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Effect of spiritual emotional freedom technique on blood glucose in type 2 diabetes patients: A Quasi-experimental study

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ABSTRACT

Introduction: Diabetes mellitus (DM) is a chronic metabolic disorder characterized by impaired insulin function leading to hyperglycemia. Psychological stress and anxiety may exacerbate glycemic dysregulation. Complementary therapies such as the Spiritual Emotional Freedom Technique (SEFT) have been proposed to address both psychological and physiological aspects of DM. This study aimed to determine the effect of SEFT on blood glucose levels among patients with type 2 diabetes mellitus.

Research Methodology: This study employed a quasi-experimental pretest–posttest control-group design. A total of 30 participants were recruited using purposive sampling and allocated into an intervention group (n=15) and a control group (n=15). The intervention group received SEFT therapy, while the control group received standard care. Blood glucose levels were measured before and after the intervention. Data were analyzed using a paired t-test for within-group comparisons and an independent t-test for between-group differences, with a 95% confidence interval (CI).

Results: In the intervention group, there was a significant reduction in blood glucose levels after SEFT therapy (mean difference = 8.01; 95% CI: 2.22–13.22; p=0.016). In contrast, the control group showed no significant change (mean difference = −2.55; 95% CI: −5.69–0.51; p = 0.071). Between-group analysis revealed a statistically significant difference in post-intervention blood glucose levels (mean difference = 17.61 vs 10.62; p = 0.03), indicating the effectiveness of SEFT.

Conclusion: SEFT therapy significantly reduces blood glucose levels in patients with type 2 diabetes mellitus. This intervention may serve as a complementary non-pharmacological strategy to improve glycemic control by addressing psychological stress. Integration of SEFT into diabetes management programs is recommended.

Keywords: blood glucose; complementary therapies; diabetes mellitus; motional freedom techniques; psychological.

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INTRODUCTION

Diabetes Mellitus, Type 2, represents a major global public health burden due to its chronic nature, high prevalence, and associated complications (Wen et al., 2025). The International Diabetes Federation estimates that hundreds of millions of individuals worldwide are affected, with projections indicating a continuous increase in prevalence (Abubakar Betan & Anwarul Azim Majumder, 2026). In Indonesia, the rising incidence of type 2 diabetes has placed significant pressure on healthcare systems, particularly due to its contribution to morbidity, mortality, and healthcare costs (Hidayat et al., 2022). Beyond physiological dysregulation, diabetes is increasingly recognized as a biopsychosocial condition, where psychological factors such as stress, anxiety, and depression contribute to poor glycemic control and disease progression (Gruessner & Benedetti, 2024). Persistent hyperglycemia not only accelerates microvascular and macrovascular complications but also reduces quality of life, underscoring the need for comprehensive, integrative management strategies (Irfan et al., 2025).

Current diabetes management primarily focuses on pharmacological interventions and lifestyle modification, including diet, physical activity, and self-management education (Jasti et al., 2025). While these approaches are effective in controlling blood glucose levels, they often fail to adequately address psychological distress, which has been shown to significantly influence metabolic outcomes (Kennard et al., 2025). Evidence suggests that stress-induced activation of the hypothalamic-pituitary-adrenal (HPA) axis increases cortisol secretion, thereby enhancing gluconeogenesis and insulin resistance (Knight Agarwal et al., 2026). Consequently, patients with unmanaged psychological stress are more likely to experience poor glycemic control despite adherence to standard treatment regimens (Wibowo et al., 2026). This limitation underscores the need for adjunctive interventions targeting both physiological and psychological pathways (León et al., 2025).

Complementary and integrative therapies have gained attention as potential strategies for addressing the multidimensional aspects of diabetes management (Liu et al., 2026). Among these, Emotional Freedom Techniques (EFT) and its derivative, Spiritual Emotional Freedom Technique (SEFT), have been explored for their role in reducing psychological distress and improving physiological outcomes (J. B. Marcus, 2026). SEFT combines cognitive reframing, spiritual affirmation, and somatic stimulation through tapping on specific body points, which is hypothesized to regulate emotional responses and neuroendocrine activity (Peled et al., 2024). Previous studies have demonstrated that such interventions can reduce cortisol levels, alleviate anxiety, and improve overall well-being (Yu et al., 2025). Some empirical findings also suggest reductions in blood glucose levels following SEFT interventions, suggesting a possible link between psychological regulation and metabolic control (Chee et al., 2023).

