



Research Article

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THERAPEUTIC EFFECT OF AMALAKI RASAYANA ON DHATU KSHAYA AND DHATU SARA IN PANDU ROGA

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ABSTRACT

Pandu Roga is caused due to impaired transformation of food into proper bodily tissues like Rasa, Rakta, Mamsa etc. and Oja. In Pandu, due to vitiation of Pitta, Rakta Poshaka Sara part of Rasa Dhatu is not formed in adequate amount which will hamper the production of Rakta Dhatu and subsequent Dhatus. Hence, the present study was carried out with the objective to evaluate the status of Dhatu Kshaya and Dhatu Sara in patients of Pandu and to evaluate the therapeutic effect of Amalaki Rasayana to improve Dhatu Sara (quality of the Dhatu) and Dhatu Kshaya (quantitative assessment) in Pandu. To fulfill the objective total 30 patients of Pandu having hemoglobin level < 12 gm% were registered and were evaluated for presence of symptoms of Dhatu Kshaya and Dhatu Sara, these patients were administered Amalaki Rasayana 6 gm once in a day for 90 days and then they were evaluated for the qualitative and quantitative improvement in Dhatu. After analyzing the data statistically; qualitative and quantitative impairment was reflected in almost all dhatus but maximum impairment was reflected in Rasa dhatu and Rakta dhatu followed by subsequent Dhatus like Mamsa and Meda. Amalaki Rasayana demonstrated highly significant effect in decreasing, symptoms of Rasa, Rakta, Mamsa, Meda, Sukra Dhatu Kshaya and improving, symptoms of Twak, Rakta, Meda and Sukra Sara.

Keywords: Pandu Roga, Dhatu kshaya, Dhatu Sara, Amalaki Rasayana.

INTRODUCTION

Pandu Roga is due to incomplete transformation of food into proper body components Rasa (primary product of digested food), Rakta (blood tissue) etc and Oja (essence of seven dhatus). Globalization, marketing of food products is changing dietary habits which are less Nutritious. In India, Nutritional deficiency Anemia is very high among infants, children and women, it should be urgently addressed because it affects early life and leads to increased risk of NCDs later in life¹. Being a Rasapradoshaja Vyadhi, vitiation of the very first Dhatu after Ahara Rasa and Jatharagni (digestive/metabolic factors) is an obvious event. This results in vitiation of Rasa Dhatu eventually leading to vitiation of further Dhatus in serial order.

According to Acharya Charaka², consumption of Dosha Prakopaka hetus mainly Pitta dominant Ahara Vihara aggravates Pitta Dosha which vitiates Rasa Dhatu. As a result of vitiation of Rasa Dhatu, the Rasa mala Kapha causes Gaurava (Heaviness) and Shaithilyata (flabbiness) in Uttarottar (subsequent) Dhatus. This results in Kshaya (reduction) of Uttarottara Dhatu and Oja ("Soalparakto Alpamedasko Nihsarah Shithilendriya"). According to Acharya Chakrapani³, the word Gaurava indicates "Kriyaswa asamarthyat" which means, Dhatu cannot perform their physiological function effectively. Again, due to vitiation of Pitta, Raktaposhaka Sara part of the Rasa Dhatu is not formed in adequate amount which hampers the production of Rakta Dhatu and subsequent Dhatus. Clinical exploration of this Samprapti

(pathogenesis) may pave a new avenue for the treatment of Pandu.

Since Acharya Charaka has focused mainly on Dhatu Kshaya (decreased quantity) and Nihsarata / Asarata (decreased quality) of Dhatu in Samaprapti of this disease, Rasayana (rejuvenation and revitalization) can be the best answer to treat the disease because Rasayana helps in both, qualitative and quantitative improvement of Dhatus. The specific action of Rasayana drugs within the Poshaka Rasa level (nutrient supplement), Agni level (metabolic appreciation) and Srotasa level (tissue nourishment) is well acceptable⁴.

