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PREVENTION OF DIABETIC FOOT ULCERS IN VULNERABLE ADULT GROUPS IN THE COMMUNITY THROUGH THE JULAKWAKRI TOOLS INTERVENTION

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Abstract

Background: This study is an application of Evidence-Based Nursing Practice in the prevention of diabetic foot ulcers (DFU) in vulnerable adult communities through the JULAKWAKRI intervention tools (seven steps of self-care foot care).

Objective: To assess the effectiveness of JULAKWAKRI tools in preventing foot injuries in diabetic patients.

Methods: This quasi-experimental study with a pre- and post-test control design was conducted in the Harapan Mulya RW 4, 5, and 6 community areas in Kemayoran, Central Jakarta. The instruments used included the Spoken Knowledge in Low Literacy Diabetes (SKILLD) questionnaire, the Diabetes Empowerment Scale–Short Form (DES-SF), the Diabetes Problem-Solving Skills (DPSS) scale, and blood glucose measurements for glycemic control. Data were analyzed using the paired t-test to determine changes before and after the intervention.

Results: The intervention significantly improved knowledge (MD: 28.44; p : 0.007), empowerment (MD: 16; p : 0.006), and problem-solving (MD: 34; p : 0.008). In addition, objective outcomes based on glycemic control also showed a significant decrease of up to 132.56 points (p : 0.008).

Conclusion: DFU prevention is an essential component of empowering communities to become more independent and improving the health status of diabetic patients vulnerable to foot ulcers. The JULAKWAKWARI tools can be recommended as an effective intervention in community-based nursing practice.

INTRODUCTION

Diabetes mellitus (DM) poses a major threat to global public health, ranking as the third leading cause of death and the fourth leading cause of disability worldwide. More than 10.5% of the global adult population had diabetes in 2021, and this number is projected to increase to 12.2% (783.2 million people) by 2045 (Ezzatvar & García-Hermoso, 2023). In Indonesia, the International Diabetes Federation (IDF) reported 41.8 million people with diabetes in 2022, making Indonesia the country with the highest number of diabetes cases in Southeast Asia and ranking 34th of 204 countries globally (Tiscar-González, 2021). The prevalence of diabetic foot ulcers (DFU) in Indonesia continues to

increase in line with rising diabetes cases, reaching 15%, accompanied by an amputation rate of 30% and mortality rate of 32%. One in five diabetic patients is likely to develop DFU, and one-quarter of those affected do not fully recover (Alkendhy., 2018). Approximately 25% of DM patients have a lifetime risk of DFU, which greatly increases the risk of lower-extremity amputation (Suglo., 2022)

Previous evidence has shown that DFU is one of the most serious complications of diabetes and significantly reduces a patient's quality of life while imposing a substantial financial burden. Complications such as toe or foot loss and the risk of amputation highlight the need for patient education on foot care, blood glucose management, and preventive strategies (Wulandini Putri & Azminah, 2023). If left untreated, DFU results not only in personal suffering but also in burdens on families, healthcare providers, facilities, and society (Bus., 2023). However, research on the implementation of effective community-level interventions for DFU prevention remains limited (Lu., 2020)

A lack of proper footwear at home, poor education on its use, and inadequate self-care practices increase the risk of DFU. Proper footwear helps reduce the incidence or recurrence of DFU (Luo., 2022). Appropriate nail trimming, daily foot checks, and independent home-based strategies also play a crucial role in DFU prevention (Idramsyah, 2023). Foot exercises using rubber bands or newspapers improve blood circulation in the feet and lower limbs (Sukartini., 2019). Nutritional regulation, including adherence to diabetes-friendly diets, also contributes to better glycemic control (Lestari & Kusumaningrum, 2021). Simple herbal therapies such as bay leaf infusion have demonstrated glucose-lowering effects (Parisa., 2019).

