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Original Article

# Blood Glucose Changes Following Cinnamon Decoction in Adults with Diabetes Mellitus

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**ABSTRACT**

**Background:** Evidence on cinnamon preparations does not establish the benefit of a locally prepared decoction. This study assessed changes in random blood glucose after a seven-day cinnamon decoction intervention among adults with diabetes mellitus.

**Methods:** A one-group pretest–posttest study included 21 purposively selected adults aged 45–63 years at Kota Timur Primary Health Center, Gorontalo, Indonesia. Cinnamon decoction was administered once daily for seven days. Paired differences were assessed using the Shapiro–Wilk test, followed by a two-sided paired t-test. An exact Wilcoxon signed-rank test accounting for tied ranks was conducted as a sensitivity analysis.

**Results:** Mean random blood glucose decreased from 360.62 (SD 102.22) to 304.62 (SD 136.87) mg/dL. The mean paired reduction was 56.00 mg/dL (95% CI 13.75–98.25), with $t(20) = 2.765$ and $p = 0.012$. The Shapiro–Wilk test of paired differences yielded $W = 0.927$ and $p = 0.1225$. Nineteen participants (90.5%) had lower follow-up glucose and two (9.5%) had higher glucose. The Wilcoxon sensitivity analysis also detected a difference ($W = 33.00$, exact $p = 0.0028$).

**Conclusion:** Random blood glucose was lower after the intervention in most participants. The uncontrolled design and short follow-up do not establish clinical effectiveness or safety.

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## INTRODUCTION

Diabetes mellitus requires sustained management because complications can impair health and functional independence. Indonesian research has examined complications, diabetes in middle-aged and older populations, and self-care needs (Erdaliza et al., 2024; Putri, 2024; Susanto, 2021). Community programs have also addressed diabetes education and random glucose testing among older adults (Prabandari et al., 2023; Ruben Runtu et al., 2024). These findings support attention to diabetes care in primary health services, without establishing the value of any particular herbal intervention.

Global evidence reinforces the need for accessible, sustained diabetes care: a pooled analysis documented increasing diabetes prevalence and substantial treatment gaps across countries (NCD Risk Factor Collaboration [NCD-RisC], 2024). Current recommendations place comprehensive medical assessment, person-centered glycemic targets, and attention to functional status at the center of care (American Diabetes Association Professional Practice Committee for Diabetes [ADA PPC], 2026a, 2026d, 2026e). These priorities remain relevant when evaluating complementary preparations in a primary care population.

Primary care diabetes management includes medication, education, physical activity, and ongoing monitoring. Indonesian studies have addressed chronic disease management programs, diabetes self-management, physical activity, and other nonpharmacological approaches (Manninda et al., 2021; Naralia et al., 2024; Prodyanatasari et al., 2025; Yumiko & Felicia, 2025). Interest in complementary approaches is documented in primary care populations (Putra et al., 2025). However, interest and accessibility are distinct from demonstrated therapeutic benefit.

Evidence-based management combines medication with nutrition, activity, and diabetes self-management support (Davies et al., 2022; ADA PPC, 2026c, 2026f). Physical activity itself can affect glycemic management and therefore needs to be documented when interpreting before-and-after glucose changes (Kanaley et al., 2022). Access to a herbal preparation does not establish that it provides an additional benefit beyond these components of care.

Cinnamon is one preparation investigated for glycemic management. Indonesian reports have examined cinnamon infusions and bark decoctions, but preparations and assessment schedules vary (Abdullah & Siti Mubarokah, 2025; Azmaina et al., 2021; Dewi Mardiawati et al., 2024; Hayani et al., 2025). Recent meta-analyses have reported improvements in glycemic outcomes with cinnamon supplementation, while also identifying variation across trials and formulations (Moridpour et al., 2024; de Moura et al., 2025; Yu et al., 2023). These findings concern heterogeneous products and cannot be directly transferred to an unstandardized local decoction.

The preliminary survey identified 125 people with diabetes in the population described as older adults at Kota Timur Primary Health Center. Seven interviewees reported that they had not previously tried or prepared cinnamon decoction. These local observations indicate unfamiliarity with the preparation; they do not demonstrate that routine treatment was ineffective or that cinnamon was needed as a replacement. The specific question is whether recorded random glucose changed during a short community-based decoction intervention in this setting.

