The Effect of Moringa (Moringa oleifera) Leaf Decoction on Random Blood Glucose Levels in Elderly Residents at the Kupang Social Welfare Institution (UPTD) for the Elderly

Ludgardis Valentina Leros[1*], Anita Lidesna Shinta Amat[2], Deif Tunggal[3], Audrey Gracelia Riwu[4]

[1]Medical Education Program, Faculty of Medicine and Veterinary Medicine, Nusa Cendana University, Kupang, Indonesia

[2]Department of Biomedicine, Faculty of Medicine and Veterinary Medicine, Nusa Cendana University, Kupang, Indonesia

[3]Department of Anesthesiology and Intensive Care, Faculty of Medicine and Veterinary Medicine, Nusa Cendana University, Kupang, Indonesia

[4]Department of Biomedicine, Faculty of Medicine and Veterinary Medicine, Nusa Cendana University, Kupang, Indonesia

ABSTRACT

Background: Diabetes mellitus is a degenerative disease commonly affecting the elderly as a result of physiological aging and reduced metabolic function. Moringa leaves (*Moringa oleifera*) contain bioactive compounds such as flavonoids, saponins, and polyphenols, which have been reported to possess antihyperglycemic effects.

Objective: This study aimed to determine the effect of moringa leaf decoction on random blood glucose levels among elderly individuals at the UPTD Social Welfare Institution for the Elderly in Kupang.

Methods: This pre-experimental study employed a one-group pretest–posttest design involving 40 elderly participants selected based on inclusion criteria. The intervention consisted of administering 150 mL of moringa leaf decoction, prepared by boiling 0.3 g of moringa leaves in 450 mL of water at 80°C for 6 minutes, once daily in the morning before meals for seven consecutive days. Random blood glucose levels were measured before and after the intervention using a glucometer. Data were analyzed using the Wilcoxon signed-rank test.

Results: The mean random blood glucose level decreased from 140.2 mg/dL before the intervention to 120.7 mg/dL after the intervention. Statistical analysis showed a significant reduction in blood glucose levels (p = 0.002).

Conclusion: Moringa leaf decoction significantly reduced random blood glucose levels among elderly individuals at the UPTD Social Welfare Institution for the Elderly in Kupang.

KEYWORDS: blood glucose, elderly, moringa leaf, *Moringa oleifera*

INTRODUCTION

Diabetes mellitus is a chronic metabolic disorder characterized by hyperglycemia resulting from defects in insulin secretion, insulin action, or both.[1] It has become a global epidemic and is one of the four leading non-communicable diseases causing death worldwide.[1,2] According to the International Diabetes Federation (IDF), Indonesia ranks sixth globally, with approximately 10.3 million people living with diabetes.[1] National data from the 2018 Basic Health Research (Riskesdas) showed that the prevalence of diabetes in Indonesia increased to 2% among individuals aged 15 years and older.[3] In East Nusa Tenggara (NTT), although the prevalence is recorded as one of the lowest at 0.9%, routine blood glucose screening coverage remains a challenge, particularly in Kupang.[3,4]

The elderly population (aged ≥60 years) is highly vulnerable to diabetes due to physiological changes associated with aging, including decreased metabolic function and increased insulin resistance.[2,5] In Kupang, the elderly population increased significantly from 26,131 in 2022 to 35,497 in 2023, highlighting the urgent need for effective blood glucose management in this demographic.[4] Chronic uncontrolled hyperglycemia can lead to severe complications, such as cardiovascular disease, stroke, and kidney failure, which substantially reduce the quality of life among the elderly.[2,6]

Herbal interventions are increasingly used as complementary therapies for blood glucose management because they are more accessible and perceived to have fewer side effects. *Moringa oleifera*, widely known as the "Miracle Tree," is abundant in NTT and

contains various bioactive compounds, including flavonoids, saponins, and tannins.[7,8] These compounds, particularly quercetin, exhibit antioxidant properties that protect pancreatic beta cells from oxidative stress and improve insulin sensitivity.[8,9]

Despite the known hypoglycemic potential of *Moringa oleifera*, most previous studies have focused on capsule-based extracts rather than simple leaf decoctions that can be easily prepared by elderly individuals in community or institutional settings. Therefore, this study aims to evaluate the effect of *Moringa oleifera* leaf decoction on random blood glucose levels among elderly residents at the UPTD Social Welfare Institution for the Elderly in Kupang.

