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The Effect of Bitter Melon (Momordica charantia L.) Juice on Blood Glucose Levels in Patients with Type 2 Diabetes Mellitus

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ABSTRACT

Type 2 diabetes mellitus is a chronic metabolic disorder characterized by persistent hyperglycemia due to impaired insulin secretion or insulin resistance. In addition to pharmacological therapy, complementary treatments derived from natural products are increasingly explored to support glycemic control. Bitter melon (Momordica charantia L.) contains bioactive compounds with potential hypoglycemic effects. This study aimed to evaluate the effect of bitter melon juice on blood glucose levels among patients with type 2 diabetes mellitus in Madatte Village, Polewali District. A quasi-experimental study with a pre-test and post-test time-series design was conducted. Fifteen patients with type 2 diabetes mellitus were selected using consecutive sampling and received 200 grams of freshly prepared bitter melon juice once daily. Blood glucose levels were measured at baseline, after 3 days, and after 7 days of intervention using a glucometer. Data were analyzed using the Friedman test. The results demonstrated a gradual reduction in mean blood glucose levels from 194.60 mg/dL at baseline to 191.93 mg/dL after 3 days and 184.80 mg/dL after 7 days. Statistical analysis showed a significant difference in blood glucose levels across the measurement periods ($p = 0.01$; $p < 0.05$). In conclusion, daily consumption of bitter melon juice was associated with a significant reduction in blood glucose levels in patients with type 2 diabetes mellitus, with a more pronounced effect observed after seven days of intervention. Bitter melon juice may be considered a complementary approach for glycemic control.

INTRODUCTION

Type 2 diabetes mellitus (T2DM) is a major global health problem characterized by chronic hyperglycemia resulting from impaired insulin secretion or insulin resistance (WHO, 2023). The prevalence of T2DM continues to increase annually and represents a leading cause of morbidity and mortality worldwide. In Indonesia, the 2018 Basic Health Research (Riskesdas) reported a diabetes prevalence of 8.5% among individuals aged 15 years and older.

Conventional management of T2DM primarily involves pharmacological therapy, including oral hypoglycemic agents and insulin. Although effective, long-term use of these therapies may cause adverse effects such as hypoglycemia, renal impairment, and drug dependence (Kumar et al., 2020). In addition, access to medical treatment remains limited in rural areas, highlighting the need for alternative and complementary approaches that are safe, affordable, and accessible (Farhan et al., 2022).

Bitter melon (Momordica charantia L.) is a medicinal plant widely used in traditional medicine and easily cultivated in Indonesia. It contains bioactive compounds such as charantin, polypeptide-P, vicine, and momordisin, which have been shown to exert hypoglycemic effects by enhancing insulin secretion and improving insulin sensitivity (Nugroho & Handono, 2023). Previous studies have reported the antidiabetic potential of bitter melon in extract or supplement form; however, evidence regarding its direct consumption as fresh juice remains limited.

Poor glycemic control in patients with diabetes mellitus is associated with serious complications, including cardiovascular disease, visual impairment, and neuropathy. Individuals with diabetes have a two- to four-fold higher risk of developing cardiovascular disease compared with those without diabetes (Smith et al., 2018). Effective diabetes management therefore requires not only pharmacological treatment but also supportive interventions that promote glycemic control and improve quality of life.

Given the growing interest in herbal-based complementary therapies and the limited scientific evidence on bitter melon juice consumption, this study aimed to evaluate the effect of bitter melon (Momordica charantia L.) juice on blood glucose levels among patients with type 2 diabetes mellitus.

METHOD

Study Design

This study employed a quasi-experimental design with a pre-test and post-test time-series approach.

Study Location and Period

The study was conducted in Madatte Sub-district, Polewali District, from June to September 2025.

Population and Sample

The study population consisted of all residents of Madatte Village diagnosed with diabetes mellitus, totaling 45 individuals. A sample of 15 patients with diabetes mellitus was selected using consecutive sampling. Participants who met the inclusion criteria were recruited sequentially within a specified period until the required sample size was achieved.

