EFFECTIVENESS OF SOURSOP LEAF BREWING (ANNONA MURICATA) IN REDUCING CHOLESTEROL LEVELS AMONG PATIENTS WITH HYPERCHOLESTEROLEMIA: A ONE-GROUP PRETEST–POSTTEST STUDY

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ABSTRACT

Hypercholesterolemia is a major risk factor for cardiovascular diseases and remains a significant public health concern worldwide. In addition to pharmacological treatment, herbal therapies have gained increasing attention as complementary approaches for cholesterol management. Soursop leaves (Annona muricata) contain bioactive compounds such as flavonoids, tannins, and phenolic compounds that may contribute to lipid regulation. This study aimed to determine the effect of soursop leaf brewing on cholesterol levels among patients with hypercholesterolemia. A quantitative study with a pre-experimental one-group pretest–posttest design was conducted from August to September 2025 at the West Limboto Community Health Center, Gorontalo, Indonesia. Thirty respondents were selected using purposive sampling. Cholesterol levels were measured before and after administration of soursop leaf brewing using an EasyTouch GCU device. Data were analyzed using descriptive statistics, the Kolmogorov–Smirnov normality test, and the paired-samples t-test with a significance level of 0.05. Most respondents were aged 30–59 years (96.7%) and female (73.3%). Following the intervention, cholesterol levels decreased in 28 respondents (93.3%), while 2 respondents (6.7%) experienced an increase. The normality test showed that the data were normally distributed ($p = 0.360$). The paired-samples t-test revealed a statistically significant difference between cholesterol levels before and after administration of soursop leaf brewing ($p < 0.001$). Soursop leaf brewing significantly reduced cholesterol levels among patients with hypercholesterolemia. These findings suggest that soursop leaf brewing may serve as a potential complementary non-pharmacological intervention for cholesterol management.

Keywords: *Annona muricata, cholesterol, hypercholesterolemia, herbal medicine, soursop leaf brewing.*

INTRODUCTION

Hypercholesterolemia is one of the most prevalent metabolic disorders worldwide and remains a major public health challenge due to its strong association with cardiovascular diseases (CVDs). Characterized by elevated levels of total cholesterol and low-density lipoprotein cholesterol (LDL-C) in the bloodstream, hypercholesterolemia contributes significantly to the development of atherosclerosis, coronary heart disease, stroke, and other vascular complications [1]. Cardiovascular diseases continue to be the leading cause of mortality globally, and elevated cholesterol levels are recognized as one of the most important modifiable risk factors contributing to this burden [2]. Epidemiological studies have demonstrated that the prevalence of hypercholesterolemia remains high in both developed and

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developing countries, indicating the need for effective prevention and management strategies [3].

Cholesterol is an essential lipid molecule required for various physiological processes, including cell membrane formation, steroid hormone synthesis, vitamin D production, and bile acid metabolism. However, excessive cholesterol accumulation in the blood can lead to pathological changes in the cardiovascular system. Elevated LDL-C promotes the deposition of cholesterol within arterial walls, initiating inflammatory processes that result in plaque formation and arterial narrowing. Over time, these changes increase the risk of myocardial infarction, ischemic stroke, and peripheral vascular disease [1][2]. Several factors contribute to the development of hypercholesterolemia, including unhealthy dietary habits, obesity, physical inactivity, smoking, excessive alcohol consumption, genetic predisposition, and advancing age [2].

Current management of hypercholesterolemia primarily involves pharmacological and non-pharmacological interventions. Pharmacological therapies, particularly statins, have proven effective in reducing cholesterol levels and preventing cardiovascular events. However, long-term use of lipid-lowering drugs may be associated with adverse effects, including muscle pain, liver dysfunction, gastrointestinal disturbances, and poor patient adherence in some populations [4]. Furthermore, studies have reported that a considerable proportion of patients fail to achieve recommended lipid targets despite receiving treatment, suggesting that additional preventive and therapeutic approaches are needed [3]. Consequently, increasing attention has been directed toward complementary and alternative therapies, including herbal medicines, as potential adjuncts to conventional treatment.

The utilization of herbal medicine has increased substantially over recent decades. Traditional medicinal plants continue to play an important role in healthcare systems worldwide, with approximately three-quarters of the global population relying on herbal remedies for primary health needs [5][6]. The growing popularity of herbal medicine is driven by several factors, including affordability, accessibility, cultural acceptance, and the perception that natural products are safer than synthetic drugs [7][8]. In addition, advances in phytochemical and pharmacological research have provided scientific evidence supporting the therapeutic potential of numerous medicinal plants in the management of chronic diseases, including hypertension, diabetes mellitus, obesity, and hypercholesterolemia [9][10].

