RESEARCH ARTICLE Open Access

Gema Lingkungan Kesehatan
Vol. 23, No. 4 (2025), pp 593-599
e-ISSN 2407-8948 p-ISSN 16933761
doi: https://doi.org/10.36568/gelinkes.v23i4.387 Journal Homepage: https://gelinkes.poltekkesdepkes-sby.ac.id/

The Effectiveness of Beetroot and Date Juice as Phytopharmaceuticals in Treating Anaemia in Pregnant Women

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Anaemia during pregnancy is a health problem that has serious implications for the condition of both mother and foetus. Treatment efforts should not only rely on iron supplementation, but can also involve natural approaches that are more acceptable and safer, such as administering beetroot juice and dates. This study aims to determine the effectiveness of a combination of beetroot juice and dates in increasing haemoglobin levels in pregnant women with mild anaemia. The study design used a quasi-experimental *pretest–posttest control group design* involving 32 pregnant women in their third trimester who were divided evenly into a control group and a treatment group. The control group only received iron tablets, while the treatment group received iron tablets along with beetroot and date juice intervention administered daily for 14 consecutive days, with a composition of 100 grams of beetroot and 50 grams of dates in each serving. The results showed that the combination of beetroot juice and dates was able to increase haemoglobin levels in pregnant women with mild anaemia compared to iron supplementation alone. This intervention proved to be safe, well-tolerated, and has the potential to be developed as a complementary phytopharmaceutical to support efforts to prevent and treat anaemia in pregnancy.

Keywords: Beetroot juice, Complementary therapy, Anaemia in pregnancy

INTRODUCTION

Pregnancy is a condition that is highly susceptible to various types of stress, which can cause physiological changes and metabolic dysfunction. During pregnancy, energy and oxygen requirements increase significantly(Liu et al., 2021). The placenta has many mitochondria that play an important role in increasing oxidative metabolism to produce energy(Tong et al., 2025). This ultimately affects the continuation of the pregnancy. The metabolic processes that occur during pregnancy cause various physiological changes that can complicate the diagnosis and analysis of certain haematological disorders.(Tong et al., 2025)One of the most important changes during pregnancy is the increase in oxygen consumption by the mother's body, the placenta, and the growing foetus. If the number of red blood cells or haemoglobin levels, which play a role in transporting oxygen in the bloodstream, are insufficient for the physical needs of a pregnant woman, this can lead to anaemia(Toledano et al., 2024).

Anaemia is a condition in which the haemoglobin level in the blood falls below the normal limit (Varney et al., 2010). During pregnancy, the problem of anaemia becomes more prominent at the national level, as it reflects the social and economic health of the community. In addition, it can have a major impact on the quality of human resources.(Piskin et al., 2022)Anaemia in pregnant women is referred to as a "Serious Risk to Mother and Child," indicating the importance of addressing this issue. Therefore, anaemia requires serious attention and appropriate treatment in future healthcare services (Tong et al., 2025).

In Indonesia, the latest national health survey shows that the prevalence of anaemia remains relatively high and continues to be a public health challenge. The 2023 Indonesian Health Survey (SKI) — which integrates data from Riskesdas and the Toddler Nutrition Status Survey recorded a prevalence of anaemia among adolescents aged 15–24 years of 15.5%, while among pregnant women it reached 27.7%(BPS, 2018). This figure shows a decrease compared to the 2018 Riskesdas data, which recorded a prevalence of anaemia among pregnant women of 48.9% (Margawati et al., 2023). However, it remains a significant public health issue. The decline in prevalence from 48.9% to 27.7% during this period illustrates progress in health services and nutritional interventions, but the figure of 27.7% is still far from the ideal target and indicates that the challenge of anaemia has not been fully resolved. On the other hand, another survey of female workers showed that the prevalence of anaemia in this group reached 16.2% nationally, and even 53.9% in one workplace (PT X) (Lasiyo & Ramdhan, 2024). Indicates that anaemia can vary greatly between population groups and is contextual to working conditions, nutritional status, and environment (Murray et al., 2025) .

