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Research Article

# A CLINICAL STUDY TO EVALUATE THE EFFICACY OF SHUDDA KASISA AND AMALAKI CHURNA ON PANDU ROGA VIS A VIS IRON DEFICIENCY ANEMIA

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**ABSTRACT**

The cardinal feature of Pandu Roga is Pandutha i.e. deranged color of the skin and which is markedly observed in mucous membrane of conjunctiva, buccal cavity etc. According to Charaka samitha pandu roga is Rasapradoshja vikara and according to Sushruta samitha pandu roga is Raktapradoshja vikara. Pandu Roga can be compared to iron deficiency anemia. This becomes a major problem in the developing countries like India due to the majority of people living in the below poverty line, unhygienic food habits, nutritional deficiency and illiteracy. Iron deficiency Anemia is the most prevalent type of anemia which attributes to 50 % of total population suffering from anemia and also is the cause for 841,000 deaths annually. WHO has estimated that around 2 billion people across the world is suffering from anemia. According to W.H.O anemia as a condition in which Hemoglobin content of the blood is lower than the normal as a result of a deficiency of one or more essential nutrients regardless of the cause of such deficiency. It may impair cellular responses and immune functions and increase susceptibility to infection. In the starting stage people are not bothered about the disease, but after some time due to the long lasting of disease cause metabolic defect and further leads to emaciation and wasting of the body. Many programmes are conducted by various organization and many medicines are also available for treating anemia, in spite of all this anemia still remains as a burning nutritional problem.

**Keywords:** Panduthwa, Agnimandya, Arohanaayasa, Iron deficiency anemia, Alparaktata, Shuddha kasisa.

## INTRODUCTION

Change in the complexion of an individual (declined one) usually points towards initiation of an illness and it are one of the cardinal sign of Pandu Roga[1]. As majority of features in panduroga and anemia are similar, pandu roga is generally correlated with anemia. Among different types of anemia, Iron deficiency anemia (nutritional anemia) has been labeled as the commonest nutritional deficiency[2]. According to WHO, it is estimated that prevalence of nutritional anemia in India is 76 % in preschool children, 50 % in school children, 15-20 % in men and 50-80 % in women, 70-90 % in pregnant women.[3] Anemia is a burning problem mainly due to illiteracy and malnutrition and it is seen especially among socio economically backward community of India. School children and women of the villages are major victim of anemia. Keeping above aspects in mind an attempt had been made to find a formulation for the successful management of Pandu Roga. Kasisa is one among the iron-containing mineral. The references of Kasisa are for external application is found in Charaka samitha, Sushruta samitha and Astanga Sangraha. Later it was used as internal medicine in treating many diseases. The detailed description of Kasisa and its wide therapeutic use is found in almost all the text books of Rasa Shastra. In Rasendra Sara Sangraha[4] Kasisa is said as "Rasavadgunakaraka" this emphasizes the importance of Kasisa. The shudda kasisa, one among the several preparations prescribed in the classics for the management of Panduroga. Which is a simple and economical; Method of preparation of shuddha Kasisa is also easy when compared to other preparations like Loha, Abhraka etc. Hence shudda Kasisa is selected for this study. Along with kasisa amalaki choorna is taken for the study because it is Agnidipaka, Brimhana, Balavardhaka and help in Preenana[5]. It is a Rasayana, Vrishya and Raktapittahara[6] Ascorbic acid is a reducing substance which is the main content of Amalaki. It reduces Ferric Iron and forms absorbable complexes. Ascorbic acid is even required for maturation of RBC[7].

### Objectives of the Study

To study the efficacy of Suddha Kasisa with Amalaki choorna in pandu roga (IDA)

## MATERIALS AND METHODS

### Shuddha Kasisa

Kasisa was procured from Govindaraj Shetty and Sons, Devaraj Urs Road, Mysore, India and shodhana procedure was carried out. This involved bhavana with Bringaraja Swarasa (*Eclipta alba* q.s) for 3 days. After which it was

dried in shade and then grinded into very fine powder. Preparation was done at S.N Pandit and son`s Pharmacy, Mysore, India.

**Amalaki choorna**

Amalaki choorna was procured from S.N Pandit and son`s Pharmacy, Mysore, India

## METHODS

**Research Design**

It was a comparative clinical study with a pretest and post test design.

**Source of Data and Sampling Method**

- A total of 40 patients suffering from pandu roga (IDA) of either sex and within the age group of 16-60 years were selected incidentally from the OPD of G.A.M.C and Hospital, Mysore, India
- Data was also collected from the IPD of G.A.M.C and Hospital Mysore, India. The patients were registered and treated as outpatients and inpatients for the present study with the help of a special Performa prepared for this study.

**Diagnostic criteria**

- Pandutha (pallor) and arohana ayasa (exertion dyspnoea) with or without other laxanas of pandu roga (IDA)
- Hemoglobin percentage below 12 g% i.e. Males between 6- 12 g%. Females between 6- 11 g%
- Microcytic hypochromic anemia or normocytic hypochromic anemia in blood picture

**Inclusion criteria**

- Patients with the existence of pratyatma laxana like panduta (pallor) with or without other laxanas of pandu (IDA)
- Patients between the age group of 16-60 years.
- Hemoglobin percentage below 12 g%, Males below 6-12 g%, Females below 6-11 g%
- Blood picture presenting either microcytic hypochromic or normocytic hypochromic anemia.

