Journal Of Nursing Practice
https://thejnp.org/
ISSN: 2614-3488 (print); 2614-3496 (online) Vol.9 No.3. April 2026. Page.697-706

The Effect of Bawang Dayak Tea on Sleep Quality in Patients With Type 2 Diabetes Mellitus

Annaas Budi Setyawan[1*], U.S Mahadeva Rao[2]
[1] *Department of Fundamental Nursing, Faculty of Nursing, Universitas Muhammadiyah Kalimantan Timur, Samarinda, Indonesia*
[2] *School of Basic Medical Science, Faculty of Medicine, Universiti Sultan Zainal Abidin, Kuala Terengganu, Malaysia*
**Corresponding author: abs564@umkt.ac.id*

ABSTRACT

Background: Sleep disturbances are common among patients with Type 2 Diabetes Mellitus and are associated with poor metabolic control and reduced quality of life. Effective non-pharmacological and culturally relevant interventions are needed to improve sleep quality in this population.

Purpose: This study aims to determine the effect of Bawang Dayak tea on sleep quality in patients with Type 2 Diabetes Mellitus.

Methods: A quasi-experimental study with a pretest–posttest control group design was conducted in the working area of Community Health Center Wonorejo, Samarinda, from December 1 to 31, 2025. A total of 50 patients with Type 2 Diabetes Mellitus were assigned to an intervention group or a control group. The intervention received routine diabetes care and Bawang Dayak tea, while the control received routine care alone. Sleep quality was assessed before and after the intervention using a standardized sleep quality questionnaire. Data were analyzed using paired and unpaired statistical tests, with a significance level of < 0.05.

Results: Paired analysis revealed a significant improvement in sleep quality in the intervention group following the intervention ($p < 0.001$), whereas the control group demonstrated a smaller but statistically significant change ($p = 0.032$). Unpaired analysis revealed that post-intervention sleep quality scores were significantly better in the intervention group compared with the control group ($p < 0.001$).

Conclusion: Bawang Dayak tea significantly improves sleep quality in patients with Type 2 Diabetes Mellitus when used as a complementary intervention in diabetes care, supporting its potential integration into nursing practice for holistic diabetes.

Keywords: Bawang Dayak Tea, Type 2 Diabetes Mellitus, Quasi-Experimental Study

Received January 10, 2025; Revised February 12, 2025; Accepted March 3, 2026
DOI: https://doi.org/10.30994/jnp.v9i3.1069

BACKGROUND

Type 2 diabetes mellitus is a long-term metabolic condition marked by reduced insulin sensitivity and gradual impairment of pancreatic beta-cell function, resulting in sustained elevations in blood glucose levels and chronic systemic complications. The global prevalence of T2DM continues to increase, particularly in developing countries, contributing significantly to morbidity, mortality, and healthcare costs. Beyond metabolic abnormalities, T2DM is increasingly recognized as a condition that affects multiple dimensions of health, including sleep and overall well-being (H. Sun et al., 2022).

Sleep disturbances are highly prevalent among patients with T2DM and manifest as difficulty initiating sleep, frequent nocturnal awakenings, reduced sleep duration, and non-restorative sleep. From a physiological perspective, inadequate sleep is associated with heightened sympathetic activity, disruption of the hypothalamic–pituitary–adrenal axis, and increased cortisol levels, which collectively impair glucose regulation and promote insulin resistance. Consequently, sleep quality functions as both a contributing factor to and a consequence of metabolic dysregulation in people with type 2 diabetes mellitus (Antza et al., 2021).

Previous studies have demonstrated that poor sleep quality in patients with T2DM is associated with adverse health outcomes, including poor glycemic control, increased risk of cardiovascular disease, fatigue, mood disturbances, and decreased adherence to self-care behaviors. From a nursing and public health perspective, impaired sleep quality represents a modifiable risk factor that may influence disease progression and quality of life. However, sleep problems in patients with T2DM remain underrecognized and undertreated in routine clinical practice (Xue et al., 2023).

Management of sleep disturbances in T2DM often relies on pharmacological agents, which may pose risks related to side effects, long-term dependency, and drug interactions, especially in patients with multiple comorbidities. Consequently, there is growing interest in non-pharmacological and complementary approaches to improve sleep quality. Herbal-based interventions are being increasingly explored due to their perceived safety, accessibility, cultural acceptability, and potential to simultaneously address multiple physiological pathways (Borse et al., 2021).

