

NONI FRUIT JUICE REDUCING THE GLYCEMIC LEVELS IN PRE-DIABETIC AND DIABETIC POPULATIONAnilkumar KV^{1*}, Samhitha J¹, Nagaraju B¹, Shekar HS¹, Neerajraj GN²¹Visveswarapura Institute of Pharmaceutical Sciences, BSK-2nd Stage, Bengaluru-560070²UG-Medical, ESIC Medical College & PGIMS, Rajajinagar, Bengaluru-560010*Corresponding Author's E mail: samhitha.27@gmail.com

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ABSTRACT

Prediabetes and diabetes mellitus are progressive metabolic disorders marked by chronic hyperglycemia and substantial morbidity and mortality. Poor medication adherence and growing interest in complementary therapies have encouraged investigation of medicinal plants with hypoglycemic effects. Noni (*Morindacitrifolia*) fruit is traditionally used for various health benefits; however, scientific evidence regarding its role in glycemic control is limited. This study evaluated the effect of Noni fruit juice on blood glucose levels in prediabetic and diabetic individuals. A quasi-experimental two-group post-test design was conducted among 12 participants recruited from selected hospitals in Bengaluru. Participants were assigned to a control group (n=6), receiving routine care, or an intervention group (n=6), receiving freshly prepared Noni fruit juice daily for 10 days along with routine dietary advice. Capillary fasting blood glucose levels were measured before and after the intervention. At baseline, mean fasting glucose levels were 150.50 ± 2.62 mg/dL in the control group and 231.50 ± 2.07 mg/dL in the intervention group. After 10 days, glucose levels increased to 159.50 ± 3.60 mg/dL in the control group but decreased markedly to 169.17 ± 3.59 mg/dL in the intervention group. No adverse events were reported, and compliance was 100%. Daily Noni fruit juice supplementation demonstrated a clinically meaningful reduction in blood glucose levels, suggesting its potential as a safe complementary therapy. Further large-scale randomized studies are recommended.

Keywords: Prediabetes; Diabetes mellitus; Noni (*Morindacitrifolia*); Blood glucose; Complementary therapy.

INTRODUCTION

Prediabetes is a medical condition that occurs when blood sugar levels are elevated but not enough to diagnose as type-2 diabetes¹. Diabetes is a group of metabolic disorders with

multiple pathological disturbances with chronic illness. It requires continuous medical care for proper glycaemic control².

The multifaceted defects include lack of insulin secretion, insulin production and insulin action, disturbances in metabolism of carbohydrate, protein, lipid and nucleic acid and tend to persistent hyperglycaemia with untoward effects. The uncontrolled diabetes leads to the development of macrovascular and microvascular complications, which includes cardiovascular problems and severe damage to the organs such as eye, kidney and nerves. The other dysfunctions like infertility, fatty liver, obesity, cerebrovascular dysfunctions and damage to the peripheral arteries³.

According to the WHO reports stated that the people with type 2 diabetes are proportionally increased in most of the countries. But the age of 40 to 59 years of aged people with undiagnosed diabetes with a number of 212 million. During 2017 reports indicating that the people around the age of 20 to 79 years of 425 million adults are suffering with diabetes and may increase up to 629 million by 2045⁴. The uncontrolled diabetes cause 4 million deaths, higher number of living births with diabetes in 21 million during pregnancy. According to the 2018 studies more than 500 million people are suffering with T2D worldwide and the prevalence rate is observed in both high and low incoming countries⁵.

The incidence and pathophysiology of diabetes is associated with oxidative stress, inflammation, altered functions of β cell, activation of sympathetic system, sodium water retention, other metabolic dysfunctions, renal damage and activation of rennin angiotensin aldosterone system activation⁶.

Low medication adherence renders standard therapy unsuccessful in decreasing blood glucose levels. People began to explore for alternate herbs to solve their problems⁷. Noni (*Morinda citrifolia*) is a medicinal herb that has been utilized extensively in the community. However, the usage of this herb remains limited to lowering blood sugar levels⁸.

Numerous health-promoting active ingredients, including potassium, vitamin C, flavonoids, scopoletin, linoleic acid, molindone, alizarin, and rubidium, are found in noni. Among the hypoglycemic substances are flavonoids⁹. Noni can lower blood glucose levels, according to numerous research on its use in DM patients. Patients with diabetes mellitus who did not

take medication make up the study population¹⁰. The effect of noni in conjunction with oral antihyperglycemic medications will be investigated in this study. Therefore, it will be demonstrated whether taking noni with DM medication lowers blood glucose levels to normal or causes hypoglycemia, which will result in a better suggestion.