Nowhere till now the efforts have been made to clinically assess the Dhatu kshaya and Sara Pariksha in the patients of Pandu, Keeping the points in view, the present study has been undertaken to clinically explore the pathogenesis of Pandu roga with special reference to 'Soalparakto alpamedasko Nihsarah Shithilendriya' and to assess the efficacy of Amalaki Rasayana in context with Dhatu kshaya and Sara.

Aims and objectives of the study

- To assess Dhatu Kshaya specially Rasa, Rakta & Meda kshaya in patients of Pandu.
- To assess the Sara specially Rasa, Rakta & Meda Sara in patients of Pandu.
- To assess the efficacy of Amalaki Rasayana in the management of Dhatu Kshaya and Sarata in Pandu Roga.

MATERIAL AND METHODS

Selection of Patients

Total 30 Patients selected from OPD/IPD department of Roga Nidan Rishikul Campus UAU Haridwar having chief complaints described in Pandu were subjected to hematological investigation, Patients with Hb % Concentration less than 12 gm/dl (for either sex) after taking written consent were registered for the present study.

The study has been approved by the Institutional Ethics Committee (UAU/RC/IEC/2017-18/05) and is registered to CTRI (CTRI/2018/04/013339).

Type of Study - Interventional study

Inclusion Criteria

- Patients having classical features of Pandu.
- Patients with Hb % Concentration less than 12 gm/dl (for either sex).
- Patients between the age group of 16-60 years of age.

Exclusion Criteria

- Hemoglobin concentration less than 6 gm%.
- Patients having blood dyscrasias e.g. Thalassemia etc.
- Patients having hemorrhoids, peptic ulcer, malignancy.
- Patients having hemoglobinopathies e.g. sickle cell Anemia, Hb-S disease etc.
- Pregnant females and lactating mothers.
- Patients having positive stool investigation report for parasite.
- Pre diagnosed patients of Mal absorption syndrome.

Investigation

- Basic hematological investigations like Hemoglobin estimation, R.B.C count

- Stool examination- for detection of intestinal helminthes or their ova, cystic forms to exclude the patients of Krimija Pandu.

Selection of Drug- Amalaki Rasayana⁵

Amalaki powder was impregnated or subjected to the Bhavana with its own juice (of one thousand fruits) 21 times to potentiate its therapeutic property. In the last Bhavana, Madhu, Ghrita, pippali and mishri were added and after that, this Awaleha was packed in 100 g bottles.

Drug Trial Schedule

Group	Drug	Dose	Kala	Duration
A	Amalaki Rasayana	6 gm OD	Morning (empty stomach)	90 days

Before commencing the treatment, the patients were administered Panchakola Churna- 3 gm BD for Amapachana and Haritaki Churna – 6 gm at bed time for Kosthasuddhi. For 3-7 days According to Kostha.

Duration of Study- 90 days

Criteria of Assessment

The assessment of the trial was done on the basis of following parameters

- Improvement in the Lakshans of Dhatu kshaya.
- Improvement in the Lakshans of Sara.
- Improvement in Hb (gm%) and RBC count.

Changes in patient status were noted and following points were taken into consideration for assessment of results. To assess the effect of therapy, the assessment of dhatu Kshaya and Sara was done on the basis of number of symptoms present out of total number of symptoms in particular Dhatu as Described below:

