The desire to have a healthy progeny is innate and very intense in every living being. The hectic life and tremendous stress in daily life has made the conception and continuation of pregnancy till term very difficult. Anemia is one of the common disease conditions, which affects a pregnant woman. In Ayurvedic classics anemia in pregnancy is taken under the Rasa Pradoshajvikara. It is clear that Garbhavasthajanyapandu occurs due to the fetal demands and improper functioning of the Rasadhautu leading to malnourishment of the body. A total of 26 patients were registered from out-patient department of Streeroga and Prasutitantra, out of which four patients discontinued. The remaining 22 patients were randomly divided into two groups; Group A (n=12) Pandughnivati two tablets of 500 mg tds and Group B (n=10) Dhatrilauhavati one tablet of 500 mg tds. Dhatrilauhavati was selected for the present study due to its Pandughna, Prinana, Raktaprasadana properties. In the present study, Pandughnivati a compound formulation developed by AYUSH department was administered for patients of group A. The results revealed that the over all clinical improvement was better in patients of Group B when compared to Group A. Hence it was concluded that Dhatrilauhavati was effective in treating anemia during pregnancy.

Key words: Anemia in pregnancy (iron deficiency anemia), Dhatrilauhavati, Garbhnipandu, Pandughnivati

Introduction

Acharya Harita has described eight Garbhopadravas in Harita Samhita[1] and included Vivarnatva, which appears to be pallor that accompanies anemia. In the context of Raktagulma, Acharya Kashyapa has described furnished similar description during with Garbhavastha (pregnancy) which refers to Garbhavasthajanyapandu Pandu.[2] The growing fetus is nourished by the Rasa of mother.[3] So, mother needs a better and more nutritious diet. Kashyapa Acharya has described that Ahara Rasa of the mother is divided into three parts. First part nourishes her own body, second part nourishes the Garba (fetus) and the third part is utilized for the nourishment of Stana (breast).[4] Acharya Charaka has also described “Pandutva” (pallor) as a Rasapradoshaja Vikara.[5] It is clear that Garbhavasthajanyapandu Pandu occurs due to the fetal demands and improper functioning of the Rasadhautu leading to malnourishment of the body.

Maternal diet and maternal tissues supply nutrients to the fetus. No mother will be able to meet the extra demand of nutrients by diet alone. This leads to certain pathological conditions in a pregnant woman. Among these, iron deficiency anemia is very common.

When the hemoglobin percentage (Hb%) decreases to less than 11 g/dl in 1st trimester and 3rd trimester or less than 10.5 g/dl in 2nd trimester in peripheral blood the condition is called anemia[6] (Center for Disease Control and Prevention). In Asia and South Africa about 20% pregnant females die due to iron deficiency anemia[7] (UNICEF, 1997). In India anemia in pregnancy is the most common high risk pregnancy having incidence of 40-80%. In western countries, this incidence is 10-20%.[8]

The analysis of the formulations mentioned in the context of Pandu (anemia) indicates that they contain herbal ingredients like Shunthi, Maricha etc., which are known correctors of...
metabolism and enhancers of bio-availability of nutrients irrespective of the factor whether they contain metallic iron or not. Though metallic and non-metallic preparations are indicated in the management of Pandu, Pandughnivati had been selected, which can improve the metabolism and Agni and thus improve the Pandu. Dhatrilauhavati contains Laiha Bhasma, which is iron supplementation and Deepana which leads to proper metabolism and Dhatuposhana and other ingredients are Rasayana and Shonitasthapana, so, Dhatrilauhavati\(^5\) had been selected as a metallic preparation. The drugs were prepared in Vati form for easy administration.

**Aims and Objective**

To study the etiopathogenesis of Garbhinipandu (anemia in pregnancy).

To evaluate and compare the efficacy of Pandughnivati and Dhatrilauhavati in Garbhinipandu (anemia in pregnancy).

