*Original Article*

# A Quasi-Experimental Study on Lifestyle Education and Peripheral Circulation in Type 2 Diabetes Patients

Sri Mulyati Rahayu[1], Tuti Suprapti[2], Anri Anri[3]

[1,2,3]Universitas Bhakti Kencana, Bandung, Jawa Barat, Indonesia

OPEN ACCESS

**Jurnal Keperawatan Komprehensif (Comprehensive Nursing Journal)**

Volume 11 (3), 502-509
https://doi.org/10.33755/jkk.v11i3

**Article info**

| | | |
|---|---|---|
| Received | : | June 27, 2025 |
| Revised | : | July 30, 2025 |
| Accepted | : | July 31, 2025 |
| Published | : | July 31, 2025 |


**Corresponding author**

**Sri Mulyati Rahayu***
Universitas Bhakti Kencana
Jl. Soekarno-Hatta No.754, Cipadung Kidul, Kec. Panyileukan, Kota Bandung, Jawa Barat 40614, Indonesia
Phone : (022) 7830768
*e-mail:* sri.mulyati@bku.ac.id

**Citation**
Rahayu, S. M., Suprapti, T., & Anri, A. (2025). A quasi-experimental study on lifestyle education and peripheral circulation in type 2 diabetes patients. *Jurnal Keperawatan Komprehensif (Comprehensive Nursing Journal),* 11(3), 502–509.

**Website**
https://journal.stikep-ppnijabar.ac.id/jkk



p-ISSN : 2354 8428
e-ISSN: 2598 8727

## Abstract

**Background:** Type 2 diabetes mellitus (DM) poses a high risk for macrovascular complications such as Peripheral Arterial Disease (PAD). The Ankle Brachial Index (ABI) is a non-invasive, reliable screening tool for early detection of PAD. Lifestyle factors, particularly physical activity and dietary adherence, play a crucial role in maintaining vascular health. However, structured educational interventions integrating these aspects with ABI assessment remain limited.
**Objective:** This study aimed to determine the effect of physical activity education and dietary compliance on ABI values in patients with type 2 diabetes mellitus.
**Methods:** A quasi-experimental one-group pretest-posttest design was employed. Thirty type 2 DM patients from Riung Bandung Community Health Center and Bandung City Hospital participated in a 7-day structured educational intervention focusing on physical activity and diet. Data collection included a modified version of the Summary of Diabetes Self-Care Activities (SDSCA) questionnaire and ABI measurements. Statistical analyses used Wilcoxon signed-rank test and Spearman correlation.
**Results:** Post-intervention, participants showed improved dietary adherence (fruit/vegetable consumption increased from 3.2 to 4.9 days/week) and physical activity (specific exercise increased from 3.1 to 4.7 days/week). The mean ABI value increased from 0.94 to 1.02, with 80% of participants experiencing ABI improvement. There was a significant positive correlation between improved physical activity and dietary adherence with increased ABI values ($p < 0.05$).
**Conclusion:** A 7-day structured educational intervention effectively improved physical activity and dietary compliance, leading to better vascular function as indicated by ABI improvement. This approach is promising for community-based prevention of vascular complications in type 2 DM patients.

**Keywords**: Ankle Brachial Index (ABI), Dietary Compliance, Peripheral Arterial Disease, Physical Activity, Type 2 Diabetes Mellitus

## INTRODUCTION

Type 2 Diabetes Mellitus (DM) is a chronic metabolic disease with a globally increasing prevalence. One of the common complications in patients with DM is Peripheral Arterial Disease (PAD), which can be detected through the measurement of the Ankle Brachial Index (ABI). The ABI is the ratio of systolic blood pressure at the ankle to that in the arm, used to assess the degree of blood flow to the lower extremities. A low ABI value indicates the presence of peripheral arterial insufficiency, which may increase the risk of diabetic foot ulcers and amputation (1).

