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# The Effect of a Combination of Belimbing Wuluh (*Averrhoa Bilimbi L*) Leaves and Basil (*Ocimum Basilicum*) on Reducing Blood Pressure in the Prolanis Group of Parepare

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**ABSTRACT**

**Context/Background:**
Hypertension is a leading cause of death in Indonesia, with a prevalence of 34.11% in adults over 18. The combination of Belimbing Wuluh and basil leaves shows potential as an alternative therapy for reducing blood pressure, particularly for the Prolanis group.

**Aim/Objective**:
The research aims to evaluate the combined effect of belimbing wuluh and basil leaves on blood pressure among Prolanis groups in Parepare City's Lumpue and Lakessi primary health centers. It includes assessing respondent characteristics and comparing blood pressure changes before and after treatment with belimbing wuluh, basil, and a control group.

**Methodology:**
The method used is a Quasi-Experimental design with a randomized control group pretest-posttest, involving 48 respondents divided into three groups: combination intervention, belimbing wuluh leaves intervention, and basil leaves intervention. The study was conducted at Puskesmas Lumpue and Puskesmas Lakessi in Parepare City. Data analysis utilized Friedman test, one-way ANOVA, Tukey test, and Kruskal- Wallis test.

**Results :**
There is a significant difference in the change in blood pressure among the three different intervention groups: the combination of basil leaves and Belimbing Wuluh leaves, the basil leaves intervention group, and the Belimbing Wuluh leaves intervention group (p=0.0133).

**Conclusions :**
Studies show that the combination of basil leaves and belimbing wuluh leaves is more effective in reducing blood pressure in hypertensive patients compared to using basil leaves or belimbing wuluh leaves separately at Lumpue Health Center and Lakessi Health Center in Parepare City.

**Key-words**: Hypertension, Effectiveness, Basil Leaves, Belimbing Wuluh Leaves, Blood Pressure

**Introduction** :

Hypertension is a cardiovascular disease with high mortality and morbidity rates. It ranks as the third leading cause of premature death globally. Often asymptomatic, it's dubbed the "silent killer" (Nadialista Kurniawan, 2021). According to the World Health Organization (WHO) in 2019, approximately 22% of the world's population suffers from hypertension, with Africa having the highest prevalence at 27% and Southeast Asia at 25% [1]. WHO predicts an 80% increase in hypertension cases by 2025, totaling 1.15 billion worldwide (WHO, 2019). In the United States, over 74.5 million adults aged 20 and older have hypertension, with its causes often unidentified in 90-95% of cases. Globally, hypertension contributes to about 8 million deaths annually, including 1.5 million in Southeast Asia alone, with a 1:3 patient ratio[2].

In Indonesia, the Basic Health Research of 2018 found a hypertension prevalence of 34.11% among adults over 18 (Siswanto et al., 2020). Hypertension significantly increases the risk of heart disease and is a major cause of premature death worldwide. In 2010, 31.1% of adults globally suffered from hypertension, with a higher prevalence among economically disadvantaged populations [3]. Chronic disease prevalence in Indonesia, including hypertension, continues to rise annually. The Ministry of Health's guidelines on controlling heart disease and vascular risk factors in 2019 define hypertension as a circulation disorder causing blood pressure above normal values (≥ 140/90 mmHg) [4].

Recent surveys highlight Indonesia's rising hypertension prevalence, now a leading non-communicable disease (NCD) contributing to mortality rates that have increased from 41.7% to 60% [5]. Hypertension prevalence is higher among women (36.9%) than men (31.3%), with urban areas slightly higher (34.4%) than rural (33.7%) (Hidayati, 2018). South Sulawesi's hypertension cases rose from 120,652 in 2022 to 155,933 in 2023 (Health Department of South Sulawesi, 2023). Parepare City recorded a hypertension prevalence of 0.94% in 2022, rising to 1.45% in 2023, with Puskesmas Lumpue having the highest prevalence at 25.04% and Lauleng the lowest at 2.71% [6].