**Exclusion criteria**

- IDA resulting from acute or chronic blood loss.
- IDA in pregnancy.
- IDA resulting from underlying chronic disorders likes Rheumatoid arthritis, hepatic cirrhosis, malignant disease and other systemic disorders.
- Sideroblastic anemia, Thalassemia major and minor.
- IDA in association with other systemic disorders which interferes with the intervention.

**Intervention**

Shuddha Kasisa 250 mg with Amalaki choorna 5 g bid along with water after food.

**Study period**

Study was conducted for 30 days.

**Assessment criteria**

The results were evaluated by subjective and objective parameters mainly based on clinical observation by grading method and laboratory values. The obtained data were analyzed with the suitable statistical methods.

**Investigations**

The following investigations were done before and after treatment Hb%, RBC, PCV, MCV, MCH, MCHC and Blood Picture.

**Statistical Analysis**

The results of the present study were analyzed statistically using Descriptive Statistics, t-test Paired Samples with the help of SPSS for Windows Software (Stat's Presentation System Software)

**Grading on Clinical Features**

**Table 1: Grading on clinical features**

| Blood picture | Arohana ayasa | Pallor | Brahma | Hrudrava |
|---|---|---|---|---|
| 0-Normocytic, normochromic | 1-No dyspnoea | 1-No pallor | 0-No bhrama | 0-No hrudrava |
| 1-Normocytic, hypochromic | 2-Dyspnoea after strenous exercise | 2-Conjunctiva slightly pale, nails and other mucous membrane not pale | 1-Occasionally | 1-After heavy work |
| 2-Microcytic, normochromic | 3-Dyspnoea after moderate exercise | 3-Conjunctiva pale, mucosa and nails slightly pale | 2-Frequently | 2-After light work |
| 3-Microcytic , hypochromic | 4-Dyspnoea after mild exercise | 4-Conjunctiva, mucosa and nails pale | 3-Always | 3-Always present |

**Table 2: Grading on clinical features**

| Srama | Daurbalya | Agnimandya/hatanala | Pindikodweshtanam | Gatra shoola | Swasha |
|---|---|---|---|---|---|
| 0-No srama | 0-No daurbalya | 0-No agnimandya | 0-Absent | 0-Absent | 0-Not present |
| 1-After light work | 1-After light work | 1-Delayed digestion of heavy meals | 1-After heavy work | 1-After mild work | 1-After heavy work, relieved soon and tolerate |
| 2-After heavy work | 2-After heavy work | 2-Delayed digestion of light meals | 2-After moderate work | 2-After moderate work | 2-After modrate work relieved later and tolerate |
| 3-Always present | 3-Always present | 3-Cannot digest even light meals | 3-Only at night but beyond tolerate | 3-After heavy work | 3-After little work relieved later |

## RESULTS

Majority of the patients of pandu roga (IDA) were found in female (75 %) age between 31-45 years married (82.5 %) urban (52.5 %) and illiterate (35 %). Shudda kasisa and amalaki choorna provided highly significant effect in relieving percentage-wise relief were Arohana Ayasa (86.2 %), Panduta (89.9 %), Sarma (89.1 %), Daurbalyata (86.6 %), Hridrava (70.0 %), Hataanala (72.5 %), Pindikodweshtan (41.8 %), Gatrashoola (76.5 %), Swasha (31.5 %), Shotha (27.5 %), Kati, uru pada, ruk (64.5 %), Shira shoola (38.2.0 %) and also showed statistically High significant value 0.000 in all the subjective criteria. Hematological investigations also showed statistically High significant value 0.000 in Hb%, RBC, PCV, MCV, MCH and Blood picture and non significant result in MCHC. Over all improvements showed 85.5 % which is considered as marked improvement with highly significant value in laboratory investigations.

**Table 3: Paired Samples Statistics of objective criteria**

| pair | Objective criteria | Mean | N | Std. Deviation |
|---|---|---|---|---|
| Pair 1 | Hemoglobin BT | 8.2975 | 40 | 1.86623 |
| | Hemoglobin AT | 10.6313 | 40 | 1.86701 |
| Pair 2 | Reb blood corpuscles BT | 4.1823 | 40 | 0.88094 |
| | Reb blood corpuscles AT | 4.9713 | 40 | 0.59079 |
| Pair 3 | Packed cell volume BT | 27.465 | 40 | 7.25137 |
| | Packed cell volume AT | 35.158 | 40 | 5.81558 |
| Pair 4 | Mean corpuscular volume BT | 66.4593 | 40 | 16.28178 |
| | Mean corpuscular volume AT | 72.0375 | 40 | 11.76354 |
| Pair 5 | Mean corpuscular hemoglobin | 19.9463 | 40 | 5.93779 |
| | Mean corpuscular hemoglobin | 21.665 | 40 | 3.88155 |
| Pair 6 | Mean corpuscular hemoglobin concentration. | 29.9415 | 40 | 1.97314 |
| | Mean corpuscular hemoglobin concentration. | 30.1473 | 40 | 0.97113 |