Education on self-care practices has been shown to reduce lower-limb amputations (Hidayat., 2022). Therefore, providing DFU-related information helps patients understand their condition, evaluate risk factors, and make healthy decisions. The JULAKWAKRI tools, an intervention containing seven steps of foot self-care, aim to strengthen patient autonomy through foot assessment, blood glucose monitoring, self-examination with mirrors, dietary management, family empowerment, foot exercises, and collaboration with healthcare providers (Nursanti, 2024). Audio-visual educational methods improve knowledge retention, skill acquisition, and sensory engagement (Lengga., 2023). Family involvement is also essential for improving health outcomes among adults vulnerable to DFU (Ghasemi., 2021). Behavioral change is more likely when education is tailored to cultural differences and supported by families and community groups (Probst., 2023). This study aimed to evaluate the effectiveness of the JULAKWAKRI intervention tools in preventing diabetic foot ulcers (DFU) among adults with diabetes mellitus.

METHODS

Study Design

This study is quasi-experimental with a pre- and post-test control design.

Settings

This study was conducted in Harapan Mulya RW 4, 5, and 6, Kemayoran Subdistrict, Central Jakarta, an urban residential area with diverse socioeconomic characteristics. Based on a preliminary community assessment, the area included 32 adults diagnosed with diabetes mellitus, many of whom were at high risk for developing diabetic foot ulcers (DFU). Several contributing factors were identified, including limited access to information on diabetic foot care, the absence of structured education programs at the primary healthcare level, and insufficient family involvement in diabetes management.

Before implementing the intervention, the researchers conducted a general data assessment and a SWOT analysis, which revealed the following:

1. Key weaknesses included the lack of optimal service programs addressing DFU vulnerability among adults with diabetes and the unavailability of diabetic foot care education at the community level.
2. Opportunities emerged from the presence of active health cadres, strong neighborhood support (RT/RW), and high motivation among residents to improve disease management.
3. Community nursing diagnoses relevant to this intervention were identified as *ineffective health maintenance* and *knowledge deficit* among individuals with diabetes, specifically related to foot-care practices.

This location was selected due to its readiness to support a community-based intervention, including the availability of meeting spaces, collaboration with local leaders, and access to communication tools such as WhatsApp, which facilitated the technology-assisted components of the educational sessions. The intervention program was implemented over eight weeks, combining face-to-face meetings and online sessions. It included participation from family members and community health cadres to enhance self-care support for individuals vulnerable to DFU.

Research subject

The research subjects in this study were adults diagnosed with type 2 diabetes mellitus who resided in the Harapan Mulya RW 4, 5, and 6 neighborhoods in Kemayoran, Central Jakarta. These individuals were identified as being vulnerable to developing diabetic foot ulcers (DFU) based on community assessments and their clinical history.

The selection of research subjects followed predefined inclusion, exclusion, and dropout criteria to ensure the appropriateness and consistency of participants with the study objectives. The inclusion criteria included: (1) adults aged 18 years and above; (2) absence of audio-visual impairments; (3) a confirmed diagnosis of type 2 diabetes by a physician; (4) residency in the designated community area; (5) ability to communicate using WhatsApp; and (6) willingness to participate in all educational sessions.

The exclusion criteria consisted of adults with diabetes who met the inclusion criteria but were hospitalized or in emergency conditions during the intervention period. Subjects were categorized as

dropouts if they withdrew before completing the intervention sessions or failed to participate in the post-test assessment.

A total of nine participants met the study's criteria and were enrolled. These research subjects represent a vulnerable adult population requiring enhanced diabetes self-care support, particularly in foot-care practices to prevent DFU. Their participation was essential to evaluating the effectiveness of the JULAKWAKRI intervention tools within a real-world community context.

Intervention

The JULAKWAKRI intervention was implemented over eight weeks and consisted of structured educational sessions, skills practice, and technology-assisted learning designed to strengthen self-care behaviors related to diabetic foot ulcer (DFU) prevention. The intervention was adapted from evidence-based practices and integrated seven components of foot self-care, represented by the JULAKWAKRI tools: Assessment, Blood Sugar Check, Check Pulse & Insole, Diabetic Diet, Empowering Families, Foot Exercise, and Getting Collaboration.