Studies show 81% of hypertensive patients suffer poor quality of life [3]. Direct medical costs range from Rp142,516.00 to Rp927,207.00 due to medication expenses [4]. Non-pharmacological therapies, like herbal remedies, gain attention for their potential benefits in managing hypertension and avoiding pharmacological side effects [7].

Belimbing wuluh and basil leaves offer promising alternatives for hypertension management due to their natural compounds such as potassium, saponins, and flavonoids (Brina, 2018; Yentisukma, 2018). Basil leaves, rich in flavonoids and magnesium, act as antioxidants, dilating blood vessels and improving circulation [8]. Combining these herbs into infusions or juices, possibly with added honey, has shown significant blood pressure reduction benefits in hypertensive patients [9].

As hypertension poses a significant health and economic burden, particularly among prolanis groups with specific risk factors, further research comparing the effectiveness of these herbal therapies is crucial [10]. Puskesmas play a vital role in implementing hypertension prevention and management programs, contributing to public health initiatives and reducing NCD complications through early detection and screening [11].

**Objectives :**

The research aims to evaluate the combined effect of belimbing wuluh and basil leaves on blood pressure among Prolanis groups in Parepare City's Lumpue and Lakessi primary health centers. It includes assessing respondent characteristics and comparing blood pressure changes before and after treatment with belimbing wuluh, basil, and a control group.

**Methodology**:

Study Design

This study is an Experimental research, specifically a Quasi Experiment with a randomized control group pretest-posttest design, to determine the effectiveness of Belimbing Wuluh and basil leaf decoctions in reducing blood pressure among the Prolanis group in the working areas of Lumpue and Lakessi Community Health Centers (Puskesmas).

Population and Sample

The population in this study consists of all hypertensive patients who are members of the Prolanis group in the working areas of Lumpue and Lakessi Community Health Centers in Parepare City, from January 2023 to December 2023, totaling 120 individuals. Involving 48 respondents divided into three groups: combination intervention, belimbing wuluh leaves intervention, and basil leaves intervention. The study was conducted at Puskesmas Lumpue and Puskesmas Lakessi in Parepare City. The sampling technique is using Simple Random Sampling.

Research Variable

The dependent variable is blood pressure, while the independent variables include basil leaves and belimbing wuluh leaves.

Data Collection

Primary data are obtained directly from the original source through instruments such as questionnaires. These instruments include demographic information and other primary data, such as blood pressure measurements before and after intervention using a sphygmomanometer, conducted by health personnel alongside researchers. Secondary data, on the other hand, are indirectly obtained through intermediaries or from sources like Riskesdas, the Parepare City Health Office, Lumpue and Lakessi Community Health Centers.

Data Analysis

Univariate analysis describes each research variable's characteristics and distributions, presented as percentages. Normality tests precede ANOVA and Friedman tests for intervention, comparator I (belimbing wuluh), and comparator II (basil) groups.

Ethical Approval

The research adheres to research ethics principles to prevent potential risks and harm to respondents, ensuring their willingness to participate. This study has been registered with the Research Ethics Committee of the Faculty of Public Health, Hasanuddin University, with Registration Number: 4630/UN4.14.1/TP.01.02/2023.

**Results**:

Based on Table 1, this study shows changes in blood pressure (∆BP) in the main intervention group based on various characteristics. In the age group under 60 years, there was a significant decrease in blood pressure of 14.1 mmHg (p=0.0013), while in the age group over 60 years, the decrease of 11 mmHg was not significant (p=0.0605). Body mass index (BMI) showed a significant decrease in the normal BMI group of 18.3 mmHg (p=0.0022), while in the obese group, the decrease of 19.5 mmHg was not significant (p=0.0679). Family history showed a significant decrease of 19.4 mmHg in those with a family history (p=0.0000) and a non-significant decrease of 17.6 mmHg in those without a family history (p=0.1088). Duration of illness ≥5 years showed a significant decrease of 20.1 mmHg (p=0.0033), while ≤5 years showed a decrease of 16.6 mmHg (p=0.0394). Education showed a significant decrease in the high school education group of 19.2 mmHg (p=0.0112) and in the low education group of 18.9 mmHg (p=0.0001). The p-values in the last column indicate no significant differences between groups within each category.