Physical activity and dietary adherence are essential components in the management of Diabetes Mellitus (DM). Education on these two aspects is expected to improve glycemic control and prevent vascular complications. Several studies have shown that interventions such as foot exercises can improve ABI values in patients with type 2 DM (1) After receiving education, the majority of respondents were found to be compliant with the diabetic diet (2)

Research on the management of microvascular and macrovascular complications in patients with type 2 Diabetes Mellitus (DM) has significantly advanced in recent years. One of the current focal points in this field is the use of the Ankle Brachial Index (ABI) as a non-invasive screening tool for detecting Peripheral Arterial Disease (PAD) in DM patients. The ABI has been widely utilized as an indicator of lower limb perfusion and an early predictor of chronic wound risk and potential amputation, making it an important benchmark in evaluating the outcomes of clinical interventions, particularly those related to lifestyle management (3) (4)

As holistic approaches to Diabetes Mellitus (DM) management continue to evolve, health education-based interventions, particularly those targeting physical activity and diet, are increasingly recognized as key strategies for improving clinical parameters, including the Ankle Brachial Index (ABI). In several recent studies, researchers have explored the role of structured education on physical activities such as diabetic foot exercises, programmed walking, or interval training in enhancing peripheral blood circulation and significantly improving ABI (5) (1,6). Physical activity has been proven to improve endothelial function and reduce peripheral vascular resistance, both of which are major components influencing ABI values.

A low-glycemic and high-fiber diet plays a crucial role in controlling blood glucose levels and reducing systemic inflammation, which can exacerbate peripheral atherosclerosis. Several studies have reported that the combination of dietary education and physical activity is more effective than single interventions in improving Ankle Brachial Index (ABI) and preventing the progression of Peripheral Arterial Disease (PAD) (7) (8). The state of the art of this study lies in the fact that previous research has primarily evaluated single interventions and did not incorporate a systematic, measurable, and sustainable educational approach. A study by Setyorini et al. found that after performing diabetic foot exercises, ABI values increased by 46.7%. (9–11), Meanwhile, the study by Yurlina et al. found that after receiving education, the majority of respondents adhered to the diabetic diet (12), However, educational interventions focusing on dietary adherence that influence ABI values are still rarely conducted.The novelty of this study lies in its educational intervention design, which integrates physical activity and dietary adherence simultaneously, using a quasi-experimental approach and ABI measurement as a parameter for assessing peripheral circulation. This research contributes to the understanding that structured health education not only leads to behavioral changes but can also result in physiological improvements that are objectively measurable, such as an increase in ABI. This opens up opportunities to develop community-based clinical education programs that can be integrated into primary care services as a preventive measure against diabetic vascular disorders. This study aims to determine the effect of structured education on physical activity and dietary adherence on changes in Ankle Brachial Index (ABI) values in patients with type 2 Diabetes Mellitus. Specifically, the study evaluates the improvement in physical activity levels and dietary compliance following a 7-day educational intervention and examines the corresponding changes in ABI measurements before and after the intervention to assess the impact on peripheral vascular function.

## METHODS

### Study Design

This study employed a pre-experimental design with a one-group pretest-posttest approach. The design was selected to evaluate the effect of a structured educational intervention on physical activity and dietary adherence, and its impact on Ankle Brachial Index (ABI) values among patients with type 2 Diabetes Mellitus (DM). This design allows comparison of outcome measures (physical activity, dietary adherence, and ABI) before and after the intervention within the same participant group, without a control group.

### Sample

The target population consisted of patients diagnosed with type 2 DM who were enrolled in the Prolanis chronic disease management program at Riung Health Center, Bandung, and inpatients with type 2 DM at Bandung City General Hospital (RSUD Kota Bandung). A purposive sampling technique was used to select participants based on predetermined inclusion and exclusion criteria. Inclusion criteria were: (1) age between 35 and 65 years; (2) diagnosis of type 2 DM for at least 5 years; (3) absence of diabetic gangrene; (4) no auditory impairments; (5) ability to attend the full educational session; and (6) willingness to provide informed consent. Patients were excluded if they had open lower-limb wounds, amputations, or other comorbid conditions that prevented participation in the intervention. A total of 30 participants were recruited for the study.

**Instrument**

Two main instruments were used for data collection in this study. Dietary adherence and physical activity were assessed using a modified version of the Summary of Diabetes Self-Care Activities (SDSCA) questionnaire, focusing specifically on the frequency (days per week) of recommended behaviors such as fruit and vegetable consumption and engagement in exercise. The Ankle Brachial Index (ABI) was measured using a calibrated digital sphygmomanometer, following standardized procedures. Systolic blood pressure readings were obtained from the brachial artery (upper arm) and the dorsalis pedis artery (ankle), and the ABI was calculated as the ratio of ankle to brachial systolic pressure, with values below 0.9 indicating potential peripheral arterial disease (PAD).