The implementation followed a combination of face-to-face meetings, online Zoom sessions, and WhatsApp-based educational reinforcement, allowing flexibility and accessibility for participants within a community setting. The intervention procedures included the following elements:

1. Week-by-Week Intervention Flow

- a. Week 1 (Face-to-face, 2 hours):
Introduction to the program, sharing personal experiences with diabetes and foot problems, and administration of pre-test questionnaires.
- b. Week 2 (Online Zoom, 2 hours):
Upload and discussion of educational videos covering JULAKWAKRI components A (Assessment) and B (Blood Sugar Check).
- c. Week 3 (Offline, 2 hours):
Hands-on practice of components A and B, including mirror-assisted foot assessment and self-monitoring of blood glucose.
- d. Week 4 (Online Zoom, 2 hours):
Upload and explanation of educational videos on components C (Check Pulse & Insole) and D (Diabetic Diet).
- e. Week 5 (Offline, 2 hours):
Practice session for components C and D, focusing on pulse assessment, foot risk identification, and dietary planning.
- f. Week 6 (Online Zoom, 2 hours):
Upload of educational videos for components E (Empowering Families), F (Foot Exercise), and G (Getting Collaboration).
- g. Week 7 (Offline, 2 hours):

Practice of components E, F, and G, including family involvement in foot care, therapeutic foot exercises using simple materials, and guidelines for seeking professional care or referrals.

h. Week 8 (Online Zoom, 2 hours):

Group sharing session to reflect on overall intervention experiences, followed by administration of post-test questionnaires.

2. Educational Approach

The intervention used a blended learning model combining audiovisual content, guided demonstrations, group discussions, and independent home practice. Video materials were shared through WhatsApp and Zoom to enhance accessibility and encourage repetition of skills.

3. Role of Family and Community Cadres

Family members were encouraged to participate as supporters in monitoring dietary patterns, assisting with foot assessments, and reinforcing adherence to daily self-care routines. Community health cadres also played an active role in mobilizing participants, ensuring attendance, and assisting during offline sessions.

4. Integration of Evidence-Based Foot-Care Principles

Each JULAKWAKRI component was derived from validated and evidence-supported practices, such as mirror-based foot inspection, therapeutic foot exercises, and nurse-facilitated problem-solving strategies. The stepwise structure ensured that participants progressively developed knowledge, skills, and self-efficacy in preventing DFU.

Table 1. JULAKWAKRI Intervention Tools.

A	Assessment: conducting a foot assessment using a mirror by examining the toes, soles, calluses, and corns (Akça Doğan & Enç, 2022).
B	Blood sugar check: Self-monitoring of blood sugar (Soelistijo, 2021).
C	Check pulse & insole: Check the pulse in the femoral, popliteal, posterior tibial, dorsalis pedis, and sole areas to avoid the risk of injury (Nursanti, 2024).
D	Diabetic diet: Adjust your diet according to your calorie needs, limit your intake of complex carbohydrates, and avoid foods that are high in carbohydrates (PERMENKES.No.603, 2020).
E	Empowering families: Family empowerment as a strategy to improve self-care management skills at home through the use of herbs and the provision of footwear at home (Mphasha, 2022).
F	Foot Exercise: Foot exercises using newspaper or rubber bands (Sukartini, 2019).
G	Getting Collaboration: Get help from the healthcare team if you have an injury or other issues that make your health worse, or through the referral system. (Heng, 2020).

Data collection

Data collection was conducted throughout the eight-week intervention period using a combination of structured questionnaires, observational assessments, and physiological measurements. Before data collection, participants were informed about the study objectives, procedures, and their rights. Written informed consent was obtained from all participants.

The pre-test was administered during the first face-to-face meeting, where baseline measurements were collected. These included assessments of diabetes knowledge, empowerment, problem-solving skills, and glycemic control. During the intervention, data were also gathered through periodic monitoring, guided practice sessions, and communication via WhatsApp for reinforcement and clarification.

Four validated instruments were used to measure the primary outcomes:

1. Spoken Knowledge in Low Literacy Diabetes (SKILLD)

Used to evaluate participants' diabetes-related knowledge. This tool is designed for populations with low literacy levels and covers essential self-care concepts.