METHODS

Study Design and Setting:

This study employed a **quasi-experimental two-group post-test design** to evaluate the effect of *Noni (Morindacitrifolia) fruit juice* on blood glucose levels among individuals with altered glycemic status. The study was conducted at **Kempegowda Institute of Medical Sciences Hospital and Research Centre, Bengaluru**, and **Divisional Railway Hospital, Bengaluru**. The design was selected to compare glycemic outcomes between a control group and an intervention group over a fixed intervention period.

Study Population and Sample Size:

A total of **12 participants** diagnosed with either **prediabetes or diabetes mellitus** were enrolled in the study. Participants were divided equally into two groups:

- **Control group (n=6):** Received routine care without any herbal supplementation.
- **Intervention group (n=6):** Received freshly prepared *Noni fruit juice* in addition to routine dietary recommendations.

Participants were selected based on availability and willingness to participate, following inclusion and exclusion criteria defined by glycemic status. All participants completed the study, resulting in **zero attrition**.

Inclusion and Exclusion Criteria:

Inclusion criteria included adults with elevated fasting blood glucose levels categorized as prediabetic or diabetic and individuals not receiving insulin therapy.

Exclusion criteria included participants with severe systemic illness, pregnancy, known allergy to herbal products, or those receiving insulin or other investigational treatments.

Formulation Details:**Table.1: Formulation of Noni (*Morindacitrifolia*) Fruit Juice**

S. No	Ingredient	Botanical / Grade	Quantity per Dose	Functional Role
1	Noni fruit	<i>Morindacitrifolia</i> (Fresh, ripe)	1 medium fruit (≈50 g pulp)	Active hypoglycemic ingredient
2	Purified water	Potable drinking water	100 mL	Vehicle / Diluent

Method of Preparation

1. Fresh ripe Noni fruits were collected and washed thoroughly under running water to remove dirt and impurities.
2. The fruits were cut into small pieces and blended using a sterile mixer.
3. Exactly 100 mL of potable drinking water was added to the blended pulp.
4. The mixture was filtered using a clean muslin cloth to obtain a uniform juice.
5. The freshly prepared juice was administered immediately to ensure maximum phytochemical stability.

Dose and Administration

- Dose: One serving (~100 mL) of freshly prepared Noni fruit juice
- Route: Oral
- Frequency: Once daily
- Duration: 10 consecutive days

**Figure. A: Fresh Noni (*Morindacitrifolia*) Fruit**



Figure B: Preparation of Noni Fruit Juice



Figure C: Final Prepared Noni Fruit Juice

Measurement of Blood Glucose Levels:

Capillary blood glucose levels were measured using a **glucometer (gluco-check)** from the participants' index finger. Measurements were taken:

- **Before initiation of the intervention** (baseline)
- **After completion of the 10-day intervention period**

Blood glucose values were categorized based on standard clinical criteria:

- Normal: 70-100 mg/dL
- Prediabetes: 100-125 mg/dL
- Diabetes: ≥ 126 mg/dL

Ethical Considerations:

Ethical clearance (No. VIPS/70/2024-25, dated 27 April 2024) was obtained from the Institutional Ethics Committee of Visveswarapura Institute of Pharmaceutical Sciences, Bengaluru, with Kempegowda Institute of Medical Sciences Hospital and Research Centre, Bengaluru, serving as the mentor institute. Written informed consent was obtained from all participants prior to initiation of the study. Participant confidentiality and safety were ensured throughout the study period. All participants were advised to continue their routine diet and lifestyle practices as recommended by the hospital.

Statistical Analysis:

Data were expressed as **Mean $\pm$ Standard Error of Mean (SEM)**. Descriptive statistics were used to summarize blood glucose levels before and after intervention. Comparisons between control and intervention groups were interpreted based on observed mean differences.

Post-Intervention Blood Glucose Levels:

Following the 10-day intervention period:

- The control group showed an increase in mean blood glucose levels to **159.50 $\pm$ 3.60 mg/dL**
- The intervention group demonstrated a **marked reduction** in blood glucose levels to **169.17 $\pm$ 3.59 mg/dL**

Despite higher baseline glucose levels, participants receiving Noni fruit juice exhibited a **substantial reduction in glycemia**, suggesting a potential hypoglycemic effect of the intervention.