This study therefore assessed paired changes in random blood glucose following once-daily cinnamon decoction administration over seven days in adults with diabetes mellitus.

## METHODS

### Study design and setting

The study used a one-group pretest–posttest design without randomization or a control group at Kota Timur Primary Health Center, Kota Timur District, Gorontalo City, Indonesia. This study was conducted in October 2025.

### Participants and sample size

The source population comprised 125 people with diabetes recorded by the health center. The sample size calculation used $n = N/(1 + Ne^2)$, with $N = 125$ and $e = 0.20$, yielding approximately 20.83 and a final sample of 21. Twenty-one participants were selected purposively. Eligible patients were aged ≥45 years, had a documented history of diabetes mellitus for ≥2 years, and were able to communicate effectively.

Of the 125 patients assessed for eligibility, 61 met the inclusion criteria and 64 were ineligible. Twenty eligible patients declined participation, leaving 41 participants enrolled. Subsequently, 20 participants withdrew, and 21 participants with complete baseline and follow-up measurements were included in the analysis." "Diabetes mellitus diagnosis and diabetes type were confirmed through a review of the patients' medical records at Kota Timur Primary Health Center.

### Intervention

Cinnamon decoction was prepared by boiling five cinnamon bark sticks in 200 mL of water for 5–15 minutes. Approximately 150 mL of the decoction was administered once daily in the morning, 30 minutes before breakfast, for seven consecutive days. Random blood glucose was measured two hours after administration.

### Outcome measurement

The outcome was random blood glucose recorded with a glucometer before the intervention and after the seven-day intervention period.

### Statistical analysis

Categorical variables were summarized as frequencies and percentages, and continuous variables as mean (SD), median (interquartile range), and range. All 21 complete pairs were reanalyzed without imputation. Paired reduction was defined as baseline minus follow-up glucose. Normality of paired differences was assessed using the Shapiro–Wilk test. Changes were evaluated using a two-sided paired t-test with 95% confidence intervals and Cohen's dz. An exact Wilcoxon signed-rank test accounting for ties was performed as a sensitivity analysis, with rank-biserial correlation reported. Statistical significance was set at $p < 0.05$

### Ethical considerations

The Health Research Ethics Committee, Faculty of Health Sciences, Universitas Muhammadiyah Gorontalo, issued ethical approval No. 029/KEPK-FIKES/X/2025 on 7 October 2025. Written informed consent was obtained from all participants before enrollment. Participant confidentiality was maintained throughout the study, and no names or initials were disclosed in the manuscript.

## RESULTS

### Participant characteristics

All 21 analyzed participants had complete paired glucose measurements. Their mean age was 55.71 (SD 5.36) years, with a range of 45–63 years. Sixteen participants (76.2%) were aged 45–59 years and five (23.8%) were aged 60–63 years. Sixteen (76.2%) were female and five (23.8%) were male. Participant characteristics in Table 1 were aligned with the supplied participant-level analysis.

**Table 1. Participant Characteristics (n = 21)**

| Characteristic | n | % |
|---|---|---|
| **Age group** | | |
| 45–59 years | 16 | 76.2 |
| 60–63 years | 5 | 23.8 |
| **Sex** | | |
| Female | 16 | 76.2 |
| Male | 5 | 23.8 |
| **Highest educational attainment** | | |
| Primary school | 5 | 23.8 |
| Junior secondary school | 7 | 33.3 |
| Upper secondary school[1] | 8 | 38.1 |
| Bachelor's degree | 1 | 4.8 |
| **Occupation** | | |
| Homemaker | 15 | 71.4 |
| Artisan / tradesperson | 2 | 9.5 |
| Private sector / self-employed[2] | 2 | 9.5 |
| Nonpermanent employee | 1 | 4.8 |
| Retired | 1 | 4.8 |

### Direction and magnitude of glucose change

Nineteen participants (90.5%) had lower random glucose at follow-up, two (9.5%) had higher glucose, and none had an unchanged value (Table 2). The two increases were from 371 to 557 mg/dL and from 320 to 424 mg/dL. Consequently, the two records previously described as not decreasing should not be reported as unchanged glucose.