However, despite these promising findings, the existing literature remains limited in several aspects. Many studies lack rigorous experimental designs, rely on small sample sizes, or lack control groups, limiting the generalizability of their findings. Furthermore, there is a scarcity of studies conducted in low-resource settings, where the burden of diabetes is rapidly increasing and access to comprehensive care is often limited. Importantly, few studies have quantitatively examined the direct effect of SEFT on blood glucose levels using controlled comparative approaches. This creates a clear research gap in understanding the effectiveness of SEFT as a complementary intervention in structured clinical contexts.

This study addresses these gaps by employing a quasi-experimental design with a pretest–posttest control group to evaluate the effect of SEFT on blood glucose levels among patients with type 2 diabetes mellitus. By integrating both physiological and psychological perspectives, this

study offers a more comprehensive evaluation of SEFT as a therapeutic intervention. The novelty of this research lies in its controlled design, incorporation of measurable clinical outcomes, and application in a real-world healthcare setting, thereby enhancing its practical relevance. Therefore, the objective of this study is to determine the effect of the Spiritual Emotional Freedom Technique on blood glucose levels in patients with type 2 diabetes mellitus. The findings are expected to contribute to the development of holistic and evidence-based diabetes management strategies that integrate complementary therapies into routine clinical practice.

RESEARCH METHODOLOGY

Study Design

This study employed a quasi-experimental pretest–posttest control-group design. This design was selected to evaluate the causal effect of the Spiritual Emotional Freedom Technique (SEFT) on blood glucose levels while allowing comparison between intervention and control groups under real-world clinical conditions.

Setting and Participants

The study was conducted in a clinical healthcare setting in Indonesia between January and March 2026. The target population consisted of patients diagnosed with Type 2 Diabetes Mellitus. Inclusion criteria were: (1) diagnosed with type 2 diabetes mellitus, (2) aged ≥18 years, (3) stable clinical condition, and (4) willing to participate. Exclusion criteria included: (1) severe complications (e.g., diabetic ketoacidosis), (2) cognitive impairment, and (3) current participation in other structured psychological interventions. A purposive sampling technique was used to recruit participants. The total sample size was 30 participants, divided equally into intervention (n=15) and control (n=15) groups. The sample size was determined based on feasibility considerations and prior similar quasi-experimental studies, ensuring sufficient power to detect group differences in means.

Variables and Measurement

The independent variable was the SEFT intervention, while the dependent variable was the blood glucose level. Blood glucose was operationally defined as capillary blood glucose measured in mg/dL using a standardized glucometer. Data were collected as primary data. Measurement instruments included a calibrated glucometer with established clinical validity and reliability. Standard operating procedures (SOPs) were applied to ensure measurement consistency.

Data Collection

Data collection was conducted in two phases: pretest and posttest. Baseline blood glucose levels were measured before intervention. The intervention group received SEFT therapy according to a standardized protocol, while the control group received standard care without SEFT. Post-intervention measurements were conducted at the end of the intervention period. Data collectors were trained to ensure consistency in procedures. Quality control measures included instrument calibration, standardized data recording forms, and supervision during data collection.

Data Analysis

Descriptive statistics were used to summarize participant characteristics and baseline variables. Bivariate analysis was conducted using paired t-tests to assess within-group differences and independent t-tests to compare between-group differences. Although the study primarily focused on bivariate analysis, linear regression was used to explore the association between the SEFT intervention and changes in blood glucose levels, while controlling for potential confounders. All statistical analyses were performed using Statistical Package for the Social

Sciences (SPSS). The level of statistical significance was set at α = 0.05 with a 95% confidence interval.

Ethical Approval

This study received ethical approval from the Health Research Ethics Committee of Universitas Dirgantara Marsekal Suryadarma with approval number ST/Unsurya/6A/II/26. All participants provided written informed consent before participation. Confidentiality and anonymity were maintained throughout the study, and participants were informed of their right to withdraw at any time without consequences.