The data in Table 2 show the results of variable tests within Intervention Group I before and after treatment, consisting of 16 participants, with blood pressure (BP) measurements taken before and after intervention. The results indicate that in the age group under 60 years, there was a significant average BP reduction of 14.1 mmHg with a p-value of 0.0044, whereas in the over 60 age group, the average BP reduction of 11 mmHg was not significant with a p-value of 0.0605. In the BMI category, participants with normal BMI showed a significant average BP reduction of 14.3 mmHg (p = 0.0269), while those who were obese experienced a reduction of 12.4 mmHg (p = 0.0218). Participants with a family history of hypertension showed a BP reduction of 12.4 mmHg (p = 0.0071), whereas those without a family history experienced a reduction of 15.4 mmHg, though not significant (p = 0.1088). Duration of illness ≥5 years showed a BP reduction of 15.4 mmHg (p = 0.0000), whereas ≤5 years did not show a significant reduction (p = 0.7150). Participants with high school education showed a BP reduction of 12.7 mmHg (p = 0.0054), and those with lower education levels experienced a reduction of 14.2 mmHg (p = 0.0034). The presented p-values between groups indicate no significant differences among subgroups for all variables tested.

The data in Table 3 shows the results of variable tests within intervention group II before and after treatment, evaluating parameters such as age, BMI, family history, duration of illness, and education. The results indicate significant differences in the <60 years age group with a mean decrease in ∆BP of 12.2 (p=0.0000), while the >60 years age group showed a larger decrease of 14.5 (p=0.0114). For BMI, the normal BMI group showed a significant decrease of 12.7 (p=0.0076), whereas the obese group showed a similar decrease of 12.7 (p=0.0176). A positive family history showed a ∆BP decrease of 12.1 (p=0.0022), whereas the group without family history showed a decrease of 14.5 (p=0.0679). Duration of illness ≥5 years showed a ∆BP decrease of 11 (p=0.0340), while ≤5 years showed a decrease of 13.1 (p=0.0000). Higher education showed a significant ∆BP decrease of 13.5 (p=0.0000), whereas lower education showed a decrease of 10.9 (p=0.0328). These results indicate that these factors have varying impacts on ∆BP changes within intervention group II after treatment.

The data analysis from Figure 1 reveals significant blood pressure reductions across all stages from pre-test to post-test 7 in the main intervention group, Comparator I,

and Comparator II. Each group showed a steady decrease in blood pressure, supported by statistical significance (p = 0.0000), indicating effective interventions with either basil and starfruit leaf combination or individual treatments.

Table 4 presents the analysis of mean differences in blood pressure changes among the Main Intervention Group, Comparator I, and Comparator II. The Main Intervention Group, consisting of 16 participants, had a sum of ranks of 519.00 with a corresponding p-value of 0.0133, indicating a significant difference in blood pressure changes compared to the other groups. Comparator Intervention Group I and Comparator Intervention Group II had sum of ranks of 365.50 and 291.50, respectively, but specific p-values are not provided. This suggests that the Main Intervention Group experienced a more significant change in blood pressure compared to both Comparator Groups, highlighting the effectiveness of the main intervention in reducing blood pressure. The Kruskal-Wallis test yielded p=0.0133, indicating a significant difference in blood pressure changes among the three intervention groups. Post-hoc Tukey test is recommended to determine the most effective intervention in blood pressure reduction, given the normal data distribution and significant Kruskal-Wallis results.

The Tukey test in Table 6 reveals significant differences among the groups regarding blood pressure reduction. The Main Intervention Group significantly outperformed Comparator II (p = 0.009), but showed no significant difference compared to Comparator I (p = 0.157). There was also no significant difference between Comparator II and Comparator I (p = 0.441). Thus, the Main Intervention Group is more effective in lowering blood pressure compared to the comparators.