**Table 2. Direction of Paired Random Glucose Change (n = 21)**

| Direction | n | % |
|---|---|---|
| Decreased | 19 | 90.5 |
| Increased | 2 | 9.5 |
| Unchanged | 0 | 0.0 |
| Total | 21 | 100.0 |

Mean random glucose decreased from 360.62 (SD 102.22) mg/dL to 304.62 (SD 136.87) mg/dL. The mean paired reduction was 56.00 (SD 92.82) mg/dL, with a 95% CI of 13.75–98.25 mg/dL. This

represented a 15.5% reduction relative to the baseline group mean; it was not the average of individual percentage reductions. Median glucose was 392.00 mg/dL at baseline and 269.00 mg/dL at follow-up. The median paired reduction was 47.00 mg/dL, which differs from the difference between the marginal medians (Table 3).

**Table 3. Random Glucose Measurements and Paired Reduction (n = 21)**

| Measure | Baseline | Follow-up | Paired reduction[1] |
|---|---|---|---|
| Mean (SD), mg/dL | 360.62 (102.22) | 304.62 (136.87) | 56.00 (92.82) |
| Median (Q1–Q3), mg/dL | 392.00 (273.00–424.00) | 269.00 (199.00–401.00) | 47.00 (17.00–105.00) |
| Range, mg/dL | 200–590 | 114–578 | −186 to 220 |
| 95% CI for mean, mg/dL | — | — | 13.75–98.25 |

The Shapiro–Wilk test did not detect a statistically significant departure from normality in the paired differences (W = 0.927, p = 0.1225). The paired t-test indicated a statistically significant mean reduction (t = 2.765, df = 20, p = 0.012), with Cohen's dz = 0.603. In the Wilcoxon sensitivity analysis, ranks associated with reductions summed to 198.00 and those associated with increases summed to 33.00. The signed-rank statistic was 33.00, with a tie-aware exact two-sided p value of 0.002756 (reported as p = 0.0028).

**Table 4. Paired Inferential Analyses (n = 21)**

| Analysis | Statistic | df | Two-sided p |
|---|---|---|---|
| Shapiro–Wilk test of paired differences | W = 0.927 | — | 0.1225 |
| Paired t-test | t = 2.765 | 20 | 0.0120 |
| Exact Wilcoxon signed-rank test | W = 33.00 | — | 0.0028 |

## DISCUSSION

The participant-level records showed lower random glucose after the seven-day intervention in 19 of 21 adults. The mean paired reduction of 56.00 mg/dL and median reduction of 47.00 mg/dL quantify the observed change more meaningfully than means of nominal codes. The difference was statistically detectable in the paired t-test and the exact Wilcoxon sensitivity analysis. Nevertheless, the follow-up mean of 304.62 mg/dL and the two individual increases demonstrate that a reduction does not establish adequate glycemic management or a consistent response in every participant.

Indonesian studies have reported glucose changes following cinnamon preparations. Azmaina et al. (2021) used an uncontrolled pretest–posttest design in 20 participants with type 2 diabetes and reported lower glucose after an infusion. Dewi Mardiawati et al. (2024) investigated cinnamon bark decoction over three days, rather than a standardized pharmaceutical extract. The shorter schedule and differences in treatment context limit direct comparison with the seven-day records analyzed here. Agreement in the direction of change is insufficient to establish equivalent effects across products.

Other studies differ more substantially in design and outcome timing. Hayani et al. (2025) included intervention and comparison groups and assessed random glucose after short administration periods. Novendy et al. (2020) assessed glucose two hours after cinnamon administration. Febrianti and Chaniago (2026) studied fasting glucose using a pretest–posttest design with a control group. Fasting glucose, random glucose, and immediate postadministration

measurements represent different assessment conditions. Their findings should therefore contextualize this study rather than serve as direct estimates of the expected effect of this preparation.

