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# Effectiveness of ginger infusion as a complementary therapy to reduce blood pressure in 3-month injectable contraceptive acceptors

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***Abstract:***
Women using three-month depot medroxyprogesterone acetate (DMPA) injectable contraception may be at risk of elevated blood pressure, yet simple non-pharmacological options are rarely used in community midwifery. This study aimed to examine the effectiveness of ginger infusion (*wedang jahe*) in reducing blood pressure among three-month injectable contraceptive acceptors. A one-group pretest–posttest pre-experimental study was conducted at an independent midwifery practice in Pasuruan City, Indonesia, from September to October 2025. Thirty-two acceptors with blood pressure ≥130/80 mmHg who were not taking antihypertensive medication were recruited by purposive sampling. Participants drank 4 g of fresh ginger steeped in 200 mL of warm water twice daily for seven consecutive days. Blood pressure was measured before and after the intervention and analyzed using a paired t-test. Mean systolic blood pressure decreased from 143.2 to 126.9 mmHg (−16.3 mmHg; 11.4%) and mean diastolic blood pressure from 91.3 to 81.8 mmHg (−9.5 mmHg; 10.4%), both $p < 0.001$. The proportion of participants with blood pressure below 140/90 mmHg rose from 12.5% to 62.5%. Ginger infusion was associated with a clinically meaningful short-term reduction in blood pressure and may serve as a low-cost adjunct within family planning services, pending confirmation in controlled trials.

***Keywords:***
complementary therapy; depot medroxyprogesterone acetate; ginger infusion; hypertension; midwifery

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## INTRODUCTION

Hypertension is the leading modifiable risk factor for cardiovascular disease, stroke, and premature death worldwide. The number of adults aged 30–79 years living with hypertension doubled between 1990 and 2019 to more than 1.2 billion, and a large proportion of them remain undiagnosed or uncontrolled, particularly in low- and middle-income countries (NCD Risk Factor Collaboration, 2021; Mills et al., 2020). Even modest reductions matter: every 10 mmHg fall in systolic blood pressure lowers the risk of major cardiovascular events by about one-fifth (Ettehad et al., 2016). Because hypertension often develops silently during the reproductive years, routine

Volume 02 Number 01 (May 2026)
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health contacts with women offer an important but frequently missed opportunity for early detection and prevention.

Family planning services are one such contact. Hormonal contraception has been linked to higher blood pressure, and a recent population-based survey in Indonesia found that women using oral contraceptives had greater odds of hypertension than non-users (Zakiyah et al., 2025). For progestin-only injectables such as depot medroxyprogesterone acetate (DMPA), the evidence is less consistent. A meta-analysis reported no overall effect of progestin-only methods on blood pressure (Glisic et al., 2018), whereas a prospective cohort found that systolic and diastolic blood pressure rose significantly over 12 months among DMPA users (Kantarama et al., 2024), and a cross-sectional study showed that diastolic blood pressure increased with longer duration of DMPA use (Shiferaw et al., 2021). Local Indonesian data have similarly reported increases in blood pressure among DMPA acceptors (Istiwardani et al., 2022). In community settings, these hormonal influences overlap with lifestyle and occupational determinants, such as high salt intake, physical workload, and limited screening, which are common among rural and agricultural populations in East Java (Afandi et al., 2026). Women who receive three-month injections therefore represent a practical target group for blood pressure monitoring and low-risk preventive interventions.

Non-pharmacological strategies are recommended as the first step for people with elevated blood pressure or grade 1 hypertension (Unger et al., 2020). Among dietary approaches, ginger (Zingiber officinale Roscoe) has attracted attention for being inexpensive, widely available, and culturally familiar. Ginger contains bioactive compounds, mainly gingerols, shogaols, and paradols, with antioxidant and anti-inflammatory properties (Mao et al., 2019). Experimental studies indicate that ginger lowers blood pressure by blocking voltage-dependent calcium channels in vascular smooth muscle (Ghayur & Gilani, 2005) and inhibits angiotensin-I converting enzyme activity (Akinyemi et al., 2013). At the clinical level, a meta-analysis of six randomized trials (345 participants) found that ginger supplementation reduced systolic blood pressure by 6.36 mmHg and diastolic blood pressure by 2.12 mmHg, with clearer effects in adults aged ≤50 years, at doses ≥3 g/day, and in trials lasting ≤8 weeks (Hadi et al., 2019). A broad systematic review of 109 randomized trials also concluded that ginger is generally safe and well tolerated (Anh et al., 2020).