**Tables and Figures:**

**Table 1. Average Blood Pressure Differences Based on Respondent Characteristics in the Main Intervention Group Before and After Treatment at Lumpue Health Center and Lakessi Health Center, Parepare City, 2024**

| Variable | Main Intervention Group | | | | ΔBP | P-Value | P-Value |
|---|---|---|---|---|---|---|---|
| | Before | | After | | | | |
| | n(16) | Mean | n(16) | Mean | | | |
| **Age** | | | | | | | |
| <60 years | 11 | 151.9 | 11 | 137.8 | 14.1 | 0.0013 | 0.3501 |
| >60 years | 5 | 144.6 | 5 | 133.6 | 11 | 0.0605 | |
| **BMI** | | | | | | | |
| Normal | 12 | 147.1 | 12 | 128.2 | 18.3 | 0.0022 | 0.8719 |
| Obesity | 4 | 144.7 | 4 | 125.2 | 19.5 | 0.0679 | |
| **Family History** | | | | | | | |
| Yes | 13 | 146.7 | 13 | 127.3 | 19.4 | 0.0000 | 0.6677 |
| No | 3 | 145.6 | 3 | 128.0 | 17.6 | 0.1088 | |
| **Duration of Illness** | | | | | | | |
| ≥5 years | 11 | 146.1 | 11 | 126.0 | 20.1 | 0.0033 | 0.2790 |
| ≤5 years | 5 | 147.4 | 5 | 130.8 | 16.6 | 0.0394 | |
| **Education** | | | | | | | |
| High School | 8 | 147.8 | 8 | 128.6 | 19.2 | 0.0112 | 0.9047 |
| Low Education | 8 | 145.2 | 8 | 126.3 | 18.9 | 0.0001 | |

**Table 2. Average Blood Pressure Differences Based on Respondent Characteristics in Comparison Intervention Group I Before and After Treatment at Lumpue Health Center and Lakessi Health Center, Parepare City, 2024**

| Variable | Intervention Group I | | | | ΔBP | P-Value | P-Value |
|---|---|---|---|---|---|---|---|
| | Before | | After | | | | |
| | n(16) | Mean | n(16) | Mean | | | |
| **Age** | | | | | | | |
| <60 years | 11 | 151.9 | 11 | 137.8 | 14.1 | 0.0044 | |
| >60 years | 5 | 144.6 | 5 | 133.6 | 11 | 0.0605 | 0.8040 |
| **BMI** | | | | | | | |
| Normal | 6 | 152.3 | 6 | 138.0 | 14.3 | 0.0269 | |
| Obesity | 10 | 148.0 | 10 | 135.6 | 12.4 | 0.0218 | 0.7235 |
| **Family History** | | | | | | | |
| Yes | 13 | 148.1 | 13 | 135.5 | 12.4 | 0.0071 | |
| No | 3 | 156.0 | 3 | 140.6 | 15.4 | 0.1088 | 0.6882 |
| **Duration of Illness** | | | | | | | |
| ≥5 years | 12 | 149.2 | 12 | 133.8 | 15.4 | 0.0000 | 0.1174 |
| ≤5 years | 4 | 150.7 | 5 | 144.5 | 6.2 | 0.7150 | |
| **Education** | | | | | | | |
| High School | 11 | 152.0 | 11 | 139.3 | 12.7 | 0.0054 | 0.5693 |
| Low Education | 5 | 144.4 | 5 | 130.2 | 14.2 | 0.0034 | |

