OMNI NURSING JOURNAL

Effect of Education on Clean and Healthy Life Behavior in Diabetes Mellitus Patients on Gangrene Incidence During the Corona Virus-19 Pandemic

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Article info:
Received: 2024-09-27
Revised: 2024-10-25
Accepted: 2024-11-25

e-ISSN: 3047-6054
Volume 1(4): 113-121, November 2024

Abstract

Background: Diabetes mellitus is the most common disease that causes other diseases or complications, one of which is gangrene. In connection with the spread of the corona virus-19, this can worsen the health of people with diabetes mellitus if they experience complications, one of which is gangrene. With that, Clean and Healthy Lifestyle plays a very important role in the daily life of people with diabetes mellitus during the corona virus-19 pandemic to prevent gangrene. Researchers provide interventions in the form of education on clean and healthy living behavior in patients with diabetes mellitus.
Objective: This study aims to determine the effect of education on clean and healthy living behavior in patients with diabetes mellitus on the incidence of gangrene during the corona virus-19 pandemic.
Methods: This research was conducted with a pre-experimental approach with the One Group Pretest-Postest Design. The sample used is 58 respondents with stratified random sampling technique. Analysis of the data used is the Mc Nemar test.
Results: Based on statistical tests using the Mc Nemar test, the value of p-value or significant is 0.004 <0.05 which means there is an effect of education on clean and healthy living behavior in diabetes mellitus patients on the incidence of gangrene during the corona virus-19 pandemic.
Conclusion: Education on clean and healthy behavior positively influenced diabetes mellitus patients in preventing gangrene during the COVID-19 pandemic. The intervention encouraged improved self-care practices, particularly in foot care, hygiene, and lifestyle management, thereby reducing the risk of complications. These findings highlight the importance of integrating preventive education into diabetes care, especially during public health crises.

Keywords: Clean and healthy living behavior; covid-19; diabetes mellitus; education; gangrene

Introduction

Coronavirus Disease 2019 (COVID-19) is an infectious disease caused by Severe Acute Respiratory Syndrome Coronavirus2 (SARS CoV-2). SARS-CoV-2 is a new type of coronavirus that has never been previously identified in humans. There are two types of coronaviruses that are known to cause diseases that can cause severe symptoms, namely Middle East Respiratory Syndrome (MERS) and severe acute respiratory syndrome (SARS). Common signs and symptoms of COVID-19 infection include symptoms of acute respiratory distress such as fever, cough and shortness of breath. The average incubation period is 5-6 days with the longest incubation period being 14 days. In severe cases of COVID-19 it can cause pneumonia, acute respiratory syndrome, kidney failure, and even death (Sugihantono, 2020).

There is a higher risk of complications from COVID-19 in some vulnerable populations, especially the elderly, individuals who are debilitated or who have several chronic conditions.

The risk of death increases with age, and is also higher in those who have diabetes, heart disease, blood clotting problems, or who have shown signs of sepsis. The average mortality rate is 1%, the mortality rate being 6% for people with cancer, hypertension, or chronic respiratory disease, 7% for people with diabetes, and 10% for people with heart disease. Meanwhile, the mortality rate among people aged 80 years or older is 15% higher. Vulnerable groups are groups of people who are easily exposed to low health conditions, which are included in this group, namely minority groups, people who do not have health insurance, groups of people living with HIV/AIDS, children, the elderly, the poor, and the homeless (Pradana, 2020).

International Diabetes Federation (IDF) said that in 2015 Indonesia stood in seventh position with 10 million sufferers. The number of people with diabetes mellitus is expected to increase by 2040. Indonesia is also the third country with the number of people with impaired glucose tolerance (20-79 years) in 2015 which amounted to 29 million people (IDF, 2015). In 2017 the International Diabetes Federation stated that around 425 million people worldwide suffer from diabetes mellitus. Indonesia ranks seventh for the most diabetes mellitus sufferers in the world with a total of 10.3 million sufferers (IDF, 2017 in Aziz, et al, 2020). Patients with diabetes mellitus have a 29 times higher risk of experiencing gangrene, this is because people with diabetes mellitus are susceptible to infections which are closely related to the proliferation of germs in environments with high glucose levels. Diabetic gangrene is a complication of diabetes mellitus which is caused by damage to tissue necrosis by embolism of large arteries in the body so that the blood supply stops. Gangrene occurs due to neuropathy and vascular disorders in the leg area. Gangrene appears in the leg area in the form of open sores followed by local tissue death (Rosa, 2019).