Despite this evidence, important gaps remain. Most clinical studies have evaluated ginger powder, capsules, or extracts in older adults or people with metabolic disorders (Hadi et al., 2019; Pariwat et al., 2022), while Indonesian studies have examined other populations, such as postpartum women (Luthfiyah et al., 2023). Consequently, evidence remains limited regarding the use of ginger among women using DMPA, particularly in the form of *wedang jahe*, a traditional warm ginger infusion commonly consumed in Indonesian households. This distinction is important because the effects reported for standardized supplements may not be directly transferable to household preparations, which can vary in ginger concentration and preparation methods.

Independent midwifery practices (*Praktik Mandiri Bidan*, PMB) provide an appropriate community-based setting for exploring this approach, as they deliver injectable contraceptive services and maintain regular contact with acceptors every three months. These routine visits create opportunities for blood pressure assessment, health education, and counseling on complementary dietary approaches. Evaluating ginger infusion in this setting may provide preliminary evidence to inform midwifery practice, while maintaining routine blood pressure monitoring and referral in

Volume 02 Number 01 (May 2026)
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accordance with clinical guidelines. Therefore, this study aimed to examine changes in systolic and diastolic blood pressure following ginger infusion among acceptors of three-month injectable contraception at an independent midwifery practice in Pasuruan City, Indonesia.

## METHODS

This study used a pre-experimental, one-group pretest–posttest design, in which blood pressure was measured in the same participants before and after the intervention without a comparison group. The design was selected to provide preliminary evidence on the effect of ginger infusion in a routine community midwifery setting. Reporting followed the Transparent Reporting of Evaluations with Nonrandomized Designs (TREND) statement (Des Jarlais et al., 2004).

The study was conducted at PMB Khusnul Khotimah, an independent midwifery practice in Pasuruan City, East Java, Indonesia, from September to October 2025. The target population comprised women receiving three-month DMPA injectable contraception at the practice. Participants were selected by purposive sampling. Inclusion criteria were: (1) current use of three-month injectable contraception; (2) blood pressure ≥130/80 mmHg at screening; (3) not taking antihypertensive medication; and (4) willingness to complete the seven-day intervention. Exclusion criteria were a history of kidney disease, diabetes mellitus, or heart disease, and failure to complete the intervention. A total of 32 acceptors were enrolled and analyzed. A sensitivity power analysis indicated that with 32 participants, a two-tailed paired t-test at $\alpha = 0.05$ had 80% power to detect a within-subject effect size (dz) of 0.51 or larger, corresponding to a medium effect (Faul et al., 2007; Lakens, 2013).

The intervention consisted of ginger infusion (*wedang jahe*), prepared by steeping 4 g of fresh ginger rhizome in 200 mL of warm water. Participants drank one serving twice daily, in the morning and in the evening, for seven consecutive days (8 g of fresh ginger per day). Participants were asked to maintain their usual diet and physical activity and not to use other herbal products during the study period. Daily consumption was recorded on an observation sheet and checked by the researcher.

The primary outcomes were systolic and diastolic blood pressure, measured with a digital sphygmomanometer before the first serving (pretest) and after completion of the seven-day intervention (posttest). Measurements were taken with the participant seated after at least five minutes of rest, with the arm supported at heart level and the same device used for each participant, in line with recommended practice (Muntner et al., 2019). Blood pressure was categorized according to the International Society of Hypertension guideline as normal to high-normal (<140/90 mmHg), mild or grade 1 hypertension (140–159/90–99 mmHg), and moderate or grade 2 hypertension (160–179/100–109 mmHg) (Unger et al., 2020). Demographic data (age and duration of injectable contraceptive use) were collected with a structured questionnaire. The questionnaire and observation sheet were tested for validity and reliability ($r > 0.70$) before use.