Bawang Dayak (*Eleutherine palmifolia*) is a medicinal plant traditionally utilized in Indonesia to support the treatment of various health disorders, including diabetes mellitus. Research has identified several bioactive constituents in Bawang Dayak, such as flavonoids, phenolic compounds, and alkaloids, which demonstrate antioxidant, anti-inflammatory, and blood glucose–lowering activities. These biological properties may promote metabolic balance and mitigate oxidative stress, both of which are closely linked to the regulation of sleep processes (Setyawan et al., 2020).

Although several studies have explored the antidiabetic effects of Bawang Dayak, empirical evidence regarding its potential impact on sleep quality remains limited. Most existing research focuses on glycemic outcomes or laboratory-based analyses, with minimal attention to patient-reported outcomes such as sleep quality(Arbain et al., 2022). Furthermore, studies examining herbal tea formulations derived from Bawang Dayak in clinical populations with type 2 diabetes mellitus (T2DM) are scarce, highlighting a significant gap in the literature (Kamarudin et al., 2021).

To the best of our knowledge, this study is among the first to evaluate the influence of Bawang Dayak tea on sleep quality in individuals with type 2 diabetes mellitus, using a standardized sleep evaluation approach that integrates local herbal medicine with patient-centered outcomes in diabetes care.

The rationale of this study is grounded in the need for safe, culturally relevant, and non-pharmacological nursing interventions that address sleep disturbances as an integral component of holistic diabetes management. By generating empirical evidence on the effect of Bawang Dayak tea on sleep quality, this study is anticipated to inform the advancement of evidence-based complementary nursing interventions and encourage the incorporation of traditional herbal therapies into modern diabetes care.

OBJECTIVE

The objective of this study is to determine whether the administration of Bawang Dayak tea improves sleep quality in individuals living with type 2 diabetes mellitus.

METHODS

This research is a quantitative study with a quasi-experimental research design and a pretest-posttest control group design approach. A multistage sampling was used to select type 2 diabetes mellitus patients for this study. This research was conducted at Public Health Center of Wonorejo, Samarinda from December 1 to 31, 2025. First, patients were selected from Wonorejo Public Health Center Samarinda using purposive sampling technique. Information about the recruitment of the patients was distributed using a flyer sent by the public health center to health cadres in their working area. A total of 80 patients aged 30-65 years were initially identified for the study (Dahlan, 2019). The main inclusion criterion of patients for the study was patients aged 30 to 65 years living in the area of Wonorejo Public Health Center, Samarinda, agreeing to participate in the study from beginning to end, and suffering from type 2 DM with blood sugar 200-400mg/dl, Meanwhile exclusion criterion for the study was patients who received insulin injection therapy and had severe disease complications such as kidney failure or heart disease (Setyawan & Masnina, 2018).

Based on inclusion and exclusion criteria, 20 patients were excluded from the study (not meeting inclusion and exclusion criteria=12; declining to participate =5; and other reason =3). A total of 60 type 2 diabetes mellitus patients participated in this study. The 60 patients were randomly allocated in two group, randomized by computer-generated number. The two groups were intervention group (30 patients) and control group (30 patients). During the intervention program, five patients were dropped from the intervention group (lost to follow-up/moved other cities =3; discontinued intervention/ limited time =2), while five patients were dropped in control group (lost to follow-up =4; discontinued intervention/sick =1). At the end of study, data of 10 patients were excluded from analysis, including five in the intervention group (due to missing data) and five in the control group (due to loss to follow-up), respectively. Data from a total of type 2 diabetes mellitus patients divided into two groups (25 of patients in intervention group and 25 of patients in control group) were used and analyzed in this study (figure 1).