Based on Riskesda Survey Data (2018) the incidence of diabetes mellitus in 2013 in Indonesia reached 6.5% and in 2018 there was an increase of 10.9% (Riskesdas Data, 2018). Data on the achievement of the profile of the NTB Health Office showed that the number of people with diabetes mellitus in 2017 reached 5.8% (Profile of the NTB Health Office, 2017). Meanwhile, data on people with diabetes mellitus in East Lombok Regency in 2019 amounted to 27,564 people from 2.6% with a population of 1,056,312 people (East Lombok Health Service Profile, 2019). An epidemiological study conducted by Ronald W. Kartika in 2017 showed that in Indonesia there are more than one million cases of amputations each year due to diabetes mellitus. The proportion of people with diabetic gangrene in Indonesia is around 15% with an amputation rate of 30%. Approximately 68% of patients with diabetic gangrene are male and 10% of patients with gangrene experience recurrence (Rosa, 2019).

The existence of diabetes mellitus complications in the form of gangrene will affect and have an impact on the lives of individuals and families. The impact of problems that can occur in individuals include changes in patterns of perception and management of healthy living, changes in nutrition and metabolism patterns, changes in elimination patterns, changes in sleep and rest patterns, changes in activity and exercise patterns, changes in relationship and role patterns, changes in sensory and cognitive patterns. , changes in patterns of perception and self-concept, changes in sexual and reproductive patterns, changes in stress and coping patterns, and changes in values and beliefs (Maghfuri, 2016). Clean and healthy living behavior has been established through the regulation of the Minister of Health of the Republic of Indonesia Number: 2269/MENKES/PER/XI/2011. The Ministry of Health has also launched the Healthy Community Movement (Germas) in Indonesia since November 15, 2016 (Primadi, 2017). The Healthy Community Movement or Germas is an effort by the government to involve and empower the community to maintain, improve and protect their health (Rosidin, 2020).

Based on the results of a preliminary study conducted at the Labuhan Lombok Health Center, data was obtained, namely the number of people with diabetes mellitus as many as 139 people. West sandubaya hamlet with 32 people with diabetes mellitus, brain village hamlet with 12 people with diabetes mellitus, Jejangke hamlet with 5 people with diabetes mellitus, Karang Kapitan hamlet with 11 people with diabetes mellitus, balanced hamlet with as many as 5 people with diabetes mellitus 26 people, Dasan Lendang with 13 people with diabetes mellitus, Bilawang Hamlet with 20 people with diabetes mellitus, and Sasak Hamlet with 20 people with diabetes mellitus. Based on the above background, this research was conducted in the hope of obtaining the influence of education in the application of clean and healthy living behavior in

patients with diabetes mellitus on the incidence of gangrene during the corona virus-19 pandemic.The purpose of this study is to determine the effect of clean and healthy living behavior education in patients with diabetes mellitus on the incidence of gangrene during the corona virus-19 pandemic in the Labuhan Lombok Health Center Working Area.

Methods

Study Design

This research utilizes a pre-experimental approach with a One Group Pretest-Posttest**.**

Samples

The population in this study were all people with diabetes mellitus in the Labuhan Lombok Health Center working area, totaling 139 people. The sample used was 58 respondents with stratified random sampling technique. The sample selection in this study is divided into two criteria, namely Inclusion Criteria and Exclusion criteria. The inclusion criteria in this study are a) Age 30-40 years old b) Able to carry out independent activities c) diabetes mellitus patients who have gangrene (Grade 0-5 according to Wagner Meggit) and diabetes mellitus patients who do not have gangrene d) diabetes mellitus patients who can read and write. The exclusions in this study are a) diabetes mellitus patients who are unable to perform independent activities b) diabetes mellitus patients who have complications that can interfere with research (chronic kidney failure, heart failure, vision, etc.) c) diabetes mellitus patients who are not willing to be research respondents.