**Table 4: Paired Samples Paired Samples Correlations Statistics of objective criteria**

| | objective criteria | N | Correlation | Sig. |
|---|---|---|---|---|
| Pair 1 | Hemoglobin BT & Hemoglobin AT | 40 | 0.728 | 0 |
| Pair 2 | Reb blood corpuscles BT& Reb blood corpuscles AT | 40 | 0.416 | 0.008 |
| Pair 3 | Packed cell volume BT & Packed cell volume AT | 40 | 0.694 | 0 |
| Pair 4 | Mean corpuscular volume BT & Mean corpuscular volume AT | 40 | 0.605 | 0 |
| Pair 5 | Mean corpuscular hemoglobin BT & Mean corpuscular hemoglobin AT | 40 | 0.603 | 0 |
| Pair 6 | Mean corpuscular hemoglobin concentration BT & Mean corpuscular hemoglobin concentration AT | 40 | 0.341 | 0.031 |

**Table 5: Paired Samples differences Statistics of objective criteria**

| | | Paired Differences | | | |
|---|---|---|---|---|---|
| Pair | objective criteria | Mean | Std. Deviation | Std. Error Mean | Sig. (2tailed) |
| Pair 1 | Hemoglobin BT & Hemoglobin AT | -2.33375 | 1.37633 | 0.21762 | |
| Pair 2 | Reb blood corpuscles BT& Reb blood corpuscles AT | -0.789 | 0.83195 | 0.13154 | 0 |
| Pair 3 | Packed cell volume BT & Packed cell volume AT | -7.693 | 5.27962 | 0.83478 | 0 |
| Pair 4 | Mean corpuscular volume BT & Mean corpuscular volume AT | -5.57825 | 13.10626 | 2.07228 | 0.01 |
| Pair 5 | Mean corpuscular hemoglobin BT & Mean corpuscular hemoglobin AT | -1.71875 | 4.74776 | 0.75069 | 0.028 |
| Pair 6 | Mean corpuscular hemoglobin concentration BT & Mean corpuscular hemoglobin concentration AT | -0.20575 | 1.87885 | 0.29707 | 0.493 |

**Table 6: Degree of Arohana ayasa of the patients Before and After the clinical trials**

| | Cross table | | | | | | total |
|---|---|---|---|---|---|---|---|
| session | | | Arohana ayasa | | | | |
| | Before | | No dyspnea | After strenuous work | Moderate exercise | Mild exercise | |
| | | count | 0 | 0 | 15 | 25 | 40 |
| | | %within Arohanaayasa | .0 % | .0 % | 78.9 % | 96.2 % | 50.0 % |
| | | % of total | .0 % | .0 % | 18.8 % | 31.3 % | 50.0 % |
| | After | count | 30 | 5 | 4 | 1 | 40 |
| | | %withn Arohanaayasa | 100.0 % | 100.0 % | 21.1 % | 3.8 % | 50.0 % |
| | | % of total | 37.5 % | 6.3 % | 23.8 % | 32.5 % | 100.0 % |
| Total | | count | count | 5 | 19 | 26 | 80 |
| | | % within | %within Arohanaayasa | 100.0 % | 100.0 % | 100.0 % | 100.0 % |
| | | % of total | % of total | 6.3 % | 23.8 % | 32.5 % | 100.0 % |

| Chi square test | | | |
|---|---|---|---|
| | value | df | Asymp.sig.(2 sided) |
| Pearson Chi-Square | 63.522[a] | 3 | .000 |
| Likelihood Ratio | 82.869 | 3 | .000 |
| Linear-by-Linear association | 59.263 | 1 | .000 |
| N of Valid Cases | 80 | | |

**Table 7: Degree of Pandutha of the patients before and after the clinical trials**

| | Cross table | | | | | | total |
|---|---|---|---|---|---|---|---|
| session | | | Pandutha | | | | |
| | Before | | No pallor | Conjunctiva pale | Conjunctiva mucosa pale | Conjunctiva, mucosa nail pale | |
| | | count | 0 | 7 | 19 | 14 | 40 |
| | | % within Pandutha | .0 % | 58.3 % | 90.5 % | 93.3 % | 50.0 % |
| | | % of total | .0 % | 8.8 % | 23.8 % | 17.5 % | 50.0 % |
| | After | count | 32 | 5 | 2 | 1 | 40 |
| | | %within Pandutha | 100.0 % | 41.7 % | 9.5 % | 6.7 % | 50.0 % |
| | | % of total | 40.0 % | 6.3 % | 2.5 % | 1.3 % | 50.0 % |
| Total | | count | count | 12 | 21 | 15 | 80 |
| | | % within | % within pandutha | 100.0 % | 100.0 % | 100.0 % | 100.0 % |
| | | % of total | % of total | 15.0 % | 26.3 % | 18.8 % | 100.0 % |

| Chi square test | | | |
|---|---|---|---|
| | value | df | Asymp.sig.(2 sided) |
| Pearson Chi-Square | 57.362[a] | 3 | .000 |
| Likelihood Ratio | 74.046 | 3 | .000 |
| Linear-by-Linear association | 51.201 | 1 | .000 |
| N of Valid Cases | 80 | | |