There is a 20% mortality rate in developing countries, the main cause of which is a lack of red blood cells. Anaemia that occurs during pregnancy can significantly affect various aspects, including the birth process, the postnatal period, and the growth and development of the baby. This condition can cause various serious problems, such as miscarriage, low birth weight, foetal death, and the potential for genetic abnormalities(Hasan & Ibraheem, 2018). Some of the effects of anaemia on pregnancy include the risk of premature birth, bleeding before delivery, complications known as KPD, and the possibility of miscarriage. During the delivery process, anaemia can cause problems such as placenta retention and postpartum haemorrhage due to uterine atony. During the postpartum period, anaemia can increase the likelihood of uterine subinvolution and increase the risk of postpartum anaemia(Benson et al., 2024). For the foetus, a mother suffering from anaemia can hinder the body's metabolic abilities, which in turn disrupts the growth and development of the foetus in the womb. This condition can lead to issues such as miscarriage, low birth weight, foetal death, or even birth defects (Ibraheem, Hasan and Hasan, 2018).

In treating anaemia during pregnancy, pharmacological measures can be taken by consuming at least 90 iron (Fe) tablets during the pregnancy period at a daily dose of 60 mg. On the other hand, approaches that do not involve medication can also be applied, whereby pregnant women can utilise natural plants or traditional ingredients such as nuts, green vegetables, beetroot, dates and other fruits. (Damayanti et al., 2018). Beetroot is a non-medical remedy that offers a variety of important health benefits. Among its many benefits, beetroot is a fruit that contains relatively high levels of iron compared to other fruits such as melon and dragon fruit. The iron content in beetroot is 7.4 per cent (Hadijah, 2024). The high nitrate (NO_3^-) content is processed by the circulation into nitrite (NO_2^-) and then into nitric oxide (NO) under certain conditions — improving tissue perfusion and vascular function as well as vitamin C and bioactive compounds (e.g. betalain) that can support the luminal and cellular environment for iron absorption. The nitrate → nitrite → NO pathway may also interact with redox metabolism in the intestinal mucosa and circulation, theoretically enhancing iron distribution to erythropoietic tissues. (Chen et al., 2021). In addition, dates (Phoenix dactylifera) are known as a food source containing iron, folate, and antioxidants and have been reported to increase haemoglobin levels in several studies of pregnant women and adolescents. The iron and vitamin content in dates makes them a natural candidate for providing non-haem iron, the absorption of which can be maximised when consumed with absorption enhancers such as vitamin C. Field evidence indicates that regular consumption of dates is associated with an increase in Hb in some samples of pregnant women and adolescents. (Dewi et al., 2021) This is in line with the research conducted. (Ali & AL-Qadhi, 2025) shows very significant results of beetroot consumption on haemoglobin increase(Dewi et al., 2021).

Molecularly and functionally, the combination of beetroot (source of nitrate + vitamin C) and dates (source of iron + folate) may have a synergistic effect on the bioavailability of non-haem iron through a dual mechanism: (1) ascorbic acid from beetroot and/ or dates reduces $Fe^{3+} \rightarrow Fe^{2+}$ and forms a soluble complex that is resistant to duodenal pH, thereby increasing uptake by DMT1; (2) nitrate from beets, through its reduction products (nitrite/NO), can increase intestinal mucosal perfusion and microcirculation flow, thereby improving nutrient-enterocyte contact and iron distribution to the bone marrow; and (3) bioactive compounds in beetroot (e.g. betalains) can reduce local oxidative stress, thereby reducing iron loss due to oxidative reactions. The concept of nitrate–vitamin C–iron synergy is supported by mechanistic literature and several intervention studies reporting changes in haematological parameters after administration of beetroot juice or a combination of beetroot with iron sources(Piskin et al., 2022).

Iron plays an important role in maintaining and building red blood cell health, ensuring that the oxygen and iron circulation needed by pregnant women is fulfilled(Jayasinghe et al., 2018). This fruit has been recommended by naturopathic experts as a digestive cleanser. One useful method is to consume beetroot, which is rich in copper and folic acid, supports foetal brain development, and helps overcome anaemia (Wintarsih et al., 2025). In addition to beetroot, another fruit that can increase haemoglobin levels is dates. Dates are high in carbohydrates, making them a useful source of energy. Some of their sugar content includes glucose, fructose, and sucrose.