METHODS

This study employed a pre-experimental design using a one-group pretest–posttest approach. The research was conducted at the UPTD Social Welfare Institution for the Elderly in Kupang, East Nusa Tenggara, Indonesia, over a 10-day period in June 2025. The study population consisted of 73 elderly residents living at the institution, from which 40 participants were selected using a purposive sampling technique. Inclusion criteria included individuals aged ≥60 years, having random blood glucose (RBG) levels of ≥100 mg/dL, not currently receiving glucose-lowering medications, not previously diagnosed with diabetes mellitus, and willing to consume the intervention for seven consecutive days. Participants who were unwilling to complete the intervention protocol or who were receiving anti-diabetic therapy were excluded.

Moringa oleifera leaves were obtained from a plantation in Noelbaki, Kupang. Leaves from the fourth node below the shoot (approximately 45 days old) were selected to ensure optimal nutrient content. The decoction was prepared daily by boiling 0.3 g of fresh moringa leaves in 450 mL of water at a stable temperature of 80°C for 6 minutes. After filtration, 150 mL of the decoction was administered orally once daily in the morning before breakfast (approximately 07:00 AM) for seven consecutive days.

Random blood glucose levels were measured twice: prior to the intervention (pretest) on the first day and after completion of the intervention (posttest) on the seventh day, approximately 5–7 hours after the final dose of the intervention. Measurements were performed using a digital glucometer in accordance with standard blood glucose monitoring procedures. Capillary blood samples were collected from the third, fourth, or fifth fingertip using sterile, single-use lancets to minimize the risk of infection.

Data were analyzed using univariate analysis to describe participants' characteristics and blood glucose levels. Data normality was assessed using the Shapiro–Wilk test. As the data were not normally distributed ($p < 0.05$), the Wilcoxon signed-rank test was applied to evaluate differences in random blood glucose levels before and after the intervention, with statistical significance set at $p \leq 0.05$. This study received ethical approval from the Health Research Ethics Commission of the Faculty of Medicine and Veterinary Medicine, Universitas Nusa Cendana (No: 16/UN15.21/KEPK-FKKH/2025). Written informed consent was obtained from all participants prior to data collection.

RESULT

Phytochemical screening of the *Moringa oleifera* leaf decoction confirmed the presence of several bioactive compounds that may contribute to its antihyperglycemic effects. As shown in Table 1, the decoction tested positive for flavonoids, tannins, saponins, and vitamin C, while alkaloids were not detected.

Table 1. Phytochemical Identification of *Moringa oleifera* Leaf Decoction

Phytochemical Test	Result	Observation
Flavonoids	Positive (+)	Orange color formation
Tannins	Positive (+)	Greenish-black/dark blue color
Saponins	Positive (+)	Formation of stable foam
Alkaloids	Negative (–)	No precipitate formed
Vitamin C	Positive (+)	Color change to clear yellow

A total of 40 elderly residents participated in this study. The distribution of participants based on age and gender is presented in Table 2. Most participants were aged 60–74 years (52.5%), followed by those aged 75–90 years (42.5%). Female participants slightly outnumbered males.

Table 2. Characteristics of Respondents (n = 40)

Characteristics	Category	Frequency (n)	Percentage (%)
Age	Elderly (60–74 years)	21	52.5
	Old (75–90 years)	17	42.5
	Very old (>90 years)	2	5.0
Gender	Male	18	45.0
	Female	22	55.0

Descriptive statistics of random blood glucose (RBG) levels before and after the intervention are shown in Table 3. The mean RBG level prior to the intervention was 140.2 ± 37.30 mg/dL, which decreased to 120.7 ± 39.72 mg/dL after seven days of moringa leaf decoction administration.