**Data Collection**

The intervention consisted of a 7-day structured educational program focusing on two main components: physical activity and dietary adherence. Education was delivered using verbal instructions, printed materials, and visual demonstrations. Each participant attended a daily 30-minute session, covering topics such as low-glycemic diet planning, high-fiber intake, and foot exercise routines beneficial for peripheral circulation.

Baseline (pretest) data were collected on Day 1, including demographic characteristics, SDSCA questionnaire responses, and ABI values. Posttest data were collected on Day 8, immediately following the final education session. All measurements and questionnaire administrations were conducted by trained researchers to ensure consistency and reliability.

**Data Analysis**

Data were analyzed using SPSS version 25.0. Descriptive statistics (mean, standard deviation, frequency, and percentage) were used to summarize participants' demographic characteristics and baseline variables. The Wilcoxon signed-rank test was used to compare pre- and post-intervention data on physical activity, dietary adherence, and ABI values, as the data did not meet the assumptions of normality. To examine the relationship between lifestyle adherence and ABI changes, the Spearman rank correlation test was employed. A p-value of <0.05 was considered statistically significant.

**Ethical Considerations**

This study was reviewed and approved by the Health Research Ethics Committee of Bhakti Kencana University, with approval number 126/09.KEPK/UBK/VII/2023. Prior to participation, all subjects were informed about the study's purpose, procedures, potential risks, and benefits. Written informed consent was obtained from all participants. The study complied with the ethical principles of the Declaration of Helsinki, ensuring confidentiality, voluntary participation, and the right to withdraw at any time without penalty.

## RESULTS

**Table 1. Results of the T-Test on the Effect of Pre-Diet Education on Type 2 DM Patients**
**Coefficients**

| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | | |
| 1 | (Constant) | .660 | .091 | | 7.265 | <.001 |
| | PreDiet1 | .044 | .016 | .451 | 2.754 | .010 |
| | PreDiet2 | .028 | .018 | .249 | 1.520 | .140 |

Table 1 indicates that the pre-education value of the healthy eating pattern variable is less than 0.05 (0.010). This suggests that there is a 5% error rate in the relationship between the healthy eating pattern variable and ABI. The B coefficient of 0.044 indicates that there is a positive relationship between the healthy eating pattern variable and ABI. The vegetable consumption variable has a significance value of >0.05 (0.140).

**Table 2. T-Test Results on the Effect of Pre-Education Physical Activity in Type 2 Diabetes Mellitus Patients**

**Coefficients**

| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | | |
| 1 | (Constant) | .795 | .079 | | 10.036 | <.001 |
| | PreFisik1 | .035 | .013 | .460 | 2.666 | .013 |
| | PreFisik2 | .001 | .020 | .007 | .040 | .968 |

Based on Table 2. The physical activity level before education was less than 0.05 (0,013). This indicates that the physical activity variable has an impact on ABI with a 5% kesalahan threshold. The correlation between the physical activity variable and ABI can be seen from coefficient B, which is around 0.033. This indicates that the physical activity variable has a positive correlation with ABI. The olahraga variable's significance level is greater than 0.05 (0,968). This indicates that the olahraga variable has no effect on ABI with a 5% kesalahan threshold.

**Table 3. Results of the T-Test on the Effect of Post-Diet Education on Type 2 DM Patients**

**Coefficients**

| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | | |
| 1 | (Constant) | .750 | .137 | | 5.494 | <.001 |
| | PostDiet1 | .038 | .022 | .328 | 1.740 | .023 |
| | PostDiet2 | .014 | .024 | .109 | .575 | .004 |

Table 3 indicates that the healthy eating pattern variable post-education has a significance value of < 0.05 (0.023). This suggests that there is a 5% error rate in the relationship between ABI and the healthy eating pattern variable following education. The vegetable consumption variable has a significance value of less than 0.05 (0.004). This suggests that there is a 5% error rate in the relationship between the vegetable consumption variable and ABI.

