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Review Article

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# "GARBHINI PANDU (ANAEMIA IN PREGNANCY): LAUHA AND MANDURA FORMULATIONS, EFFICACY AND SAFETY — A NARRATIVE REVIEW"

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**ABSTRACT:**
**Background:** Anaemia affects more than a third of pregnant women worldwide and is most common in South Asia, where iron deficiency is the predominant cause. Oral iron salts are effective but are often poorly tolerated, and adherence is low. Ayurveda describes anaemia under Pandu roga, and contemporary Ayurvedic obstetrics uses the term Garbhini pandu for anaemia in pregnancy. Iron-based herbomineral formulations, namely Lauha kalpas prepared from incinerated iron (Lauha bhasma) and Mandura kalpas prepared from processed iron oxide (Mandura bhasma), are the mainstay of treatment. **Objective:** To review the classical understanding of Pandu in pregnancy, the pharmaceutics of Lauha and Mandura formulations, and the clinical, experimental and safety evidence for their use in anaemia of pregnancy. **Methods:** Charaka Samhita and Bhaishajya Ratnavali were reviewed. PubMed was searched for systematic reviews and trials of conventional iron therapy in pregnancy and for clinical, pharmaceutical, experimental and safety studies of Ayurvedic iron formulations. Findings were synthesised narratively. **Results:** Systematic reviews, including a 2026 network meta-analysis of 19 randomised trials, report that several Lauha and Mandura formulations raise haemoglobin and iron indices, with Sarva-jvara-hara lauha among the most effective. A multicentre open-label study of Dhatri lauha in 400 adults showed a modest rise in haemoglobin without hepatic or renal toxicity. Evidence specific to pregnancy is limited to one small trial of Dhatri lauha and Punarnava mandura in 24 women. Rodent toxicity studies are reassuring, but heavy-metal contamination of some Ayurvedic products and isolated allergic reactions are documented. **Conclusion:** Lauha and Mandura formulations are plausible and partly supported haematinics, but they have not been compared with standard iron in adequately powered pregnancy trials. They should be used only as quality-tested products, alongside hemoglobin monitoring and conventional care.

**KEYWORDS:** Garbhini pandu, Pandu roga, iron deficiency anaemia, pregnancy, Lauha bhasma, Mandura bhasma

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## INTRODUCTION

Anaemia in pregnancy is one of the most widespread maternal health problems. A meta-analysis of 52 studies with more than 1.2 million women estimated its global prevalence at 36.8%, with most cases being mild, the highest prevalence in the third trimester and a substantially higher burden in developing countries; anaemia in pregnancy carries a risk of preterm birth and low birth weight[1]. In India, iron deficiency anaemia affects nearly half of the population and contributes substantially to adverse pregnancy outcomes and maternal deaths[2].

Daily oral iron supplementation is the standard preventive intervention. A Cochrane review of 44 trials with more than 43,000 women found that it reduced maternal anaemia at term by about 70% and iron deficiency at term by 57%, although its effects on low birth weight and preterm birth did not reach statistical significance[3]. Treatment of established iron deficiency anaemia relies on higher doses of oral iron, with intravenous iron for women who do not respond or cannot tolerate it. A meta-analysis of 11 trials found that intravenous iron achieved target haemoglobin more often and faster than oral iron and caused fewer adverse reactions[4]. A large trial in India found that a single dose of intravenous ferric carboxymaltose in the second trimester reduced the rate of low birth weight compared with twice-daily oral ferrous sulphate (25.2% vs 29.3%), and that both intravenous preparations increased the proportion of women who became non-anaemic without additional iron or transfusion[5]. The persistently high burden of iron deficiency anaemia in India has been attributed in part to the poor tolerability of oral iron[6].