**Materials and Methods**

**Patients**

Patients attending the out-patient department of Streeroga and Prasootitantra, those fulfilling the criteria for the selection were selected for the study. A detailed history was taken according to the proforma specially prepared for this purpose.

**Drugs**

Pandughnivati and Dhatrilauhavati were prepared in pharmacy of Gujarat Ayurved University, Jamnagar.

Pandughnivati contains Amalaki, Bibhitaki, Punarnava, Vidanga, Shunthhi, Maricha, Pippali and Katuki in an equal amount. Bhavana of Kumari Swarasa (one time), Gomutra (one time), Punarnava (two times) and Amalaki (two times) Swarasa was given during preparing the Vati.

Dhatrilauhavati contains four parts Dhatri, two parts Laiha Bhasma and one part Yastimadhu. Bhavana with Amruta Kwatha for seven times was given during preparing the Vati.

**Criteria for selection of patients**

- **Inclusion criteria**
  1. Patients with clinical signs and symptoms of Pandu (anemia) described in Ayurvedic classics and modern medicine
  2. Patients of 2nd or 3rd trimester of pregnancy
  3. Patients having Hb% equal to or less than 10 gm% but more than 6.5 gm%
  4. Microcytic hypochromic appearance of red blood cell in peripheral smear.

- **Exclusion criteria**
  1. Patients suffering from pregnancy related complications such as pregnancy induced hypertension pregnancy induced hypertension (PIH), hyperemesis gravidarum, pre-eclampsia etc
  2. 1st trimester of pregnancy
  3. Patients having with high risk pregnancy
  4. Patients having Hb% count less than 6.5 gm% and more than 10 gm%.

**Criteria for assessment**

1. Increase in Hb%
2. Improvement in signs and symptoms of the disease
3. Improvement in other biological parameters.

**Ethical clearance**

The study was cleared by the Institutional Ethics Committee. Prior to initiation of the study, written consent was taken from each patient. Patients were asked to withdraw their name from the study at any time without giving any reason if they wish.

**Investigation**

Hematological investigations like Hb (Hemoglobin) %, total red blood cell (TRBC), total leucocyte count (TLC), differential leucocyte count (DLC), platelet count, erythrocyte sedimentation rate (ESR), packed cell volume (PCV), mean cell volume (MCV), Mean corpuscular hemoglobin (MCH), Mean corpuscular hemoglobin concentration (MCHC), peripheral smear, serum ferritin, serum iron, total iron binding capacity (TIBC) and routine and microscopic urine investigations were done.

**Posology**

Group A: Patients were given two tablets of Pandughnivati (500 mg) tds, before the meal with luke warm water for 90 days.

Group B: Patients were given one tablet of Dhatrilauhavati (500 mg) tds, before the meal with luke warm water for 90 days.

**Statistical test**

Based on observations, the data obtained were statistically analyzed in terms of mean, standard deviation, standard error and unpaired t-test was considered at the level of \(P < 0.001\) as highly significant, \(P < 0.05\) or \(P < 0.01\) as significant and \(P > 0.05\) as insignificant to assess the result.

**Assessment for overall effect of therapy**

- Complete remission: 100% relief in the signs and symptoms
- Marked Improvement: Above 76%
- Moderate Improvement: 51-75% relief in the signs and symptoms
- Mild improvement: 26-50% relief in the signs and symptoms
- Unchanged: Up to 25% relief.

**Observations**

In this clinical study, total 14 patients were registered in Group A, out of which 12 patients completed the treatment, whereas two patients discontinued. Out of 12 patients registered in Group B, 10 patients completed the treatment, whereas two patients discontinued.