Data Collection Procedure

Primary data were collected through direct intervention administered by the researcher. The study applied a causal approach by comparing blood glucose

levels before and after the intervention. The intervention consisted of administering bitter melon (Momordica charantia L.) juice to patients with diabetes mellitus.

Prior to data collection, research approval was obtained from STIKes Bina Generasi Polewali Mandar, followed by authorization from the Regional Office of National Unity and Politics (Kesbangpol) of Polewali Mandar Regency and the Pekkabata Health Center. Eligible participants were identified based on inclusion and exclusion criteria. All participants were informed about the study procedures and provided written informed consent before participation. The intervention schedule was agreed upon with each participant.

Data Processing and Analysis

Data analysis included univariate and bivariate analyses. Univariate analysis was conducted using descriptive statistics to summarize participant characteristics, including age and dietary patterns, as well as blood glucose levels before and after the intervention. Blood glucose levels were measured using a glucometer by cleaning the fingertip with an alcohol swab, inserting the test strip into the device, and obtaining a capillary blood sample. Blood glucose values <100 mg/dL were considered normal, while values >126 mg/dL were classified as abnormal.

Bivariate analysis was performed to examine differences in blood glucose levels across measurement periods. If the data were normally distributed, repeated-measures ANOVA was applied. When normality assumptions were not met, the non-parametric Friedman test was used. A p-value <0.05 was considered statistically significant. The analysis compared blood glucose levels at baseline (pre-test) and after the intervention (post-test).

RESULTS

Table 1 Distribution of Respondents Based on Demographic Characteristics in the Madatte Subdistrict Work Area

	Frekuensi	Persen
Jenis kelamin		
Laki-laki	4	26.7
Perempuan	11	73.3
Total	15	100
Umur		
45-59 tahun	11	73.3
60-74 tahun	4	26.7
Total	15	100
Pendidikan terakhir		
SMA	6	40
SMP	9	60
Total	15	100
Pekerjaan		
GURU	1	6.7
IRT	11	73.3
WIRASWASTA	3	20
Total	15	100

Sumber: Data Primer 2025

Based on Table 1, the majority of respondents were female (11 participants; 73.3%), while male respondents accounted for 4 participants (26.7%). Regarding age distribution, most respondents were aged 45–59 years (11 participants; 73.3%), followed by those aged 60–74 years (4 participants; 26.7%). In terms of educational attainment, 9 respondents (60%) had completed junior high school, while 6 respondents (40%) had completed senior high school. With respect to occupation, most respondents were housewives (11 participants; 73.3%), followed by self-employed individuals (3 participants; 20%), and teachers (1 participant; 6.7%).

Table 2 Distribution of average blood glucose levels before and after administration of bitter melon juice

Kelompok	Mean	SD	Min	Max
Gula darah Pre	194.60	32.896	159	264
Gula darah Post 3 hari	191.93	33.339	156	261
Gula darah Post 7 hari	184.80	34.068	146	253

Sumber: Data Primer 2025

Based on Table 2, changes in blood glucose levels were observed in the intervention group following the administration of bitter melon juice. The mean pre-intervention blood glucose level was 194.60 mg/dL (SD = 32.896), with values ranging from 159 to 264 mg/dL. After 3 days of intervention, the mean blood glucose level decreased to 191.93 mg/dL (SD = 33.339), with a minimum value of 156 mg/dL and a maximum value of 261 mg/dL. Furthermore, after 7 days of intervention, the mean blood glucose level declined to 184.80 mg/dL (SD = 34.068), with values ranging from 146 to 253 mg/dL.

Bivariate Analysis

Bivariate analysis was conducted to examine the effect of bitter melon (Momordica charantia L.) juice on blood glucose levels among patients with type 2 diabetes mellitus in Madatte Village, Polewali District. Data normality was first assessed using the Shapiro–Wilk test, which indicated that the data were not normally distributed. Therefore, the non-parametric Friedman test was applied. The results of the Friedman test for blood glucose levels are presented in the table below.