Ayurveda has its own long tradition of iron therapy. Pandu roga, characterised by pallor, fatigue, breathlessness, palpitations and loss of appetite, is described in detail in the classical texts, and iron is administered not as a salt but as herbomineral preparations in which incinerated iron or iron oxide is combined with herbs[7–9]. These Lauha and Mandura formulations are widely prescribed for pregnant women in India and are included in some public health programmes[10]. The aim of this review is to present the classical concept of anaemia in pregnancy, to describe the pharmaceutics of Lauha and Mandura formulations, and to summarise critically the evidence for their efficacy and safety.

## METHODOLOGY

This narrative review was prepared in two parts. First, the classical texts, namely Charaka Samhita (Sharira sthana, chapter 6 and Chikitsa sthana, chapter 16) and Bhaishajya Ratnavali (Pandu roga chikitsa), were studied for descriptions of Pandu roga, the nourishment of the fetus and iron-based formulations[7,8]. Second, PubMed was searched for literature published up to October 2026 using combinations of the terms anaemia, anemia, pregnancy, Pandu, Garbhini pandu, Lauha, Loha, Mandura, Dhatri lauha, Punarnava mandura, iron deficiency, Ayurveda, heavy metals and toxicity. Reviews, systematic reviews, network meta-analyses, randomised and non-randomised clinical studies, pharmaceutical and experimental studies, and case reports on safety were considered. Every reference cited in this article was checked against its PubMed record for authors, title, journal, year, volume, pages and digital object identifier. Retracted publications identified during the search were excluded. The findings are synthesised narratively rather than statistically.

## CLASSICAL UNDERSTANDING OF PANDU IN PREGNANCY

### 1. Pandu roga

Charaka describes Pandu roga as a disorder in which aggravated Pitta, located in the heart and propelled by Vata, vitiates Rakta (blood) and the other tissues, producing pallor, loss of strength and complexion, and depletion of the tissues (Dhatu kshaya)[7]. Its causes include excessive intake of sour, salty, pungent and incompatible food, daytime sleep, excessive exertion and suppression of urges, and its symptoms include fatigue, breathlessness on exertion, palpitations, giddiness, loss of appetite, swelling around the eyes and dryness of the skin[7]. Five types are described according to the dominant Dosha, together with a type caused by eating clay (Mrittika bhakshana)[7]. The clinical picture of the Vata- and Pitta-dominant forms and the association with pica closely resemble iron deficiency anaemia.

### 2. Garbhini pandu

The classical texts explain that the fetus is nourished from the mother's Rasa dhatu, the nutritive essence of digested food, which also sustains her own tissues and later forms breast milk[7]. When the mother's intake or digestion is inadequate, the continuous and increasing demand of the growing fetus depletes her Rasa and

Rakta, leading to Pandu. Contemporary Ayurvedic obstetrics therefore uses the term Garbhini pandu for anaemia arising in pregnancy and attributes it to inadequate nourishment of the mother in the face of continuously increasing fetal demand[11]. Nausea, vomiting and poor appetite in early pregnancy are regarded as aggravating factors. This formulation corresponds closely to the biomedical understanding of iron deficiency in pregnancy as a mismatch between the increased iron requirements of fetal growth and maternal red cell expansion on the one hand and limited intake, absorption and stores on the other[3].

### 3. Principles of treatment

Charaka advises that Pandu be treated first by mild purification, where strength permits, and then by nourishing and blood-forming drugs, among which iron preparations are prominent; the classical formulations include Navayasa churna, Mandura vataka and Punarnava mandura[7]. Later compendia such as Bhaishajya Ratnavali list many additional Lauha and Mandura formulations for Pandu[8]. In pregnancy, purification procedures are generally avoided, and treatment relies on correcting digestion (Agni), dietary measures and gentle haematinic formulations[7].