In the present study, maximum number of patients, i.e., 46.15% belonged to age group of 23-27 years, 46.15% were between 13 and 16 weeks of gestation, 69.23% were multipara, 53.85% patients belonged to urban area, 100% were housewives, 65.38% were vegetarian, 88.46% patients were addicted of tea, 73.07% patients had Vata-Pitta Prakriti and 84.62% had Mandagni.
Results

Group A provided relief in all the cardinal features of Garbhinipandu. The result observed in Shwasa (dyspnea) (60%) and Hridrava (palpitation) (53.33%) were highly significant statistically (<0.001). Daurbalya (general weakness) (33.33%), Shrama (fatigue) (40%), Aruci (anorexia) (28.57%) and Pindikodvestana (leg cramps) (55.55%) were decreased which were found statistically significant (P < 0.05) [Table 1]. No response was seen in objective parameters in this study [Table 2]. In Group B, results observed were highly significant statistically (P < 0.001) in Panduta (pallor) (50%) and Shwasa (dyspnea) (56.25%). The results in Shrama (fatigue) (61.54%), Hridrava (palpitation) (55.55%), Aruci (anorexia) (42.85%), Pindikodvestana (leg cramps) (49.49%) were significant statistically (<0.05) [Table 3]. Hb%, TRBC, PCV were slightly increased and TIBC was decreased in Group B whereas no result was found in other objective parameters [Table 4].

Total effect of therapy

On subjective parameters, in Group A, none of the patient had got complete remission, 5.33% of patients got marked improvement, and 33.33% patients got moderate improvement. 41.67% of patients had got mild improvement and 16.67% remained unchanged. In Group B none of the patients had got complete remission, 10% patients got marked improvement, 50% patients got moderate improvement, 30% patients had got mild improvement and 10% remained unchanged [Figure 1].

On objective parameters, in Group A, none of the patients had got complete remission, marked improvement and moderate improvement. Nearly 16.67% of patients had got mild improvement and 83.33% remained unchanged.

Table 1: Effect on cardinal features-Group A

| N   | Chief complaints       | Mean score | % of relief | SD (±) | SE (±) | t     | P     |
|-----|------------------------|------------|-------------|--------|--------|-------|-------|
| 12  | Pallor (Panduta)       | 2.08       | 1.58        | 24     | 0.29   | 1.73  | >0.05 |
| 12  | General weakness (Daurbalya) | 2.13       | 1.33        | 33.33  | 0.88   | 0.25  | 2.60  | <0.05 |
| 12  | Fatigue (Shrama)       | 1.25       | 0.75        | 40     | 0.52   | 0.15  | 3.31  | <0.05 |
| 11  | Dyspnea (Shwasa)       | 1.36       | 0.54        | 60     | 0.40   | 0.12  | 6.71  | <0.001|
| 12  | Palpitation (Hridrava) | 1.25       | 0.58        | 53.33  | 0.49   | 0.14  | 4.7   | <0.001|
| 12  | Anorexia (Aruchi)      | 1.75       | 1.25        | 28.57  | 0.52   | 0.15  | 3.31  | <0.05 |
| 7   | Leg cramps (Pindikodvestana) | 1.28       | 0.57        | 55.55  | 0.48   | 0.18  | 3.87  | <0.05 |

SD: Standard deviation, SE: Standard error, BT: Before treatment, AT: After treatment

Table 2: Effects on laboratory investigations-Group A

| n   | Laboratory investigation | Mean score | % of relief | SD (±) | SE (±) | t     | P     |
|-----|--------------------------|------------|-------------|--------|--------|-------|-------|
| 12  | Hb%                      | 9.43       | 8.66        | 8.12   | 1.18   | 0.34  | 2.24  | <0.05 |
| 12  | TRBC                     | 3.65       | 3.44        | 5.86   | 0.55   | 0.15  | 1.34  | >0.05 |
| 12  | PCV                      | 29.40      | 27.15       | 7.65   | 3.44   | 0.99  | 2.26  | <0.05 |
| 12  | MCV                      | 81.5       | 80.93       | 0.69   | 9.21   | 2.66  | 0.21  | >0.05 |
| 12  | MCH                      | 26.37      | 25.97       | 1.51   | 3.31   | 0.95  | 0.41  | >0.05 |
| 12  | MCHC                     | 32.25      | 31.99       | 0.82   | 1.06   | 0.30  | 0.87  | >0.05 |
| 12  | S. iron                  | 34.50      | 32.36       | -6.20  | 7.73   | 2.23  | 0.95  | >0.05 |
| 12  | S. ferritin              | 18.48      | 17.01       | -7.97  | 19.96  | 5.76  | 0.25  | >0.05 |
| 12  | TIBC                     | 397.75     | 363         | 4.41   | 92.51  | 26.70 | 0.62  | >0.05 |