2. Diabetes Empowerment Scale – Short Form (DES-SF)

Used to assess empowerment and self-efficacy related to diabetes self-management.

3. Diabetes Problem-Solving Skills (DPSS) Scale

Used to measure participants' ability to identify and respond to diabetes-related problems, particularly those associated with foot ulcer risk.

4. Glycemic Control Measurements

Capillary blood glucose levels were measured using a standardized glucometer to assess changes in glycemic control before and after the intervention.

Throughout the intervention, a combination of online sessions, educational videos, hands-on practice, and group discussions supported ongoing data collection and participant engagement. The post-test was conducted during the final Zoom meeting (Week 8), using the same set of instruments to evaluate changes following the JULAKWAKRI intervention.

All data were recorded systematically and stored securely to maintain confidentiality and ensure the accuracy of analysis.

Data Analysis

Data analysis in this study was conducted using quantitative statistical procedures to evaluate the effectiveness of the JULAKWAKRI intervention on knowledge, empowerment, problem-solving skills, and glycemic control among adults with diabetes mellitus. All collected data were reviewed for completeness and accuracy before analysis.

Descriptive statistics, including mean and standard deviation, were used to summarize participants' demographic characteristics and baseline outcome measures. These statistics provided an overview of the distribution and variability of the data.

To examine the effect of the intervention, the study employed the paired t-test, an appropriate statistical method for comparing pre-test and post-test scores within the same group of participants. This test was used to determine whether there were statistically significant improvements in:

1. Diabetes knowledge (SKILLD),
2. Empowerment (DES-SF),
3. Problem-solving skills (DPSS), and
4. Glycemic control (blood glucose levels).

Significance levels were set at $p < 0.05$, indicating that differences between pre-test and post-test outcomes were considered statistically meaningful. The mean difference (MD) between pre-test and post-test scores was also calculated to quantify the magnitude of change resulting from the intervention.

All statistical analyses were performed using standard analytical procedures consistent with quasi-experimental research designs. The findings of the paired t-test demonstrated significant improvements across all outcome variables, supporting the effectiveness of the JULAKWAKRI intervention in enhancing self-care abilities and glycemic outcomes among the study participants.

Ethical Consideration

This study obtained ethical approval from the Faculty of Nursing at Airlangga University on April 4, 2024, with ethics certificate number 3126-KEPK. Before participation, respondents were informed about the study objectives, procedures, and their rights. All participants provided written informed consent before taking part in the study.

RESULTS

The JULAKWAKRI intervention was conducted over 8 weeks from May to June 2024, with the intervention guidelines in Table 2 as follows:

Table 2. Overview of the JULAKWAKRI tools intervention.

Intervention	Freq.	Duration	Total Time	Meeting Topics / Education
Week 1	1x	2 Hours	120 minutes	Face-to-face meeting (introduction, sharing stories about illnesses and injuries suffered), distributing pre-test questionnaires
Week 2	1x	2 Hours	120 minutes	Zoom Meeting Upload educational videos JULAKWAKRI tools: A and B
Week 3	1x	2 Hours	120 minutes	Offline Practice: JULAKWAKRI tools: A & B

Intervention	Freq.	Duration	Total Time	Meeting Topics / Education
Week 4	1x	2 Hours	120 minutes	Zoom Meeting Upload educational videos JULAKWAKRI tools JULAKWAKRI tools: C and D
Week 5	1x	2 Hours	120 minutes	Offline JULAKWAKRI tools practice: C and D
Week 6	1x	2 Hours	120 minutes	Zoom meeting Upload educational videos JULAKWAKRI tools E, F, dan G
Week 7	1x	2 Hours	120 minutes	Offline JULAKWAKRI tools practice: E, F & G
Week 8	1x	2 Hours	120 minutes	Zoom Meeting Sesi sharing tentang keseluruhan intervensi JULAKWAKRI, <i>posttest</i> Sharing session on the overall JULAKWAKRI intervention, post test

Table 3. Characteristics of participants.