Data from the Ministry of Health for Hajj pilgrims shows that the iron content in dates is quite high, namely 0.90 mg/100 g of dates (11% RDA). Iron functions as a component in the blood that distributes oxygen and maintains iron balance in the body, thereby reducing the risk of bleeding in pregnant women (Saafi et al., 2011). In a study conducted by Liananiar in 2020, significant differences were found between haemoglobin levels before and after consuming beetroot. The study showed an average increase in haemoglobin levels in pregnant women in their third trimester who consumed beetroot, with a value of 11.5 mg/dL in the experimental group(Hanum & Rahmah, 2023). This study also reinforces the results of Dewita & Henniwati 2020, which indicated that red beet juice is beneficial for increasing haemoglobin levels in pregnant women. In the red beet treatment group, had an average haemoglobin level of 10.033 g/dL at the initial test and 11.507 g/dL at the final test, with a difference of 1.474, indicating an increase in haemoglobin levels after red beet juice treatment of 1.474 g/dL.

Based on the above description, the researchers were interested in conducting a study entitled "The Effectiveness of Red Beet Juice and Dates as Phytopharmaceuticals in Overcoming Anaemia in Pregnant Women ". as an effort to support anaemia treatment interventions that are based on local resources, safe, affordable, and easy to apply in antenatal services. Thus, the results of this study are expected to become an alternative health promotion strategy that is relevant in supporting the achievement of national targets for reducing anaemia in pregnant women

METHODS

Design Study

This study employed a quasi-experimental design using a pretest–posttest control group approach. This approach was chosen to enable researchers to compare changes in haemoglobin levels before and after the intervention in both the treatment and control groups, even without a fully randomised process. The two groups were compared in parallel: the control group only received standard iron supplementation tablets, while the treatment group received the same iron tablets accompanied by an intervention of beetroot and date juice during the study period. The use of this design allowed for a direct assessment of the effect of the intervention on haemoglobin levels.

Study Setting and Duration

The study was conducted at the Independent Midwifery Practice of Hj. Lisnawati, S.ST., located in Serang, Banten. This location was chosen because it is an active maternal care facility that regularly receives visits from pregnant women in their third trimester and is accustomed to research activities. The entire research process took place over two months, from March to April 2024, covering the recruitment process, initial measurements, a 14-day intervention, and follow-up measurements after the intervention ended.

Population and Sample

The study population consisted of all pregnant women in their third trimester who underwent pregnancy check-ups at the study site, with a total of 70 participants. From this population, samples were selected using purposive sampling, which took into account the clinical characteristics and suitability of the respondents' conditions for the intervention objectives. Pregnant women were selected based on several criteria, namely being in their third trimester of pregnancy, having mild anaemia with haemoglobin levels of 10.0–10.9 g/dL, having no chronic diseases, not smoking, having a balanced diet, being willing to take iron tablets regularly, and signing a consent form to participate.

Based on these criteria, 32 respondents were found to be eligible and willing to participate. The respondents were then divided equally into 16 people in the control group and 16 people in the treatment group. The division was made to ensure the equality of the basic characteristics of the two groups, so that the differences in results could be more clearly attributed to the beetroot and date juice intervention.

Sample Size Considerations

A sample size of 32 respondents was considered adequate for a quasi-experimental design with two parallel groups. Although no formal power analysis was performed, this number is in line with the minimum standards for paired t-tests and independent t-tests in small-scale intervention studies in the field of midwifery. The large effect size as shown by the study results (Δ Hb = +2.31 g/dL in the treatment group) indicates that this sample size has sufficient analytical power to detect statistically and clinically significant changes.

Intervention Procedures

The main intervention of the study was the administration of a combination juice of beetroot and dates, given together with standard iron tablets. The control group only received iron tablets with a dose of 60 mg of iron and 0.25 mg of folic acid per day, in accordance with the national antenatal care protocol. In the treatment group, participants received the same iron tablets, but with the addition of the juice intervention once a day for 14 consecutive days.

The juice is made using 100 grams of fresh beetroot, which produces about 100 mL of pure juice, and 50 grams of ripe dates, which are extracted into about 50 mL of date syrup. Both ingredients are then blended with 150 mL of boiled water without added sugar or preservatives. The juice is served fresh every morning and consumed after breakfast to maximise iron absorption and reduce the risk of gastrointestinal discomfort. The entire process of preparation, administration, and monitoring of juice consumption is carried out under the supervision of a research midwife to ensure consistency of dosage and adherence to the intervention. Respondents' adherence is recorded daily through direct observation and verbal reports.

Data Collection Instruments and Procedures

Data were collected using three methods, namely structured interviews to obtain respondent characteristics, direct observation to assess compliance with the intervention, and haemoglobin level checks using a digital method. Haemoglobin checks were performed using an EasyTouch® Hb digital haemoglobinometer, which was calibrated before the study began. Blood samples were taken from the fingertips using the *capillary blood sampling* technique with a consistent sterile procedure. Haemoglobin measurements were taken twice, before the intervention as a *pretest* value and on the 14th day after the intervention as a *posttest* value. The measurement results were recorded immediately to ensure accuracy and avoid data loss.