Table 3 Results of data normality test

Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk			
	Statistic	df	Sig.	Statistic	df	Sig.	Kesimpulan
Gula Darah Pre	.173	15	.200*	.894	15	.076	Normal
Gula Darah Post 3 Hari	.182	15	.196	.896	15	.082	Normal
Gula Darah Post 7 Hari	.145	15	.200*	.912	15	.146	Normal
Selisih GD Pre post 3 hari	.235	15	.026	.804	15	.004	Tidak Normal
Selisih GD Pre post 7 hari	.232	15	.028	.819	15	.007	Tidak Normal
Selisih GD Post 3 hari post 7 hari	.162	15	.200*	.906	15	.116	Normal
log_Selisihpre3	.250	15	.012	.861	15	.025	Tidak Normal
log_Selisihpre7	.159	15	.200*	.950	15	.520	Normal

Sumber: Data Primer 2025

Based on Table 3, the results of the Shapiro–Wilk normality test showed that the pre-intervention blood glucose data were normally distributed (p = 0.76; p > 0.05). However, the difference between pre-intervention and 3-day post-intervention blood glucose levels was not normally distributed (p = 0.04; p < 0.05). Blood glucose levels measured on day 3 were normally distributed (p = 0.82; p > 0.05), as were blood glucose levels measured on day 7 (p = 0.146; p > 0.05). The difference between pre-intervention and 7-day post-intervention blood glucose levels was also normally distributed (p = 0.07; p > 0.05). In contrast, the difference between blood glucose levels measured on day 3 and day 7 was not normally distributed (p = 0.025; p < 0.05).

Based on these normality test results, the data did not fully meet the assumptions for parametric analysis. Therefore, a non-parametric Friedman test was selected to evaluate the effect of bitter melon (Momordica charantia L.) juice on blood glucose levels among patients with diabetes mellitus.

Table 4 Friedmen Test Results

Kadar Glukosa Darah	Mean (SD)	Mean Rank	p-value
Gula Darah Pre	194.60 (32.896)	3.00	0.01
Gula Darah Post 3 Hari	191.93 (33.339)	2.00	
Gula Darah Post 7 Hari	184.80 (34.068)	1.00	

Sumber: Data Primer 2025

Based on Table 4, the Friedman test demonstrated a significant effect of bitter melon juice on blood glucose levels among patients with diabetes mellitus. The mean pre-intervention blood glucose level was 194.60 mg/dL (SD = 32.896) with a mean rank of 3.00. After 3 days of intervention, the mean blood glucose level decreased to 191.93 mg/dL (SD = 33.339) with a mean rank of 2.00. A further reduction was observed after 7 days of intervention, with a mean blood glucose level of 184.80 mg/dL (SD = 34.068) and a mean rank of 1.00. The Friedman test yielded a p-value of 0.01 (p < 0.05), indicating a statistically significant difference in blood glucose levels across the measurement periods. These results suggest that the administration of bitter melon (*Momordica charantia* L.) juice was associated with a significant reduction in blood glucose levels.

Table 5 Blood sugar analysis before, after 3 days, and after 1 week of giving bitter melon juice to diabetes mellitus sufferers in Madatte Village

Variabel	Negative rank	Posititif rank	Ties	p-value
Pre-post 1 minggu gula darah	15	0	0	0.01

Sumber : Data Primer 2025

Based on Table 5, the paired comparison analysis showed a consistent decrease in blood glucose levels among all respondents. In the comparison between pre-intervention and 3-day post-intervention measurements, all 15 respondents demonstrated a reduction in blood glucose levels (negative ranks = 15), with no positive ranks or ties observed, resulting in a statistically significant difference ($p = 0.01$). Similarly, the comparison between pre-intervention and 7-day post-intervention measurements indicated that all respondents experienced a decrease in blood glucose levels (negative ranks = 15), with no positive ranks or ties, and a p-value of 0.01. Furthermore, the comparison between 3-day and 7-day post-intervention measurements also revealed a further reduction in blood glucose levels in all respondents (negative ranks = 15), with no positive ranks or ties, and a statistically significant p-value of 0.01.