Instruments

The instruments used in this study were the Demographic Questionnaire, the Clean and Healthy Living Behavior Questionnaire and the observation sheet. The instruments used in this study included a Demographic Questionnaire, a Clean and Healthy Living Behavior Questionnaire, and an observation sheet. The Demographic Questionnaire was developed by the researchers to obtain detailed information about the participants' personal background. It consisted of items related to the respondent's initials, age, gender, comorbidities, duration of illness, educational background, and occupation.

The Clean and Healthy Living Behavior Questionnaire was adapted from an instrument developed by Ika Febty Diyah Chiptarini in 2015, in a study entitled “Overview of Knowledge and Behavior About the Management of Diabetes Mellitus in Diabetes Mellitus Patients at the East Ciputat Health Center.” The validity of this questionnaire was tested using the corrected item-total correlation method with a significance threshold of 0.3. Items with a correlation value above 0.3 were considered valid, while those below 0.3 were deemed invalid. The results showed that the two items measuring educational behavior were valid. For blood sugar monitoring behavior, two out of three questions (questions 1 and 2) were valid. In the domain of foot care behavior, five out of seven items were valid (items 1, 3, 5, 6, and 7). Other behavior domains such as diet, medication adherence, and physical activity were not tested for validity, as these behaviors were assessed through observation based on the respondent's weekly habits.

Reliability testing was conducted using the Spearman-Brown formula, appropriate for questionnaires with an even number of Guttman scale items, and a reliability coefficient above 0.60 was considered acceptable. The instrument was tested on 30 individuals and analyzed using SPSS version 20. The reliability scores obtained were 0.95 for educational behavior, 0.86 for blood sugar monitoring behavior, and 0.98 for foot care behavior, indicating excellent internal consistency.

In addition, an observation sheet was used to collect clinical and behavioral data. The sheet included fields for the respondent's initials, date of observation, gender, presence of gangrene, duration of wound, blood sugar level, wound staging based on the Wagner-Meggitt classification, and wound size.

Data Collection

Data collection was carried out in July 2021 at the Labuhan Lombok Health Center, East Lombok Regency. To determine respondents, the researcher began to take a relationship

building approach of mutual trust with respondents and their families to get approval to become respondents. Before the research begins, the researcher first explains the purpose and benefits of holding this study, then if the family or patient is willing, then please sign an approval sheet to become a respondent. Before the researcher provided education about clean and healthy living behavior, the researcher gave the respondents 2 questionnaires, namely the demographic questionnaire and the clean and healthy living behavior questionnaire, the respondents were given 20 minutes to fill out the questionnaire. Next, the researcher observed the respondents to find out whether there were gangrene lesions or not, after which the researcher provided treatment in the form of education about clean and healthy living behavior. This education is given for 1 hour in one meeting, the media used are LCD, laptop, PPT, Meter, Blood Sugar Check at A Time. After education, the researcher then re-observed if there were gangrene wounds for 4 weeks or 28 days and assessed whether there was any change or progress in the healing of gangrene wounds after being given treatment.

Data Analysis

Data analysis in this study is univariate analysis and bivariate analysis. Univariate analysis was used to determine individual characteristics based on several variables descriptively using frequency distribution and proportions, including age, gender, comorbidity, long time sick, education and type of work. Bivariate analysis was conducted in this study to determine the relationship between independent variables (anxiety level) and dependent variables (work motivation) using the Mc Nemar test with a significance level of 5% ($\alpha = 0.05$).

Ethical Considerations

This research obtained research permission from Sekolah Tinggi Ilmu Kesehatan Hamzar Lombok Timur with number: 212/SPm/STIKZAR/VII/2021. There are three ethical principles that are firmly adhered to in conducting this research, namely Informend Concent, Confidentiality and Anonymity.