Participant characteristics and blood pressure categories were summarized as frequencies and percentages, and blood pressure values as means. Normality of the paired differences was checked with the Shapiro–Wilk test. Differences between pretest and posttest mean blood pressure were analyzed with a paired t-test, with statistical significance set at $p < 0.05$. The mean difference and

Volume 02 Number 01 (May 2026)
e-ISSN: 3164-8835; p-ISSN: 3164-8827

relative change (%) were calculated to describe the magnitude of the effect. Permission to collect data was granted by PMB Khusnul Khotimah. All participants received written and verbal information about the study and provided written informed consent. Participation was voluntary; participants could withdraw at any time without affecting their contraceptive care, and data were kept confidential and analyzed anonymously.

## RESULTS

All 32 participants completed the seven-day intervention and were included in the analysis. As shown in Table 1, most participants were aged 35–45 years (62.5%), and more than half had used injectable contraception for at least three years (56.3%).

Table 1. Characteristics of participants (n = 32)

| Characteristic | Frequency (n) | Percentage (%) |
|---|---|---|
| Age | | |
| 35–45 years | 20 | 62.5 |
| >45 years | 12 | 37.5 |
| Duration of injectable contraceptive use | | |
| <3 years | 14 | 43.7 |
| ≥3 years | 18 | 56.3 |

Before the intervention, most participants were classified as having mild hypertension (56.2%), while 31.3% had moderate hypertension. Following seven days of ginger infusion, the proportion classified as having normal-to-high-normal blood pressure increased from 12.5% to 62.5%, while the proportion with moderate hypertension decreased from 31.3% to 9.4% (Table 2).

Table 2. Blood pressure categories before and after the intervention (n = 32)

| Blood pressure category | Before intervention, n (%) | After intervention, n (%) |
|---|---|---|
| Normal to high-normal (<140/90 mmHg) | 4 (12.5%) | 20 (62.5%) |
| Mild hypertension (140–159/90–99 mmHg) | 18 (56.2%) | 9 (28.1%) |
| Moderate hypertension (160–179/100–109 mmHg) | 10 (31.3%) | 3 (9.4%) |

*Categories based on the 2020 International Society of Hypertension guideline (Unger et al., 2020)

Mean systolic blood pressure decreased from 143.2 mmHg before the intervention to 126.9 mmHg afterward, representing a mean reduction of 16.3 mmHg. Mean diastolic blood pressure also decreased from 91.3 to 81.8 mmHg, representing a reduction of 9.5 mmHg. Paired t-test results indicated statistically significant differences in both systolic and diastolic blood pressure measurements before and after the intervention (both $p < 0.001$; Table 3).

Volume 02 Number 01 (May 2026)
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Table 3. Mean blood pressure before and after the intervention (n = 32)

| Blood pressure | Before intervention (mmHg) | After intervention (mmHg) | p-value[a] |
|---|---|---|---|
| Systolic | 143.2 | 126.9 | <0.001 |
| Diastolic | 91.3 | 81.8 | <0.001 |

[a]Paired t-test

Table 4 summarizes the magnitude of the observed changes. Systolic and diastolic blood pressure decreased by 11.4% and 10.4% relative to their respective baseline means. The number of participants with blood pressure below 140/90 mmHg increased from 4 (12.5%) before the intervention to 20 (62.5%) afterward, representing an absolute increase of 50.0 percentage points. Meanwhile, the number of participants classified as having moderate hypertension decreased from 10 (31.3%) to 3 (9.4%), an absolute reduction of 21.9 percentage points.

Table 4. Magnitude of blood pressure change after seven days of ginger infusion (n = 32)

| Outcome | Before | After | Change |
|---|---|---|---|
| Systolic blood pressure, mean (mmHg) | 143.2 | 126.9 | −16.3 (−11.4%) |
| Diastolic blood pressure, mean (mmHg) | 91.3 | 81.8 | −9.5 (−10.4%) |
| Blood pressure <140/90 mmHg, n (%) | 4 (12.5) | 20 (62.5) | +16 (+50.0 pp) |
| Moderate hypertension, n (%) | 10 (31.3) | 3 (9.4) | −7 (−21.9 pp) |

*Change = after − before; percentages in brackets for blood pressure values are relative change from baseline. pp = percentage points.