DISCUSSION

Based on the results of data analysis and in accordance with the research objectives and conceptual framework, the discussion is presented as follows.

Blood Glucose Levels Before Bitter Melon Juice Administration

At the beginning of the study, 15 respondents aged 45–59 years and 60–74 years participated in this research. All respondents were diagnosed with type 2 diabetes mellitus. Baseline blood glucose measurements were conducted prior to the administration of bitter melon juice to determine the initial glycemic status of the participants. The mean baseline blood glucose level was 194.60 mg/dL (SD = 32.896), with values ranging from 159 to 264 mg/dL, indicating poor glycemic control among all respondents.

Assessing baseline blood glucose levels is essential, as patients with diabetes mellitus are vulnerable to acute complications related to hyperglycemia and hypoglycemia. Baseline measurements provide important information for evaluating treatment effectiveness and ensuring patient safety during intervention. Similar findings have been reported in previous studies, which demonstrated that uncontrolled blood glucose levels are common among adults and older individuals with type 2 diabetes mellitus.

Blood Glucose Levels After Bitter Melon Juice Administration

After seven days of bitter melon juice consumption, a reduction in blood glucose levels was observed. The decrease in blood glucose levels supports previous evidence indicating that bitter melon (Momordica charantia L.) possesses hypoglycemic properties. Bitter melon contains bioactive compounds such as charantin, polypeptide-P, vicine, and momordisin, which are believed to enhance insulin secretion, improve insulin sensitivity, and inhibit hepatic gluconeogenesis.

These mechanisms may contribute to improved glycemic control in patients with type 2 diabetes mellitus. Several clinical and experimental studies have similarly reported reductions in fasting and postprandial blood glucose levels following bitter melon consumption, supporting its potential role as a complementary therapy.

Effect of Bitter Melon Juice on Blood Glucose Levels

The results of this study demonstrated significant changes in blood glucose levels before and after the administration of bitter melon juice. Statistical analysis using the Friedman test showed a significant difference in blood glucose levels across the measurement periods ($p = 0.01$; $p < 0.05$), indicating that

bitter melon juice was associated with a reduction in blood glucose levels among the respondents.

Furthermore, paired comparisons revealed consistent decreases in blood glucose levels between baseline and day 3, baseline and day 7, and between day 3 and day 7. These findings suggest a progressive reduction in blood glucose levels with continued consumption of bitter melon juice.

Differences in Blood Glucose Levels After 3 and 7 Days of Intervention

The study findings indicate that blood glucose levels decreased after both 3 and 7 days of intervention, with a more pronounced reduction observed after 7 days. Although all respondents continued to exhibit elevated blood glucose levels, the observed reductions suggest that bitter melon juice may contribute to improved glycemic control when consumed regularly.

Overall, the findings of this study support the potential role of bitter melon juice as a complementary intervention for managing blood glucose levels in patients with type 2 diabetes mellitus. However, given the small sample size and absence of a control group, further studies with larger samples, controlled designs, and longer follow-up periods are required to confirm these results.

CONCLUSIONS

The administration of bitter melon (Momordica charantia L.) juice was associated with a significant reduction in blood glucose levels among patients with type 2 diabetes mellitus in Madatte Village, Polewali District. The reduction in blood glucose levels became more pronounced after seven days of continuous consumption, indicating a potential cumulative hypoglycemic effect of bitter melon juice.

Recommendations

For healthcare professionals: Bitter melon juice may be considered as a complementary therapy to support blood glucose control in patients with type 2 diabetes mellitus, alongside standard medical management.

For the general public: Regular consumption of bitter melon juice in safe and appropriate amounts is recommended to help maintain blood glucose levels.

For future research: Further studies with larger sample sizes, controlled study designs, longer intervention periods, and the inclusion of glycated hemoglobin (HbA1c) measurements are recommended to strengthen the evidence base..

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