Table 3. Descriptive Statistics of Random Blood Glucose Levels

Variable	Mean (mg/dL)	Standard Deviation (SD)
Pre-intervention RBG	140.2	37.30
Post-intervention RBG	120.7	39.72

Because the data were not normally distributed ($p < 0.05$), the Wilcoxon signed-rank test was applied to assess differences in RBG levels before and after the intervention. As presented in Table 4, the analysis demonstrated a statistically significant reduction in RBG levels following the intervention ($p = 0.002$).

Table 4. Wilcoxon Signed-Rank Test Results

Variable	Mean ± SD (mg/dL)	p-value
RBG before intervention	140.2 ± 37.30	0.002
RBG after intervention	120.7 ± 39.72	

Further analysis showed that 31 participants (77.5%) experienced a decrease in blood glucose levels, while 9 participants showed a slight increase, and none remained unchanged. These results indicate that the administration of *Moringa oleifera* leaf decoction significantly reduced random blood glucose levels among the elderly participants.

DISCUSSION

This study aimed to examine the association between screen-time duration and fine motor development in preschool-aged children. The results demonstrated a statistically significant moderate negative correlation ($r = -0.449$; $p = 0.001$), indicating that longer screen exposure is associated with a lower likelihood of age-appropriate fine motor development. These findings support the displacement hypothesis described by Lontoh et al.[4] and Oswald et al.[6], which suggests that excessive engagement with digital devices reduces time allocated to physical and manipulative play that is essential for motor skill development.

The underlying mechanisms contributing to delayed fine motor development are multifactorial, involving both behavioral and neurobiological processes. Fine motor proficiency depends on the maturation of the corticospinal tract and the integration of sensory, proprioceptive, and motor inputs.[7] Conventional play activities, such as stacking blocks, drawing, and cutting, provide graded resistance and tactile feedback necessary for regulating grip strength and finger coordination. In contrast, touchscreen

interactions are typically limited to repetitive and low-resistance movements, such as tapping or swiping, which offer insufficient biomechanical complexity to support optimal fine motor refinement.[8]

From a neuroplasticity perspective, early childhood—particularly between the ages of 2 and 5 years—represents a critical period during which brain development is highly responsive to environmental stimulation. Hutton et al. reported that increased screen exposure among preschool children was associated with reduced microstructural integrity of white matter tracts involved in language and emergent literacy, which are anatomically and functionally linked to motor planning networks.[9] In addition, many digital applications utilize reward-intensive designs that rapidly stimulate dopamine release.[8] Such overstimulation may blunt the sensitivity of the brain's reward system, subsequently diminishing children's motivation to participate in non-digital activities requiring sustained attention and physical effort, such as handwriting practice or self-care tasks.[10]

Parental involvement emerged as an important contextual factor influencing screen exposure. Although most mothers in this study were housewives (76.4%), a condition that theoretically allows for greater parental supervision, unsupervised screen use was highly prevalent. Only 23.6% of parents consistently accompanied their children during gadget use. This finding challenges the assumption that parental presence at home ensures active mediation. Laksmi et al. emphasized that responsive parenting practices, including co-viewing and interactive engagement, are essential to reducing the negative effects of screen exposure.[11] Active parental involvement can transform passive screen use into opportunities for language and cognitive stimulation, although concerns regarding displacement of motor activities remain.[12]

Furthermore, more than half of the children in this study (54.5%) exceeded the World Health Organization's recommendation to limit sedentary screen time to no more than one hour per day for young children.[2] The high prevalence of inappropriate fine motor development (63.6%) observed underscores the urgency for early intervention. Unlike gross motor skills, which may develop incidentally through spontaneous play, fine motor skills require targeted and consistent stimulation, which appears to be insufficient among children with excessive screen dependence.