Sleep quality was assessed using the Pittsburgh Sleep Quality Index (PSQI), a standardized and validated self-report questionnaire widely used to measure sleep quality in clinical and community-based populations. Assessment with the PSQI involves 19 items that produce seven sleep-related component scores covering subjective sleep experience, sleep initiation, sleep length, sleep efficiency, sleep problems, medication use, and daytime dysfunction. Higher global scores, ranging from 0 to 21, correspond to poorer sleep quality (Fabbri et al., 2021). Adherence to the intervention was monitored using daily consumption logs and regular follow-up visits by the research team. In addition to sleep quality assessment, sociodemographic and clinical characteristics—including age, sex, duration of diabetes, and current diabetes treatment—were collected using a structured questionnaire at baseline.

Data were analyzed using statistical software. Descriptive statistics were used to

ISSN: 2614-3488 (print); 2614-3496 (online) Vol.9 No.3. April 2026. Page.697-706

summarize participants' sociodemographic and clinical characteristics, including age, sex, duration of diabetes, and treatment regimen. Given that the study involved more than 50 participants, the Kolmogorov–Smirnov test was applied to assess data normality. The resulting p-value of 0.213 exceeded the 0.05 threshold, supporting the assumption of normality (Habibzadeh, 2024).

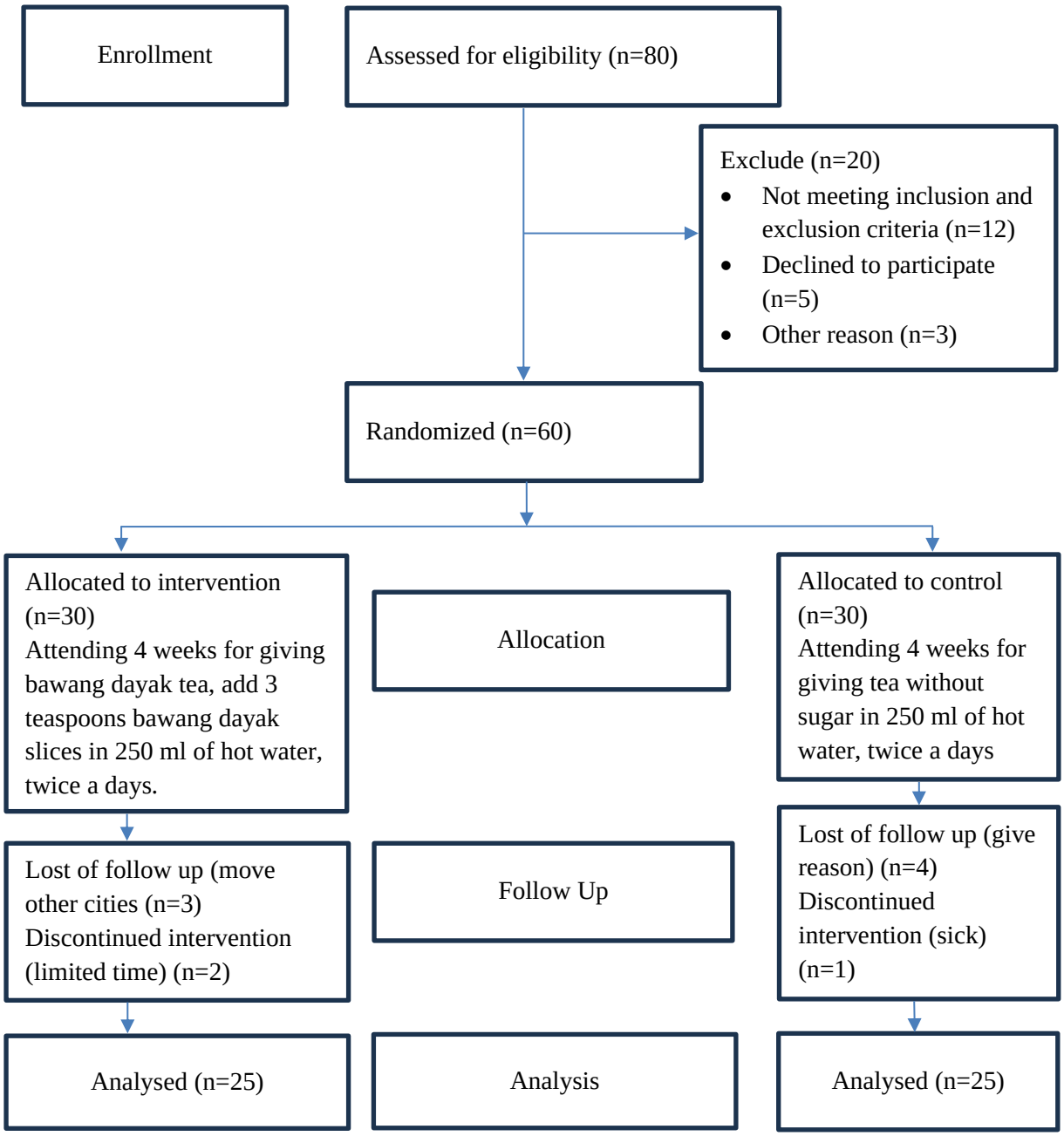

Figure 1: CONSORT flow diagram for enrollment, allocation and follow up participant

Bivariate analysis was conducted to evaluate differences in sleep quality scores. Paired t-tests were used to examine within-group differences in sleep quality scores between pretest and posttest measurements in both the intervention and control groups. Unpaired (independent) t-tests were applied to compare sleep quality scores between the intervention and control groups. A p-value of less than 0.05 ($p < 0.05$) was considered statistically significant (Polit &

Beck, 2021).

In terms of safety, no significant adverse effects or unintended consequences were reported by any participant in either the intervention or control groups during study period. The administration of Bawang Dayak tea twice daily for 4 weeks was well tolerated, with no gastrointestinal distress or other adverse health complications among participants who completed the protocol (Setyawan et al., 2019). This strictly absent profile of adverse effects reinforces the safety of the intervention within this sample.