Results

Characteristics of respondents

Table 1 shows that most respondents were aged 36–40 years, comprising 35 individuals (60%), followed by those aged 30–35 years with 23 individuals (40%). In terms of gender, most respondents were female, totaling 33 individuals (57%), while male respondents accounted for 25 individuals (43%). Regarding comorbidity status, most respondents (47 respondents or 81%) reported no comorbid conditions, whereas 11 respondents (19%) indicated having comorbidities. When examining the duration of illness, the largest proportion had been ill for 3 years (23 respondents or 40%), followed by 2 years (22 respondents or 38%), and 1 year (13 respondents or 22%). In terms of educational background, most respondents had completed senior high school (33 respondents or 57%), followed by junior high school (14 respondents or 24%), primary school (9 respondents or 16%), and only a small number held a bachelor's degree (2 respondents or 3%). As for employment status, most respondents were employed (45 respondents or 78%), while 13 respondents (22%) reported having no occupation. Overall, the respondents were predominantly middle-aged female individuals, most of whom had moderate to low educational backgrounds and were actively working, with a significant proportion having lived with diabetes mellitus for two to three years without comorbidities.

Table 1. Distribution of Respondents

Caracteristic of The Respondents		f	%
Age	30-35	23	40
	36-40	35	60
Gender	Male	25	43
	Famale	33	57
Comorbidity	Yes	11	19
	No	47	81
Long time sick	1 year	13	22
	2 years	22	38
	3 years	23	40
Education	Bachelor	2	3
	Senior High School	33	57
	Junior High School	14	24
	Primary School	9	16
Type of work	Yes	45	78
	No	13	22

Source: SPSS Processed Data

Table 2 displays changes in respondents' behavior before and after receiving education on clean and healthy living. Prior to the intervention, most respondents (43 individuals or 74%) demonstrated negative clean and healthy life behavior, while only 15 respondents (26%) exhibited positive behavior. However, after the educational intervention, the number of respondents with positive clean and healthy behavior increased significantly to 37 individuals (64%), whereas those with negative behavior decreased to 21 respondents (36%).
This shift indicates that the educational program had a meaningful impact on promoting healthier behaviors among diabetes mellitus patients during the pandemic, particularly in managing hygiene, diet, foot care, and physical activity.

Table 2. Frequency Distribution of Respondents Based on Clean and Healthy Life Behavior

Clean and Healthy Life Behavior	Pretest		Posttest	
	f	%	f	%
Positve	15	26	37	64
Negative	43	74	21	36
Total	58	100	58	100

Source: SPSS Processed Data

Table 3 presents data on the incidence of gangrene among respondents before and after receiving education. At the pretest stage, 16 respondents (28%) were recorded as having gangrene, while 42 respondents (72%) did not experience gangrene. Following the educational intervention and a 4-week observation period, the number of gangrene cases decreased significantly to 7 respondents (12%), whereas those without gangrene increased to 51 respondents (88%).These findings suggest that clean and healthy living behavior education contributed positively to reducing the incidence of gangrene in diabetes mellitus patients during the COVID-19 pandemic.

Table 3. Frequency Distribution of Respondents Based on Gangrene Incidence

Ganggrene	Pretest		Posttest	
	f	%	f	%
Yes	16	28	7	12
No	42	72	51	88
Total	58	100	58	100

Source: SPSS Processed Data

Table 4 shows the cross-tabulation between pretest and posttest gangrene incidence to assess the effectiveness of the educational intervention. Among the 16 respondents who had gangrene during the pretest, 7 (43.75%) remained with gangrene after the intervention, while 9 (56.25%) experienced improvement and no longer had gangrene. All 42 respondents who did not have gangrene in the pretest remained free of gangrene in the posttest. Statistical analysis using the McNemar test yielded a p-value of 0.004 ($p < 0.05$), indicating a statistically significant effect of the educational program on reducing the incidence of gangrene. This finding reinforces the role of education in enhancing self-care practices among diabetes mellitus patients, especially during health crises such as the COVID-19 pandemic.

