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Uterine Involution and Hemoglobin Level Changes After Angkak Infusion in Postpartum Women

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Abstract

Background: Postpartum anemia and delayed uterine involution may hinder maternal recovery and increase postpartum morbidity. Angkak (*Monascus purpureus*-fermented red rice) contains iron, amino acids, antioxidants, and bioactive compounds that may support hemoglobin synthesis, erythropoiesis, and tissue repair. However, evidence regarding its use among postpartum mothers remains limited. Aim this study to assess changes in uterine involution and hemoglobin levels among postpartum mothers after consuming angkak infusion.

Methods: A quasi-experimental one-group pre–post study was conducted among 25 postpartum mothers. Participants consumed 3 g of angkak infused in 150 mL of warm water daily for 14 days. Fundal height was measured on postpartum days 1, 7, and 14, while hemoglobin levels were assessed on days 1 and 14. Data were analyzed using the Wilcoxon signed-rank test and paired sample t-test.

Result: Mean fundal height decreased from 16.84 cm on day 1 to 11.80 cm on day 7 and approximately 7–8 cm on day 14. Mean hemoglobin levels increased from 10.42 g/dL to 11.72 g/dL. Both changes were statistically significant. No adverse effects were reported during the intervention.

Conclusion: Daily angkak infusion for 14 days was associated with improved uterine involution and increased hemoglobin levels among postpartum mothers. However, due to the absence of a control group, causal conclusions cannot be established. Further controlled studies with larger samples are recommended.

Keywords: Angkak, Red Yeast Rice, Postpartum Mothers, Hemoglobin, Postpartum Anemia.

BACKGROUND

Postpartum anemia and delayed uterine involution are significant maternal health concerns that can impede recovery following childbirth. The prevalence of postpartum anemia remains elevated in many low- and middle-income countries, including Indonesia, where approximately 30% of postpartum women in certain regions experience anemia (1,2). Postpartum anemia is linked to fatigue, diminished physical performance, impaired immunity, reduced quality of life, and decreased breastfeeding success (3). In addition, delayed uterine involution may increase the risk of postpartum hemorrhage, infection, and extended recovery periods (4). As a result, interventions that facilitate both hematological recovery and normal uterine involution are essential components of postpartum care.

Uterine involution is a physiological process involving sustained uterine contractions and autolysis of hypertrophied uterine muscle fibers after delivery. This process is primarily regulated by oxytocin and hormonal changes following placental expulsion (5). Effective uterine muscle contraction requires adequate oxygen delivery. Therefore, anemia may indirectly contribute to delayed uterine involution by reducing oxygen transport to tissues, including the uterine musculature, which impairs contractile function and tissue recovery (6). Normal involution is typically assessed by the progressive reduction in fundal height, which generally decreases by approximately 1 to 2 cm per day during the early postpartum period.

A preliminary survey at TPMB D, Malang Regency, Indonesia, conducted between January and March 2025, found that 40% (24 of 60) of postpartum mothers experienced slower-than-expected uterine involution. Several participants also reported symptoms indicative of anemia, such as fatigue and weakness. Hemoglobin assessments among postpartum women identified one case of severe anemia, two cases of moderate anemia, and three cases of mild anemia. These results suggest that anemia and delayed uterine involution are persistent clinical concerns in the local postpartum population and merit further investigation.

Current approaches to improving postpartum hemoglobin levels primarily include iron supplementation and nutritional interventions. Recently, there has been increased interest in locally available, affordable, and culturally acceptable food-based interventions. Red yeast rice (*angkak*), a fermented rice product produced with *Monascus purpureus* is one such intervention. Angkak contains bioactive compounds, including iron, amino acids, pigments, and antioxidants, that may support erythropoiesis and enhance hematological status (7). Previous studies have demonstrated potential benefits of red yeast rice in improving hematological parameters and antioxidant activity (8,9). Thus, the biological rationale for angkak consumption to improve hemoglobin levels is supported.