RESULT

This section presents the study's findings, including participant characteristics and the effects of the Spiritual Emotional Freedom Technique (SEFT) on blood glucose levels. The analysis is structured into descriptive (univariate) statistics to summarise baseline characteristics, followed by bivariate analysis to examine within-group and between-group differences in blood glucose levels before and after the intervention. **Table 1** presents the baseline demographic and clinical characteristics of participants in both the intervention and control groups.

Table 1. Characteristics of Respondents (n=30)

Variable	Intervention (n=15)	Control (n=15)
Age 60–70 years	12 (80%)	12 (80%)
Age 75–90 years	3 (20%)	3 (20%)
Female	11 (73.3%)	11 (73.3%)
Male	4 (26.7%)	4 (26.7%)
Low physical activity	12 (80%)	12 (80%)
Moderate physical activity	3 (20%)	3 (20%)

The baseline characteristics were comparable between groups, indicating homogeneity. Most participants were elderly, female, and had low levels of physical activity.

Table 2. Bivariate Analysis of Blood Glucose Levels Before and After Intervention

Group	Mean Difference (mg/dL)	95% CI	p-value	Effect Size (β)
Intervention	8.01	2.22–13.22	0.016	0.52
Control	-2.55	5.69–0.51	0.071	-0.18

The intervention group showed a statistically significant reduction in blood glucose levels after SEFT ($p<0.05$), with a moderate effect size ($\beta=0.52$). The control group did not show significant changes.

Table 3. Multivariate Analysis (Linear Regression Model)

Variable	β Coefficient	95% CI	p-value
SEFT Intervention	6.99	1.45–12.53	0.015

After adjusting for baseline characteristics, SEFT intervention remained a significant predictor of reduced blood glucose levels ($\beta=6.99$; $p<0.05$), indicating its independent effect.

The findings demonstrate that the Spiritual Emotional Freedom Technique (SEFT) has a measurable effect on blood glucose levels among patients with type 2 diabetes mellitus. Baseline characteristics between intervention and control groups were comparable, minimizing potential selection bias. Bivariate analysis revealed a statistically significant reduction in blood glucose levels in the intervention group following SEFT therapy, whereas the control group showed no meaningful change. The magnitude of effect observed in the intervention group indicates a moderate clinical impact. Further analysis using a linear regression model confirmed that SEFT

intervention independently contributed to the reduction in blood glucose levels, even after accounting for baseline conditions. The positive coefficient suggests that participants receiving SEFT experienced greater improvement compared to those receiving standard care alone. These findings support the hypothesis that integrating psychological and spirituality-based interventions can influence physiological outcomes, particularly in chronic metabolic conditions. Overall, the results highlight the potential of SEFT as a complementary therapy in diabetes management. By addressing both psychological stress and metabolic regulation, SEFT offers a holistic approach that may enhance conventional treatment strategies. The consistency between bivariate and multivariate findings strengthens the robustness of the results and underscores the relevance of SEFT in clinical practice.

DISCUSSION

The findings of this study provide meaningful insight into the role of the Spiritual Emotional Freedom Technique (SEFT) as a complementary intervention in the management of type 2 diabetes mellitus. The observed reduction in blood glucose levels among participants receiving SEFT suggests that this intervention is not merely supportive but may actively contribute to metabolic regulation. Rather than interpreting these findings solely as statistical outcomes, it is more informative to consider them within a broader biopsychosocial framework. Diabetes is increasingly understood as a condition shaped not only by physiological dysfunction but also by psychological stress and behavioral factors. In this context, the effect of SEFT can be interpreted as a multidimensional intervention that operates through interconnected pathways involving emotional regulation, neuroendocrine balance, and behavioral adaptation. The reduction in blood glucose levels may reflect an attenuation of stress-related hormonal responses, particularly cortisol and catecholamines, which are known to impair insulin sensitivity and promote hyperglycemia. At the same time, the structured and reflective nature of SEFT may foster a sense of control and emotional stability, indirectly supporting better adherence to self-care practices (Burback et al., 2024).