Table 4. The Effect of Education on Clean and Healthy Life Behavior in Diabetes Mellitus Patients on Gangrene Incidence During the Corona Virus-19 Pandemic in the Work Area of the Labuhan Lombok Health Center

	Post Test		Total	p-*value*
	No Ganggrene	Ganggrene		
Pre Test	9	7	16	
	42	0	42	0.004
Total	51	7	58	

Source: SPSS Processed Data

Discussion

Clean and Healthy Living Behaviors in Diabetes Mellitus Patients

The study showed that prior to education, only 15 respondents (26%) practiced positive clean and healthy living behaviors, while 43 respondents (74%) exhibited negative behaviors. After receiving educational interventions, the number of respondents with positive behaviors increased to 37 (64%), while those with negative behaviors decreased to 21 (36%). This indicates that education significantly influenced behavioral change, although many diabetic patients still showed passive tendencies despite having knowledge about proper practices such as diet, exercise, medication adherence, blood sugar monitoring, and foot care.

Preventive behaviors in DM patients include maintaining foot hygiene, choosing proper footwear, and regulating diet and physical activity (Hartono in Hikmawati, 2018; Septian, 2014). These efforts are vital in preventing complications, particularly amputation risks (Nabyl, 2012). Additionally, stable blood sugar control plays a key role in wound healing and preventing diabetic ulcers (Hananta, 2011).

Negative behaviors were found to be influenced by age, education, and occupation. The majority of respondents (35 individuals) were aged 36–40 years, with the rest in the 30–35 age range. These age groups are known to have an increased risk of type 2 diabetes, linked to biological decline in insulin metabolism (Damayanti, 2015; Amir & Wungow, 2015). Furthermore, individuals over 30 tend to neglect health, focusing more on lifestyle satisfaction until entering older age when health becomes a concern (Arsandi, 2012).

In terms of gender, women dominated the sample, which aligns with WHO data (2016) showing higher DM prevalence in Indonesian women due to obesity and lack of physical activity, contributing to insulin resistance and hyperglycemia (Trisnawati & Setyorogo, 2013).

Gangrene Incidence During the Corona Virus-19 Pandemic

The study found that before education, 16 respondents (28%) experienced gangrene, while 42 respondents (72%) did not. Following four weeks of counseling and observation, gangrene incidence dropped to 7 respondents (12%), and those without gangrene increased to 51 respondents (88%). This reveals the effectiveness of educational intervention in reducing gangrene during the pandemic.

Gangrene, a severe complication of diabetes, results from tissue necrosis due to disrupted blood supply, often stemming from neuropathy and vascular disorders in the legs (Rosa et al., 2019). Lack of awareness about gangrene was a critical factor in its occurrence, especially among those with lower educational backgrounds (elementary to high school). According to Notoatmodjo (2009), education is a key factor in behavioral change, as greater knowledge promotes better health practices.

The Effect of Clean and Healthy Life Behavior (PHBS) Education on Gangrene Incidence in Diabetes Mellitus Patients During the COVID-19 Pandemic

This study revealed that PHBS education significantly reduced gangrene incidence, confirmed by the McNemar test (p = 0.004). These findings are in line with prior studies, Sari et al. (2021) demonstrated that structured foot care education reduced gangrene risk in DM patients. Putra et al. (2023) showed that diabetes self-care education improved behaviors such as blood sugar monitoring and wound inspection. Wahyuningsih et al. (2022) confirmed that community-based structured education decreased diabetic foot complications by fostering preventive behaviors.

These findings are supported by the Health Belief Model (HBM), which posits that behavioral change occurs when individuals perceive themselves at risk, believe the condition is serious, and see benefits outweighing the barriers (Glanz et al., 2015). Education enhances perception, raises awareness, and promotes preventive behaviors.

From a pathophysiological perspective, chronic hyperglycemia impairs immune function and wound healing, increasing the risk of foot ulcers and gangrene (Al-Bahadili et al., 2021). Without proper education and behavioral adjustment, minor foot injuries can escalate into serious complications.