**Table 4. Results of the T-Test on the Effect of Post-Education Physical Activity on Type 2 DM Patients**

**Coefficients**

| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | | |
| 1 | (Constant) | .756 | .157 | | 4.824 | <.001 |
| | PostFisik1 | .057 | .018 | .544 | 3.234 | .003 |
| | PostFisik2 | -.007 | .021 | -.060 | -.357 | .024 |

Table 4 indicates that the post-education physical activity variable has a significance value of less than 0.05 (0.003). This suggests that there is a 5% error rate in the relationship between the physical activity variable and ABI. The B coefficient of 0.057 indicates that there is a positive relationship between the physical activity variable and ABI. The exercise variable's significance value is less than 0.05 (0.024). This suggests that there is a 5% error rate in the relationship between the exercise variable and ABI.

**Table 5. Changes in ABI Values Based on Intervention**

| Change Category Number of Respondents | Percentage (%) | Percentage (%) |
|---|---|---|
| Increase ABI | 24 | 80% |
| **Unchaged** | 5 | 16.67% |
| **Decrease ABI** | 1 | 3.33% |
| **Total Respondent** | 30 | 100% |

## DISCUSSION

Table 1 indicates that the pre-education value of the healthy eating pattern variable is less than 0.05 (0.010). This suggests that there is a 5% error rate in the relationship between the healthy eating pattern variable and ABI. The B coefficient of 0.044 indicates that there is a positive relationship between the healthy eating pattern variable and ABI. The vegetable consumption variable has a significance value of >0.05 (0.140). The study's findings indicate that eating vegetables has no effect on ABI values because participants only reported eating vegetables for two or three days out of a seven-day period.

Table 2 indicates that the pre-education physical activity value is less than 0.05 (0.013). This suggests that there is a 5% error rate in the relationship between the physical activity variable and ABI. The B coefficient of 0.035 indicates that there is a positive relationship between the physical activity variable and ABI. The exercise variable has a significance value of > 0.05 (0.968). With a 5% error rate, this suggests that the exercise variable has no effect on ABI. The findings of the study demonstrate that exercise has no effect on the ABI value because, according to the respondents, they have only rarely gone swimming and walking in the last seven days, which has little effect on the ABI value.

Table 3 indicates that the healthy eating pattern variable post-education has a significance value of < 0.05 (0.023). This suggests that there is a 5% error rate in the relationship between ABI and the healthy eating pattern variable following education. The vegetable consumption variable has a significance value of less than 0.05 (0.004). This suggests that there is a 5% error rate in the relationship between the vegetable consumption variable and ABI. This improvement demonstrates that the instruction given is successful in raising patients' knowledge of and adherence to healthy eating habits. A balanced diet is crucial for enhancing ABI and lowering inflammation in patients with intermittent claudication, according to research by Gardner et al. (13). Increased polyol activation will result from chronic hyperglycemia brought on by an uncontrolled diet. This happens because the enzyme aldose reductase, which turns glucose into sorbitol, is activated. After sorbitol is transformed into fructose, the combination inhibits nerve cells and results in intracellular hypertonicity (14)

Table 4 indicates that the post-education physical activity variable has a significance value of less than 0.05 (0.003). This suggests that there is a 5% error rate in the relationship between the physical activity variable and ABI. The B coefficient of 0.057 indicates that there is a positive relationship between the physical activity variable and ABI. The exercise variable's significance value is less than 0.05 (0.024). This suggests that there is a 5% error rate in the relationship between the exercise variable and ABI. Following education, the research findings indicate alterations in ABI values for both physical activity and diet adherence. This rise is consistent with research showing that regular exercise can enhance peripheral blood flow(15). The 6-minute walking distance (+49.6 meters) can be increased more effectively with high-intensity exercises that induce ischemic pain than with low-intensity exercises or control, according to McDermot's research on walking exercises that induce ischemia but actually increase mobility. This implies that in order to promote physiological adaptations, ischemia during exercise might be required. Exercise-induced ischemia promotes neuromuscular alterations (denervation/reinnervation) and vascular adaptations (such as elevated nitric oxide) (16). In line with Suza's research findings that lower extremity exercises significantly improve ABI values in patients with type 2 diabetes mellitus (Suza et al., 2020).(18)

