the treatment group, namely a mean of 49.27 with a standard deviation of 6.08, and in the control group, a mean of 47.93 with a standard deviation of 2.54. Meanwhile, post-test 1 data obtained a p-value of 0.180 from the score data shown in the treatment group, namely a mean of 56.00 with a standard deviation of 5.74, and in the control group, a mean of 52.93 with a standard deviation of 4.26. Meanwhile, post-test 2 data obtained a p-value of 0.001 from the score data shown in the treatment group, namely a mean of 64.13 with a standard deviation of 2.82, and in the control group, a mean of 59.07 with a standard deviation of 2.91.

Furthermore, the difference data Δ pre-test – post-test 1 obtained a p-value of 0.250 from the score data shown in the treatment group, namely a mean of 6.73 with a standard deviation of 3.84, and in the control group, a mean of 5.00 with a standard deviation of 2.72. Meanwhile, the difference data Δ post-test 1 – post-test 2 obtained a p-value of 0.135 from the score data shown in the treatment group, namely a mean of 8.13 with a standard deviation of 4.08, and in the control group, a mean of 6.13 with a standard deviation of 3.73. Meanwhile, the difference data Δ pre-test - post-test 2 obtained a p-value of 0.019 from the score data shown in the treatment group, namely a mean of 14.87 with a standard deviation of 4.74, and in the control group, a mean of 11.13 with a standard deviation of 3.20.

**Table 3. Effect Size in Treatment and Control Groups (N=30)**

Variabel	Group	Sample	Cohen's Effect
Dietary Compliance	Treatment	15	1.76*
	Control	15	

\*Cohen's Effect

Table 3 shows that the effect size between the treatment group and the control group was 1.76.

## DISCUSSION

The results of the score of increasing patient diet compliance after being given e-health education of diabetes mellitus treatment in the intervention group showed a *pre-test* value of 49.27 and *post-test 2* value of 64.13 while in the control group given the booklet showed a *pre-test* value of 47.93 and *post-test 2* value of 59.07. There was no difference in dietary compliance between the intervention group

and the control group after being given the diabetes mellitus e-health education intervention. However, diet compliance increased in the intervention group and the control group before and after intervention of e-health education of diabetes mellitus. This increase occurred due to the influence of the participant's age and education level.

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The effect size obtained from the e-health education of diabetes mellitus intervention on dietary compliance in participants is strong with a value of 1.76. This research shows that the provision of education in the form of audio visual through e-health education of diabetes mellitus has a strong effect in increasing dietary compliance in research participants.

There was no difference in increasing dietary compliance after 7 days of education using pocket books and leaflets with a p value = 0.670 (Hidayah, 2017). Factors that influence a person to become obedient are predisposing factors, enabling factors and driving factors, one of the predisposing factors is knowledge, attitudes, beliefs (Ekayanti & Pratiwi, 2017).

The better the dietary adherence, the more normal the blood sugar levels will be. This can be attributed to good knowledge about the diabetes mellitus diet, enabling them to understand what needs to be done and to lead a better life, resulting in patients with diabetes mellitus having controlled blood sugar levels (Kusnanda, Dharma, Armaini, & Chaidir, 2023).

The results of this study have shown that e-health education for diabetes mellitus has an effect on dietary compliance behavior in patients with grade 2 diabetic ulcers. It is hoped that this educational innovation can be used as an educational method to improve their dietary compliance behavior.

This educational innovation is an educational media developed by integrating a website containing audio-visual videos, by accessing the website by scanning a QR barcode that will direct to a website link that has been converted to facilitate access to the educational content page.

## CONCLUSION

There was an increase in dietary compliance scores after being given the e-health education of diabetes mellitus intervention in the treatment group and control group. E-health education has a significant influence on dietary compliance in diabetes mellitus patients.

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