Among the medicinal plants receiving increasing scientific attention is soursop (Annona muricata L.), a tropical plant widely distributed in Southeast Asia, Africa, and Latin America. Traditionally, various parts of the soursop plant, including its leaves, fruits, seeds, bark, and roots, have been used to treat a variety of health conditions. In many communities, soursop leaves are commonly prepared as herbal teas or decoctions and consumed for their perceived health-promoting properties [11]. The widespread traditional use of soursop leaves has encouraged researchers to investigate their phytochemical composition and potential medicinal benefits.

Phytochemical analyses have revealed that soursop leaves contain a diverse range of bioactive compounds, including flavonoids, phenolic compounds,

tannins, alkaloids, acetogenins, and other secondary metabolites with biological activity [12]. Recent studies have further identified important phytochemicals such as rutin, nictoflorin, cyanidanol, and other antioxidant compounds that may contribute to the plant's therapeutic effects [13]. These compounds are known to possess antioxidant, anti-inflammatory, antimicrobial, and metabolic regulatory properties that may play a role in preventing or managing chronic diseases [14].

The potential cholesterol-lowering effect of soursop leaves is believed to be associated with several biological mechanisms. Flavonoids and phenolic compounds can inhibit lipid oxidation, reduce oxidative stress, improve endothelial function, and regulate lipid metabolism pathways. In addition, these bioactive compounds may enhance bile acid excretion and reduce intestinal cholesterol absorption, thereby contributing to lower circulating cholesterol concentrations [12][13]. Oxidative stress and chronic inflammation are recognized as important contributors to dyslipidemia and atherosclerotic progression; therefore, the antioxidant properties of soursop leaves may provide protective effects against cardiovascular disease development [14].

Experimental evidence has further supported the hypolipidemic potential of soursop leaf preparations. A recent in vivo study reported that soursop leaf-based products significantly improved lipid profiles by reducing total cholesterol and low-density lipoprotein levels while increasing high-density lipoprotein concentrations [15]. These findings suggest that soursop leaves may serve as a promising natural intervention for managing hypercholesterolemia and reducing cardiovascular risk. Nevertheless, most available studies have focused on extracts, concentrated formulations, or fermented products derived from soursop leaves. Scientific evidence regarding the effectiveness of soursop leaf brewing, which represents one of the most common methods of consumption among the general population, remains limited.

Considering the increasing prevalence of hypercholesterolemia, the growing interest in herbal medicine, and the potential bioactivity of soursop leaves, further investigation is needed to evaluate the effectiveness of soursop leaf brewing as a practical and affordable intervention for cholesterol management. Therefore, this study aims to determine the effect of soursop leaf brewing on reducing cholesterol levels among patients with hypercholesterolemia in the working area of the West Limboto Community Health Center. The findings of this study are expected to contribute to the scientific evidence supporting the utilization of soursop leaf brewing as a complementary approach for improving lipid profiles and promoting cardiovascular health.

RESEARCH METHODS

Study Design and Setting

This study employed a quantitative approach using a pre-experimental one-group pretest–posttest design. According to Sugiyono [16], a one-group pretest–posttest design involves a single group of participants who are measured before and after an intervention to evaluate changes resulting from the treatment. This design was used to assess the effect of soursop leaf brewing (Annona muricata) on cholesterol levels among patients with hypercholesterolemia.

The study was conducted from August to September 2025 in the working area of the West Limboto Community

Health Center, Gorontalo Regency, Indonesia.

Population and Sample

The target population consisted of all patients with hypercholesterolemia registered in the working area of the West Limboto Community Health Center, totaling 93 individuals. According to Sugiyono [17], a population refers to the entire group of subjects possessing specific characteristics that are relevant to the research objectives.

The sample size was calculated using the Lemeshow formula for finite populations, resulting in a minimum sample of 30 respondents. Participants were selected using a purposive sampling technique. Purposive sampling is a non-probability sampling method in which respondents are selected based on specific criteria established by the researcher.

The inclusion criteria were: (1) willingness to participate in the study and sign informed consent; (2) total cholesterol level >200 mg/dL; and (3) age ≥30 years. The exclusion criteria were refusal to participate and age below 30 years.