Comparative Outcome:

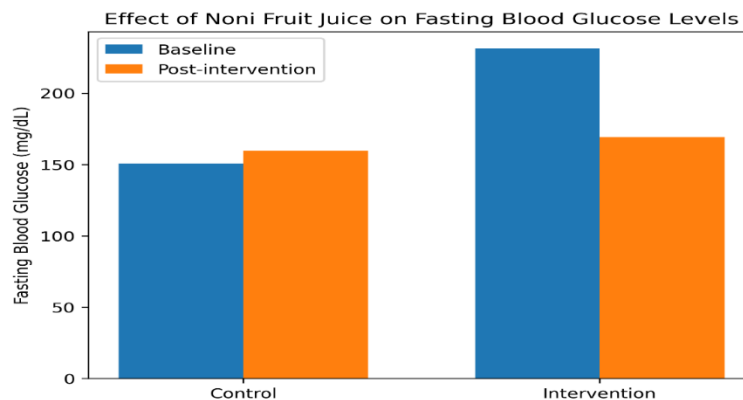
The reduction in blood glucose levels observed in the intervention group was **clinically meaningful** when compared to the control group, which showed a rising trend. These findings indicate that **Noni fruit juice supplementation may contribute to improved glycemic regulation**.

Table 2: The blood glucose levels of all participants in both groups before the intervention

Group	P1	P2	P3	P4	P5	P6	Mean $\pm$ SEM
Diabetic Control	160	154	146	148	151	144	150.50 $\pm$ 2.62
Intervention	238	231	226	230	236	228	231.50 $\pm$ 2.07

Table 3: The effect of Noni (*Morinda Citrifolia*) Juice in blood glucose levels after the intervention

Group	P1	P2	P3	P4	P5	P6	Mean $\pm$ SEM
Diabetic Control	174	162	154	155	160	152	159.50 $\pm$ 3.60
Intervention	181	170	161	162	176	165	169.17 $\pm$ 3.59

**Figure. D: Effect of Noni (*Morindacitrifolia*) fruit juice on fasting blood glucose levels in control and intervention groups.**

The intervention group demonstrated a marked reduction in glucose levels after 10 days compared to baseline, while the control group showed a slight increase.

DISCUSSION

The present study demonstrates that daily consumption of Noni (*Morindacitrifolia*) fruit juice for ten days resulted in a notable reduction in blood glucose levels among prediabetic and diabetic individuals¹¹. This observation supports the growing body of evidence highlighting the antihyperglycemic potential of medicinal plants as adjunctive therapies in diabetes management¹².

The hypoglycemic effect of Noni fruit may be attributed to its rich phytochemical composition, including flavonoids, scopoletin, potassium, vitamin C, and linoleic acid, which are known to enhance insulin sensitivity, reduce oxidative stress, and modulate glucose metabolism¹³. Flavonoids, in particular, have been shown to improve pancreatic β -cell function and inhibit intestinal glucose absorption¹⁴.

Interestingly, the intervention group exhibited a greater reduction in glucose levels despite higher baseline values, indicating that Noni fruit juice may exert stronger effects in individuals with poorer glycemic control¹⁵. Importantly, no cases of hypoglycemia were observed, suggesting that Noni juice may offer glycemic stabilization rather than excessive glucose lowering¹⁶.

The increase in blood glucose levels in the control group underscores the progressive nature of dysglycemia when no additional therapeutic measures are implemented¹⁷. These findings emphasize the potential role of herbal interventions in preventing disease progression in prediabetic individuals¹⁸.

CONCLUSION

The findings of this study suggest that Noni (*Morinda citrifolia*) fruit juice supplementation significantly reduces blood glucose levels in prediabetic and diabetic populations. The intervention was well tolerated, safe, and associated with improved glycemic outcomes over a short duration. Noni fruit juice may serve as a promising complementary therapy alongside standard dietary and medical management of diabetes. Its natural origin, ease of preparation, and absence of adverse effects make it a feasible option for glycemic control, particularly in resource-limited settings.

LIMITATIONS

- The **small sample size (n=12)** limits generalizability of findings.
- Short intervention duration (10 days) restricts evaluation of long-term effects.
- Lack of randomization and blinding may introduce selection bias.
- Glycemic control was assessed only using fasting blood glucose; **HbA1c and insulin levels** were not measured.

Dietary intake was not strictly controlled beyond hospital recommendations.

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