Hb: Hemoglobin, TRBC: Total red blood cell, MCV: Mean cell volume, PCV: Packed cell volume, MCH: Mean corpuscular hemoglobin, MCHC: Mean corpuscular hemoglobin concentration, S. iron: Serum iron, S. ferritin: Serum ferritin, TIBC: Total iron-binding capacity, SD: Standard deviation, SE: Standard error, BT: Before treatment, AT: After treatment

Table 3: Effect on cardinal features-Group B

| n   | Chief complaints       | Mean score | % of relief | SD (±) | SE (±) | t     | P     |
|-----|------------------------|------------|-------------|--------|--------|-------|-------|
| 10  | Pallor (Panduta)       | 1.8        | 0.9         | 50     | 0.56   | 0.17  | 5.01  | <0.001|
| 10  | General weakness (Daurbalya) | 2          | 1.3         | 35     | 1.05   | 0.33  | 2.09  | <0.05 |
| 10  | Fatigue (Shrama)       | 1.3        | 0.5         | 61.54  | 0.63   | 0.2   | 4     | <0.05 |
| 10  | Dyspnea (Shwasa)       | 1.6        | 0.7         | 56.25  | 0.56   | 0.18  | 5.01  | <0.001|
| 9   | Palpitation (Hridrava) | 1          | 0.44        | 55.55  | 0.52   | 0.17  | 3.16  | <0.05 |
| 10  | Anorexia (Aruchi)      | 1.4        | 0.8         | 42.85  | 0.51   | 0.16  | 3.67  | <0.05 |
| 7   | Leg cramps (Pindikodvestana) | 1.57       | 0.57        | 49.49  | 0.66   | 0.22  | 3.5   | <0.05 |

SD: Standard deviation, SE: Standard error, BT: Before treatment, AT: After treatment
In Group A, result was observed statistically significant to drop by 60%. Tannins in tea can cause iron absorption. 88.46% which is the foremost step in development of Pandu creates women during pregnancy due to Pramitabhojana etc., is consumed abundantly by the pregnant patients were having a vegetarian diet. As iron supplied from Para. This observation indicates that repeated pregnancies and due to excessive blood loss they become Anemic. 65.38% had deficiency anemia. Almost 84.62% had Ama production and improper Rasa property. Thus, all cumulative effect leads to proper metabolism, iron absorption, improved blood formation and correction of disease.

On comparing the effect of therapy on objective and subjective parameters of both groups there was not significant results. It means that both the therapies have more or less same effect and any one of them cannot be claimed as superior to other statistically. However, the better result was obtained in Group B than Group A. This may be attributed to the presence of Lauha Bhasma in Dhatrilauhavati. These results were observed due to efficacy of drugs of Pandughnivati such as Rakthavardhaka, Annapachana and Srotoshodhaka. The decrease in Hb% can be due to the combined effect of increased demand and raised hemo-dilution which is physiological in pregnancy state. Dhatrilauhavati provided relief in all the cardinal features of Garbhinipandu. Hb%, TRBC, PCV were increased in percentage. Dhatrilauhavati contains Lauha Bhasma, which is iron supplementation and Deepana which leads to proper metabolism and Dhatuposhana. Amalaki and Amruta are Rasayana which leads to Dhatuposhana as well as supportive for the iron absorption. Yastimadhu has Shonitasthapana property. Thus, all cumulative effect leads to correction of metabolism, iron absorption, improved blood formation and correction of disease.