However, evidence for a direct effect of angkak on uterine involution is limited. While improved hemoglobin status may theoretically enhance tissue oxygenation and postpartum recovery, few studies have examined the association between angkak consumption and changes in uterine involution in postpartum women. Most existing research has focused on hematological outcomes or the nutritional benefits of red yeast rice, and studies that concurrently evaluate hemoglobin levels and uterine involution in postpartum mothers are rare (10).

Given these gaps in the literature, this study aimed to assess changes in uterine involution and hemoglobin levels among postpartum mothers who consumed angkak infusion for 14 days. The findings are expected to contribute to the evidence base regarding the use of locally available food-based interventions in postpartum care and provide preliminary information for future controlled studies in midwifery practice.

METHODS

Study Design

A quasi-experimental one-group pre-post design was used to assess changes in uterine involution and hemoglobin (Hb) levels among postpartum mothers after consuming angkak infusion. This Research Reporting by Transparent Reporting of Evaluation with Non-Randomized Designs (TRENDS).

Sample/Participants

The study population comprised postpartum mothers attending postnatal care visits at TPMB D. Participants were recruited through purposive sampling. Inclusion criteria included postpartum mothers on days 1-3 after delivery, aged 20-35 years, with a singleton pregnancy, vaginal delivery without obstetric complications, willingness to consume angkak infusion for 14 consecutive days, willingness to participate in all study procedures, and provision of written informed consent. Exclusion criteria included severe anemia (Hb <7 g/dL), postpartum hemorrhage, puerperal infection, current use of iron supplements or other hematinic agents, allergy to red yeast rice (*Monascus purpureus*), chronic hematological disorders, and participation in other intervention studies.

The minimum sample size was calculated using a paired-sample approach with a 5% significance level and 80% power. This calculation indicated that at least 25 participants were required, and all eligible participants completed the study.

Intervention

The intervention involved angkak infusion prepared from 3 g of food-grade red yeast rice (*Monascus purpureus*) sourced from a licensed local producer. The angkak was infused in 150 mL of warm water and consumed once daily for 14 consecutive days. Participants received both verbal and written instructions regarding preparation and consumption. Compliance was monitored using a daily consumption checklist completed by participants and verified through daily follow-up by researchers via home visits, telephone, or online communication. Primary outcome variables were uterine involution and hemoglobin level. Uterine involution was assessed through measurement of fundal height (TFU) using a non-elastic measuring tape. Measurements were performed on postpartum days 1, 7, and 14 by trained midwives using standardized anatomical landmarks, namely the symphysis pubis and the uterine fundus. Hemoglobin levels were measured on postpartum days 1 and 14 using a calibrated digital hemoglobinometer. Capillary blood samples were obtained via finger-prick testing in accordance with standard infection prevention protocols.

Data Collection

The research was conducted at TPMB D, Malang Regency, East Java, Indonesia, from January to March 2025.

Data Analysis

Secondary variables included maternal age, parity, nutritional status, breastfeeding status, and history of anemia during pregnancy. Descriptive statistics were used to summarize participant characteristics. Normality of continuous variables was assessed using the Shapiro-Wilk test. Changes in hemoglobin levels between day 1 and day 14 were analyzed using the paired-sample *t*-test because the data were normally distributed. Changes in fundal height between observation periods were analyzed using the Wilcoxon signed-rank test because the data did not meet the assumptions of normal distribution. Statistical significance was established at $p < 0.05$.

Ethical Consideration

Ethical approval was granted by the Health Research Ethics Committee of STIKes Panti Waluya Husada Malang (No. 06/PHB/KEPK/330/09.25). Written informed consent was obtained from all participants prior to enrollment.

RESULT AND DISCUSSION

RESULT

Characteristics of Participants

A total of 25 postpartum mothers were included in the study. Respondent characteristics are summarized in Table 1.