Table 5 shows that the average ABI value increased by +0.08 from 0.94 (pre-test) to 1.02 (post-test). ABI values increased for up to 80% of respondents, suggesting that their peripheral vascular status had improved. The ankle brachial index (ABI) test can be used to establish the criteria for diagnosing peripheral artery disease. Peripheral artery disease patients have lower blood pressure in their legs than in their arms. Numerous foot movements that are comparable to pressure-applying foot massage movements are included in foot exercises (19). These movements have an impact on endorphin hormones, which can help vasodilate blood vessels and lower blood pressure, especially the brachial systolic pressure, which is directly correlated with the ABI value.(20)(21)(22)(23). This improvement shows that patients are more aware of and follow dietary and physical activity recommendations as a result of the education they received. According to research by Nuryani et al. (2023), patients with diabetes mellitus benefit greatly from nutritional education in terms of their improved knowledge and eating habits. (24)(Saripah, 2024).

Seven days of intensive instruction is essential for increasing patients' understanding and inspiration to lead healthy lives. A structured education program improves clinical parameters like ABI values by educating patients about the value of physical activity and a balanced diet in managing diabetes. The study's findings support the notion that patients' health behaviors and associated clinical parameters can benefit from brief educational interventions. In order to prevent and manage vascular complications in patients with type 2 diabetes mellitus, similar educational programs can be implemented in healthcare facilities.(26).

## STUDY LIMITATIONS

Several limitations must be acknowledged. First, the study employed a pre-experimental one-group pretest-posttest design, limiting causal inference due to the absence of a control group. Second, the sample size was relatively small (n=30) and drawn from two healthcare settings in Bandung, which may limit generalizability to broader populations. Third, self-reported behavior (diet and activity) may be prone to recall and social desirability bias. Lastly, the duration of the intervention (7 days), while effective, may not reflect long-term behavioral adherence or sustained ABI improvement. Future studies should consider randomized controlled designs with longer follow-up periods and larger sample sizes to confirm these findings and assess long-term vascular outcomes.

## CONCLUSION

This study concludes that a seven-day structured educational program significantly improved patients' adherence to healthy dietary and physical activity behaviors, leading to a notable enhancement in Ankle Brachial Index (ABI) values, which reflect improved peripheral vascular function. The findings demonstrate that even a short-term, dual-focused intervention targeting diet and physical activity can yield positive changes in clinical indicators of vascular health among individuals with type 2 diabetes mellitus. These results highlight the importance of incorporating lifestyle education into diabetes management strategies. Implications for practice suggest that primary healthcare providers should integrate brief, structured educational interventions into routine care to support vascular health and reduce the risk of complications in diabetic patients. Implications for research point to the need for future studies employing randomized controlled trials and longer-term follow-up to confirm the effectiveness and sustainability of such interventions. Additionally, exploring the use of digital platforms for education may enhance accessibility and scalability of lifestyle programs in diverse healthcare settings.

### Funding Statement

This study received no external funding and was independently supported by the researchers. No financial sponsor played any role in study design, data collection, analysis, or publication.

### Author Contributions

SMR. conceptualized the study, conducted the data collection, and led the initial drafting of the manuscript. I.M.P. contributed to the development of the intervention, performed data analysis, and participated in critical revisions of the manuscript. TS and AA. supported the literature review, contributed to data interpretation, and assisted with final editing. All authors have read and approved the final version of the manuscript and agree to be accountable for all aspects of the work.

**Conflict of Interest Disclosure**

The authors declare no conflict of interest related to this study.

**Data Availability Statement**

The data that support the findings of this study are available from the corresponding author upon reasonable request, subject to ethical approval and participant confidentiality agreements.