**Table 8: Degree of Sharma of the patients before and after the clinical trials**

| | Cross table | | | | | | total |
|---|---|---|---|---|---|---|---|
| session | | | Sharma | | | | |
| | Before | | No shrama | occasionally | frequently | always | |
| | | count | 2 | 6 | 21 | 11 | 40 |
| | | %within shrama | 6.5 % | 37.5 % | 95.5 % | 100.0 % | 50.0 % |
| | | % of total | 2.5 % | 7.5 % | 26.3 % | 13.8 % | 50.0 % |
| | After | count | 29 | 10 | 1 | 0 | 40 |
| | | %within shrama | 93.5 % | 41.7 % | 9.5 % | 6.7 % | 50.0 % |
| | | % of total | 36.3 % | 12.5 % | 1.3 % | .0 % | 50.0 % |
| Total | | count | count | 16 | 22 | 15 | 80 |
| | | % within | %within shrama | 100.0 % | 100.0 % | 100.0 % | 100.0 % |
| | | % of total | % of total | 15.0 % | 26.3 % | 18.8 % | 100.0 % |

| Chi square test | | | |
|---|---|---|---|
| | value | df | Asymp.sig.(2 sided) |
| Pearson Chi-Square | 57.698[a] | 3 | .000 |
| Likelihood Ratio | 66.766 | 3 | .000 |
| Linear-by-Linear association | 49.548 | 1 | .000 |
| N of Valid Cases | 80 | | |

**Table 9: Degree of Dourbhalyatha of the patients before and after the clinical trials**

| | Cross table | | | | | | total |
|---|---|---|---|---|---|---|---|
| session | | | Dourbhalyatha | | | | |
| | Before | | No Dourbhalyatha | occasionally | frequently | always | |
| | | count | 1 | 7 | 20 | 12 | 40 |
| | | % within Dourbhalyatha | 3.0 % | 46.7 % | 100.0 % | 100.0 % | 50.0 % |
| | | % of total | 2.5 % | 7.5 % | 26.3 % | 13.8 % | 50.0 % |
| | After | count | 32 | 8 | 0 | 0 | 40 |
| | | % within Dourbhalyatha | 97.0 % | 53.3 % | .0 % | .0 % | 50.0 % |
| | | % of total | 40.0 % | 10.0 % | .0 % | .0 % | 50.0 % |
| Total | | count | count | 15 | 20 | 12 | 80 |
| | | % within | %within Dourbhalyatha | 100.0 % | 100.0 % | 100.0 % | 100.0 % |
| | | % of total | % of total | 18.8 % | 25.0 % | 15.0 % | 100.0 % |

| Chi square test | | | |
|---|---|---|---|
| | value | df | Asymp.sig.(2 sided) |
| Pearson Chi-Square | 61.188[a] | 3 | .000 |
| Likelihood Ratio | 81.213 | 3 | .000 |
| Linear-by-Linear association | 55.833 | 1 | .000 |
| N of Valid Cases | 80 | | |

**Table 10: Degree of hridrava of the patients before and after the clinical trial**

| | Cross table | | | | | | total |
|---|---|---|---|---|---|---|---|
| session | | | hridrava | | | | |
| | Before | | No hridrava | After hard work | After mild work | always | |
| | | count | 9 | 14 | 14 | 3 | 40 |
| | | %within hridrava | 20.0 % | 87.5 % | 87.5 % | 100.0 % | 50.0 % |
| | | % of total | 11.3.% | 17.5 % | 17.5 % | 3.8 % | 50.0 % |
| | After | count | 36 | 2 | 2 | 0 | 40 |
| | | %within hridrava | 80.0 % | 12.5 % | 12.5 % | .0 % | 50.0 % |
| | | % of total | 45.0 % | 2.5 % | 2.5 % | .0 % | 50.0 % |
| Total | | count | count | 16 | 16 | 3 | 80 |
| | | % within | %within hridrava | 100.0 % | 100.0 % | 100.0 % | 100.0 % |
| | | % of total | % of total | 20.0 % | 20.0 % | 3.8 % | 100.0 % |

| Chi square test | | | |
|---|---|---|---|
| | value | df | Asymp.sig.(2 sided) |
| Pearson Chi-Square | 37.200[a] | 3 | .000 |
| Likelihood Ratio | 41.754 | 3 | .000 |
| Linear-by-Linear association | 30.121 | 1 | .000 |
| N of Valid Cases | 80 | | |