Ethical conduct consistent with the Declaration of Helsinki was ensured, and approval for the study was obtained from the Ethics Committee of the Health Polytechnic, under the Ministry of Health, East Kalimantan, with the number: DP.04.03/F.XXXIV.25/283/2025.

RESULTS

A total of 50 patients with Type 2 Diabetes Mellitus completed the study, with 25 participants assigned to the intervention group and 25 to the control group. The results are presented in three parts: (1) sociodemographic and clinical characteristics of participants**,** including age, sex, duration of diabetes, and treatment regimen; (2) within-group comparisons of sleep quality before and after the intervention; and (3) comparative analyses between groups.

Table 1. Sociodemographic and Clinical Characteristics of Participants

Characteristics	**Intervention Group (n = 25)**	**Control Group (n = 25)**
Age (years), mean ± SD	56.4 ± 7.8	55.9 ± 8.1
Sex, n (%)		
Male	12 (48.0)	12 (48.0)
Female	13 (52.0)	13 (52.0)
Duration of diabetes (years), mean ± SD	6.8 ± 3.2	6.5 ± 3.5
Treatment regimen (oral antidiabetic drugs), n (%)		
Metformin	10 (40.0)	9 (36.0)
Sulfonylurea	7 (28.0)	9 (32.0)
Metformin + Sulfonylurea	8 (32.3)	8 (33.3)

The sociodemographic characteristics of participants in the intervention and control groups were comparable at baseline. The mean age of participants in the intervention group (56.4 ± 7.8 years) was similar to that of the control group (55.9 ± 8.1 years), with both groups predominantly consisting of middle-aged to older adults. Sex distribution was also well-balanced, with a slight female predominance in the intervention group (52.0%) and an equal split in the control group (52.0% female, 48.0% male), while the control group showed an equal proportion of males and females (Fischer et al., 2023).

Clinical characteristics were also similar between groups. The mean duration of diabetes was 6.8 ± 3.2 years in the intervention group and 6.5 ± 3.5 years in the control group. All participants were treated with oral antidiabetic drugs, including metformin, sulfonylurea, or a combination of metformin and sulfonylurea, with comparable distributions across both groups. These findings indicate baseline homogeneity between the intervention and control groups, supporting the validity of subsequent comparisons of sleep quality outcomes (Yu et al., 2022).