## PHARMACEUTICS OF LAUHA AND MANDURA FORMULATIONS

### 1. Lauha kalpas

Lauha kalpas are compound herbomineral formulations in which iron is the major ingredient. A critical review of the classical literature found that they are prepared not only as incinerated powders but also as herbal powders (Churna), confections (Avaleha), solidified decoctions (Rasakriya) and Putapaka preparations, and that iron is used in Ayurveda for several conditions apart from Pandu[9]. The iron component, Lauha bhasma, is prepared by repeated heating and quenching of iron in liquids (Shodhana), followed by incineration with herbal decoctions such as Triphala until a fine, non-metallic powder is obtained[12]. A study establishing a standard manufacturing procedure for Teekshna lauha bhasma found that 20 cycles of incineration at 650 °C with Triphala decoction produced a bhasma meeting both classical and modern analytical criteria, with particle size in the range 100–500 nm[12]. These findings suggest that classical processing converts metallic iron into finely divided iron oxides, which may influence absorption and tolerability, although comparative bioavailability studies against iron salts are lacking.

### 2. Mandura kalpas

Mandura bhasma is prepared from iron rust or slag (Mandura), purified and incinerated in a similar way. Formulations such as Punarnava mandura combine it with herbs including Punarnava (*Boerhavia diffusa*), Trikatu and Triphala, which are intended to improve digestion, reduce swelling and aid assimilation of iron. In practice, Mandura formulations are traditionally regarded as milder than Lauha preparations and are often chosen for pregnant women and children, although this preference has not been examined in comparative studies.

### 3. Role of herbal components

Most Lauha and Mandura formulations contain Amalaki (*Phyllanthus emblica*), a rich source of ascorbic acid, and Trikatu, the pungent combination of ginger, black pepper and long pepper. Ascorbic acid enhances non-haem iron absorption, and piperine from black and long pepper is known to enhance the bioavailability of co-administered compounds. These components provide a biologically plausible rationale for the classical combination of iron with herbs, although their contribution has not been tested separately in clinical studies.

## EVIDENCE FOR EFFICACY

### 1. Systematic reviews

An early systematic review of Ayurvedic formulations for iron deficiency anaemia identified ten studies, three of them in pregnant women, and reported that most formulations produced significant improvements in symptoms and haematological indices without the side effects associated with iron salts[10]. Its conclusions were, however, based on small, mostly unblinded studies.

A 2026 systematic review and network meta-analysis included 19 randomised trials with 2,121 participants testing 26 Ayurvedic treatments for iron deficiency anaemia in India[2]. Sarva-jvara-hara lauha and Pippalyadi yoga produced statistically significant improvements in haemoglobin, with mean differences of 1.82 g/dL and 1.45 g/dL respectively, and Bibhitakadi vataka showed the largest point estimate for raising serum ferritin, although with a wide confidence interval crossing zero[2]. The authors called for further research before these findings could be applied in public

health[2]. This network meta-analysis is the most rigorous synthesis available, but it was not limited to pregnancy and was based on a small number of trials per treatment.

**2. Comparative studies of Lauha and Mandura formulations**

A frequently cited study compared six Ayurvedic iron preparations, namely Navayasa churna, Punarnavadi mandura, Dhatri lauha, Pradarantaka lauha, Sarva-jvara-hara lauha and Vrihat yakridari lauha, each given at 250 mg twice daily for 30 days to 20 iron-deficient anaemic patients, with a control group receiving an allopathic preparation containing ferrous fumarate, vitamin C, folic acid and vitamin B12[13]. All preparations produced significant increases in haemoglobin, red cell indices, serum iron, transferrin saturation and ferritin. The rate of haemoglobin regeneration exceeded that of the allopathic preparation for all except Pradarantaka lauha, Sarva-jvara-hara lauha was the most effective at 0.16 g/dL per day, and the response correlated with the iron content of each preparation[13]. No side effects comparable to those of iron salts were observed. The correlation with iron content is an important finding, because it indicates that the haematinic effect of these formulations depends largely on the iron they contain and therefore on consistent manufacturing.