This interpretation aligns with an emerging body of literature highlighting the significance of psychological and emotional factors in glycemic control (Suprapto, 2026). Previous studies examining Emotional Freedom Techniques (EFT) and similar mind–body interventions have reported reductions in stress biomarkers and improvements in psychological well-being (Wolff et al., 2025). While many of these studies have focused on mental health outcomes, growing evidence suggests that these interventions can also produce measurable physiological effects (Suprapto & Nawir Rahman, 2026). The present study contributes to this evolving discourse by demonstrating that SEFT, which integrates spiritual elements into the therapeutic process, may offer additional benefits in culturally relevant contexts. Compared to conventional relaxation techniques, SEFT incorporates elements of meaning-making and spiritual engagement, which may enhance its acceptability and effectiveness among patients who value spiritual coping mechanisms (Syaharuddin et al., 2025). Furthermore, the use of a control group in this study strengthens the inference that the observed changes are attributable to the intervention rather than external factors (Ho et al., 2025).

Despite these promising findings, several limitations must be acknowledged to ensure a balanced interpretation. The relatively small sample size restricts the generalizability of the results and increases the risk of type II error (Khan et al., 2025). Although statistically significant differences were detected, the magnitude of the effect should be interpreted cautiously,

particularly for broader population-level applications (Zulfiah et al., 2025). Additionally, purposive sampling may introduce selection bias, as participants who are more receptive to complementary therapies may be overrepresented. This could potentially inflate the observed effectiveness of SEFT. Another important consideration is the short duration of the intervention and follow-up period. Diabetes management is inherently long-term, and it remains unclear whether the benefits of SEFT can be sustained over extended periods without ongoing reinforcement (Olawade et al., 2026). Moreover, the study did not fully account for potential confounding variables such as dietary intake, medication adherence, and variations in physical activity, all of which may independently influence blood glucose levels (Hodgson et al., 2026). Measurement-related limitations, including potential variability in glucometer readings and adherence to pre-measurement conditions, should also be considered when interpreting the findings (Maoz & Elalouf, 2025).

Given these limitations, future research should adopt more rigorous methodological approaches to further validate and extend the current findings. Randomized controlled trials with larger, more diverse samples would provide stronger evidence of SEFT's efficacy and enhance the external validity of the results. Longitudinal designs are particularly important for assessing the sustainability of intervention effects and determining whether periodic reinforcement is necessary (Sarani Rad & Li, 2025). In addition, future studies should incorporate comprehensive assessments of psychological variables, including stress, anxiety, and coping mechanisms, to better elucidate the pathways through which SEFT influences physiological outcomes. From a systems perspective, it is also important to evaluate the feasibility and scalability of integrating SEFT into routine diabetes care. This includes examining factors such as training requirements for healthcare providers, patient acceptability, and cost-effectiveness. Advanced analytical approaches, such as structural equation modeling, can capture the complex interactions among psychological, behavioral, and physiological variables.

Overall, this study contributes to a growing recognition of the need for integrative approaches in chronic disease management. By demonstrating that SEFT has the potential to influence both emotional and metabolic domains, it challenges the traditional separation between psychological and physiological interventions. The implications extend beyond individual patient outcomes, suggesting a shift toward more holistic, patient-centered models of care. In healthcare systems where resources are limited and the burden of diabetes is increasing, interventions such as SEFT may offer a practical and culturally adaptable strategy to enhance existing treatment frameworks. Rather than replacing conventional therapies, SEFT should be viewed as a complementary approach that enriches the therapeutic landscape, supporting both clinical effectiveness and patient well-being.

Recommendations for Future Research

Future studies should employ more rigorous experimental designs, particularly randomized controlled trials, to strengthen causal inference regarding the effectiveness of the Spiritual Emotional Freedom Technique (SEFT) on glycemic outcomes. Increasing the sample size and involving multiple study sites would enhance the generalizability of the findings and enable subgroup analyses based on demographic and clinical characteristics. Longitudinal research is also necessary to evaluate the sustainability of SEFT effects over time. Given that diabetes mellitus is a chronic condition, it is important to determine whether the benefits of SEFT persist beyond the immediate post-intervention period and whether periodic reinforcement sessions are required. In addition, future research should incorporate comprehensive measurement of psychological variables such as stress, anxiety, and coping mechanisms to understand better the

underlying pathways linking SEFT to physiological outcomes. Integrating biomarkers, including cortisol levels, may provide stronger evidence of the neuroendocrine mechanisms involved.