Respondent	Category	Frequency	Percentage (%)
Education	Elementary School	4	44
	Junior High School	-	-
	High School	4	44
	College	1	11
	Total	9	100.0
Religious	Islam	9	100
	Christianity	-	-
	Total	9	100.0
Gender	Male	1	11
	Female	8	89
	Total	9	100.0

Based on Table 3, it is known that most respondents in this study have a low level of education, namely, elementary school and high school graduates, which are 44.5% and 11% for college graduates. Most respondents are female, 89%, and 11% are male. The questionnaire analysis shows that most respondents are female and have a low level of education.

Table 4. Results of the JULAKWAKRI tools Intervention.

Outputs	Mean		SD		MD	<i>p</i>
	Pre	Post	Pre	Post		
Knowledge	55.00	83.44	7.071	4.391	28.44	0.007
Empowerment	24.44	40.00	3.712	0.000	16	0.006
Problem Solving	74.22	108.44	4.522	5.897	34	0.008
Glycemic control	359	226.44	36.814	56.367	132.56	0.008

Description: Paired t-test result, Mean: average value, SD: standard deviation, MD: mean difference, *p*: significance value

The results of the study are shown in Table 4. The JULAKWAKRI intervention had a significant impact on increasing knowledge (MD: 28.44; *p*-value: 0.007), empowerment (MD: 16; *p*-value: 0.006), and problem solving (MD=34; *p*-value = 0.008). In addition, objective outcomes based on glycemic control also showed a significant decrease of up to 132.56 (*p*-value: 0.008).

DISCUSSION

The test results show that the JULAKWAKRI intervention has a positive effect on the knowledge of respondents who have DM and are susceptible to DFU in the community. Education and age, with previous experience, influence cognitive and affective aspects, which consist of knowledge, attitude, and self-efficacy (Heng, 2020). Previous experience with diabetic foot injuries motivated participants to actively participate in the JULAKWAKRI intervention. The use of IT-based education and practices that could be repeated at home increased patients' knowledge. Misconceptions about diabetes, beliefs about treatment, lack of awareness, and pessimism about diabetes are some of the factors that pose obstacles to education and thus become barriers to effective intervention. A person's knowledge is usually obtained from experiences, either their own or those of others, which can shape knowledge over a long period of time and remain until old age (Guler & Oguz, 2011)

Family empowerment plays a diverse and significant role in strengthening JULAKWAKRI interventions and demonstrating better results in DFU prevention and management (Suglo, 2022). Until now, education has been provided conventionally through brochures and leaflets, but not through discussions utilizing information technology (IT) and hands-on practice. As a result, some respondents expressed feelings of pessimism about vulnerable DFU problems, feeling exhausted due to prolonged illness, irregular control, and low commitment, which are individual barriers to the independent management of vulnerable DFU, especially for patients with complex prognoses and minimal family support. Poor communication experiences in health services, financial problems, and social stigma also hinder self-care foot care practices (Zhu, 2023). Motivation gained from previous education does not affect health status, and it has been proven that personalized care education, with family and community support, is a key factor for better self-management behavior in vulnerable DFU patients. Empowering

families and providing maximum support has proven effective, with increased adherence to medication visits, diet, and routine foot examinations (Laopoulou, 2020).

The JULAKWAKRI tools intervention had a positive impact on the empowerment of adults vulnerable to DFU in the community. Empowering patients vulnerable to DFU is important so that they can take control of their own lives by improving their quality of life (Jahanpeyma., 2020) Stress often affects the emotions and thought processes of patients vulnerable to DFU, raising concerns that the process of learning to acquire knowledge and improve skills will be disrupted (Souza., 2016) Beliefs influence a person's ability to organize and carry out the actions needed to achieve certain goals (Simorangkir & Rohaeti, 2019). Self-care behavior indirectly increases confidence in preventing DFU, which can be modified in DSME interventions in patients vulnerable to DFU (Rozan, 2019). Self-efficacy plays a role in behavioral changes that result in optimal health (Sudirman & Modjo, 2021)