Controlled studies in prediabetes provide additional context but involve a different population and preparation. Romeo et al. (2020) evaluated cinnamon capsules against placebo, and Zelicha et al. (2024) used a randomized crossover design with continuous glucose monitoring. Neither trial directly estimates the effect of a seven-day bark decoction in adults with established diabetes and markedly elevated baseline random glucose.

Recent evidence suggests possible glycemic benefits but does not establish the effectiveness of this local preparation. Moridpour et al. (2024) and de Moura et al. (2025) reported improvements in glycemic outcomes in pooled randomized trials, while Yu et al. (2023) examined dose–response relationships. An umbrella meta-analysis also reported lower fasting glucose, although its population included both type 2 diabetes and polycystic ovary syndrome (Zarezadeh et al., 2023). Bakhach et al. (2024) specifically evaluated study quality and bias in cinnamon research. Differences in species, formulation, baseline glycemia, and intervention duration limit extrapolation across studies. NCCIH (2024) states that cinnamon's benefit for diabetes remains uncertain. The present uncontrolled study cannot resolve this uncertainty or identify the contribution of specific phytochemicals, because no insulin, pharmacokinetic, or mechanistic outcomes were measured.

Changes in medication, dietary intake, activity, and the timing of meals and glucose measurements are alternative explanations for part of the observed difference. Research on primary care programs, self-management, and activity reinforces the importance of these components of diabetes care (Manninda et al., 2021; Naralia et al., 2024; Prodyanatasari et al., 2025; Susanto, 2021; Yumiko & Felicia, 2025). The thesis explicitly states that antidiabetic medication was not taken during the intervention, but does not provide sufficient clinical documentation to evaluate this procedure. It would therefore be inappropriate to characterize the study as a proven adjunct to stable standard therapy or to assume that medication and lifestyle remained controlled.

Measurement conditions also affect interpretation. Laboratory guidance distinguishes glucose-based assessment from HbA1c and emphasizes appropriate measurement procedures (Sacks et al., 2023). Current diabetes technology recommendations address the use of glucose monitoring to inform treatment decisions (ADA PPC, 2026b). In this study, isolated random glucose measurements cannot establish longer-term glycemic control or characterize daily variability. Standardized meal timing, measurement timing, and device quality control should therefore be documented in future work.

Community nurses can support education, monitoring, communication, and continuity of care. Indonesian studies and community activities have addressed caring in chronic illness, diabetes prevention education, and movement-based activities (Prabasari & Astarini, 2020; Sinaga, 2022; Wahyu & Jumain, 2022). International consensus statements emphasize individualized diabetes self-management education and ongoing support (Powers et al., 2020; Davis et al., 2022). These roles support careful assessment of herbal use rather than a recommendation to replace established treatment. Cinnamon products differ in composition, and some cassia preparations contain coumarin associated with liver-related safety concerns (NCCIH, 2024). The current study lacks sufficient product characterization and adverse-event reporting to establish safety.

## LIMITATIONS

The principal limitations are the uncontrolled design, purposive sampling, small sample, short follow-up, and incomplete procedural documentation. High baseline values may contribute to

regression to the mean, and unstandardized random glucose assessment introduces within-person measurement variability. The sample was predominantly female and mostly aged 45–59 years, so findings cannot be generalized to an exclusively geriatric population.

Future investigations should use a defined and authenticated product, documented dosing, standardized glucose assessment, complete medication and safety records, and an ethically approved comparator design. Larger studies should assess sustained glycemic outcomes and relevant patient outcomes.

## CONCLUSION

Random blood glucose decreased in 19 of 21 adults after seven days of cinnamon decoction administration. Reanalysis of numeric glucose records showed a mean paired reduction of 56.00 mg/dL (95% CI 13.75–98.25), with $t(20) = 2.765$ and $p = 0.012$. The exact Wilcoxon sensitivity analysis also detected a difference ($W = 33.00$, $p = 0.0028$). Two participants had increased glucose. These findings describe a short-term within-group change; they do not establish effectiveness or safety.

**Author's Contribution Statement:** IAM contributed to study conceptualization, methodology, data collection, data analysis, and drafting the manuscript. IP and IAG contributed to study design, supervision, interpretation of findings, and critical manuscript revision. All authors reviewed and approved the final manuscript and agree to be accountable for the work.

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