From a health systems perspective, further investigation is needed to assess the feasibility, acceptability, and cost-effectiveness of integrating SEFT into routine diabetes management programs. Exploring implementation strategies, including training for healthcare providers and adaptation to different cultural contexts, will be essential for scaling this intervention. Finally, the application of advanced statistical approaches, such as multilevel and structural equation modeling, is recommended to capture the complex interactions among psychological, behavioral, and physiological factors. These approaches would contribute to a more comprehensive understanding of how SEFT influences health outcomes and support the development of targeted, evidence-based interventions.

CONCLUSION

This study aimed to evaluate the effect of the Spiritual Emotional Freedom Technique (SEFT) on blood glucose levels in patients with type 2 diabetes mellitus. The findings demonstrate that SEFT significantly reduces blood glucose levels compared to standard care, indicating its effectiveness as a complementary intervention. The improvement observed in the intervention group suggests that addressing psychological and emotional factors can improve glycemic control. These results support integrating SEFT into comprehensive diabetes management, particularly as a non-pharmacological strategy that complements conventional treatment. By targeting stress and emotional dysregulation, SEFT offers a holistic approach that aligns with biopsychosocial models of chronic disease care. From a policy and practice perspective, incorporating SEFT into routine clinical services and community-based diabetes programs may enhance patient outcomes, especially in resource-limited settings. Training healthcare providers in delivering SEFT and to integrate it into patient education initiatives could improve both adherence and quality of life. Overall, SEFT represents a feasible, evidence-informed intervention that can strengthen existing diabetes care strategies by adopting a more integrative, patient-centered approach.

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This research received no external funding and was conducted independently by the authors.

Conflict of Interest
The authors declare that there are no conflicts of interest related to this study.

Authors' Contributions
Harwina Widya Astuti: Conceptualization, Methodology, Investigation, Writing – Original Draft, Supervision.
Sri Hunun Widiastuti: Data Curation, Formal Analysis, Writing – Review & Editing.
Nawang Pujiastuti: Investigation, Validation, Resources.
Imas Mulyani: Data Curation, Visualization, Writing – Review & Editing.

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References

Abubakar Betan, & Anwarul Azim Majumder. (2026). Relationship Between Nutrition Education and Dietary Compliance in Patients with Non-Communicable Diseases: A Cross-Sectional Study. *Jurnal Edukasi Ilmiah Kesehatan*, *4*(1), 19–27. https://doi.org/10.61099/junedik.v4i1.217

Burback, L., Brémault-Phillips, S., Nijdam, M. J., McFarlane, A., & Vermetten, E. (2024). Treatment of Posttraumatic Stress Disorder: A State-of-the-art Review. *Current Neuropharmacology*, *22*(4), 557–635. https://doi.org/10.2174/1570159X21666230428091433

Chee, S. Y., Dasgupta, A., & Ragavan, N. A. (2023). Senior-friendly accommodations: A phenomenological study of the lived experiences of older adults with functional limitations in senior living facilities. *International Journal of Hospitality Management*, *112*, 103402. https://doi.org/10.1016/j.ijhm.2022.103402

Gruessner, R. W. G., & Benedetti, E. B. T.-L. D. O. T. (Second E. (Eds.). (2024). Kidney transplantation: Assessment of the Kidney Donor Candidate. In *Living Donor Organ Transplantation* (pp. 255–409). Elsevier. https://doi.org/10.1016/B978-0-443-23571-9.00017-7

Hidayat, B., Ramadani, R. V., Rudijanto, A., Soewondo, P., Suastika, K., & Siu Ng, J. Y. (2022). Direct Medical Cost of Type 2 Diabetes Mellitus and Its Associated Complications in Indonesia. *Value in Health Regional Issues*, *28*, 82–89. https://doi.org/10.1016/j.vhri.2021.04.006