In the present study, majority of patients (69.23%) were Multi Para. This observation indicates that repeated pregnancies and due to excessive blood loss they become Anemic. 65.38% patients were having a vegetarian diet. As iron supplied from Veg. diet is mainly non-Haem iron and its bioavailability is only about 1-10%. That is why vegetarians are more prone for iron deficiency anemia. Almost 84.62% had Mandagni. Mandagni creates Ama production and improper Rasa Dhatu formation, which is the foremost step in development of Pandu. 88.46% were habituated to tea. Tannins in tea can cause iron absorption to drop by 60%.

In Group A, result was observed statistically significant improvement in a maximum of the cardinal features of Garbhinipandu. This may be attributed to the presence of Lauha Bhasma in Dhatrilauhavati. These results were observed due to efficacy of drugs of Pandughnivati such as Rakthavardhaka, Annapachana and Srotoshodhaka. The decrease in Hb% can be due to the combined effect of increased demand and raised hemo-dilution which is physiological in pregnancy state. Dhatrilauhavati provided relief in all the cardinal features of Garbhinipandu. Hb%, TRBC, PCV were increased in percentage. Dhatrilauhavati contains Lauha Bhasma, which is iron supplementation and Deepana which leads to proper metabolism and Dhatuposhana. Amalaki and Amruta are Rasayana which leads to Dhatuposhana as well as supportive for the iron absorption. Yastimadhu has Shonitasthapana property. Thus, all cumulative effect leads to correction of metabolism, iron absorption, improved blood formation and correction of disease.

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**Table 4: Effects on laboratory investigations-Group B**

| n   | Laboratory investigation | Mean score | % of relief | SD (±) | SE (±) | t   | P    |
|-----|--------------------------|------------|-------------|--------|--------|-----|------|
| 10  | Hb %                     | 9.08       | −0.55       | 1.19   | 0.37   | −0.13 | >0.05|
| 10  | TRBC                     | 3.53       | −9.07       | 0.34   | 0.10   | −2.92 | <0.05|
| 10  | PCV                      | 28.16      | −0.92       | 3.84   | 1.21   | −0.75 | >0.05|
| 10  | MCV                      | 80.3       | 5.70        | 4.30   | 1.36   | 3.36  | <0.01|
| 10  | MCH                      | 25.75      | 8.31        | 1.65   | 0.52   | 4.10  | <0.01|
| 10  | MCHC                     | 32.03      | 2.90        | 1.38   | 0.43   | 2.12  | <0.05|
| 10  | S. iron                  | 32.05      | −6.46       | 6.47   | 2.04   | 1.01  | >0.05|
| 10  | S. ferritin              | 25.12      | −17.91      | 33.38  | 10.55  | 0.42  | >0.05|
| 10  | TIBC                     | 366.8      | 15.67       | 128.20 | 40.54  | 1.41  | >0.05|

**Figure 1: Overall effect of therapy on subjective parameters**

**Figure 2: Overall effect of therapy on objective parameters**
and formation of proper Dhatu. Amalaki, which is a rich source of Vitamin C, is known enhancer of iron absorption. It also contains Katuki which is Pitta Virechaka, thus corrects Pitta and Rakta. Punarnava has Srotoshodhaka and Raktavardhaka properties. Thus, the cumulative effects of all the drugs lead to correction of metabolism, iron absorption, improved blood formation and correction of disease.

Probable mode of action of Dhatrilauhavati in Pandu
Dhatrilauhavati contains Lauha Bhasma, which is iron supplement and has Deepana property which leads to proper metabolism and Dhatuposhana. Amalaki and Amruta are Rasayana which lead to Dhatuposhana as well as are supportive for the iron absorption. Yastimadhu has Shonitasthapana property. Thus, cumulative effects of all the drugs lead to correction of metabolism, iron absorption, improved blood formation and correction of disease.