**3. Dhatri lauha**

Dhatri lauha, which combines Lauha bhasma with Amalaki and other herbs, is one of the most widely used formulations. In a prospective, open-label, single-arm study conducted at 12 centres of the Central Council for Research in Ayurvedic Sciences, 400 adults aged 18–60 years with iron deficiency anaemia (haemoglobin 6–10 g/dL) received Dhatri lauha 500 mg twice daily for 45 days[6]. Mean haemoglobin rose from 8.46 g/dL to 9.18 g/dL, with significant improvements in red cell indices, serum iron and ferritin; liver and kidney function remained normal and no participant withdrew because of adverse events[6]. The rise of about 0.7 g/dL in 45 days is modest, and the absence of a control group and of pregnant participants limits the conclusions. The authors themselves recommended randomised trials with standard care as the comparator[6].

**4. Punarnava mandura and other Mandura preparations**

Punarnava mandura has been evaluated in several populations. In an uncontrolled study of 50 elderly patients with anaemia, Punarnava mandura 500 mg twice daily with buttermilk for 90 days produced significant improvement in symptoms and quality of life, although 10 patients did not complete treatment[14]. In an open-label trial in 60 children aged 2–16 years with iron deficiency anaemia, a mineral-free herbal formulation (Pandughni vati) and Punarnavadi mandura given for 90 days were found to be equally effective on clinical and laboratory parameters[15]. In an experimental model of mercuric chloride-induced anaemia in rats, Punarnavadi mandura given for 30 days attenuated the fall in haemoglobin and ferritin and the rise in total iron-binding capacity and protected the liver and kidney from histological damage[16].

**5. Other Lauha formulations**

Trikatrayadi lauha, which combines Lauha bhasma with Trikatu and Triphala, was compared with a conventional iron preparation in 56 patients with iron deficiency anaemia; both produced significant improvement in symptoms, haemoglobin, red cell count, serum iron and transferrin saturation[17]. In children, a randomised, double-blind, placebo-controlled study of a Trikatrayadi lauha suspension in 123 participants reported a rise in haemoglobin of 3.33 g/dL over 10 weeks without adverse effects[18]. This is one of the few placebo-controlled trials of an Ayurvedic iron formulation, but it was conducted in children rather than in pregnant women.

**6. Evidence specific to pregnancy**

The only PubMed-indexed controlled study specific to Garbhini pandu compared Dhatri lauha and Punarnava mandura in 24 pregnant women with anaemia[11]. Women were randomly allocated to two groups (n = 15 and n = 9), each receiving one of the two formulations as two 500 mg tablets three times a day for 90 days, with buttermilk in the first group and lukewarm water in the second. Overall clinical improvement was better in the first group, in which the rise in haemoglobin was statistically significant, and no adverse drug reactions were observed[11]. The study is valuable as proof of feasibility, but its very small and unequal groups, different vehicles (Anupana) for the two groups, absence of a standard iron comparator and lack of perinatal outcomes mean that it cannot establish the efficacy or safety of either formulation in pregnancy.

## SAFETY

### 1. Preclinical toxicity

Rodent studies conducted according to international guidelines have generally been reassuring. Tapyadi loha, a formulation traditionally used for iron deficiency anaemia in pregnant and non-pregnant women, caused no mortality or signs of toxicity at a single oral dose of 2000 mg/kg, and no behavioural, haematological, biochemical or histopathological abnormalities when given at up to 1000 mg/kg daily for 28 days[19]. The authors noted that the belief that Ayurvedic drugs have no side effects is a misconception and that safety data are lacking for many formulations[19]. No reproductive or developmental toxicity studies of Lauha or Mandura formulations were identified in PubMed, which is a major gap for products intended for use in pregnancy.

### 2. Heavy metals and product quality

The most serious safety concern relates to product quality rather than to properly prepared iron. A study of Ayurvedic medicines purchased online found detectable lead, mercury or arsenic in about one-fifth of US- and Indian-manufactured products; products made by Rasa shastra methods, which combine herbs with metals and minerals, had a higher prevalence of toxic metals (40.6% vs 17.1%), and all metal-containing products exceeded at least one standard for acceptable daily intake[20]. Lauha and Mandura formulations belong to this herbomineral group. Although properly processed iron bhasma should not contain lead or mercury, contamination of raw materials or inadequate quality control could expose both mother and fetus to toxic metals, which cross the placenta. Only products manufactured under good manufacturing practice and tested for heavy metals should therefore be used in pregnancy.

