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Pepe leaf extract (*gymnema sylvestre*) to reduce blood glucose levels in pregnant women with a history of gestational diabetes mellitus

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Abstract

Background: Gestational diabetes mellitus (GDM) is a glucose intolerance disorder that appears during pregnancy and has the potential to cause complications in both mother and fetus. The use of pharmacological therapies such as insulin is often constrained by safety limitations in pregnant women, so a safe and effective adjuvant alternative is needed. Gymnema sylvestre (pepe leaf) is known to have hypoglycemic effects through the mechanism of inhibiting glucose absorption, stimulating β pancreatic cell function, and increasing peripheral glucose utilization.
Purpose: To evaluate the effectiveness of pepe leaf extract (gymnema sylvestre) in reducing blood glucose levels in pregnant women with a history of gestational diabetes mellitus.
Method: A quasi-experiment with a pretest-posttest control group design. The study took place from August 2025 in Community Health Center Bumiaji, Batu Malang. The independent variables studied were effectiveness of pepe leaf extract (Gymnema sylvestre), while the dependent variable was blood glucose levels. Using purposive sampling and lameshow formula 60 participants were selected devided into two group, who meet specific inclusion and exclusion criteria. The analysis proceeded with a univariate test to determine the frequency distribution of respondents characteristics, followed by bivariate analysis using paired t-test.
Results: Before the intervention, the mean fasting blood glucose (FBG) levels were 129.1±6.9 mg/dL in the treatment group and 124.6±4.7 mg/dL in the control group. After the intervention, mean FBG decreased to 117.5±6.2 mg/dL in the treatment group and 113.0±5.4 mg/dL in the control group. The post-intervention difference between groups was statistically significant ($p<0.001$), demonstrating a significant effect of the intervention on reducing fasting blood glucose levels.
Conclusion: Showed that the intervention provided was effective in reducing fasting blood glucose (GDP) levels in pregnant women with a history of gestational diabetes.

Keywords: Blood Glucose; Diabetes; Gestational; Pregnant.

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INTRODUCTION

Gestational diabetes mellitus (GDM) is a form of glucose intolerance that appears or is first detected during pregnancy (Kurniawan, Priyono, Putri, Egiestine, Waldan, Susanto, & Angelina, 2025). This condition is not only temporary, but also increases the risk of mothers developing type 2 diabetes mellitus later in life, as well as increasing the likelihood of children born with obesity and metabolic disorders at a young age (Mato, 2023). Globally, the prevalence of GDM shows an increasing trend along with lifestyle changes, increasing gestational age, and increasing prevalence of obesity in women of childbearing age (Bashir, Fagier, Ahmed, & Konje, 2024).

According to the International Diabetes Federation (IDF), in 2021 it is estimated that around 21.1 million or 16.7% of the total pregnancies in the world will experience hyperglycemia, and 80% of them are caused by gestational diabetes. According to Riskesdas 2018, the prevalence of gestational diabetes is estimated to be around 1.9% of all pregnancies, but this figure tends to increase along with lifestyle changes and obesity rates in women of childbearing age (Wati & Abdullah, 2024). Data from the East Java Provincial Health Office shows an increase in cases of pregnant women at high risk, including gestational diabetes, which requires further monitoring in first-level health facilities. Malang City, based on Puskesmas data compiled by the Malang City Health Office in 2022, around 7% of pregnant women who carry out pregnancy examinations are detected to have blood glucose levels exceeding normal limits and are at risk of suffering from gestational diabetes. The high incidence rate confirms that GDM is a maternal health problem that requires serious attention, especially in developing countries with limited access to screening and safe therapies (Thakur, Agrawal, Chakole, & Wandile, 2023).

Undiagnosed or uncontrolled GDM can cause a variety of serious complications in both mother and fetus. In mothers, GDM increases the risk of preeclampsia, gestational hypertension, premature delivery, and the need for operative delivery measures such as cesarean section. In the fetus, maternal hyperglycemia can cause macrosomia, birth trauma, neonatal hypoglycemia, respiratory distress syndrome, and increase the risk of long-term morbidity (Saifullah, Fujiko, Pramono, Lestari, & Hamsah, 2022). Management of gestational diabetes mellitus (GDM) begins with lifestyle interventions, including dietary modification, physical activity regulation, and health education (Adli, 2021). Pharmacological therapy is considered when glycemic targets are not achieved. The use of antidiabetic drugs during pregnancy is limited due to potential fetal risks. Safe alternative supportive therapies are needed to help reduce blood glucose levels in pregnant women (Lee, Park, & Choi, 2022).