ISSN: 2614-3488 (print); 2614-3496 (online) Vol.9 No.3. April 2026. Page.697-706

Table 2. Paired t-Test Analysis of Sleep Quality Scores Before and After the Intervention

Group	Measurement	Mean ± SD	Mean Difference	p-value
Intervention (n = 25)	Pretest	9.87 ± 2.11	3.64	0.001
	Posttest	6.23 ± 1.98		
Control (n = 25)	Pretest	9.65 ± 2.05	0.67	0.032
	Posttest	8.98 ± 2.00		

Table 2 presents the results of the paired t-test analysis comparing sleep quality scores before and after the intervention within each group. In the intervention group, the mean sleep quality score decreased from 9.87 ± 2.11 at the pretest to 6.23 ± 1.98 at the posttest, indicating a mean reduction of 3.64 points. This reduction was statistically significant ($p < 0.001$), indicating a substantial improvement in sleep quality following the administration of Bawang Dayak tea in conjunction with routine diabetes care.

In the control group, sleep quality scores also showed a modest reduction from 9.65 ± 2.05 at pretest to 8.98 ± 2.00 at posttest, with a mean difference of 0.67 points. This change was statistically significant ($p = 0.032$); however, the magnitude of improvement was considerably smaller than that observed in the intervention group. These findings suggest that while routine diabetes care alone may lead to slight improvements in sleep quality, the addition of Bawang Dayak tea resulted in a more pronounced improvement.

Table 3. Comparison of Posttest Sleep Quality Scores Between Intervention and Control Groups (Unpaired t-Test)

Group	n	Mean ± SD	Mean Difference	p-value
Intervention	25	6.23 ± 1.98	2.75	**0.001**
Control	25	8.98 ± 2.00		

The unpaired t-test analysis demonstrated a statistically significant difference in posttest sleep quality scores between the intervention and control groups ($p < 0.001$). Participants in the intervention group showed significantly lower sleep quality scores, indicating better sleep quality, compared with those in the control group. These findings suggest that the addition of Bawang Dayak tea to routine diabetes care was more effective in improving sleep quality than routine care alone.

DISCUSSION

This study investigated the effect of Bawang Dayak (*Eleutherine palmifolia*) tea on sleep quality in patients with Type 2 Diabetes Mellitus. The findings demonstrated that participants who received Bawang Dayak tea in addition to routine diabetes care experienced a significant improvement in sleep quality compared with those who received routine care alone. These results directly address the study's objective and support the hypothesis that Bawang Dayak tea may serve as an effective complementary intervention for improving sleep quality in patients with type 2 diabetes mellitus (T2DM) (Magliano, Dianna et al., 2021).

The baseline characteristics presented in Table 1 show that the intervention and control groups were comparable in terms of age, sex distribution, duration of diabetes, and oral antidiabetic treatment regimens . This baseline homogeneity is crucial for ensuring internal validity, as it reduces the likelihood that demographic or clinical confounders influenced differences in outcomes (Setyawan, 2024). Comparable baseline characteristics allow for a more accurate interpretation of the intervention effect observed in subsequent analyses (Polit

& Beck, 2021).

Within-group analysis using paired t-tests (Table 2) demonstrated a statistically significant improvement in sleep quality in the intervention group after the administration of Bawang Dayak tea. The substantial reduction in sleep quality scores suggests a clinically meaningful effect (Timur, 2021). This improvement may be attributed to the bioactive compounds present in Bawang Dayak, such as flavonoids and phenolic compounds, which have been reported to exert antioxidant, anti-inflammatory, and neuroregulatory effects that may facilitate sleep regulation (Kamarudin et al., 2021).

Although the control group also showed a statistically significant improvement in sleep quality, the magnitude of change was relatively small. This modest improvement may reflect the effects of routine diabetes management, increased health monitoring during the study period, or natural variability in sleep patterns (Ardhany et al., 2021). However, the limited change observed in the control group indicates that routine care alone may be insufficient to produce substantial improvements in sleep quality among patients with T2DM (Borzouei et al., 2024).

The between-group comparison using an unpaired t-test (Table 3) revealed a significant difference in posttest sleep quality scores between the intervention and control groups. Participants in the intervention group had significantly better sleep quality than those in the control group, confirming the added benefit of Bawang Dayak tea beyond routine diabetes care. This finding underscores the potential role of complementary herbal interventions in enhancing patient-centered outcomes in diabetes management (Febrinda et al., 2021).