Table 1. Frequency distribution of respondent characteristics

No	Characteristics	Category	Frequency (n)	Percentage (%)
1	Age	< 20 years	2	8%
		20–35 years	20	80%
		> 35 years	3	12%
2	Parity	Primipara (first child)	9	36%
		Multipara (≥2 children)	16	64%
3	Occupation	Housewife	17	68%
		Employed (non-household)	8	32%
4	Education	Elementary School	1	4%
		Junior High School	4	16%
		Senior High School	15	60%
		Higher Education	5	20%

According to Table 1, the majority of respondents were aged 20 to 35 years (80%), were multiparous (64%), worked as housewives (68%), and had completed senior high school education (60%).

Table 2 presents fundal height (TFU) measurements for postpartum days 1, 7, and 14.

Table 2. TFU measurement results before and after intervention

Group	Mean	Minimum	Maximum	Standard Deviation
Day 1	16.84	15.0	19.0	1.00
Day 7	11.80	10.0	14.0	1.13

Table 2 indicates that the mean fundal height was 16.84 ± 1.00 cm on day 1, 11.80 ± 1.13 cm on day 7, and 4.92 ± 0.57 cm on day 14. The minimum fundal height decreased from 15.0 cm on day 1 to 10.0 cm on day 7 and 4.0 cm on day 14. The maximum value declined from 19.0 cm on day 1 to 14.0 cm on day 7 and 6.0 cm on day 14.

The Wilcoxon signed-rank test identified statistically significant differences in fundal height measurements between day 1 and day 7, day 7 and day 14, and day 1 and day 14 ($p < 0.001$ for all comparisons).

Table 3 presents hemoglobin measurements taken before and after the observation period.

Table 3. Hb measurement results before and after intervention

Group	**Mean**	**Minimum**	**Maximum**	**Standard Deviation**
Before (Day 1)	10.42	9.6	11.3	0.50
After (Day 14)	11.72	10.8	12.5	0.51

Hemoglobin measurements demonstrated a significant increase following the intervention. The mean value rose from 10.42 (range 9.6–11.3) on Day 1 to 11.72 (range 10.8–12.5) on Day 14. Both minimum and maximum values increased, reflecting a general improvement in hemoglobin levels among participants. The standard deviation remained nearly unchanged (0.50 before versus 0.51 after), indicating that the increase was consistently distributed across the group with minimal additional variability.

Table 4. Results of Analysis of Changes in Fundal Height (TFU) During the Observation Period

Variable	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference (Lower)
Uterine Fundal Height before–after observation	5.04	0.74	0.15	4.73

The mean difference in fundal height between baseline and follow-up measurements was 5.04 cm. The paired-sample test yielded a t-value of 33.60 and a p-value of < 0.001, indicating a statistically significant difference in fundal height measurements during the observation period.

The observed reduction in fundal height aligns with the physiological process of uterine involution, which typically occurs during the postpartum period. However, because this study did not include a control group, the observed changes cannot be attributed exclusively to angkak infusion consumption.

Table 5. Results of Analysis of Changes in Hemoglobin (Hb) Levels During the Observation Period

Variable		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference (Lower)
Hemoglobin observation	before–after	1.30	0.41	0.08	1.13

The mean hemoglobin level increased by 1.30 g/dL between baseline and day 14 measurements. The paired-sample test yielded a t-value of 16.25 and a p-value of < 0.001, indicating a statistically significant difference in hemoglobin levels over the observation period.Clinically, an increase of 1.30 g/dL suggests improvement in maternal hematological status during the postpartum period. However, due to the absence of

DISCUSSION

The present study observed a significant reduction in mean fundal height from 16.84 cm on postpartum day 1 to 11.80 cm on day 7 and 4.92 cm on day 14. Statistical analysis showed significant differences in fundal height measurements during the observation period ($p < 0.001$). These findings indicate that uterine involution progressed throughout the first two weeks postpartum among participants who consumed angkak infusion.

The observed decrease in fundal height is consistent with the normal physiological process of postpartum uterine involution. Previous studies have reported that fundal height and uterine dimensions progressively decrease during the early postpartum period as the uterus returns toward its pre-pregnancy size and condition (5,11). The pattern observed in this study is therefore consistent with expected postpartum recovery.