The results of the JULAKWAKRI intervention test had a significant effect on the problem-solving scores of adults vulnerable to DFU in the community. The application of deep learning in this intervention provided a more reliable and faster solution (Das, 2023). Social support obtained from the community that can be felt, understood, noticed, or accepted by patients vulnerable to DFU. The existence of support groups is necessary to minimize depression by providing support to patients to fight negative emotions or help patients alleviate existing depression by increasing self-esteem (Polikandrioti, 2020). Family empowerment through the community plays a diverse and significant role that strengthens JULAKWAKRI interventions and demonstrates better results in the prevention and management of DFU. Until now, education has been carried out conventionally through brochures and leaflets, but not through discussions utilizing IT and direct practice. Therefore, some respondents expressed feelings of pessimism regarding DFU vulnerability issues, feeling exhausted due to prolonged illness, irregular control, and low commitment, which are individual barriers to self-management for vulnerable DFU patients, especially those with complex prognoses and minimal family support. Poor communication experiences in healthcare services, financial problems, and social stigma also hinder independent foot care practices (Zhu, 2024).

Motivation gained from previous education can influence health status, and it has been proven that education focused on care, with family and community support, is a key factor for better self-management behavior in patients vulnerable to DFU. Family empowerment and support in the community have been proven effective, with community support increasing compliance with treatment visits, diet, and regular foot examinations. (Laopoulou, 2020). Lifestyle changes resulting from the JULAKWAKRI intervention for vulnerable DFU patients can improve clinical and health status, indicating that JULAKWAKRI can influence glycemic control (Wu, 2021). The techniques applied in this intervention were able to boost morale through open-ended questions, positive affirmations, training community members to be good listeners, summarizing during Zoom meetings and offline meetings, showing empathy for one another, embracing differences, providing support, and encouraging positive change among respondents.

Glycemic improvement during the JULAKWAKRI intervention period was maintained for 8 weeks, with respondents showing significant improvements in glycemic control, outcome expectations, and self-management behaviors, aided by social support. This proves that this intervention program is effective in improving lifestyle, clinical, and psychosocial aspects (Azami, 2018).

LIMITATION

The study was conducted in a single urban community setting, which may differ from rural or underserved areas in terms of resources, community support, and access to healthcare. Therefore, caution should be exercised when applying these findings to different populations. Future research with larger sample sizes, randomized controlled designs, and multi-site implementation is recommended to strengthen the evidence supporting the effectiveness of the JULAKWAKRI intervention.

CONCLUSION

The application of the JULAKWAKRI Tools was implemented in the community, particularly among vulnerable adults with DFU. In implementing this intervention, data collection from respondents was conducted through tracing. Interventions and actions involving families to enhance the therapeutic effect on clients, but development and implementation with other materials or with aggregate groups of elderly people (other than adults) are needed so that the application of this intervention is more optimal and beneficial to the community.

The use of technology in the implementation of the JULAKWAKRI intervention needs to be supported by families and the community, especially for infrastructure that requires data network connections and mobile phones for those with low to middle economic conditions, because the implementation of this intervention is considered easy, fast, and directly targets participants with DFU problems with significant results.

The implementation of the JULAKWAKRI intervention also helps alleviate the activities of other family members with their respective busy schedules who cannot always accompany the participants, as some parts of the intervention are conducted without face-to-face interaction, thereby saving costs while maintaining health care. The implementation of this intervention is an innovation related to health care education for groups vulnerable to DFU. Families in the health support system need to continue to receive support and be reminded of their duties to maintain health care functions for DFU-vulnerable issues, care for family members with DM, modify the environment to be healthy, and utilize health services. The presence of health cadres in the community in the implementation of this intervention needs to be appreciated, because health cadres are an extension of community nurses in the community. Without cooperation with health cadres, this JULAKWAKRI intervention will not run optimally.

AUTHOR CONTRIBUTION

Indah Nursanti: Contributed to developing the proposal, collecting data, analyzing, and writing the first draft of the manuscript.

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CONFLICT OF INTEREST

There is no conflict of interest in this research.

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