Variables and Operational Definitions

The independent variable was the administration of soursop leaf brewing (Annona muricata), while the dependent variable was blood cholesterol level. Independent variable is a factor that influences changes in another variable, whereas a dependent variable is the outcome affected by the independent variable.

Soursop leaf brewing was prepared using five fresh soursop leaves boiled in 200 mL of water until the volume was reduced to 100 mL. Cholesterol level was measured in mg/dL using an EasyTouch GCU device.

Intervention Procedure

Baseline cholesterol levels (pretest) were measured before administering the intervention. The soursop leaves were thoroughly washed under running water and boiled in 200 mL of water until the volume decreased to approximately 100 mL. The boiling process lasted approximately 15 minutes until the solution reached boiling temperature and changed color.

The prepared soursop leaf brewing was then administered to the respondents according to the intervention protocol. Following the intervention period, cholesterol levels were remeasured (posttest) using the same instrument and procedure.

Data Collection

Primary data were collected directly from respondents through observation sheets and cholesterol examinations conducted before and after the intervention. The observation sheets recorded participant characteristics and cholesterol measurement results. Secondary data were obtained from official publications and reports issued by relevant institutions, including the Gorontalo Provincial Health Office.

Cholesterol measurements were performed using the EasyTouch GCU device following standard procedures. Blood samples were obtained through fingertip capillary puncture using a sterile lancet. The blood sample was applied to the cholesterol test strip, and the results displayed by the device were recorded immediately.

Statistical Analysis

Data analysis consisted of univariate and bivariate analyses. Univariate analysis was used to describe respondent characteristics and cholesterol levels before and after the intervention

through frequency distributions, means, and standard deviations.

Bivariate analysis was performed to determine the effect of soursop leaf brewing on cholesterol levels. Prior to hypothesis testing, data normality was assessed using the Shapiro–Wilk test. If the data were normally distributed ($p > .05$), a paired-samples t-test was applied. If the normality assumption was not met ($p < .05$), the Wilcoxon signed-rank test was used as an alternative non-parametric test. Statistical significance was determined at a 95% confidence level with a significance level of $p < .05$ [17].

Ethical Considerations

All respondents received an explanation regarding the objectives, procedures, benefits, and potential risks of the study before participation. Written informed consent was obtained from all participants prior to data collection. Confidentiality and anonymity of participant information were maintained throughout the study.

RESEARCH RESULT

Characteristics of Respondents

A total of 30 respondents with hypercholesterolemia participated in this study.

Age Distribution

Table 1. Characteristics of Respondents by Age

Age (years)	n	%
30–59	29	96.7
>60	1	3.3
Total	30	100.0

Based on Table 1, the majority of respondents were aged 30–59 years, accounting for 29 individuals (96.7%). Only one respondent (3.3%) was older than 60 years. These findings indicate that most participants were in the productive adult age group, which is considered vulnerable to lifestyle-related metabolic disorders, including hypercholesterolemia.

Sex Distribution

Table 2. Characteristics of Respondents by Sex

Sex	n	%
Female	22	73.3
Male	8	26.7
Total	30	100.0

As shown in Table 2, female respondents constituted the majority of the study population, with 22 participants (73.3%). In contrast, male respondents accounted for 8 participants (26.7%). This distribution demonstrates that women represented nearly three-quarters of all respondents included in the study.

Blood Pressure Distribution Before and After Intervention

Table 3. Distribution of Blood Pressure Before and After Administration of Soursop Leaf Brewing

Blood Pressure Category	Before n (%)	After n (%)
Hypertension	13 (43.3)	9 (30.0)
Prehypertension	17 (56.7)	20 (66.7)
Normal	0 (0.0)	1 (3.3)
Total	30 (100.0)	30 (100.0)

Table 3 shows that prior to the intervention, most respondents were classified as prehypertensive, accounting for 17 individuals (56.7%), while 13 respondents (43.3%) were categorized as hypertensive. No respondents had normal blood pressure before receiving soursop leaf brewing.

Following the intervention, the proportion of respondents with hypertension decreased from 43.3% to 30.0%. Meanwhile, the number of respondents classified as prehypertensive increased to 20 individuals (66.7%). One respondent (3.3%) achieved normal blood pressure status after consuming soursop leaf brewing. These findings suggest a shift

in blood pressure categories following the intervention period.