Given the one-group pre-post design without a comparison group, the reduction in fundal height observed in this study cannot be attributed exclusively to angkak infusion consumption. Uterine involution is a natural process following childbirth, and a comparable decline in fundal height would be anticipated even without intervention (12). Therefore, these findings should be interpreted as

temporal changes during the study period rather than as evidence of a causal relationship between angkak and uterine involution.

Nevertheless, these findings are relevant, as they demonstrate that participants who consumed angkak infusion exhibited a pattern of uterine involution consistent with normal postpartum recovery. No adverse events related to the intervention were reported during the observation period, indicating that the intervention was well tolerated.

The present findings are in agreement with previous studies reporting progressive reductions in fundal height during the postpartum period. Kristoschek et al. reported continuous uterine involution during the early puerperium, with substantial reductions in uterine size occurring within the first two weeks postpartum. Similar findings have also been reported in studies of postpartum maternal recovery in which uterine involution progressed as part of the normal physiological adaptation after childbirth (5).

Although improved maternal hematological status may theoretically support postpartum recovery, the current study did not directly measure uterine contractility, uterine perfusion, oxytocin levels, or other biological mechanisms related to involution (13). Therefore, any potential relationship between angkak consumption and uterine involution requires further investigation using controlled study designs and additional physiological measurements. Furthermore, previous studies on red yeast rice have primarily focused on its nutritional, antioxidant, and hematological properties rather than postpartum uterine recovery outcomAdditionally, postpartum mothers with adequate hemoglobin levels experienced more rapid uterine involution compared to those with postpartum anemia. The observed increase in hemoglobin levels during the intervention indirectly supports the decrease in TFU reported in this study (14). Furthermore, previous research has shown that TFU naturally decreases by 1–2 cm per day, and the present results align with this physiological pattern (15).ern (15).

Thus, red yeast rice infusion not only has the potential to increase hemoglobin levels, but can also be used as an effective non-pharmacological intervention in accelerating the process of uterine involution, especially in areas that rely on local food as a form of traditional wisdom in community midwifery practices.

The study results showed a significant increase in hemoglobin (Hb) levels after administering red yeast rice infusion for 14 days to postpartum women. The average Hb before the intervention was 10.42 g/dL with a standard deviation of 0.50, a minimum value of 9.6 g/dL, and a maximum of 11.3 g/dL. After the intervention, the average Hb increased to 11.72 g/dL, with a standard deviation of 0.51, a minimum value of 10.8 g/dL, and a maximum of 12.5 g/dL. The average increase of 1.3 g/dL indicates that red yeast rice infusion significantly improved hemoglobin levels.

The present study found a statistically significant increase in mean hemoglobin levels from 10.42 g/dL on day 1 to 11.72 g/dL on day 14 ($p < 0.001$). The mean increase of 1.30 g/dL indicates an improvement in hemoglobin status during the observation period among postpartum mothers who consumed angkak infusion.

These findings are consistent with previous studies reporting improvements in hemoglobin levels among postpartum women receiving nutritional interventions aimed at supporting maternal recovery and reducing the risk of postpartum anemia (16). Adequate hemoglobin levels are important during the postpartum period because anemia has been associated with fatigue, impaired physical functioning, delayed recovery, and reduced quality of life among mothers (17).

However, the present study did not directly assess the iron content, bioactive compounds, erythropoiesis, or other biological mechanisms potentially related to changes in hemoglobin levels. Therefore, although an increase in hemoglobin levels was observed during the study period, the contribution of specific components of angkak infusion cannot be determined from the current findings (18).

Furthermore, because this study used a one-group pre-post design without a control group, the observed increase in hemoglobin levels should be interpreted with caution. Additional controlled studies with larger sample sizes are needed to determine whether the observed changes are attributable to angkak consumption and to evaluate its potential role as a food-based intervention for postpartum recovery.