Conclusion
Garbhinipandu may be correlated with iron deficiency anemia in pregnancy, which is commonly seen. In the present study on comparison a better percentage of improvement was noted in group B (Dhatrilauhavati) in terms of subjective and objective parameters than group A (Pandughnivati).

References
1. Harita, Harita Samhita. In: Tripathi H, editor. Trutiya Sthana 51/1. Varanasi: Chaukambha Krishnadas Academy; 2005. p. 456.
2. Kashayapa, Kashyapa Samhita, Khila Sthan, Rakta Gulma. Adhyay 9/46-49. Vidyotini Hindi Commentary. Pt. Hemraj Sharma. Varanasi: Chaukhamba Sanskrit Sansthan; 2008. p. 289.
3. Agnivesh, Charaka Samhita, Sharira Sthana. Khudikagarbhavakranti Adhyay, 3/12. In: Pt. Shastry KN, Chaturvedi GN, editors. Vidyotini Vyakhya, Charaka Samhita, Part I. Varanasi: Chaukhamba Bharati Academy; 2006. p. 859.
4. Kashayapa, Kashyapa Samhita, Sutra Sthana, Lehadhya. Vidyotini Hindi Commentary. Pt. Hemraj Sharma. Varanasi: Chaukhamba Sanskrit Sansthan; 2008. p. 2.
5. Agnivesh, Charaka Samhita, Sutra Sthana, Vividhitapitiyadi Adhyaya, 28/25. In: Pt. Shastry KN, Chaturvedi GN, editors. Vidyotini Vyakhya, Charaka Samhita, Part I. Varanasi: Chaukhamba Bharati Academy; 2006. p. 571.
6. Anaemia prevalence by UNICEF. Available from: http://www.cdpf.ca.gov/health.info.com. [Last cited on 2009 Nov 27].
7. Available from: http://www.medicalschemes.com. [Last cited on 2009 Nov 27].
8. Datta DC. Anaemia in pregnancy. Text Book of Obstetrics. 5th ed. Calcutta: New Central Book Agency; 2001. p. 277.
9. Govind Das Sen. Bhaishajya Ratnavali. In: Pro. Mishra S, editor. Shula Rogadhikara 30/142-147. Varanasi: Chaukhamba Prakashana; 2007. p. 259.
10. Available from: http://www.whfoods.com/genpage.php?name=george. [Last cited on 2010 Oct. 15].

हिन्दी सारांश
गर्भिणी पाण्डु में पाण्डुच्छों एवं धात्रीलोहवटी का तुलनात्मक अध्ययन
अमित वि. रुपारा, एस. बी. दोंगा, एल. पी. देई
गर्भिणी खी को प्रभावित करने वाली व्याधियों में पाण्डु प्रमुख है। आयुर्विज्ञानिक ज्ञानों में पाण्डु को रस प्रदौष्ट विकार के अन्तर्गत सम्मिलित किया गया है। गर्भावस्था ज्ञान अवास्था के लिए अतिरिक्त आवश्यकता तथा पाण्डु की अवस्था फार्मावानुपात होता है। प्रस्तुत अवस्था में कुल 22 रूपांतरों को पंजीकृत किया गया जिसमें से कुल 20 रूपांतरों ने चिकित्सा अवधि पूर्ण की। प्रथम वर्ग में सम्मिलित 12 रूपांतरों को पाण्डुच्छी बदी, 400 मि.प्रा. की 2 गोली दिन में तीन बार दी गई तथा द्वितीय वर्ग में सम्मिलित 10 रूपांतरों को धाती लोह बदी 500 मि. प्रा. की 1 गोली दिन में तीन बार दी गई। इस अध्ययन में प्रथम वर्ग की अपेक्षा द्वितीय वर्ग में उल्लासवर्धक परिषाम प्राप्त हुआ है।