## DISCUSSION

This study found that drinking ginger infusion twice daily for seven days was associated with a significant reduction in blood pressure among women using three-month injectable contraception. Mean systolic blood pressure fell by 16.3 mmHg and mean diastolic blood pressure by 9.5 mmHg, and the proportion of women with blood pressure below 140/90 mmHg increased from one in eight to almost two in three. These results suggest that a simple, home-prepared ginger drink may help control blood pressure in this group.

The direction of the effect is consistent with earlier clinical evidence. In a meta-analysis of randomized trials, ginger reduced systolic blood pressure by 6.36 mmHg and diastolic blood pressure by 2.12 mmHg, and the effect was stronger in adults aged 50 years or younger and at doses of at least 3 g/day (Hadi et al., 2019). Our participants were women of reproductive age who consumed about 8 g of fresh ginger daily, which fits the subgroup in which ginger appeared most effective. Studies of red ginger among postpartum women with hypertension in Indonesia also reported reductions in blood pressure (Luthfiyah et al., 2023). However, the reduction observed here was larger than the pooled estimates from controlled trials. This difference is not surprising, because single-group studies usually show larger changes than randomized trials, and participants in this study started with relatively high blood pressure.

Several biological mechanisms may explain the findings. Gingerols and shogaols, the main pungent compounds in ginger, have antioxidant and anti-inflammatory properties that may protect the vascular endothelium (Mao et al., 2019). Ginger extract relaxes vascular smooth muscle by

Volume 02 Number 01 (May 2026)
e-ISSN: 3164-8835; p-ISSN: 3164-8827

blocking voltage-dependent calcium channels, an action similar to that of calcium channel blockers (Ghayur & Gilani, 2005). Aqueous ginger extracts have also been shown to inhibit angiotensin-I converting enzyme and lipid peroxidation in vitro (Akinyemi et al., 2013). Because *wedang jahe* is a water-based infusion, it likely contains water-soluble phenolic compounds that act through these pathways. Together, these mechanisms provide a plausible basis for a short-term fall in peripheral vascular resistance.

Beyond its potential vascular effects, ginger infusion offers a practical means of integrating traditional dietary practices into community-based health promotion. The preparation of *wedang jahe* uses a familiar household ingredient and requires relatively simple preparation, making it potentially accessible to women in rural communities. However, the biological activity of a homemade infusion may vary depending on the ginger variety, preparation method, water temperature, and the concentration of active compounds. Although ginger contains bioactive constituents with potential cardiovascular effects (Mao et al., 2019), the actual concentration delivered through a fresh ginger infusion cannot be assumed to be equivalent to that of standardized ginger extracts used in experimental studies. Therefore, future research should characterize the preparation and active compound content of ginger infusion to improve the reproducibility of interventions and facilitate comparisons across studies.

The relevance of these mechanisms for DMPA users deserves careful interpretation. The link between progestin-only contraception and blood pressure remains uncertain. A meta-analysis found no overall effect on blood pressure (Glisic et al., 2018), whereas cohort and cross-sectional studies reported rising blood pressure over time and higher diastolic pressure with longer use (Kantarama et al., 2024; Shiferaw et al., 2021). In our sample, more than half of the participants had used injections for at least three years, and most were aged 35–45 years, an age at which arterial stiffness and the prevalence of hypertension increase (Mills et al., 2020). Local findings likewise show higher blood pressure among DMPA acceptors, although not always a clear relationship with duration of use (Istiwardani et al., 2022). The present study was not designed to test whether ginger counteracts any hormonal effect; rather, it shows that women with elevated blood pressure in this population responded to a low-risk dietary intervention.

The size of the change should also be interpreted with caution. Participants were selected because their blood pressure was elevated, so part of the decline may reflect regression to the mean, in which extreme values tend to move closer to the average on repeated measurement (Barnett et al., 2005). Blood pressure is also sensitive to measurement conditions, including anxiety, rest duration, and familiarity with the procedure (Muntner et al., 2019). Participation in a study may also encourage healthier behaviors, such as reducing salt intake or resting more. A randomized trial in older hypertensive women illustrates this point: systolic blood pressure fell in both the ginger and control groups (Pariwat et al., 2022). The true effect of ginger infusion is therefore probably smaller than the 16-mmHg observed here, and the findings should be regarded as preliminary.