The significant between-group difference observed in Table 3 should be interpreted in relation to the comparable sociodemographic and clinical characteristics. Both groups were similar in age, sex distribution, and oral antidiabetic treatment regimens, including metformin, sulfonylurea, and combination therapy (Z. Sun et al., 2024). Age and sex are known to influence sleep patterns, while diabetes medications may indirectly affect sleep through their impact on glycemic control; however, the homogeneity of these variables between groups suggests that they did not account for the observed differences. Therefore, the superior sleep quality in the intervention group can be attributed with greater confidence to the Bawang Dayak tea intervention, thereby strengthening the internal validity of the findings (Huang et al., 2024).

From a physiological perspective, sleep disturbances in type 2 diabetes mellitus (T2DM) are closely linked to insulin resistance, oxidative stress, and dysregulation of the hypothalamic–pituitary–adrenal axis. Poor sleep quality exacerbates metabolic imbalance, whereas improved sleep may enhance glucose homeostasis. The antioxidant and anti-inflammatory properties of Bawang Dayak may reduce oxidative stress and promote neuroendocrine balance, thereby contributing to improved sleep quality in patients with type 2 diabetes mellitus (T2DM) (Kurnia et al., 2025).

The findings of this study are consistent with previous research, which reports positive effects of herbal and plant-based interventions on sleep quality, particularly those rich in flavonoids and polyphenols (Chen et al., 2020). Prior studies have demonstrated that herbal teas can promote relaxation, reduce stress, and enhance sleep quality in individuals with chronic conditions. The results of the present research align with this growing body of evidence, supporting the therapeutic potential of herbal interventions in sleep management (Ebrahim et al., 2025).

Several limitations of this study warrant careful consideration. First, the quasi-experimental design and the lack of participant blinding, a challenge inherently posed by the distinct sensory characteristics of Bawang Dayak tea, potentially introduced performance bias. The study's reliance on the self-reported PSQI questionnaire to measure sleep quality, while based on a validated tool, is susceptible to recall bias. Therefore, to minimize the inherent bias

of self-reporting, future studies would benefit from validating these findings using objective sleep measurement instruments, such as polysomnography or actigraphy. Second, regarding potential sources of imprecision and the number of analyses, the reduction from the initial N=60 to a final analytical sample of N=50 due to participant attrition (dropout and missing data) increases the potential for wider confidence intervals around the statistical estimates, although sufficient statistical power for the primary outcome was maintained. This reduced sample size (n=25 per group) limited our ability to perform detailed subgroup analyses, thus restricting the exploration of how different patient characteristics might modify the treatment effect.

However, this study differs from many previous investigations in that it focuses on a locally available traditional herbal tea and implements the intervention within a community health center setting. This contextual approach enhances the cultural relevance and feasibility of the intervention, particularly in primary healthcare environments in Indonesia. The use of Bawang Dayak tea reflects an integration of indigenous knowledge into evidence-based nursing practice.

CONCLUSION

This study demonstrates that the administration of Bawang Dayak (*Eleutherine palmifolia*) tea in addition to routine diabetes care significantly improves sleep quality in patients with Type 2 Diabetes Mellitus. The findings directly address the study objective and provide scientific evidence that Bawang Dayak tea is an effective complementary intervention for enhancing sleep quality, as shown by significant within-group improvements and superior outcomes compared to routine care alone.

From a nursing practice perspective, these results support the integration of Bawang Dayak tea as a non-pharmacological, culturally relevant intervention within community-based diabetes management programs. Nurses can play a crucial role in educating patients about the safe use of herbs and monitoring sleep outcomes as part of comprehensive care. Future research is recommended to employ randomized controlled designs, longer intervention periods, and objective sleep measurements to confirm these findings and further explore the long-term benefits of Bawang Dayak tea in diverse populations with Type 2 diabetes mellitus.

ACKNOWLEDGMENT

The authors extend their sincere appreciation to all participants for their valuable involvement and cooperation in this research. The authors also express their appreciation to the nursing students of Muhammadiyah University of East Kalimantan for their assistance and support during the research process.

CONFLICTS OF INTEREST

The authors report no conflicts of interest related to this article.

REFERENCES

Antza, C., Kostopoulos, G., Mostafa, S., Nirantharakumar, K., & Tahrani, A. (2021). The links between sleep duration, obesity and type 2 diabetes mellitus. *The Journal of Endocrinology*, *252*(2), 125–141. https://doi.org/10.1530/JOE-21-0155.