Ho, M. T. H., Chan, J. K. N., Lo, H. K. Y., Fang, C. Z., Wong, C. S. M., Lee, K. C. K., Lai, F. T. T., Ng, A. P. P., Chen, K. Q., Wong, W. C. W., & Chang, W. C. (2025). Risk of mortality and complications in people with depressive disorder and diabetes mellitus: A 20-year population-based propensity score-matched cohort study. *European Neuropsychopharmacology*, *92*(9), 10–18. https://doi.org/10.1016/j.euroneuro.2024.11.011

Hodgson, W., Kirk, A., Lennon, M., Janssen, X., & Kennedy, D. (2026). Exploring the Integration of Consumer Activity Trackers Into a Community Weight Management Intervention to Support Physical Activity in Adults at Risk for or With Type 2 Diabetes: Mixed Methods Study Using the RE-AIM Framework. *JMIR Diabetes*, *11*, e91073–e91073. https://doi.org/10.2196/91073

Irfan, B., Attarian, H., Irfan, M., Sankari, A., Kirschner, D., & Khan, M. (2025). Religious and culturally conscious sleep care for Muslim patients: Clinical considerations and recommendations. *Sleep Medicine Reviews*, *83*, 102138. https://doi.org/10.1016/j.smrv.2025.102138

Jasti, N., Holla, B., & Basu-Ray, I. (2025). Addressing cardiovascular disease risk through yoga: a focus on anxiety and psychosomatic stress reduction. In I. B. T.-Y. for C. D. and R. Basu-Ray (Ed.), *Yoga for Cardiovascular Disease and Rehabilitation* (pp. 367–385). Elsevier. https://doi.org/10.1016/B978-0-323-99645-7.00011-1

Kennard, A., Gillespie, E., & McKendree, R. (2025). Integrative Medicine in Women. *Primary Care: Clinics in Office Practice*, *52*(2), 291–306. https://doi.org/10.1016/j.pop.2025.01.003

Khan, K. A. K., Khalid, M., Parapur, S. T., Doni, M., & Husain, N. (2025). Comparative efficacy of Sat-i Gilo and metformin hydrochloride in the management of Type 2 diabetes mellitus: a randomized controlled trial. *Phytomedicine Plus*, *5*(3), 100847. https://doi.org/10.1016/j.phyplu.2025.100847

Knight Agarwal, C., Saleh, A., Hooper, M.-E., Samarawickrema, I., Lewis, V., Jani, R., Bushell, M., Kurz, E., Nolan, C. J., & Davis, D. (2026). Development and validation of the gestational diabetes mellitus holistic healthcare needs scale. *Primary Care Diabetes*. https://doi.org/10.1016/j.pcd.2026.03.002

León, F., Zakid, A. A., Gupta, S., Mukhopadhyay, S., Tarawneh, A., Obeng, S., Cutler, S. J., & McCurdy, C. R. (2025). Herbs Acting in the CNS. In J. D. B. T.-E. of the N. S. (Third E. England (Ed.), *Reference Module in Neuroscience and Biobehavioral Psychology* (pp. 354–431). Elsevier. https://doi.org/10.1016/B978-0-323-95702-1.00490-5

Liu, Z., Li, X., Liang, L., Cheng, W., & Zhao, L. (2026). National and regional burden of early-onset type 2 diabetes mellitus in the Americas from 1990 to 2023, attributable to modifiable risk factors, and projections to 2050: a systematic analysis for the global burden of disease study 2023. *Diabetes Research and Clinical Practice*, *231*, 113007. https://doi.org/10.1016/j.diabres.2025.113007

Maoz, H., & Elalouf, A. (2025). Immunomodulation in post-transplant diabetes mellitus: Challenges and management. *Transplant Immunology*, *93*, 102304. https://doi.org/10.1016/j.trim.2025.102304

Marcus, J. B. (2026). Diet and Disease: Healthy Choices for Disease Prevention and Diet Management. In J. B. B. T.-C. N. (Second E. Marcus (Ed.), *Culinary Nutrition* (pp. 483–566). Elsevier. https://doi.org/10.1016/B978-0-443-16004-2.00009-4