**Table 3. Average Blood Pressure Differences Based on Respondent Characteristics in Comparison Intervention Group II Before and After Treatment at Lumpue Health Center and Lakessi Health Center, Parepare City, 2024**

| Variable | Intervention Group II | | | | ΔBP | P-Value | P-Value |
|---|---|---|---|---|---|---|---|
| | Before | | After | | | | |
| | n(16) | Mean | n(16) | Mean | | | |
| **Age** | | | | | | | |
| <60 years | 12 | 147.4 | 12 | 135.2 | 12.2 | 0.0000 | 0.4512 |
| >60 years | 4 | 151.0 | 4 | 136.5 | 14.5 | 0.0114 | |
| **BMI** | | | | | | | |
| Normal | 9 | 148.7 | 9 | 136.0 | 12.7 | 0.0076 | 0.9815 |
| Obesity | 7 | 147.7 | 7 | 135.0 | 12.7 | 0.0176 | |
| **Family History** | | | | | | | |
| Yes | 12 | 147.5 | 12 | 135.4 | 12.1 | 0.0022 | 0.4512 |
| No | 4 | 150.5 | 4 | 136.0 | 14.5 | 0.0679 | |
| **Duration of Illness** | | | | | | | |
| ≥5 years | 3 | 148.0 | 3 | 137.0 | 11 | 0.0340 | 0.5321 |
| ≤5 years | 13 | 148.3 | 13 | 135.2 | 13.1 | 0.0000 | |
| **Education** | | | | | | | |
| High School | 11 | 150.5 | 11 | 137.0 | 13.5 | 0.0000 | 0.3771 |
| Low Education | 5 | 143.4 | 5 | 132.4 | 10.9 | 0.0328 | |

**Figure 1. Mean Blood Pressure Reduction in the Main Intervention Group, Comparator Intervention I, and Comparator Intervention II**

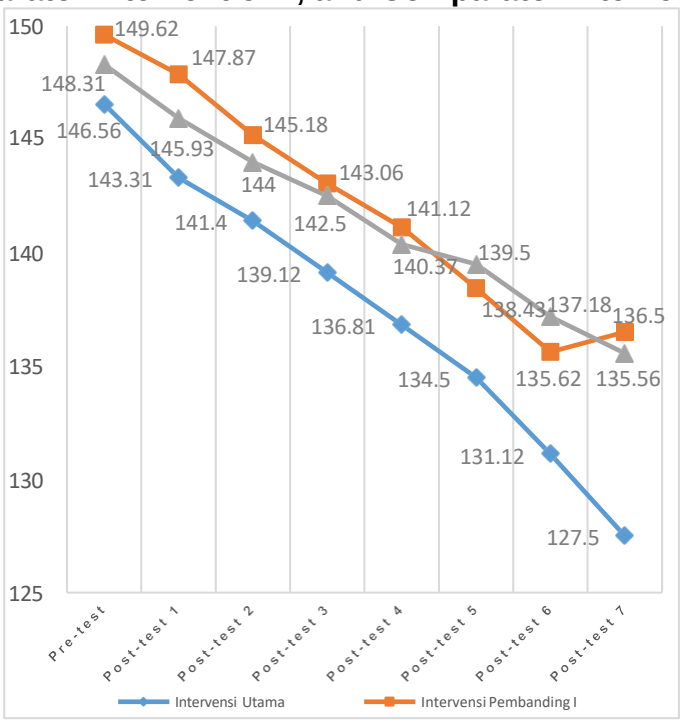


**Table 4. Analysis of Mean Differences in Blood Pressure Changes Between the Main Intervention Group, Comparator I, and Comparator II**

| Kelompok | *n* | *Sum of rank* | *p value* |
|---|---|---|---|
| Main Intervention Group | 16 | 519.00 | |
| Comparator Intervention Group I | 16 | 365.50 | 0.0133 |
| Comparator Intervention Group II | 16 | 291.50 | |

**Table 5. Tukey Test**

| Kelompok | *Std. Error* | *p value* |
|---|---|---|
| Comparator Intervention Group I vs Main Intervention Group | 2.029 | 0.157 |
| Comparator Intervention Group II vs Main Intervention Group | 2.029 | 0.009 |
| Comparator Intervention Group II vs Comparator Intervention Group I | 2.029 | 0.441 |

**Discussion :**

Based on the research findings, the intervention successfully reduced the number of respondents who initially had Stage 1 hypertension. Before the intervention, most respondents were in this category, but after the treatment, the majority shifted to the pre-hypertension category. This indicates that the intervention has a positive effect in lowering blood pressure levels among respondents who initially had high blood pressure.