One potential approach is the use of complementary therapies derived from medicinal plants with proven hypoglycemic effects and favorable safety profiles. Herbal interventions such as Gymnema sylvestre have been reported to reduce blood glucose levels through mechanisms including inhibition of intestinal glucose absorption, enhancement of insulin sensitivity, and improvement of pancreatic β-cell function (Alam, Sarker, Sultana, Chowdhury, Rashid, Chaity, & Mohamed, 2022). In the context of gestational diabetes mellitus, such therapies may serve as supportive treatments alongside lifestyle modification, helping to achieve better glycemic control while minimizing risks to both the mother and fetus (Harahap, Harahap, Siregar, Nasution, Almadany, & Dongoran, 2025).

One of the widely researched supportive therapy candidates is Gymnema sylvestre R.Br., known in Indonesia as pepe leaves. This plant has long been used in traditional Ayurvedic medicine in India to manage blood sugar levels. The main active compound in pepe leaves, gymnemic acid, has a unique mechanism of action that inhibits the absorption of glucose in the intestines, suppresses sweet sensations in the tongue, promotes cell regeneration β pancreas, and stimulates the use of glucose by peripheral tissues (Muddapur, Manjunath, Alqahtani, Shaikh, Khan, Mannasaheb, & More, 2024).

Several pre-clinical trials have shown that pepe leaf extract can significantly lower blood glucose in a model of diabetic animals. Clinical studies in non-pregnant women also indicate that the administration

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of Gymnema sylvestre extract at a dose of ≤400 mg/day is relatively safe and effective in lowering blood glucose levels without causing significant side effects. This advantage makes pepe leaves a potential candidate as a complementary therapy for GDM management, especially in areas that have access to the plant's resources (Khan, Sarker, Ming, Mohamed, Zhao, Sheikh, & Rashid, 2019).

RESEARCH METHOD

A quasi-experiment with a pretest-posttest control group design. The study took place from August 2025 in Community Health Center Bumiaji, Batu Malang. The independent variables studied were effectiveness of pepe leaf extract (Gymnema sylvestre), while the dependent variable was blood glucose levels. Using purposive sampling and lameshow formula 60 participants were selected devided into two group, who meet specific inclusion and exclusion criteria.

The inclusion criteria included gestational age ≥24 weeks and as well as abnormal glucose tolerance test (GTT) results. Exclusion criteria required having chronic diseases such as hypertension, kidney disease, heart disease, asthma.

Early in the study, all respondents in both the intervention and control groups underwent fasting blood glucose (FBG) testing as baseline data (pretest). The tests were conducted using a validated glucometer in accordance with standard procedures. The results of these measurements were used as a basis for assessing changes in blood glucose levels after the intervention.

The intervention group was given pepe leaf extract (Gymnema sylvestre) in capsule form at a dose of 400 mg per day, taken once a day after meals for 30 consecutive days. During the intervention period, the respondents' compliance in taking the capsules was monitored through daily records and weekly interviews conducted with the assistance of research assistants.

The control group was not given pepe leaf extract, but instead received standard intervention in the form of health education for pregnant women with gestational diabetes. The education included information on healthy eating patterns, blood sugar management, and the importance of compliance with health professional recommendations.

The implementation of education and respondent compliance were also monitored through records and periodic interviews. After the 30-day intervention period ended, all respondents underwent another fasting blood glucose test (posttest). The comparison of test results before and after the intervention was used to assess the effectiveness of pepe leaf extract in lowering blood glucose levels.

The analysis proceeded with a univariate test to determine the frequency distribution of respondents characteristics, followed by bivariate analysis using paired t-test. This research has obtained permission from the Research Ethics Committee Dr. Soepraoen Hospital Institute of Science and Health Sciences with number. KEPK-EC/294/VIII/2025.

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RESEARCH RESULTS

Table 1. Characteristics of Participants (N=60)

Variable	Results	
	Intervention (n=30)	Control (n=30)
Age (Mean±SD)(Range)(Year)	(34.103±7.349) (20-40)	(36.683±8.042) (20-40)
20–29	12/40.0	10/33.3
30–39	14/46.7	15/50.0
≥40	4/13.3	5/16.7
Education (n/%)		
Junior High School	6/20.0	5/16.7
Senior High School	15/50.0	14/46.7
College	9/30.0	11/36.6
Age Of Pregnancy (n/%)		
24–28	9/30.0	10/33.3
29–32	11/36.7	9/30.0
33–36	10/33.3	11/36.7
Employment (n/%)		
Housewives	18/60.0	17/56.7
Freelancer	9/30.0	10/33.3
Civil servants	3/10.0	3/10.0
Parity (n/%)		
Primigravida	10/33.3	11/36.7
Multigravida	20/66.7	19/63.3
Level Of Economy (n/%)		
Poor	8/26.7	7/23.3
Moderate	17/56.6	18/60.0
Good	5/16.7	5/16.7

Tabel 1. Characteristics of participants with a mean age and standard deviation intervention group (26.103±7.349) and control group (25.028±6.831) ranging from 20-35 years. The majority of participants in both the intervention and control groups completed high school, at 50.0% and 46.7%, respectively. In terms of gestational age, most participants were between 29 and 32 years old, at 36.7% in the intervention group and 30.0% in the control group. Based on employment status, the majority of participants in both groups were housewives, with a proportion of 60.0% in the intervention group and 56.7% in the control group. In terms of parity, most participants were multigravida, namely 66.7% in the intervention group and 63.3% in the control group. In terms of economic status, the majority of participants in both groups were in the moderate economic category, 56.6% in the intervention group and 60.0% in the control group.