**Table 11: Degree of Hatanala of the patients before and after the clinical trial**

| | Cross table | | | | | | total |
|---|---|---|---|---|---|---|---|
| session | | | Hatanala | | | | |
| | Before | | No Hatanala | After hard work | After mild work | always | |
| | | count | 7 | 13 | 18 | 2 | 40 |
| | | % within Hatanala | 16.3 % | 76.5 % | 100.0 % | 100.0 % | 50.0 % |
| | | % of total | 8.8 % | 16.3 % | 22.5 % | 2.5 % | 50.0 % |
| | After | count | 36 | 4 | 0 | 0 | 40 |
| | | % within Hatanalat | 83.7 % | 23.5 % | .0 % | .0 % | 50.0 % |
| | | % of total | 45.0 % | 5.0 % | .0 % | .0 % | 50.0 % |
| Total | | count | count | 17 | 18 | 2 | 80 |
| | | % within | %within Hatanala | 100.0 % | 100.0 % | 100.0 % | 100.0 % |
| | | % of total | % of total | 21.3 % | 22.5 % | 2.5 % | 100.0 % |

| Chi square test | | | |
|---|---|---|---|
| | value | df | Asymp.sig.(2 sided) |
| Pearson Chi-Square | 44.323[a] | 3 | .000 |
| Likelihood Ratio | 54.146 | 3 | .000 |
| Linear-by-Linear association | 40.457 | 1 | .000 |
| N of Valid Cases | 80 | | |

**Table 12: Degree of Pindikodewstana of the patients before and after the clinical trial**

| | Cross table | | | | | | total |
|---|---|---|---|---|---|---|---|
| session | | | Pindikodewstana | | | | |
| | Before | | No Pindikodewstana | After hard work | After mild work | always | |
| | | count | 23 | 10 | 4 | 3 | 40 |
| | | %within Pindikodewstana | 37.7 % | 83.3 % | 100.0 % | 100.0 % | 50.0 % |
| | | % of total | 28.8 % | 12.5 % | 5.0 % | 3.8 % | 50.0 % |
| | After | count | 38 | 2 | 0 | 0 | 40 |
| | | %within Pindikodewstana | 62.3 % | 16.7 % | .0 % | .0 % | 50.0 % |
| | | % of total | 47.5 % | 2.5 % | .0 % | .0 % | 50.0 % |
| Total | | count | count | 12 | 4 | 3 | 80 |
| | | % within | %within Pindikodewstana | 100.0 % | 100.0 % | 100.0 % | 100.0 % |
| | | % of total | % of total | 15.0 % | 5.0 % | 3.8 % | 100.0 % |

| Chi square test | | | |
|---|---|---|---|
| | value | df | Asymp.sig.(2 sided) |
| Pearson Chi-Square | 16.022[a] | 3 | .001 |
| Likelihood Ratio | 19.253 | 3 | .000 |
| Linear-by-Linear association | 13.873 | 1 | .000 |
| N of Valid Cases | 80 | | |

**Table 13: Degree of Gatrashoola of the patients before and after the Clinical trial**

| | Cross table | | | | | | total |
|---|---|---|---|---|---|---|---|
| session | | | Gatrashoola | | | | |
| | Before | | No Gatrashoola | After hard work | After mild work | always | |
| | | count | 4 | 11 | 21 | 4 | 40 |
| | | %within Gatrashoola | 11.8 % | 52.4 % | 100.0 % | 100.0 % | 50.0 % |
| | | % of total | 5.0 % | 13.8 % | 26.3 % | 5.0 % | 50.0 % |
| | After | count | 30 | 10 | 0 | 0 | 40 |
| | | % within Gatrashoola | 88.2 % | 47.6 % | .0 % | .0 % | 50.0 % |
| | | % of total | 37.5 % | 12.5 % | .0 % | .0 % | 50.0 % |
| Total | | count | count | 21 | 21 | 4 | 80 |
| | | % within | % within Gatrashoola | 100.0 % | 100.0 % | 100.0 % | 100.0 % |
| | | % of total | % of total | 15.0 % | 5.0 % | 3.8 % | 100.0 % |

| Chi square test | | | |
|---|---|---|---|
| | value | df | Asymp.sig.(2 sided) |
| Pearson Chi-Square | 44.930[a] | 3 | .000 |
| Likelihood Ratio | 57.209 | 3 | .000 |
| Linear-by-Linear association | 42.259 | 1 | .000 |
| N of Valid Cases | 80 | | |

**Table 14: Degree of Swasha of the patients before and after the clinical trial**

| | Cross table | | | | | Total |
|---|---|---|---|---|---|---|
| session | | | Swasha | | | |
| | Before | | No swasha | After hard work | After mild work | |
| | | count | 32 | 7 | 21 | 40 |
| | | %within swasha | 45.7 % | 77.8 % | 100.0 % | 50.0 % |
| | | % of total | 40.0 % | 8.8 % | 13 % | 50.0 % |
| | After | count | 38 | 2 | 0 | 40 |
| | | %within swasha | 54.3 % | 22.2 % | .0 % | 50.0 % |
| | | % of total | 47.5 % | 2.5 % | .0 % | 50.0 % |
| Total | | count | count | 9 | 1 | 80 |
| | | % within | %within swasha at | 100.0 % | 100.0 % | 100.0 % |
| | | % of total | % of total | 11.3 % | 1.3 % | 100.0 % |

| Chi square test | | | |
|---|---|---|---|
| | value | df | Asymp.sig.(2 sided) |
| Pearson Chi-Square | 4.292[a] | 3 | .117 |
| Likelihood Ratio | 4.843 | 3 | .089 |
| Linear-by-Linear association | 4.121 | 1 | .040 |
| N of Valid Cases | 80 | | |