Age

The majority of respondents in this study were aged ≥45-55 years. The relationship between age and hypertension highlighted that the risk tends to increase with age due to natural aging processes, arterial stiffness, and hormonal changes affecting blood pressure [1]. Blood vessels generally experience increased tension and stiffness with age, leading to higher blood pressure. Lifestyle factors such as unhealthy diets, lack of physical activity, and smoking exacerbate hypertension risks in older individuals. The finding that there was no difference in blood pressure before and after the intervention across age groups suggests that age did not influence the blood pressure reduction observed in this study's context [12].

Body Mass Index (BMI)

Body Mass Index (BMI) is a measure used to evaluate the proportion of a person's weight to their height. According to Table 5, 27.08% and 8.33% of respondents were categorized as having Obesity I and Obesity II, respectively. Excess body fat accumulation can lead to hormonal changes, increased insulin resistance, and chronic inflammation, all of which can affect vascular function [13]. High blood pressure in individuals with high BMI also increases the risk of heart disease and stroke. Therefore, maintaining a healthy BMI through a balanced diet and active lifestyle is crucial for preventing high blood pressure and promoting overall heart health [14]. The study found no difference in blood pressure before and after the intervention based on BMI.

Family history

Most respondents have a family history of hypertension (93.75%), indicating a higher risk due to genetic factors influencing blood pressure regulation and shared lifestyle habits [15]. However, Table 11 shows no significant blood pressure difference before and after the intervention based on family history ($p = 0.6667$). This contrasts with Ranasinghe et al.'s (2022) findings, which link family history to a 29% increased risk of hypertension [16]. Their research highlights significant prevalence among those with family history (29.3%) versus those without (24.4%), stressing the need for intensive risk assessment and management in individuals with familial hypertension for effective prevention and health outcomes [17].

Duration of Suffering

Based on the findings, 79.17% of the 48 respondents in this study had suffered from hypertension for more than 5 years (Table 5), indicating a significant history of long-term hypertension with heightened risks of cardiovascular complications [18]. This aligns with research suggesting prolonged hypertension increases the likelihood of serious conditions such as heart disease and stroke due to chronic high blood

pressure damaging blood vessels and organs over time [19]. However, Table 11 shows no significant blood pressure difference before and after the intervention based on duration of hypertension (p = 0.2790), contrasting with Charchar et al.'s (2024) findings linking longer hypertension duration to higher health risks [20]. Regular blood pressure monitoring and effective hypertension management remain crucial to mitigate these risks effectively [21].

Education Level

The majority of respondents have a low level of education, comprising 62.50% of the sample, as seen in Table 5. Education level can influence hypertension risk through various mechanisms [22]. Epidemiological studies suggest that individuals with lower education levels tend to have higher hypertension prevalence due to differences in understanding healthy lifestyles, access to proper healthcare, and ability to manage stress and other lifestyle factors [23]. Lower-educated individuals may engage more in unhealthy eating habits, lack physical activity, and smoke, all of which are hypertension risk factors. The lack of significant blood pressure differences pre- and post-treatment based on education level, indicated by a p-value of 0.9047 in Table 11, contrasts with Nugroho et al.'s findings (2021) emphasizing education's role in hypertension risk reduction through improved health literacy and lifestyle awareness [24].

Effectiveness of Blood Pressure Before and After Administration of Basil and Starfruit Leaf Combination Brew on Hypertensive Patients

The study findings demonstrate the effectiveness of basil and starfruit leaf infusion in reducing blood pressure among hypertensive patients (Anjaypati et al., 2023). The intervention group showed significant blood pressure reduction from day one through day seven [26]. All participants experienced substantial decreases in blood pressure from the first to the seventh day (100% response rate), with statistically significant results ($p=0.000$, $p<0.05$). This highlights the efficacy of the basil and starfruit leaf combination in managing high blood pressure [26]. Basil leaves contain antioxidants and anti-inflammatory compounds that relax blood vessels and improve circulation, while starfruit leaves contain flavonoids and tannins with diuretic and vasodilator effects, reducing blood volume and enhancing blood flow [27]. The study underscores their combined effectiveness in lowering systolic blood pressure, offering a potentially safer and more acceptable alternative to synthetic medications. Preparation involves boiling 2.5 grams each of starfruit and basil leaves in 200 ml of water for 10-15 minutes to make 150 ml, strained and consumed once daily [28]. This combination not only helps manage blood pressure but also provides additional cardiovascular health benefits [8].