## REFERENCES


1. Dwi E, Sari L, Silvitasari I. PENGARUH SENAM KAKI TERHADAP ANKLE BRACHIAL INDEX PADA PASIEN DM T2 DI PUSKESMAS BANYUANYAR. Jurnal Imliah Ilmu Kesehatan. 2023;1(4).
2. Yurlina F, Yunie Atrie U, Julia H. Pengaruh Pendidikan Kesehatan terhadap Kepatuhan Diet pada Pasien Diabetes Mellitus Tipe 2 di Rawat Jalan RSUD Palmatak. Jurnal Keperawatan. 2023 Jul 27;13(2):49–58.
3. Kaka AS, Landsteiner A, Ensrud KE, Logan B, Sowerby C, Ullman K, et al. Risk prediction models for diabetic foot ulcer development or amputation: a review of reviews. J Foot Ankle Res. 2023 Dec 1;16(1).
4. Guo P, Tu Y, Liu R, Gao Z, Du M, Fu Y, et al. Performance of risk prediction models for diabetic foot ulcer: a meta-analysis. PeerJ. 2024;12(7).
5. Nur C, Tahir M. Efektifitas Senam Terhadap Sensitivitas Kaki Pada Pasien Diabetes Mellitus Tipe 2 Wilayah Kerja Puskesmas Pangkajene Kabupaten Sidenreng Rappang [Internet]. Vol. 01, Jurnal Inonasi Pengabdian Masyarakat. 2021. Available from: https://stikesmu-sidrap.e-journal.id/JIPengMas
6. Jumari J, Luawo HP, Ratnawati R, Pratama EF. PENINGKATAN NILAI ANKLE BRACHIAL INDEX (ABI) DENGAN INTERVENSI AKUPRESUR DAN SENAM KAKI PADA PASIEN DIABETES MELITUS TIPE 2. Klabat Journal of Nursing [Internet]. 2024;6(2):2685–7154. Available from: http://ejournal.unklab.ac.id/index.php/kjn
7. Nihullohti Astam, Aminah S. The Relationship Between Physical Activity and Diet Compliance with Blood Glucose Levels in Type 2 Diabetes Mellitus Patients at Mary Cileungsi Green Hospital in November 2022. Jurnal Ilmiah Keperawatan (Scientific Journal of Nursing). 2023;3(9).
8. Fatimah OM, Purwanti OS. THE RELATIONSHIP BETWEEN DIABETES SELF MANAGEMENT AND ANKLE BRACHIAL INDEX VALUE IN PATIENTS WITH DIABETES MELLITUS. Indonesian Journal of Global Health Research [Internet]. 2024; Available from: https://doi.org/10.37287/ijghr.v6i3.3103.
9. Setyorini A, Asty Sasbilla A, Studi Keperawatan P, Tinggi Ilmu Kesehatan Surya Global S. SENAM KAKI DIABETIK BERPENGARUH TERHADAP PENINGKATAN ANKLE BRACHIAL INDEX (ABI) PADA PENDERITA DIABETES MELITUS TIPE II. Nursing Science Journal (NSJ). 2023;4(1):2722–4988.
10. Said A, Mikawati M, Rahmadania W, Mudatsir A. Diabetes Distress: Assessment And Screening Of Stress Levels Among People With Diabetes Mellitus. Jurnal Keperawatan Komprehensif (Comprehensive Nursing Journal). 2022;8(2).
11. Sofianingrum A, Jati SP, Martini M. Challenges on Standardized Diabetes Mellitus Care Implementation in the Primary Health Care in Indonesia: A Narrative Review. Jurnal Keperawatan Komprehensif (Comprehensive Nursing Journal). 2023;9(2).
12. Yurlina F, Yunie Atrie U, Julia H. Pengaruh Pendidikan Kesehatan terhadap Kepatuhan Diet pada Pasien Diabetes Mellitus Tipe 2 di Rawat Jalan RSUD Palmatak. Jurnal Keperawatan. 2023 Jul 27;13(2):49–58.
13. Gardner AW, Montgomery PS, Wang M, Shen B, Casanegra AI, Silva-Palacios F, et al. Diet is associated with ankle-brachial index, inflammation, and ambulation in patients with intermittent claudication. J Vasc Surg. 2020 Oct 1;72(4):1375–84.
14. Syihabuddin M, Sri Wahyunigsih I. Hubungan Antara Aktifitas Fisik, Nilai Ankle Brachial Index Dan Pola Makan Dengan Kejadian Neuropati Diabetik Pada Pasien Dm. Jurnal Riset Kesehatan Modern [Internet]. 2025;7(2). Available from:

https://journalpedia.com/1/index.php/jrkm

15. Muslim B, Sulastri D, Yuliana D. Hubungan Peran Edukasi Kesehatan Dalam Meningkatkan Kepatuhan Pengobatan dan Olah Raga pada Pasien Diabetes Mellitus di Wilayah Kerja Puskesmas Putih Doh Kecamatan Cukuh Balak Kabupaten Tanggamus Tahun 2024. Journal of Citizen Research and Development. 2025;
16. McDermott MM, Dayanidhi S, Kosmac K, Saini S, Slysz J, Leeuwenburgh C, et al. Walking Exercise Therapy Effects on Lower Extremity Skeletal Muscle in Peripheral Artery Disease. Circ Res. 2021 Jun 11;128(12):1851–67.
17. Suza DE, Hijriana I, Ariani Y, Hariati H. Effects of lower extremity exercises on ankle-brachial index values among type 2 diabetes mellitus patients. Open Access Maced J Med Sci. 2020 Jan 2;8(E):1–6.
18. Alisa F, Andika M, Refti Y, Allam A, Nursuari H, Valentina P, et al. Pengaruh Active Lower Range of Motion Terhadap Nilai Ankle Branchial Index (ABI) PadaPasien Diabetes Mellitus Tipe II. Jurnal Keperawatan Muhammadiyah. 2022;7(2).
19. Aditiya Nurul Hamdi M, Sasmito Adi G. HUBUNGAN AKTIVITAS FISIK DENGAN KEJADIAN NEUROPATI PERIFER DIABETIKUM PADA PENDERITA DM TIPE II DI PUSKESMAS MAESAN. Vol. 8, Jurnal Kajian Ilmiah Interdisiplinier. 2024.
20. Lariwu CK, David BY, Gunung S, Tomohon M, Korespondensi A, Florence J, et al. PENGARUH SENAM KAKI TERHADAP NILAI ABI PADA PASIEN DMT2. Vol. 1, Journal | Watson Journal of Nursing. 2022.
21. Geby Arditha S, Hasanah U, Keperawatan Dharma Wacana A. IMPLEMENTASI SENAM KAKI TERHADAP NILAI ANKLE BRACHIAL INDEX DAN NILAI IPSWICH TOUCH TEST IMPLEMENTATION OF FOOT EXERCISES ON ANKLE BRACHIAL INDEX VALUES AND IPSWICH TOUCH TEST VALUES. Jurnal Cendikia Muda. 2025;5(4).
22. Ziady HH, El-Zeiny NAE monem, Fetohy EM, Hewi SAH, Hagras EMA. Assessment of diabetes health literacy and its predictors among diabetic older adults attending geriatric clubs, 2024. Alexandria Journal of Medicine [Internet]. 2025 Dec 31;61(1):1–10. Available from: https://www.tandfonline.com/doi/full/10.1080/20905068.2025.2464362
23. Feldman H, ElSayed NA, McCoy RG, Moverley J, Oser SM, Segal AR, et al. Standards of Care in Diabetes—2023 Abridged for Primary Care Providers. Clinical Diabetes. 2023;41(1):4–31.
24. Nuryani N, Usman WI, Maesarah M. Nutrition Education, Physical Activity and Dietary Habits in Diabetes Mellitus Patients. Media Gizi Indonesia. 2023 Oct 23;18(2SP):8–12.
25. Saripah I. Edukasi Perilaku ABC (Antecedents, Behaviour, Consequences) Efektif Dalam Meningkatkan Kepatuhan Diet Pasien Diabetes Mellitus ABC Behavioral Education (Antecedents, Behavior, Consequences) is Effective in Increasing Diet Compliance Diabetes Mellitus Patients. JACOM: Journal of Community Empowerment. 2024;2(1):33–42.
26. Powers MA, Bardsley JK, Cypress M, Funnell MM, Harms D, Hess-Fischl A, et al. Diabetes Self-management Education and Support in Adults with Type 2 Diabetes: A Consensus Report of the American Diabetes Association, the Association of Diabetes Care & Education Specialists, the Academy of Nutrition and Dietetics, the American Academy of Family Physicians, the American Academy of PAs, the American Association of Nurse Practitioners, and the American Pharmacists Association. Diabetes Care. 2020 Jul 1;43(7):1636–49.