Arbain, D., Sriwahyuni, K., Susanti, D., & Taher, M. (2022). Genus Eleutherine: A review of its distribution, traditional uses, phytochemistry, biological activities and its interchangeable common names. *South African Journal of Botany*, *150*, 731–743. https://doi.org/https://doi.org/10.1016/j.sajb.2022.08.022.

Ardhany, S. D., Putra, C. D., & Novaryatiin, S. (2021). *Modification of Anti-acne Bawang*

Dayak (Eleutherine bulbosa (Mill .) Urb .) Cream to Propionibacterium acnes. 94–98. https://doi.org/10.4103/japtr.JAPTR.

Borse, S. P., Chhipa, A. S., Sharma, V., Singh, D. P., & Nivsarkar, M. (2021). Management of Type 2 Diabetes: Current Strategies, Unfocussed Aspects, Challenges, and Alternatives. *Medical Principles and Practice*, *30*(2), 109–121. https://doi.org/10.1159/000511002.

Borzouei, S., Ahmadi, A., & Pirdehghan, A. (2024). Sleep quality and glycemic control in adults with type 2 diabetes mellitus. *Journal of Family Medicine and Primary Care*, *13*(8), 3398–3402. https://doi.org/10.4103/jfmpc.jfmpc_118_24.

Budi Setyawan, A. (2024). Antidiabetic Properties of Stingless Bee Pollen in High-Fat Diet FED-Low Dose STZ Induced Experimental T2DM Rats. *Asian Journal of Medicine and Biomedicine*, *8*(1), 86–97. https://doi.org/10.37231/ajmb.2024.8.1.712.

Chen, D., Sun, Z., Liu, Y., Li, Z., Liang, H., Chen, L., Xu, X., Yang, J., Ma, G., & Huo, X. (2020). Eleucanainones A and B: Two Dimeric Structures from the Bulbs of Eleutherine americana with Anti-MRSA Activity. *Organic Letters*, *22*(9), 3449–3453. https://doi.org/https://doi.org/10.1021/acs.orglett.0c00903.

Dahlan, M. S. (2019). *Besar Sampel dalam Penelitian Kedokteran dan Kesehatan* (5 (ed.)). PT. Epidemiologi Indonesia.

Ebrahim, Y. M., Sadek, M. A., Sabry, M. O., Lotfy, R. M., El-Dessouki, A. M., Abou-Hussein, D., El-Shiekh, R. A., & ElBishbishy, R. M. (2025). Integrative sleep management: from molecular pathways to conventional and herbal treatments. *Naunyn-Schmiedeberg's Archives of Pharmacology*, *398*(10), 13515–13543. https://doi.org/10.1007/s00210-025-04183-y.

Fabbri, M., Beracci, A., Martoni, M., Meneo, D., Tonetti, L., & Natale, V. (2021). Measuring Subjective Sleep Quality: A Review. *International Journal of Environmental Research and Public Health*, *18*(3), 1082. https://doi.org/10.3390/ijerph18031082.

Febrinda, A. E., Nurwitri, C. C., & Husyairi, K. A. (2021). Aktivitas antioksidan dan preferensi konsumen pada minuman fungsional berbasis umbi bawang dayak. *Jurnal Sains Terapan: Wahana Informasi Dan Alih Teknologi Pertanian*, *11*(2), 11–19. https://doi.org/10.29244/jstsv.11.2.11-19.

Fischer, H. E., Boone, W. J., & Neumann, K. (2023). Quantitative research designs and approaches. In *Handbook of research on science education* (pp. 28–59). Routledge.

Habibzadeh, F. (2024). Data distribution: Normal or abnormal? *Journal of Korean Medical Science*, *39*(3), 1–8.

Huang, X., He, Y., Xu, H., Shen, Y., Pan, X., Wu, J., & Chen, K. (2024). Association between sociodemographic status and the T2DM-related risks in China: implication for reducing T2DM disease burden. *Frontiers in Public Health*, *11*, 1297203. https://doi.org/10.3389/fpubh.2023.1297203.

Kamarudin, A. A., Sayuti, N. H., Saad, N., Razak, N. A. A., & Esa, N. M. (2021). Eleutherine bulbosa (Mill.) Urb. Bulb: Review of the Pharmacological Activities and Its Prospects for Application. *International Journal of Molecular Sciences*, *22*(13), 6747. https://doi.org/10.3390/ijms22136747.