**Table 15: Degree of Shotha of the patients before and after the Clinical trial**

| | Cross table | | | | | Total |
|---|---|---|---|---|---|---|
| session | | | Shotha | | | |
| | Before | | absent | mild | Moderate | |
| | | count | 29 | 8 | 3 | 40 |
| | | %within Shotha | 42.6 % | 88.9 % | 100.0 % | 50.0 % |
| | | % of total | 36.3 % | 10.0 % | 3.8 % | 50.0 % |
| | After | count | 39 | 1 | 0 | 40 |
| | | %within Shotha | 57.4 % | 11.1 % | .0 % | 50.0 % |
| | | % of total | 48.8 % | 1.3 % | .0 % | 50.0 % |
| Total | | count | count | 9 | 3 | 80 |
| | | % within shot | %within shot at | 100.0 % | 100.0 % | 100.0 % |
| | | % of total | % of total | 11.3 % | 1.3 % | 100.0 % |

| Chi square test | | | |
|---|---|---|---|
| | value | df | Asymp.sig.(2 sided) |
| Pearson Chi-Square | 9.915[a] | 2 | .007 |
| Likelihood Ratio | 11.832 | 2 | .003 |
| Linear-by-Linear association | 9.176 | 1 | .002 |
| N of Valid Cases | 80 | | |

**Table 16: Degree of kati uru jangha shoola of the patients before and after the clinical trial**

| | Cross table | | | | | | total |
|---|---|---|---|---|---|---|---|
| session | | | kati,uru jangha shoola | | | | |
| | Before | | No | After hard work | After mild work | always | |
| | | count | 7 | 15 | 12 | 6 | 40 |
| | | % within | 21.9 % | 51.7 % | 92.3 % | 100.0 % | 50.0 % |
| | | % of total | 8.8 % | 18.8 % | 15.0 % | 7.5 % | 50.0 % |
| | After | count | 25 | 14 | 1 | 0 | 40 |
| | | % within | 78.1 % | 48.3 % | 7.7 % | .0 % | 50.0 % |
| | | % of total | 31.3 % | 17.5 % | .1.3 % | .0 % | 50.0 % |
| Total | | count | count | 21 | 21 | 4 | 80 |
| | | % within | % within | 100.0 % | 100.0 % | 100.0 % | 100.0 % |
| | | % of total | % of total | 36.3 % | 16.3 % | 7.5 % | 100.0 % |

| Chi square test | | | |
|---|---|---|---|
| | value | df | Asymp.sig.(2 sided) |
| Pearson Chi-Square | 25.467[a] | 3 | .000 |
| Likelihood Ratio | 30.064 | 3 | .000 |
| Linear-by-Linear association | 24.273 | 1 | .000 |
| N of Valid Cases | 80 | | |

**Table 17: Degree of Shirashoola of the patients before and after the clinical trial**

| | Cross table | | | | | | total |
|---|---|---|---|---|---|---|---|
| session | | | Shirashoola | | | | |
| | Before | | No Shirashoola | After hard work | After mild work | always | |
| | | count | 24 | 13 | 2 | 1 | 40 |
| | | %within Shirashoola | 39.3 % | 81.3 % | 100.0 % | 100.0 % | 50.0 % |
| | | % of total | 30.0 % | 16.3 % | 2.5 % | 1.3 % | 50.0 % |
| | After | count | 37 | 3 | 0 | 0 | 40 |
| | | %within Shirashoola | 60.7 % | 18.8 % | .0 % | .0 % | 50.0 % |
| | | % of total | 46.3 % | 3.8 % | .0 % | .0 % | 50.0 % |
| Total | | count | count | 16 | 2 | 1 | 80 |
| | | % within | %within Shirashoola | 100.0 % | 100.0 % | 100.0 % | 100.0 % |
| | | % of total | % of total | 20.0 % | 2.5 % | 1.3 % | 100.0 % |

| Chi square test | | | |
|---|---|---|---|
| | value | df | Asymp.sig.(2 sided) |
| Pearson Chi-Square | 12.020[a] | 3 | .007 |
| Likelihood Ratio | 13.689 | 3 | .003 |
| Linear-by-Linear association | 10.815 | 1 | .001 |
| N of Valid Cases | 80 | | |