### 3. Clinical adverse events

Clinical trials of Lauha and Mandura formulations have reported few adverse events[6,11], and the absence of the gastrointestinal effects common with iron salts is frequently cited as their main advantage[10,13]. Adverse events are, however, rarely sought systematically. A recent pharmacovigilance case report described a cutaneous allergic reaction attributed to Punarnava mandura in an older woman, which resolved on withdrawal and did not recur when other medicines were resumed[21]. Such reports are a reminder that well-tolerated does not mean free of risk, and that adverse events from Ayurvedic iron formulations should be monitored and reported.

## DISCUSSION

This review shows that the Ayurvedic account of Garbhini pandu, in which the nutritive demand of the fetus depletes the mother's Rasa and Rakta, corresponds closely to the biomedical model of iron deficiency in pregnancy[3,7]. The classical therapeutic response, iron given in processed herbomineral form with digestive and ascorbate-rich herbs, is pharmacologically plausible[9,12].

The evidence for efficacy is real but limited. A network meta-analysis and several comparative studies show that Lauha and Mandura formulations raise haemoglobin and iron indices, with effects that correlate with iron content[2,13]. The best-designed studies, namely a multicentre study of Dhatri lauha in adults and a placebo-controlled trial of Trikatrayadi lauha in children, did not include pregnant women[6,18], and the only pregnancy-specific trial is too small to guide practice[11]. No trial has compared an Ayurvedic iron formulation with standard oral iron in pregnancy, measured iron absorption from bhasma preparations, or reported birth weight, preterm birth or other perinatal outcomes. By contrast, conventional oral and intravenous iron have been tested in trials involving tens of thousands of pregnant women[3,5].

Safety considerations are also important. Preclinical toxicity studies are reassuring for properly prepared products[19], but developmental toxicity data are absent and the documented presence of toxic metals in some herbomineral products[20] makes quality control essential. The claimed advantage of better gastrointestinal tolerability, which would be highly relevant given the poor tolerability of oral iron[6], has not been tested against iron salts in a blinded comparison.

Several research priorities follow. First, randomised, non-inferiority trials should compare a standardised Lauha or Mandura formulation with standard oral iron in pregnant women with mild to moderate iron deficiency anaemia, with haemoglobin, ferritin, tolerability and adherence as primary outcomes and birth weight and preterm birth as secondary outcomes. Second, every batch used in research should be characterised for iron content and tested for lead, mercury, arsenic and cadmium. Third, iron absorption and bioavailability from bhasma preparations should be measured, for example with stable-isotope methods.

Fourth, developmental and reproductive toxicity studies should be completed for the most widely used formulations. Finally, mineral-free herbal alternatives, which have shown comparable short-term effects in children[15], deserve evaluation in pregnancy.

From a clinical perspective, Lauha and Mandura formulations may be used as part of integrative care for mild anaemia in pregnancy, or for women who cannot tolerate iron salts, provided that products are quality-tested, haemoglobin is monitored at regular intervals and there is a clear threshold for switching to standard oral or intravenous iron. Moderate or severe anaemia, anaemia in late pregnancy and anaemia that does not respond to treatment require conventional management, given the effectiveness of intravenous iron in rapidly correcting haemoglobin and its potential to reduce low birth weight[4,5].

## CONCLUSION

Garbhini pandu is a coherent Ayurvedic description of anaemia in pregnancy that aligns with current understanding of iron deficiency. Lauha and Mandura formulations raise haemoglobin in small studies and in a network meta-analysis, and preclinical safety data are reassuring for properly manufactured products. However, pregnancy-specific evidence is very limited, no trial has compared these formulations with standard iron therapy in pregnant women, and product quality remains a concern. Adequately powered trials with perinatal outcomes and rigorous quality control are needed before these formulations can be recommended as alternatives to conventional iron therapy in pregnancy.

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