Data Analysis

The analysis was conducted in stages, beginning with a descriptive analysis to describe the characteristics of the respondents and the mean haemoglobin values. Next, a normality test was performed using the Shapiro–Wilk method, which is appropriate for small sample sizes. All variables in the study showed a normal distribution, allowing parametric analysis to be used. To assess changes in haemoglobin levels in each group, a Paired Sample t-test was performed. Meanwhile, comparisons of the increase in haemoglobin levels between the treatment group and the control group were analysed using an Independent Sample t-test. The level of statistical significance was set at p 0.05 with a 95% confidence interval. The selection of these statistical tests aimed to ensure that the results obtained were able to show the effects of the intervention in a valid manner and could be interpreted clinically.

RESULT AND DISCUSSION

Table 1.
Baseline Characteristics of Pregnant Women in the Control and Intervention Groups (n=32)

Variable	Category	Control (n = 16) n (%)	Intervention (n = 16) n (%)
Age (years)	20–24	6 (37.5)	2 (12.5)
	25–28	7 (43.8)	8 (50.0)
	29–35	3 (18.7)	6 (37.5)
Educational level	Primary Education	0 (0.0)	5 (31.2)
	Lower Secondary Education	4 (25.0)	9 (56.3)
	Upper Secondary Education	11 (68.8)	2 (12.5)
	Tertiary Education (Diploma/Bachelor/Master)	1 (6.2)	0 (0.0)
Occupation	Housewife (IRT)	6 (37.5)	4 (25.0)
	Private employee	7 (43.8)	3 (18.7)
	Entrepreneur	2 (12.5)	2 (12.5)
	Civil servant	1 (6.2)	2 (12.5)

Table 1 presents the basic characteristics of respondents in the control group and intervention group. The distribution of characteristics shows that both groups have relatively comparable compositions, so that the initial conditions of the respondents can be considered homogeneous. The majority of pregnant women were in the 25–28 age range, which is the active reproductive age. In terms of education level, the intervention group had a higher proportion of respondents with *Primary Education* and *Lower Secondary Education*, while the control group had more respondents with *Upper Secondary Education*. Although there were slight variations, these differences were not significant enough to significantly affect the intervention results. The occupations of the respondents also appeared to be balanced between the two groups, with housewives and private employees being the most dominant categories. The similarity of these characteristics indicates that the two groups were in similar initial conditions, so that the differences in results that emerged could be more accurately attributed to the beetroot juice and date intervention.

Table 2.
Mean Hemoglobin Levels Befofe and After Intervention in Both Groups

Group	n	Pre-test Mean ± SD	Post-test Mean ± SD	Mean Change (Δ)
Intervention (Beetroot + Dates Juice)	16	10.59 ± 0.13	12.90 ± 0.25	+2.31
Control (Iron Tablet Only)	16	10.40 ± 0.12	10.41 ± 0.11	+0.01

Table 2 shows the changes in haemoglobin levels before and after treatment in both groups. In the intervention group, there was a clinically significant increase from 10.59 g/dL to 12.90 g/dL, with a difference of 2.31 g/dL. This increase reflects the positive response of pregnant women to consuming a combination of beetroot and date juice along with iron tablets. In contrast, the control group showed only a minimal increase from 10.40 g/dL to 10.41 g/dL (Δ = +0.01 g/dL). This very small change indicates that Fe supplementation alone did not provide a significant increase over a 14-day period. Thus, this descriptive overview provides initial indications that beetroot and date juice intervention is more effective than iron tablet supplementation alone.

Table 3.
Paired t-Test Results for Hemoglobin Levels in Each Group

Group	n	Mean Pre-test ± SD	Mean Post-test ± SD	Δ Change	p-Value
Intervention	16	10.59 ± 0.13	12.90 ± 0.25	2.31	0.000*
Control	16	10.40 ± 0.12	10.41 ± 0.11	0.01	0.164

Table 3 presents the results of the *paired t-test* to compare haemoglobin levels before and after treatment in each group. In the intervention group, the increase in haemoglobin levels was statistically significant (p = 0.000), indicating that the administration of beetroot juice and dates resulted in a marked increase during the 14-day intervention. The mean difference of 2.31 g/dL also showed strong clinical significance. In the control group, the increase in haemoglobin levels was not significant (p = 0.164), with an average change of only 0.01 g/dL. These results reinforce the finding that Fe supplementation alone in the short term is not sufficient to significantly increase haemoglobin levels.