The interventions with basil infusion (Comparative Intervention I) proved effective in consistently reducing blood pressure among pre-hypertensive groups. There was a significant decrease in blood pressure from the pre-test average of 149.62 mmHg to 136.50 mmHg in post-test 7, with a highly significant p-value ($p=0.0000$). This supports basil's effectiveness in managing blood pressure among pre-hypertensive individuals [9]. The results align with studies showing basil's efficacy in lowering blood pressure in elderly populations compared to avocado leaves (Alfiani et al., 2023). Similarly, starfruit leaf infusion (Comparative Intervention II) also showed a significant decrease in blood pressure from an initial average of 148.31 mmHg in the pre-test to 135.56 mmHg in post-test 7, with a highly significant p-value ($p=0.0000$). This

confirms the effectiveness of starfruit leaf infusion in consistently lowering blood pressure among pre-hypertensive groups [29].

In conclusion, both basil and starfruit leaf infusions, individually and in combination, effectively reduce blood pressure among hypertensive patients [30]. These natural remedies contain active compounds crucial for blood pressure reduction and overall cardiovascular health improvement. The findings support their potential as safe and accessible therapeutic options for managing hypertension. Further consultation with healthcare providers is advisable before adopting these herbal treatments alongside other medications [27].

The difference in effectiveness between basil leaf and starfruit leaf infusions in altering blood pressure.

Based on the results of the Kruskal-Wallis test with a p-value of 0.0133, there is a significant difference in blood pressure reduction among the three intervention groups (combination of basil leaf and starfruit leaf, basil leaf intervention group, and starfruit leaf intervention group) [30]. To assess which intervention is most effective in lowering blood pressure, further analysis using Tukey's test was conducted. The findings indicate that the Main Intervention group, which received the combination of basil leaf and starfruit leaf, had a greater impact on reducing blood pressure compared to the two comparison groups (basil leaf and starfruit leaf individually).

The Main Intervention group, receiving the combination of basil leaf and starfruit leaf, proved to be more effective in lowering blood pressure due to the synergistic active compounds present in both types of leaves [31]. Basil leaf is rich in flavonoids, magnesium, essential oils, tannins, and eugenol, collectively exerting effects that relax blood vessels, enhance blood flow, and reduce inflammation. Similarly, starfruit leaf contains magnesium, tannins, and flavonoids that also contribute to blood pressure regulation [32]. The combined action of these compounds in a single intervention showed more significant results in lowering blood pressure compared to using each leaf separately, as confirmed by statistical analysis with Tukey's test following the Kruskal-Wallis test. This suggests that the combination of these two natural ingredients could be a more effective choice for reducing blood pressure in the pre-hypertensive group in this study [33].

**Conclusion :**

Based on the conducted research, it can be concluded that factors such as age, Body Mass Index (BMI), family history, duration of hypertension, and education level influence the prevalence of hypertension, although there were no significant differences observed in blood pressure reduction based on these factors after the intervention. However, the study demonstrated that the combination decoction of belimbing wuluh and kemangi leaves is effective in lowering blood pressure among prehypertensive groups in the working areas of Lumpue and Lakessi Public Health Centers in Parepare City. These findings are supported by the synergistic effects of active compounds like flavonoids, magnesium, and tannins present in both types of leaves. Therefore, it is recommended that the community, especially those at risk of hypertension, consider using the combination of kemangi and belimbing wuluh decoction as a natural and effective alternative for managing blood pressure. It is important to consult healthcare professionals and adopt a healthy lifestyle approach to achieve optimal hypertension management.

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