Even so, the results have practical meaning. A 10-mmHg reduction in systolic blood pressure has been associated with about 20% fewer major cardiovascular events (Ettehad et al., 2016). The shift of 16 women into the normal-to-high-normal category also suggests that the response was not confined to a few individuals. If even part of the observed change is attributable to ginger, the intervention could be added to lifestyle measures recommended for people with elevated blood

Volume 02 Number 01 (May 2026)
e-ISSN: 3164-8835; p-ISSN: 3164-8827

pressure (Unger et al., 2020). Ginger is generally well tolerated, and adverse events reported in clinical trials have been mostly mild and gastrointestinal (Anh et al., 2020). Ginger infusion is also cheap, easy to prepare at home, and familiar to Indonesian families, which may support adherence.

For midwifery and community nursing practice, the findings support a stronger role for family planning visits in cardiovascular prevention. Midwives in independent practices meet DMPA acceptors every three months and can measure blood pressure at each visit, provide counseling on diet and physical activity, and suggest ginger infusion as a complementary option. Adding this advice to existing contraceptive counseling requires little extra time or cost. This approach is consistent with community-based nursing models that use locally available agricultural products to promote health (Kurniyawan et al., 2026) and that address the lifestyle and occupational determinants of hypertension in rural communities (Afandi et al., 2026). Ginger should complement, not replace, standard care. Women whose blood pressure remains at or above 140/90 mmHg should be referred for medical assessment and advised on contraceptive options that are appropriate for their cardiovascular risk.

An important clinical consideration is that elevated blood pressure among DMPA users should be managed through comprehensive cardiovascular assessment rather than relying on complementary interventions alone. Blood pressure monitoring during routine contraceptive visits provides an opportunity to identify persistent elevation, assess other cardiovascular risk factors, and determine whether further medical evaluation is needed. Although ginger infusion may be considered as a complementary dietary practice, its use should not delay referral, antihypertensive treatment, or reassessment of contraceptive suitability when clinically indicated. This is particularly important because the cardiovascular implications of progestin-only contraception remain a subject of ongoing discussion (Glisic et al., 2018; Kantarama et al., 2024; Shiferaw et al., 2021). Accordingly, ginger infusion should be positioned within an integrated approach that combines blood pressure monitoring, lifestyle modification, and appropriate clinical management rather than as an alternative to established hypertension care (Unger et al., 2020).

This study has several limitations. First, the one-group pretest–posttest design without a control group does not allow causal conclusions, and the changes may partly reflect regression to the mean, measurement effects, or behavior change. Second, the sample was small and recruited through purposive sampling from a single practice, which limits generalizability. Third, blood pressure was measured only once before and once after the intervention, and no follow-up was conducted to examine whether the effect persisted after participants stopped drinking ginger. Fourth, dietary salt intake, physical activity, stress, and sleep were not measured, and the ginger used was not standardized for its active compound content. Future studies should use randomized controlled designs with an appropriate comparison drink, larger and more diverse samples, standardized and repeated blood pressure measurements (for example, home or ambulatory monitoring), longer intervention and follow-up periods, and assessment of adherence and adverse events.

## CONCLUSION

Ginger infusion consumed twice daily for seven days was associated with a significant reduction in both systolic and diastolic blood pressure among three-month injectable contraceptive acceptors at PMB Khusnul Khotimah, Pasuruan City, with mean decreases of 16.3 mmHg and 9.5 mmHg, respectively, and a marked increase in the proportion of women with blood pressure below 140/90 mmHg. These findings indicate that ginger infusion is an effective, simple, and low-cost complementary option that midwives can offer alongside routine blood pressure monitoring in family planning services, though randomized controlled trials are needed to confirm its effects and long-term benefits.

## CONFLICT OF INTEREST

The authors declare no conflict of interest related to the research, authorship, or publication of this article.

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