Changes in Cholesterol Levels

Table 4. Changes in Cholesterol Levels After Administration of Soursop Leaf Brewing

Cholesterol Status	n	%
Decreased	28	93.3
Increased	2	6.7
Total	30	100.0

As presented in Table 4, most respondents experienced a reduction in cholesterol levels after consuming soursop leaf brewing. A total of 28 respondents (93.3%) showed decreased cholesterol levels, whereas only 2 respondents (6.7%) experienced an increase. The findings indicate that cholesterol reduction was observed in the vast majority of participants following the intervention.

Normality Test

Prior to hypothesis testing, the distribution of cholesterol data was assessed using the Kolmogorov–Smirnov normality test.

Table 5. Results of the Kolmogorov–Smirnov Normality Test

Variable	Sig.	Interpretation
Pretest and Posttest Cholesterol	0.360	Normal distribution

The results of the normality test showed a significance value of 0.360, which exceeded the threshold of 0.05. Therefore, the cholesterol data were considered normally distributed. Because the assumption of normality was satisfied, further analysis was conducted using the paired-samples t-test.

Correlation Between Pretest and Posttest Measurements

Table 6. Paired-Samples Correlations

Variable	N	Correlation (r)	p-value
Cholesterol (Pretest–Posttest)	30	0.894	<0.001
Blood Pressure (Pretest–Posttest)	30	0.727	<0.001

Table 6 presents the correlation analysis between pretest and posttest measurements. The correlation coefficient for cholesterol levels was 0.894, indicating a very strong positive relationship between measurements obtained before and after the intervention. The statistical significance value was less than 0.001, confirming a significant correlation between the two measurements.

Similarly, blood pressure measurements demonstrated a correlation coefficient of 0.727 with a significance value below 0.001. This result indicates a strong positive relationship between pretest and posttest blood pressure values among study participants.

Effect of Soursop Leaf Brewing on Cholesterol Levels

To determine whether administration of soursop leaf brewing significantly affected cholesterol levels, a paired-samples t-test was performed.

Table 7. Paired-Samples t-Test Results

Variable	p-value	Interpretation
Cholesterol Level	<0.001	Significant difference
Blood Pressure	0.023	Significant difference

The paired-samples t-test revealed a statistically significant difference in cholesterol levels before and after administration of soursop leaf brewing ($p < 0.001$). This finding indicates that cholesterol levels changed significantly following the intervention.

In addition, blood pressure measurements also showed a statistically significant difference between pretest and posttest assessments ($p = 0.023$). Therefore, both cholesterol levels and blood pressure

demonstrated significant changes after the intervention period.

Overall, the results suggest that administration of soursop leaf brewing was associated with significant changes in cholesterol levels among patients with hypercholesterolemia in the working area of the West Limboto Community Health Center.

DISCUSSION

The findings of this study demonstrated that the administration of soursop leaf brewing (Annona muricata) significantly reduced cholesterol levels among patients with hypercholesterolemia in the working area of the West Limboto Community Health Center. This finding is supported by the observation that 93.3% of respondents experienced a decrease in cholesterol levels following the intervention, while only 6.7% showed an increase. Furthermore, the paired-samples t-test revealed a statistically significant difference between pretest and posttest cholesterol measurements ($p < 0.001$), indicating that soursop leaf brewing contributed to the reduction of cholesterol levels among study participants.

The cholesterol-lowering effect observed in this study may be attributed to the rich phytochemical composition of soursop leaves. Previous studies have reported that soursop leaves contain various bioactive compounds, including flavonoids, tannins, phenolic compounds, alkaloids, and acetogenins, which possess antioxidant and metabolic regulatory properties [14]. These compounds are known to play an important role in maintaining lipid homeostasis by reducing oxidative stress and improving lipid metabolism. Oxidative stress has been identified as a major contributor to dyslipidemia and atherosclerotic progression; therefore, the antioxidant activity of soursop leaves may help prevent excessive lipid accumulation in the bloodstream.

Among the bioactive constituents present in soursop leaves, flavonoids are believed to be one of the primary compounds responsible for cholesterol reduction. Flavonoids have been reported to inhibit lipid peroxidation, enhance bile acid excretion, and reduce intestinal cholesterol absorption, resulting in lower circulating cholesterol concentrations. In addition, phenolic compounds can improve lipid metabolism through their antioxidant effects, thereby protecting cells and tissues from oxidative damage associated with elevated cholesterol levels [18]. The presence of these phytochemicals may explain the substantial proportion of respondents who experienced decreased cholesterol levels after consuming soursop leaf brewing.