Several limitations should be considered when interpreting the findings of this study. First, the study employed a one-group pre-post design without a control group, making it difficult to distinguish changes associated with angkak consumption from normal physiological postpartum recovery. Second, the sample size was relatively small and recruited from a single midwifery practice, which may limit the generalizability of the findings. Third, the study did not directly assess dietary intake, iron status indicators, erythropoietic activity, or the bioactive composition of angkak (19). Therefore, the biological mechanisms underlying the observed changes in hemoglobin levels could not be evaluated. Future studies using randomized controlled designs with larger sample sizes and more comprehensive biological measurements are needed to confirm these findings.

Angkak, also known as red yeast rice, is a traditional fermented product derived from the fermentation of rice using Monascus purpureus, a type of red mold. This natural product has been widely used in traditional Chinese and Southeast Asian medicine, not only as a food coloring and flavoring agent but also for its medicinal properties (20). Over the past decades, scientific research has supported the health benefits of angkak, particularly due to its bioactive compounds.

The primary active component in angkak is monacolin K, a natural statin that has lipid-lowering effects. In addition to monacolin K, angkak also contains isoflavones, GABA (gamma-aminobutyric acid), sterols, and various antioxidants. These compounds contribute to its ability to improve blood health, enhance circulation, and reduce oxidative stress. Angkak is also a good source of iron and B vitamins, both of which are essential for red blood cell formation and energy metabolism (21).

For postpartum mothers, angkak offers several key health benefits. Firstly, the iron content in angkak can help restore hemoglobin levels that often decrease due to blood loss during childbirth. This is crucial in preventing or treating postpartum anemia, which can lead to fatigue, delayed recovery, and reduced milk production. Secondly, the presence of monacolin K and antioxidants may help stimulate uterine muscle contractions, supporting the natural involution of the uterus—a process where the uterus returns to its pre-pregnancy size and condition. This dual action makes angkak highly relevant for use in the postpartum period (22).

Angkak is typically consumed as a herbal infusion. The recommended method is to steep 3 grams of dried angkak in 150 ml of hot water and allow it to infuse for 5–10 minutes before consumption. This infusion can be taken once daily, preferably in the morning or after meals, for 14 consecutive days. It is a simple, practical, and low-cost approach that aligns well with traditional postpartum practices, especially in rural or resource-limited settings.

Despite these limitations, the findings suggest that postpartum mothers who consumed angkak infusion during the observation period experienced significant increases in hemoglobin levels and a pattern of uterine involution consistent with normal postpartum recovery (15). As a locally available and culturally familiar food product, angkak may warrant further investigation as a potential food-based intervention to support maternal recovery during the postpartum period.

The present study found significant changes in fundal height and hemoglobin levels during the 14-day observation period among postpartum mothers who consumed angkak infusion. However, because the study did not include a control group, the observed changes cannot be attributed solely to the intervention. These findings provide preliminary evidence that may support further investigation of angkak as a complementary nutritional intervention in postpartum care. Additional randomized controlled studies are required to determine its effectiveness and underlying mechanisms.

CONCLUSION

Postpartum mothers who consumed angkak infusion for 14 days exhibited significant reductions in fundal height and significant increases in hemoglobin levels during the observation period. However, the lack of a control group precludes establishing a causal relationship between angkak infusion and these outcomes. Additional controlled studies are necessary to confirm the effectiveness of angkak infusion and its potential role in postpartum care.

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AUTHOR'S CONTRIBUTION STATEMENT

All authors made significant contributions to the research process. SIM was responsible for conceptualizing and designing the study, collecting data, performing data analysis, and drafting the original manuscript. WA contributed to data analysis, manuscript review, and critical revision of the intellectual content. All authors reviewed and approved the final version of the manuscript before submission.

CONFLICT OF INTEREST

None.

DECLARATION OF GENERATIVE AI AND AI-ASSISTED TECHNOLOGIES IN THE WRITING PROCESS

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DATA AVAILABILITY

The dataset generated and analyzed during the current study is available from the corresponding author upon request.

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