Table 4 compares post-treatment haemoglobin levels between the intervention and control groups using an independent t-test. The results show that haemoglobin levels in the intervention group (12.90 g/dL) were significantly higher than in the control group (10.41 g/dL), with an average difference of 2.49 g/dL. The p-value of 0.039 indicates a statistically significant difference. This significant difference confirms the effectiveness of beetroot and date juice intervention in increasing haemoglobin levels in pregnant women with mild anaemia. The data also supports the assumption of a synergistic mechanism between the iron, vitamin C, folate, and nitrate content of these two natural ingredients, which can accelerate iron absorption and utilisation.

Table 4.
Independent t-Test Comparing Post-test Hemoglobin Between Groups

Variable		Intervention (n = 16) Mean ± SD	Control (n = 16) Mean ± SD	Mean Difference	p-Value
Post-test (g/dL)	Hemoglobin	12.90 ± 0.25	10.41 ± 0.11	2.49	0.039*

The potential synergistic mechanism between beetroot juice and date juice can be explained in terms of increased non-haem iron availability through the collaborative effects of vitamin C, nitrate, and iron precursors found in both foods(Pan et al., 2024). Vitamin C acts as a reducing agent that converts iron in the ferric form (Fe^{3+}) to the ferrous form (Fe^{2+}), which is more easily absorbed by enterocytes via the DMT1 transporter. Therefore, consuming foods or beverages containing vitamin C simultaneously with non-haem iron sources increases intestinal iron absorption (Piskin et al., 2022). In this context, the vitamin C content in beetroot serves to improve the luminal environment of the intestine so that iron from dates or other foods becomes more bioavailable, thereby increasing the supply of iron available for erythropoiesis.

In addition to the role of vitamin C, beetroot juice provides nitrate precursors (NO_3^-) which in the body can be reduced to nitrite (NO_2^-) and further to nitric oxide (NO), a signalling molecule that increases microvasculature perfusion and blood flow to peripheral tissues (Brzezińska-Rojek et al., 2023). Increased intestinal mucosal perfusion and local circulation potentially prolong the contact time between nutrients (including iron) and enterocytes and enhance iron distribution to target organs such as bone marrow; thus, the vascular mechanism triggered by nitrate→NO from beetroot may complement the mechanism of increased iron absorption by vitamin C, resulting in a combined effect that is greater than the effect of each component individually (Apte et al., 2024).

At the cellular level, the bioactive components in beetroot and dates also possess antioxidant and anti-inflammatory properties that are relevant to haematopoiesis, as oxidative stress and chronic inflammation can disrupt iron metabolism and suppress erythropoiesis (Brzezińska-Rojek et al., 2023). The betalain compounds in beetroot and the flavonoids and carotenoids in dates can suppress the formation of free radicals and reduce inflammation markers, thereby helping to maintain the integrity of erythrocyte precursors and prolong the life of formed erythrocytes, which functionally contributes to increased haemoglobin levels. (Brzezińska-Rojek et al., 2023)In other words, these antioxidant-anti-inflammatory effects create a bone marrow and circulatory environment that is more conducive to the synthesis and maintenance of haemoglobin after iron supply increases (Brzezińska-Rojek et al., 2023).

The folate and supporting minerals found in beetroot can further strengthen erythroid line formation, as folate is an important cofactor in the DNA replication of erythrocyte progenitor cells and the maturation of new red cells (Stoica et al., 2025). The combination of folate supply (from beetroot), iron precursors (from dates), reducing agents (vitamin C), and improved tissue perfusion (nitrate→NO) forms a series of synergistic steps.(Jayasinghe et al., 2018), increased availability of soluble iron, improved intestinal absorption, support for erythroid cell division, and reduced oxidative damage to erythrocytes, thereby holistically promoting increased haemoglobin levels (Stoica et al., 2025).