The results of the present study are consistent with previous experimental findings regarding the lipid-modulating effects of soursop leaves. Candra and Darge [15], reported that honey-enriched soursop leaf kombucha significantly improved lipid profiles in animal models by reducing total cholesterol, triglycerides, and low-density lipoprotein (LDL) levels while increasing high-density lipoprotein (HDL) concentrations. Although the intervention used in their study involved a fermented preparation rather than a simple herbal brew, both studies suggest that bioactive compounds contained in soursop leaves possess considerable potential for improving lipid metabolism and reducing cardiovascular risk factors.

Similarly, Hardoko et al. [19], demonstrated that soursop leaf brew exhibits significant biological activity due to its high concentration of phytochemicals.

Although their study primarily focused on antidiabetic activity through α-glucosidase inhibition, the findings support the notion that soursop leaf brewing retains important bioactive compounds capable of producing physiological benefits. This evidence strengthens the plausibility that regular consumption of soursop leaf brewing may contribute to improvements in metabolic parameters, including cholesterol levels.

The significant reduction in cholesterol levels observed in this study may also be related to the antioxidant capacity of soursop leaves. Fitrasyah et al. [14], reported that soursop leaf tea contains substantial levels of antioxidant compounds and vitamin C, which may contribute to the neutralization of free radicals and reduction of oxidative stress. Likewise, Balderrama-Carmona et al. [18], found that extracts of Annona muricata leaves exhibit strong antioxidant activity, suggesting their potential role in preventing oxidative damage associated with chronic metabolic disorders. Since oxidative stress is closely linked to the development of hypercholesterolemia and cardiovascular disease, reducing oxidative stress through antioxidant-rich herbal preparations may provide beneficial effects on cholesterol regulation.

In addition to cholesterol reduction, this study found a significant difference in blood pressure before and after the intervention ($p = 0.023$). Although blood pressure was not the primary outcome of this study, this finding may indicate additional cardiovascular benefits associated with soursop leaf consumption. The antioxidant and anti-inflammatory properties of soursop leaves may contribute to improved vascular function and circulatory health, which could indirectly influence blood pressure regulation. However, further studies specifically designed to evaluate the antihypertensive effects of soursop leaf brewing are required before definitive conclusions can be drawn.

Despite the promising findings, several limitations should be acknowledged. First, this study employed a one-group pretest–posttest design without a control group, limiting the ability to exclude external factors that may have influenced cholesterol levels during the intervention period. Second, the sample size was relatively small and was drawn from a single health center, which may limit the generalizability of the findings. Third, the study did not assess changes in specific lipid profile parameters such as LDL, HDL, and triglycerides, which could provide a more comprehensive understanding of the lipid-modulating effects of soursop leaf brewing.

Furthermore, current scientific evidence regarding the direct effect of soursop leaf brewing on cholesterol reduction in humans remains limited. Most previous studies have focused on extracts, fermented preparations, or animal models [15]. Therefore, the present study contributes valuable preliminary evidence supporting the potential use of soursop leaf brewing as a complementary non-pharmacological intervention for hypercholesterolemia. Future studies employing randomized controlled trial designs, larger sample sizes, and detailed lipid profile assessments are recommended to further confirm the efficacy and safety of soursop leaf brewing in cholesterol management.

Overall, the findings suggest that soursop leaf brewing may serve as a promising, affordable, and natural approach to reducing cholesterol levels among individuals with hypercholesterolemia. The observed effects are likely associated with the synergistic action of flavonoids,

phenolic compounds, tannins, and other bioactive constituents that contribute to improved lipid metabolism and antioxidant defense mechanisms.

CONCLUSION

The administration of soursop leaf brewing (Annona muricata) significantly reduced cholesterol levels among patients with hypercholesterolemia in the working area of the West Limboto Community Health Center. Most respondents experienced a decrease in cholesterol levels following the intervention, and statistical analysis confirmed a significant difference between cholesterol measurements before and after treatment. These findings indicate that soursop leaf brewing has potential as a complementary non-pharmacological approach for managing hypercholesterolemia. Further studies using larger sample sizes, control groups, and comprehensive lipid profile assessments are recommended to strengthen the evidence regarding its effectiveness and clinical application.

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