During the COVID-19 pandemic, access to diabetes care was limited, which increased risk. However, tele-education proved effective. Handayani et al. (2022) reported that remote care helped patients maintain self-care practices and prevent wound deterioration.

The effectiveness of education also depends on health literacy and educational background. Lestari & Prasetya (2022) emphasized that patients with higher literacy are better at interpreting and applying health information. Therefore, educational materials must be tailored to the target audience's literacy level to maximize outcomes.

Conclusion

This study concluded that PHBS education significantly reduced gangrene incidence among diabetes mellitus patients during the COVID-19 pandemic. Education led to improvements in foot hygiene, blood glucose monitoring, medication adherence, and healthy lifestyles, all of which are essential to prevent complications.

It is therefore crucial to integrate PHBS education into routine diabetes management, particularly in primary health care and community settings. These interventions are cost-effective and impactful. During public health emergencies, accessible education, including telehealth-based outreach, should be prioritized. Furthermore, health policymakers must ensure that educational strategies match patients' literacy levels to promote meaningful and sustainable behavior change.

Acknowledgment

The authors expressed their gratitude to all parties involved in this study.

References

ADA. (2020). Diabetes Classification and Diagnosis: Standards of Medical Care in Diabetes-2020. In Diabetes Treatment (Vol. 43, pp. S14–S31). https://doi.org/10.2337/dc20-S002

Al-Bahadili, H. M., Saleh, M. H., & Al-Jubouri, M. S. (2021). Pathophysiology of diabetic foot ulcers: Review of literature. *International Journal of Diabetes Research*, 10(1), 1–7. https://doi.org/10.5923/j.diabetes.20211001.01

American Diabetes Association [ADA]. (2014). Diagnosis and Classification of Diabetes Mellitus. Diabetes Treatment. Jan; 34(Suppl 1): S62-S69, doi:10.2337/dc11-S062, PMCID: PMC3006051.

Amir, S.M.J., Wungouw, H., & Pangemanan, D. (2015). Blood Glucose Levels When Patients with Type 2 Diabetes Mellitus At Bahu Health Center Manado City. Journal of E-Biomedicine (Ebm),3.

Andriansyah, Y. (2013). Counseling and PHBS Practices in Realizing Healthy Care Village Communities. Asian Journal of Innovation and Entrepreneurship, 2(01), 45-50.

Anggraini, D.T., & Hasibuan, R. (2020). Overview of Phbs Promotion in Supporting a Healthy Lifestyle for the People of Binjai City during the 2020 Covid-19 Pandemic. Menara Medika, 3(1).

Azis, W. A., Muriman, L. Y., & Burhan, S. R. (2020). Relationship between Knowledge Level and Lifestyle of Diabetes Mellitus Patients. Journal of Professional Nursing Research, 2(1), 105-114. BAI, J.,

SUN, J., SHEN, Y., JIN, X., WANG, S., & WANG, S., & WANG, Z. (2009). Utilization of Behavioral Studies in Diabetic Foot Health Behavior Intervention [J]. Journal of Nursing Science, 7

Bani, I. A. (2015). Prevalence, knowledge, attitudes and practice of diabetes mellitus in the Jazan population, Kingdom of Saudi Arabia (KSA). Journal of diabetes mellitus, 5 (02), 115.

Budiono, A. P. (2019). The relationship between blood sugar levels >300 mg/dl with diabetic gangrene in type 2 diabetes patients in Kediri in 2017 (Doctoral dissertation, Wijaya Kusuma Surabaya). Damayanti, S. (2015). Diabetes Mellitus & Nursing Management. Yogyakarta: Nuha Medika

Dian, A. (2017). Relationship between DM Patient's Diet Compliance with Gangrene Wound Healing Process at the Surgical Clinic of Dr. Sayidiman Magetan (Doctoral dissertation, STIKES Bhakti Husada Mulia).

Febriyan, H. B. (2020). Lifestyle of people with Type 2 diabetes mellitus in people in urban areas. Wellness And Healthy Magazine, 2(2), 361-368. Fatimah, RN. (2015). Diabetes Mellitus type 2: Medical Journal of Lampung University, 4(5), 86-95 Hananta, P. Y., & Harry, L. M. (2011). Early Detection and Prevention of Diabetes Mellitus. Yogyakarta: Media Pressindo.