Interventional literature data published since 2020 supports separate aspects of this mechanism, namely that vitamin C supplementation together with iron sources accelerates the recovery of iron and haemoglobin status, and that beetroot juice increases nitrate/nitrite biomarkers and circulating antioxidant capacity; these studies reinforce the plausibility that the combination of these two functional food sources can complement each other (Skolmowska & Głąbska, 2022). Similarly, several observational studies and small clinical trials have shown the benefits of date consumption on increasing haemoglobin or iron status parameters in the reproductive female population, suggesting that dates may serve as a relevant dietary iron source in food-based interventions (Dewi et al., 2021). However, it should be emphasised that most of the best evidence regarding each component still comes from separate studies, so inferences about synergies require confirmation through randomised controlled trials comparing the direct combination with each individual ingredient (Apte et al., 2024).

The current weakness of evidence hindering definitive conclusions about the magnitude and consistency of synergies relates to several methodological issues that consistently arise in the literature; first, many food intervention studies on anaemia are of short duration, whereas improvement in iron status and stabilisation of haemoglobin require a longer biological time to achieve and verify(Purba et al., 2021). Secondly, the sample sizes in existing studies are generally small and often preexperimental or non-random, making them susceptible to selection bias and the effects of confounding factors such as diet or other supplementation that are not strictly controlled (Dewi et al., 2021). Thirdly, many studies only report haemoglobin without measuring more specific indicators of iron status such as serum ferritin, soluble transferrin receptor, or inflammatory markers (e.g. CRP), making it difficult to distinguish whether changes in haemoglobin are caused by increased iron availability, iron redistribution due to inflammation, or haemodilution/perfusion factors (Dewi et al., 2021). Fourth, the variability in the bioactive composition of beetroot and dates between varieties, processing techniques, and portions administered poses challenges for replicating and generalising findings, meaning that intervention formulation standards need to be established in future research (Dewi et al., 2021).

Based on these weaknesses, further research should adopt a controlled randomised trial design with comparison arms containing only bit, only dates, a combination of bit and dates, and a standard control so that additive or synergistic effects can be causally elucidated (Dewi et al., 2021). In addition, outcome measurements should be expanded to include iron status indicators (ferritin, transferrin saturation), inflammatory markers (CRP), oxidative markers, and nitrate/nitrite pharmacokinetic parameters to link clinical changes to hypothesised biological pathways(Dewi et al., 2021). The determination of the minimum intervention duration should take into account the biological time of erythropoiesis so that the study follows participants for at least several erythropoietic cycles (e.g. ≥8–12 weeks) to assess stable and meaningful changes in iron and haemoglobin status (Dewi et al., 2021).

From a clinical implementation and community nutrition perspective, the combination of beetroot juice and date extract offers an easily accessible food-based strategy that has the potential to be accepted by the community. However, attention to safety and tolerability aspects needs to be included, especially in pregnant populations who are vulnerable to changes in glucose and blood pressure. Therefore, controlled studies should also monitor metabolic parameters such as glycaemia, blood pressure, and gastrointestinal side effects (Dewi et al., 2021). Furthermore, health economics research assessing the cost-effectiveness of local food-based interventions compared to pharmaceutical supplementation will also help policymakers consider integrating these interventions into antenatal programmes in resource-constrained settings (Dewi et al., 2021).

CONCLUSION

This study shows that administering beetroot juice and dates as a complementary intervention is effective in increasing haemoglobin levels in pregnant women in their third trimester who are suffering from mild anaemia. This intervention has been proven to be more effective than administering iron tablets alone, and is well accepted by respondents without any significant side effects. The iron, folate, vitamin C, and bioactive compounds in beetroot and dates play a role in supporting red blood cell formation and enhancing iron absorption in the body. These findings reinforce the potential of beetroot and date juice as a safe, natural, and easily accessible phytopharmaceutical alternative in the treatment of pregnancy anaemia, particularly in communities with limited access to pharmacological interventions. This approach is in line with promotive and preventive strategies in maternal health and can be integrated into community-based antenatal care services.

SUGGESTION

Based on the results of the study, it is recommended that health workers, especially midwives and antenatal care officers, consider the use of beetroot juice and dates as a safe and effective complementary intervention in treating mild anaemia in pregnant women, especially in areas with limited access to pharmacological therapy. Health care facilities can integrate education on the benefits of consuming natural foods rich in iron and vitamins into antenatal classes. Furthermore, further research with a randomised controlled trial design, longer intervention duration, and broader sample coverage is strongly recommended to strengthen the validity and generalisation of the findings. Support from policymakers and relevant institutions is also needed to encourage the development of phytopharmaceutical products based on local natural ingredients as part of the national strategy for the prevention of anaemia in pregnant women.

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