## DISCUSSION

Prevalence of age between age group of 31 – 45 years is because the loss of Iron is comparatively more in this age group. Moreover negligence of health, due to responsibilities and work load is common. Females are more prone to pandu due to the fewer intakes of dietary iron supplement and menstrual bleeding. Mental tension and malnutrition might also be the reason. Among the 40 patients, male patients were 25.0 %. Which comprise of 10 patients and females were 75 %, which comprise of 30 patients. Maximum number of patients in the present study was females; it might be due to the fewer intakes of dietary iron supplement and menstrual bleeding in females. Mental tension and malnutrition might be the reason. Maximum of 47.5 % were in middle class, 25 % patients were in poor middle class people had the highest incidence of the disease. This might be due the negligence of health, unawareness about the disease, unavailability of nutritious food and unhygienic conditions. Patients having the classical features of pandu, showed, microcytic hypochromic anemia, and normocytic hypochromic anemia, in their peripheral blood smear, which is confirmatory test for IDA. Based on the observation, pandu can be correlated to IDA. Clinical study showed statistically highly significant results with the 'P' value 0.000. This result may be because the trail drugs are rich in iron and Amalaki is amla rasa pradhana dravya which helps in the bio availability of iron.

### Arohan ayasa

Arohana ayasa is due to dhatu kshya (rakta dhatu) this is because when the hemoglobin fails to carry required amount of oxygen to body, person feels dysponea on exertion. Clinical study showed statistically highly significant results with the 'P' value 0.000. This result may be because the trail drugs are having rakta vardaka gunas and along with the balya, rasayana, hrudhya karmas which are said to be very effective in managing this symptom.

### Pandutha

The most important presenting sign of pandu roga is panduta. This sign is the most conclusive sign of the disease because, whenever any patient comes across, the thing first observed is the appearance. Varna and prabha are the properties of Raktadhatu and pitta dosha, particularly the Bhrajaka and Ranjaka pitta. It is also the property of ojas. As more and

more ojakshaya raktakshaya and pitta prakopa occurs the patient becomes hatprabha or panduta appears. Regarding the effect of therapy, Clinical study showed statistically highly significant results with the 'P' value 0.000 in reducing pandutha. The reason for good results is may be due to increasing Hb% levels owing to yakruthuttejaka and varnya properties of daruharidra and rasayana, vrashya gunas of amalaki and pitta hara and rakta vardaka, property of shudda kasisa.

**Shrama**

This is again due to rasa raktadi dhatukshaya, raktalpata etc. As per contemporary view the red cells in the blood are responsible for supplying oxygen to body tissues. The oxygen is very necessary for the normal metabolic activities. When there is decrease in number of red cells, metabolic activities are hastened and if this condition persists for a long period, debility is experienced. Clinical study showed statistically highly significant results with the 'P' value 0.000. On this feature shudda kasisa contain Rasayana like amalaki, kasisa so it may be very effective in decreasing shrama.

**Dourbhalyatha**

The reason for dourbhalyatha is dhatukshaya, ojakshaya as well as raktalpta which cause the debility to do any work or in other words daurbalya. Regarding the effect of therapy result in Clinical study showed statistically highly significant results with the 'P' value 0.000. This Result may be attributed to shamana of vata and pitta dosha to a greater extent by shudda kasisa. These compounds has also Rasayana,vrushya properties which is necessary for Dhatukshayaja vikaras.

**Hridrava**

Hridrava or Palpitation in pandu roga is due to lack of proper nourishment and Raktalpata that results in less oxygen carrying capacity of blood to various organs, body tissues and especially to heart, Hence heart has to pump quickly to provide rapid blood flow to the body organs. Clinical study showed statistically highly significant results with the 'P' value 0.000. The reason for significant results may be , due to increased Hb% levels i.e. because of Raktavardhaka properties of shudda kasisa and Oxygen carrying capacity of Blood increased due to rich iron concentration in trail drugs.

**Hataanala**

In pandu roga agnimandya has been mentioned among in the samanya lakshanas, in terms of 'Hataanala' This may due to prakopana of pitta and vata doshas due to nidana sevana. Regarding the effect of therapy in Clinical study showed statistically highly significant results with the 'P' value 0.000. This result may be due to agni deepana property of kasisa and amalaki helped to rectify the Hataanala.

**Pindikodweshtana**

Pindikodewshtanama or Leg cramps may occur due to provoked vata dosha due to dhatukshaya. Clinical study showed statistically highly significant results with the 'P' value 0.000. The reason for maximum relief may be due to vata kaphahara, bhalya properties of kasisa and shoola hara, Rasayana properies of amalaki.

**Gatrashoola**

Gatrashoola is due to dhatukshaya, vata dosha gets provoked resulting in to pain all over the sharira. Clinical study showed statistically highly significant results with the 'P' value 0.000. This result may be due to trail which possesses vata hara and shoola hara gunas.

**Swasa**

Swasa in pandu is because of raktalpata and dhatukshya. Clinical study showed statistically significant results with the 'P' value 0.000. The drugs in are having raktavardaka and bhalya properties.

**Shotha**

Shotha in pandu is because of kapha vriddhi producing Srotorodha. Clinical study showed statistically significant results with the 'P' value 0.000, this may be due to significant kapha hara property of the trail drugs.

**Kati, uru, pada ruk**

Kati, uru, pada ruk may be due to vata vriddhi resulting from dhatu kshaya. Clinical study showed statistically highly significant result with the 'P' value 0.000. This significant result may be due to vata hara properties of trail dugs and rasayana, bhalya properties of amalaki.