Handayani, D., Mustakim, M., & Nasution, N. (2022). The effect of diabetes foot care tele-education during the COVID-19 pandemic on self-care behavior in type 2 DM patients. *Nursing Journal of Indonesia*, 23(1), 56–64. https://doi.org/10.7454/nji.v23i1.56

Hikmawati, D. (2018). Relationship of Clean and Healthy Life Behavior (PHBS) with Quality of Life of Diabetes Mellitus Ulcer Patients at the Integrated DM Poly Hospital Kraton Pekalongan Regency. (Study Program for Nursing & Nursing Profession STIKES Muhamadiyah, Pekajangan Pekalongan).

Husnaeni, H., Syaiful, S., & Wahyuni, S. . (2024). Factors Influencing the Incidence of Diabetic Foot Injuries. *Omni Health Journal*, *1*(1), 30-39. https://omnijournal.id/index.php/health/article/view/13

Indonesia, P. E. (2019). Management and prevention of type 2 diabetes mellitus in adults in Indonesia. Pb. Perkeni.

Isbaniah, F. (2020). Guidelines for the Prevention and Control of Corona Virus Disease (2020). Indonesia, P. E. (2015). Management and prevention of type 2 diabetes mellitus in Indonesia. Pb. Perkeni.

Jannah, R. (2019). Analysis of Factors Associated with Stress in Diabetes Mellitus Patients at Surabaya Public Health Center (Doctoral dissertation, Universitas Airlangga).

Kartika, R. W. (2017). Management of Diabetic Foot Gangrene. Mirror of the World of Medicine, 44(1), 18-22.

Karuniawati, B., & Putrianti, B. (2020). Description of Clean and Healthy Lifestyle (PHBS) in the Prevention of Covid-19 Transmission. Karya Husada Health Journal, 8(2), 34-53.

Kurniawan, A. A., & Wuryaningsih, Y. N. S. (2016). Recommendations for Physical Exercise for Type 2 Diabetes Mellitus. Medical Scientific Periodicals Duta Wacana, 1(3), 197.

Lestari, D., & Prasetya, H. (2022). Health literacy and self-care practices among patients with type 2 diabetes: A cross-sectional study. *Journal of Health Promotion and Behavior*, 7(2), 110–117. https://doi.org/10.26911/thejhpb.2022.07.02.05

Maghfuri, A. (2016). Diabetes Mellitus Wound Care Smart Book. Jakarta: Salemba Medika Publisher.

MOH, R. I. (2020). Guidelines for the Prevention and Control of Corona Virus Disease (COVID-19). Jakarta: Indonesian Ministry of Health & Director General of Disease Prevention and Control.

Nably, R. A. (2012). Healthy Living Guide To Prevent And Treat Diabetes Mellitus Revised Edition. Yogyakarta: Aulia Publishing.

Notoadmodjo, S. (2009). Human Resource Development. PT. Rineka Cifta.

Notoatmodjo. (2015). Health Research Methodology. Jakarta: PT. Rineka Cifta.

Nursalam. (2016). Nursing Research Methodology. Edition 4. Jakarta: Salemba Medika.

Pradana, A. A., & Casman, C. (2020). The Effect of Social Distancing Policy on the COVID-19 Outbreak on Vulnerable Groups in Indonesia. Indonesian Journal of Health Policy: JKKI, 9(2), 61-6.

Putra, A. R., Suryani, S., & Wulandari, L. P. (2023). Educational intervention improves self-care behavior and foot care knowledge in patients with diabetes mellitus. *Indonesian Nursing Journal of Education and Clinic (INJEC)*, 8(1), 43–51. https://doi.org/10.24990/injec.v8i1.456

Rahman, HS, Jyotsna, VP, Sreenivas, V., Krishan, A., & Tandon, N. (2018). The effectiveness of the patient education module on diabetic foot care in the outpatient setting: An open-label randomized controlled study. Indian Journal of Endocrinology and Metabolism, 22(1), 74.