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Table 2. Fasting Blood Glucose Levels (GDP) Pre and Post Intervention

Variable	Mean ± SD	p-value
Blood Sugar Levels		
GDP Pre		
Intervention	129.1 ± 6.9	
Control	124.6 ± 4.7	0.001
GDP Post		
Intervention	117.5 ± 6.2	
Control	113.0 ± 5.4	

Before the intervention, the mean fasting blood glucose (FBG) levels were 129.1 ± 6.9 mg/dL in the treatment group and 124.6 ± 4.7 mg/dL in the control group. After the intervention, mean FBG decreased to 117.5 ± 6.2 mg/dL in the treatment group and 113.0 ± 5.4 mg/dL in the control group. The post-intervention difference between groups was statistically significant ($p<0.001$), demonstrating a significant effect of the intervention on reducing fasting blood glucose levels.

DISCUSSION

This study demonstrates that administering pepe leaf extract (Gymnema sylvestre) at a dose of 400 mg/day for 30 days significantly reduces blood glucose levels in pregnant women with a history of gestational diabetes mellitus (GDM). These findings are consistent with previous studies showing the hypoglycemic effects of Gymnema sylvestre through mechanisms such as inhibition of intestinal glucose absorption, improved pancreatic β-cell function, and increased peripheral glucose utilization (Sandech, Jangchart, Komolkriengkrai, Boonyoung, & Khimmaktong, 2021). Clinically, these results support the potential role of pepe leaf extract as a complementary therapy for GDM, particularly for pregnant women with limited options for conventional antidiabetic treatment (Al-Mosawi, 2024).

The use of Gymnema sylvestre may offer an additional, non-pharmacological approach to improving glycemic control while minimizing potential risks to the fetus, especially in cases where lifestyle modification alone is insufficient and pharmacological therapy must be used cautiously (Defriyanti, Zuraida, & Susianti, 2021). Integrating pepe leaf extract into GDM management, under strict medical supervision, could enhance overall treatment effectiveness by supporting insulin sensitivity and stabilizing blood glucose levels. Nevertheless, further large-scale and long-term studies are needed to confirm its safety, optimal dosage, and efficacy before routine clinical application (Saqulain, Verma, Singh, Dharmalingam, Srivastav, & Kumar, 2025).

The effectiveness of Gymnema sylvestre observed in this study is consistent with findings from clinical trials in non-pregnant patients with type 2 diabetes, showing significant reductions in blood glucose levels (Muzzafar, Qamar, Bashir, Jabeen, Irfan, & Anwar, 2023). Although most evidence comes from non-pregnant populations, this study provides early support for the relevance of Gymnema sylvestre in gestational diabetes mellitus (GDM). During pregnancy, hormonal changes induce physiological insulin resistance that may worsen hyperglycemia in susceptible individuals (Mittal, Prasad, Lemos, Arevalo, & Hirani, 2025). Gymnema sylvestre helps modulate these metabolic changes by enhancing insulin sensitivity, reducing intestinal glucose absorption, and improving pancreatic β-cell function, supporting its potential role in GDM management (Rahman, Islam, Shohag, Hossain, Rahaman, Islam, & Cavalu, 2022).

In the context of gestational diabetes, these mechanisms are particularly relevant, as pregnancy is characterized by progressive insulin resistance driven by hormonal changes. By improving insulin action and limiting postprandial glucose spikes, Gymnema sylvestre may help stabilize maternal glycemic control without imposing excessive metabolic stress on pancreatic function. This dual action is important in preventing sustained

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hyperglycemia, which is associated with adverse maternal and fetal outcomes (Yolanda, Cholissodin, & Adikara, 2021). This study found no serious maternal or fetal side effects during the intervention period, with participants closely monitored by obstetricians and midwives. Unlike some oral antidiabetic drugs that may cross the placenta, Gymnema sylvestre at the administered dose showed no signs of toxicity or teratogenic effects (Kalra, Gupta, Singla, & Kalra, 2015). These findings suggest that pepe leaf extract may be a safe complementary therapy for pregnant women, although medical supervision remains essential.

CONCLUSION

This study demonstrates that the intervention effectively reduced fasting blood glucose (FBG) levels in pregnant women with a history of gestational diabetes. Baseline conditions between the treatment and control groups were comparable, and post-intervention results showed a significantly greater reduction in FBG in the treatment group compared to the control group.

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