**Shirashoola**

Shirashoola in the pandu is due to alpa rakta dhatu. When the haemoglobin fail to carry required amount of oxygen to brain at that stage person may feel shirashoola. Regarding the effect of therapy clinical study showed statistically non significant results with the 'P' value 0.000 may be due to trail drugs are containing iron which increases the rakta dhatu.

**Effect of therapies on haematological value**

Haematological values which were considered to assess the effect of drugs in case of pandu roga were Hb%, R.B.C, MCV, MCH, MCHC, and blood picture. This was analyzed before and after treatment after the intervention trial drug was found to be effective in increasing the hematological value. When statistical analysis was carried out, effect of drug was significant for most of the investigation.

**Effect of therapies on Hb%**

Clinical study showed statistically highly significant result with the 'P' value 0.000. As the exact Pharmaco-Dynamics and Pharmaco-Kinetics of the trial drugs could not be studied in this present study, the exact role of the trial drug on hemoglobin cannot be established. Trail drugs contain shudda kasisa which is very rich in iron and it also has amalaki which is rich in Vitamin-C (essential for absorption of iron). Both Iron and Vitamin-C are essential for the formation of hemoglobin.

**Effect of therapies on RBC**

Clinical study showed statistically highly significant result with the 'P' value 0.000. This result may be because the kasisa which has increased iron concentration and amalaki choorna rich in Ascorbic acid, which is also required for maturation of RBC.

**Effect of therapies on PCV**

PCV or Hematocrit value is the volume of packed red cells in a given sample of blood expressed as a percentage.

Regarding the effect of therapy clinical study showed statistically highly significant result with the 'P' value 0.000. This result may be because the increase in the Hb% due to iron and ascorbic acid of trail drugs.

**Effect of therapies on MCV**

Mean corpuscular volume indicates whether RBC's are Microcytic, Normocytic or Macrocytic. Clinical study showed statistically highly significant result with the 'P' value 0.000. The exact Pharmaco-Dynamics and Pharmaco-Kinetics of the trial drugs are not known hence the reason for this result cannot be explained.

**Effect of therapies on MCH**

Mean corpuscular haemoglobin indicates the mean amount of haemoglobin per red cell. Regarding the effect of therapy clinical study showed statistically highly significant result with the 'P' value 0.000. The reason may be trail drugs of are effective in increasing the haemoglobin at the level of red blood corpuscles.

**Effect of therapies on MCHC**

Mean corpuscular haemoglobin concentration indicates the average haemoglobin concentration per unit volume of packed red cells. Clinical study showed statistically non significant result with the 'P' value 0.031. The reason for this result may be due to the trail drugs in the present study being incapable of increasing haemoglobin concentration in the packed red cells.

**Probable mode of action of Shudda kasisa**

The drug kasisa was selected for clinical study after shodhana with Bringaraja swarasa i.e. shudda Kasisa was mainly selected for its chemical composition $FeSO_4$ $7H_2O$. Iron in this dissociable ferrous form has a very good absorption into the system. Owing to its chemical composition this drug is best absorbed into the gut. More over this drug is also mentioned in treatment of pandu roga in the Ayurvedic classics. Bringaraja swarasa was used for bhavana (shodhana) because of its haematinic property which would add to the efficacy of the drug. This drug is mentioned as panduroga hara according to Bhava Prakasha and is said to be 'rakta vardhaka'.

Amalaki choorna is given along with the shudda kasisa because it acts as Agnidipaka, Brimhana, Indriyadridikaraka, Balavardhaka Rasayana and Vrishya; ascorbic acid; which is the main content of Amalaki; which acts as a reducing substance; which reduces Ferric Iron and forms absorbable complexes. Due to its Ashukari and Vyvayi properties it gets easily absorbed in the Srotasa and thus exhibits the properties of applied drugs at a much faster level.

## CONCLUSION

After thorough analysis and systemic clinical work, the following conclusion can be drawn on the action and formulation Shudda kasisa on pandu roga with special reference to iron deficiency anemia. The clinical trial using Shudda kasisa in the treatment period showed significant results in the symptoms like pandutha, Arohanaayasa, Daurbalya, Aruchi, shrama, Agnimandya. Bhrama, Hrudrava, swasa, Shotha, shirashoola and pidikodwestana. The formulation showed significant result in improving Hb%, RBC, PCV, MCV, MCH and Blood picture and non significant results in MCHC. The trial compound contains shudda Kasisa, ($FeSO_4$ $7H_2O$.) Iron in this dissociable ferrous form has a very good absorption into the system and high amount of Vitamin C, which reduces ferric iron to ferrous iron which remains soluble even at neutral pH and is better absorbed. Even when the diet is poor in iron, Vitamin C supplement with each meal enhance iron absorption. Vitamin C taken in divided doses with each meal will increase iron absorption to a greater extent. In the present study the formulations did not show any kind of side effects. Hence it can be adapted as an ideal formulation for treating pandu Roga.

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