Riyanto, A. (2019). Health Research Methodology Application. Yogyakarta: Nuha Medika.

Rosa, S. K. D., Udiyono, A., Kusariana, N., & Saraswati, L. D. (2019). Factors associated with the onset of gangrene in patients with diabetes mellitus in RSUD KRMT Wongsonegoro Semarang. Journal of Public Health (Undip), 7(1), 192-202.

Rosidin, U., Rahayuwati, L., & Herawati, E. (2020). The behavior and role of community leaders in preventing and overcoming the COVID-19 pandemic in Jayaraga Village, Garut Regency. Umbara, 5(1), 42-50.

Saragih, L., Afifuddin, M. F., Subekti, I., & Septiasih, R. (2020). The Effect Of Gangrene Wound Treatment On Amputation Prevention And Reducing Anxiety Level. Journal Of Applied Nursing (E-Journal), 6(01), 2442-6873.

Sari, A. P., Wibisono, A., & Hidayati, S. N. (2021). Impact of foot care education on reducing the risk of gangrene in type 2 diabetes mellitus patients. *Nurse Line Journal*, 6(2), 120–129. https://doi.org/10.14710/nlj.v6i2.120

Septian, R. (2014). The Relationship between Clean and Healthy Behavior and Gangrene Incidence in Diabetes Mellitus Patients in the Inpatient Room of Sakinah Islamic Hospital, Mojokerto. Journal. S1 Nursing Study Program. STIKES Majapahit Mojokerto (Accessed on November 11, 2016).

Sharoni, SKA, Rahman, HA, Minhat, HS, Ghazali, SS & Ong, MHA (2017). Self-efficacy education program on foot self-care behavior among older patients with diabetes at a public long-term care institution, Malaysia: A Quasi-Experimental Pilot Study. BMJ open, 7(6), e014393.

Suciana, F., Daryani, D., Marwanti, M., & Arifianto, D. (2019). Management of the 5 Pillars of DM Control on Quality of Life for Type 2 DM Patients. Scientific Journal of Permas: Scientific Journal of STIKES Kendal, 9 (4), 311-318.

Sugihantono, A. (2020). Guidelines for the Prevention and Control of Corona Virus Disease (Covid-19). Soelistijo, S. A., Lindarto, D., & Decroli, E. (2019). Guidelines for the management and prevention of type 2 diabetes mellitus in adults in Indonesia 2019. Indonesian Endocrinol Society, 1 117.

Sugiyono. (2019). Quantitative Research Methods. Bandung: CV Alfabeta.

Sukmawati, D. A. (2019). Nursing care of gangrenous diabetes mellitus patients in NY. R and TN. S with the nursing problem of damage to tissue integrity in the jasmine room of RSUD Dr. Haryoto Lumajang in 2019 (Doctoral dissertation, Faculty of Nursing, University of Jember).

Wahyuni, S., Hasneli, Y., & Ermawaty, J. (2018). The Relationship of Blood Sugar Levels with The Occurrence of Gangrene In Diabetes Mellitus Patients. Journal of Nursing, 3(3)

Wahyuningsih, S., Rahayu, W., & Hidayati, A. (2022). Impact of structured education on diabetic foot prevention in community-dwelling patients: A quasi-experimental study. *Community Health Journal*, 9(3), 230–237. https://doi.org/10.31584/chj.v9i3.897

West Nusa Tenggara Provincial Health Office. West Nusa Tenggara Province Health Profile 2017. Mataram 2018 East Lombok District Health Office. East Lombok Health Profile 2019. Selong 2020

Widiastuti, L. (2020). Acupressure and Foot Exercise on Peripheral Arterial Disease Levels in Type 2 DM Clients. Silampari Nursing Journal, 3(2), 694-706.

Wulandari, N. A., Waluyo, A., & Irawati, D. (2019). Experience of Type 2 Diabetes Mellitus Patients in Taking Actions to Prevent Foot Wounds. Silampari Journal of Nursing, 2(2), 176-188.