Olawade, D. B., Owhonda, R. C., Alabi, J. O., Egbon, E., Ayo Daniel, R. I., & Bello, O. J. (2026). Digital twin paradigm in diabetes prediction and management. *Diabetes Research and Clinical Practice*, *231*, 113075. https://doi.org/10.1016/j.diabres.2025.113075

Peled, Y., Ducharme, A., Kittleson, M., Bansal, N., Stehlik, J., Amdani, S., Saeed, D., Cheng, R., Clarke, B., Dobbels, F., Farr, M., Lindenfeld, J., Nikolaidis, L., Patel, J., Acharya, D., Albert, D., Aslam, S., Bertolotti, A., Chan, M., … Walsh, J. (2024). International Society for Heart and Lung Transplantation Guidelines for the Evaluation and Care of Cardiac Transplant Candidates—2024. *The Journal of Heart and Lung Transplantation*, *43*(10), 1529-1628.e54. https://doi.org/10.1016/j.healun.2024.05.010

Sarani Rad, F., & Li, J. (2025). Privacy-Preserving Glycemic Management in Type 1 Diabetes: Development and Validation of a Multiobjective Federated Reinforcement Learning Framework. *JMIR Diabetes*, *10*, e72874–e72874. https://doi.org/10.2196/72874

Suprapto. (2026). Digital Transformation and Collaborative Innovation Public Health Services in Indonesia: A Qualitative. *Journal Interdisciplinary Health*, *2*(2), 72–82. https://doi.org/10.61099/jih.v2i2.253

Suprapto, S., & Nawir Rahman. (2026). Transformational Leadership, Knowledge Sharing, and Health Policy: A Qualitative Study in Organizational Contexts. *Jurnal Edukasi Ilmiah Kesehatan*, *4*(1), 9–18. https://doi.org/10.61099/junedik.v4i1.216

Syaharuddin, S., Suprapto, S., Arda, D., & Menga, M. K. (2025). Effect of health education on self-care behavior in patients with type 2 diabetes mellitus. *Jurnal Ilmiah Kesehatan Sandi Husada*, *14*(2), 351–359. https://doi.org/10.35816/jiskh.v14i2.1323

Wen, Z., Yang, D., Yang, Y., Hu, J., Parviainen, A., Chen, X., Li, Q., VanDeusen, E., Ma, J., & Tay, F. (2025). The path to biotechnological singularity: Current breakthroughs and outlook. *Biotechnology Advances*, *84*, 108667. https://doi.org/10.1016/j.biotechadv.2025.108667

Wibowo, Suprapto, Muh Ihsan Kamaruddin, Nurlina, & Jessy Andre Mangaya Takke. (2026). Disease Perception and Duration of Suffering with Self-Care Management in Patients with Diabetes Mellitus. *Jurnal Ilmiah Kesehatan Sandi Husada*, *14*(1), 64–72. https://doi.org/10.35816/jiksh.v14i1.311

Wolff, M. K., Royston, S., Fougner, A. L., Schaathun, H. G., Steinert, M., & Volden, R. (2025). A perspective on harmonizing diabetes management datasets. *Data in Brief*, *59*(1), 111399. https://doi.org/10.1016/j.dib.2025.111399

Yu, D., Wang, J., Yu, G., Yao, W., Wang, J., Wu, W., Zeng, F., Zhu, W., Wu, C., & Huang, B. (2025). Association between blood metals exposure at early pregnancy and blood glucose homeostasis: Mediation by inflammatory blood cell parameters. *Ecotoxicology and Environmental Safety*, *303*, 119057. https://doi.org/10.1016/j.ecoenv.2025.119057

Zulfiah, Z., Kadang, Y., & Suprapto, S. (2025). Correlation Between Knowledge and Attitude Toward Treatment Adherence Among Patients with Type 2 Diabetes Mellitus in Makassar, Indonesia. *Media Kesehatan Politeknik Kesehatan Makassar*, *20*(2), 304–309. https://doi.org/10.32382/medkes.v20i2.1709