Several limitations should be acknowledged. The cross-sectional design restricts the ability to infer causality between screen time and fine motor outcomes. Additionally, screen-time duration was assessed through parental self-report, which may be subject to recall bias. Nevertheless, the strength and consistency of the observed association highlight the need for heightened awareness among healthcare providers and caregivers regarding the neurodevelopmental risks associated with excessive reliance on digital devices as a substitute for active engagement in early childhood.

CONCLUSION

Based on the study results and statistical analysis using the Wilcoxon signed-rank test, the administration of *Moringa oleifera* leaf decoction for seven consecutive days had a significant effect on reducing random blood glucose (RBG) levels among elderly residents at the UPTD Social Welfare Institution for the Elderly in Kupang (p = 0.002). The mean RBG level decreased from 140.2 mg/dL before the intervention to 120.7 mg/dL after the intervention. These findings indicate that the bioactive compounds present in moringa leaves, particularly flavonoids and saponins, play an important role in supporting blood glucose regulation among the elderly population.

REFERENCES

1. International Diabetes Federation. *IDF Diabetes Atlas*. 8th ed. Brussels: International Diabetes Federation; 2017.
2. World Health Organization. *Global report on diabetes*. Geneva: World Health Organization; 2016.
3. Ministry of Health of the Republic of Indonesia. *National Report of Basic Health Research (Riskesdas) 2018*. Jakarta: National Institute of Health Research and Development; 2019.
4. Statistics Indonesia (BPS) Kupang City. *Kupang City in Figures 2023*. Kupang: Statistics Indonesia Kupang City; 2023.
5. World Health Organization. *Ageing and health* [Internet]. Geneva: World Health Organization; 2022 [cited 2024 Oct 24]. Available from: https://www.who.int/news-room/fact-sheets/detail/ageing-and-health
6. Indonesian Endocrinology Association (PERKENI). *Guidelines for the Management and Prevention of Type 2 Diabetes Mellitus in Indonesia 2021*. Jakarta: PERKENI Executive Board; 2021.
7. Krisnadi AD. *Moringa: A Super Nutrition*. Bandung: Media Peduli Lingkungan Foundation; 2019.

8. Syamra A, Indrawati A, Warsyidah AA. Administration of moringa leaf decoction on the reduction of blood glucose levels in patients with diabetes mellitus. *Media Laboran Journal*. 2018;8(1):1–7.

9. Tyas MF, Lestari W. Effectiveness of moringa leaf decoction in reducing blood glucose levels. *PERMAS Scientific Journal: STIKES Kendal Journal*. 2019;9(4):341–6.

10. Mauvais-Jarvis F. Epidemiology of type 2 diabetes: New insights from the biology of insulin resistance. *JCI Insight*. 2019;4(24):e1232.

11. Ogbunugafor H, Igwo-Ezikpe M, Igwilo I, Ozumba N, Adenekan S, Ugochukwu C, et al. In vitro and in vivo evaluation of antioxidant properties of *Moringa oleifera* ethanolic leaf extract. *Macedonian Journal of Medical Sciences*. 2012;5(4):397–403.

12. Sulistyorini R, Sarjadi, Johan A, Djamiatun K. Effect of ethanolic extract of moringa leaves (*Moringa oleifera*) on insulin expression and insulitis in diabetic rats. *Bandung Medical Journal*. 2015;47(2):69–76.

13. Saputra A, Puspita Sari R. The effect of moringa leaf decoction on decreasing blood sugar levels in patients with diabetes mellitus. *Nusantara Hasana Journal*. 2023;2(8):45–53.

14. Rohmawati W, Qoyyimah AU, Wahyuni S, Wintoro PD, Sawitri E, et al. Effect of moringa leaf extract administration on blood glucose levels among elderly women in Klaten. *Journal of Midwifery Science*. 2024;14(2):102–9.

15. Irwan Z. Nutrient content of moringa leaves (*Moringa oleifera*) based on drying methods. *Manarang Health Journal*. 2020;6(1):1–7.