Kurnia, A. D., Thato, R., & Tsai, H. T. (2025). Predicting factors of sleep quality among adults with type 2 diabetes mellitus: A systematic review. *Diabetes Research and Clinical Practice*, *227*, 112388. https://doi.org/10.1016/j.diabres.2025.112388.

Magliano, Dianna, Boyk, E., Balkau Beverley, Barengo, N., Barr, E., Basit, A., & Bhata, D. (2021). *IDF Diabetes Atlas 10th edition 537 million people worldwide have diabetes*. www.diabetesatlas.org.

Polit, D. F., & Beck, C. T. (2021). *Nursing Research: Generating and Assessing Evidence for*

Nursing Practice (11 (ed.)). Lippincott Williams & Wilkins.

Setyawan, A. B., Budiman, A., & Septiawan, T. (2019). Pembuatan Teh Bawang Dayak dan Manfaatnya Bagi Kader Pusat Kesehatan Masyarakat Harapan Baru Samarinda Seberang. *PengabdianMu: Jurnal Ilmiah Pengabdian Kepada Masyarakat*, *4*(2), 68–73. https://doi.org/10.33084/pengabdianmu.v4i2.812.

Setyawan, A. B., & Masnina, R. (2018). Efektivitas Teh Bawang Dayak untuk Menurunkan Kadar Gula Darah Pasien Diabetes Mellitus Tipe 2. *STRADA: Jurnal Ilmiah Kesehatan*, *7*(2), 7–13. https://doi.org/10.30994/sjik.v7i2.159.

Setyawan, A. B., Sina, I., Harfiani, E., Dewi, N. U., & Supinganto, A. (2020). Effect of tea concocted from Bawang Dayak (Eleutherine palmifolia) on cholesterol levels in patients with type 2 diabetes mellitus: A pretest-posttest control group design. *Systematic Reviews in Pharmacy*, *11*(4), 674–680. https://doi.org/10.31838/srp.2020.4.99.

Sun, H., Saeedi, P., Karuranga, S., Pinkepank, M., Ogurtsova, K., Duncan, B. B., Stein, C., Basit, A., Chan, J. C. N., Mbanya, J. C., Pavkov, M. E., Ramachandaran, A., Wild, S. H., James, S., Herman, W. H., Zhang, P., Bommer, C., Kuo, S., Boyko, E. J., & Magliano, D. J. (2022). IDF Diabetes Atlas: Global, regional and country-level diabetes prevalence estimates for 2021 and projections for 2045. *Diabetes Research and Clinical Practice*, *183*, 109119. https://doi.org/10.1016/j.diabres.2021.109119.

Sun, Z., Li, Q., Zhang, J., Sun, Z., Wu, H., Liang, H., Ma, M., Huang, L., Xu, X., & Ma, G. (2024). Phenolic constituents with antibacterial activity from Eleutherine bulbosa. *Fitoterapia*, *172*, 105787. https://doi.org/https://doi.org/10.1016/j.fitote.2023.105787.

Timur, K. L., & Dayak, T. B. (2021). *Teh Herbal Bawang Dayak (Eleutherine Bulbosa Mill) Terhadap Penurunan Kolesterol Pasien Hiperkolesterolemia di Puskesmas Nuha Bawang Dayak Herbal Tea (Eleutherine Bulbosa Mill) to Reducing Cholesterol in Hypercholesterolemia Patients at Nuha Health Center*. *11*, 130–133.

Xue, P., Tan, X., & Benedict, C. (2023). Association of socioeconomic deprivation with sleep health in patients with type 2 diabetes. *Diabetes, Obesity & Metabolism*, *25*(10), 2937–2943. https://doi.org/10.1111/dom.15190.

Yu, Y., Xie, K., Lou, Q., Xia, H., Wu, D., Dai, L., Hu, C., Shan, S., Wang, K., & Tang, W. (2022). The clinical characteristics of Chinese elderly patients with different durations of type 2 diabetes mellitus. *Frontiers in Endocrinology*, *13*, 904347. https://doi.org/10.3389/fendo.2022.904347.