Table 1: Symptoms of Dhatu kshaya

S. No.	a) Rasa Dhatu Kshaya	S. No.	e) Asthi Dhatu kshaya
1.	Hridpeeda	1.	Asthi shula (pain in the bones)
2.	Hridkampa	2.	Danta bhang (breaking of teeth)
3.	Hritsunyta (feeling of emptiness in heart)	3.	Raukshyam (dryness)
4.	Trishna (thirst)	4.	Nakha bhang (breaking of nails)
5.	Hritdravatvam (palpitation/tachycardia)	5.	Keshlomnakhadantshramshu prapatan (falling of hairs,nails teeth, body hairs)
6.	Shabdasahisunata (intolerance to loud sound)	6.	Shrama (tiredness)
7.	Swalpchestaya api hridaya tamyati (exhaustion even with little exertion)	7.	Sandhi shaiithilya (looseness in joints)
8.	Raukshya (dryness)		
9.	Shrama (fatigue)		f) Majja Dhatu kshaya
10.	Shosha (emaciation)	1.	Parva bheda (pain in small joints)
11.	Glani (debility)	2.	Asthi toda (pricking sensation in bones)
		3.	Asthi sunyata (feeling of emptiness in bones)
	b) Rakta Dhatu kshaya	4.	Pratatam vataroga (always suffers from vata vyadhi)
1.	Twakparushya (Dryness of skin)	5.	Bhrama (giddiness)
2.	Amlasheetaparthna (Desire for sour and cold substance)	6.	Timirdarsan (blackouts)
3.	Shfutita twak (cracked skin)	7.	Alpasukrata (less quantity of semen)
4.	Malaan twak (dullness of skin/ loss of complexion)		
5.	Shirashaithilya (Loss of the normal tone of the SIRĀ)		g) Sukra Dhatu kshaya
		1.	Maithun ashakti / Klaihya (loss of libido -inability to perform intercourse /impotency)
	c) Mamsa Dhatu Kshaya	2.	Sukra avisharga (no ejaculation of semen)

1.	Sfig griva udar ganda shushkta (emaciation of buttocks, neck, abdomen, cheeks)	3.	Chirat prashek (delayed ejaculation)
2.	Akshi glani (sinking of eyes)	4.	Prasekalpasukradarsan (less quantity of semen /oligozoospermia)
3.	Gatra sadan (debility)	5.	Sarakta sukraprashek (semen ejaculation mixed with blood)
4.	Dhamni shaithilya (low pulse volume)	6.	Medra vrishanavedana (pain in penis and testis)
5.	Sandhi vedana (pain in joints)	7.	Daurbalya (debility)
		8.	Mukhashosha (dryness in the mouth)
	d) Meda Dhatu kshaya	9.	Pandu (pallor)
1.	Sandhi sfutana (cracking sound in joints / crepitation)	10.	Sadan
2.	Sandhi sunyata (emptiness in joints or sucking pain in joints)	11.	Shrama (exhaustion)
3.	Raukshya (dryness)		
4.	Plecha abhivridhi (splenomegaly)		
5.	Akshno aayas (lassitude in the eyes / tired eyes)		
6.	Udar tanuta (flat tummy)		
7.	Krishangata (lean and thin body structure)		

Table 2: Symptoms of Dhatu sara

S. No.	a) Twak Sara	S. No.	e) Asthi Sara (Stula, Drida (robust)-
1.	Snigdha twak (Unctuous)	1.	Paarshni (heels)
2.	Mridu twak (smooth skin)	2.	Gulpha (ankle)
3.	Prasanna twak (clear skin)	3.	Jaanu (knee)
4.	Sukshma twak (fine/thin skin)	4.	Aratni (forearm)
5.	Alpalomatwak (less body hairs)	5.	Jatru (collar bone)
6.	Sukumaarloma (tender body hairs)	6.	Chibuk (chin)
7.	Saprabhevtwak (lustrous skin)	7.	Shir (head)
		8.	Parva (joints)
	b) Rakta Sara- (Snigdha, Rakta varna, Shrimad, Bhajishnu of-	9.	Asthi (bones)
1.	Karna (ears)	10.	Nakha (nails)
2.	Akshi (eyes)	11.	Danta (teeth)
3.	Mukha (face)		
4.	Jihwa (tongue)		f) Majja Sara
5.	Nasa (nose)	1.	Mridu anga (soft body parts)
6.	Ostha (lips)	2.	Snigdha varna (unctuous complexion)
7.	Panitala (sole of hands)	3.	Snigdha swar (unctuous voice)
8.	Paadtala (sole of feet)	4.	Sthoola sandhi (big joints)
9.	Nakha (nails)	5.	Dhirgha vritta sandhi (long rounded joints)
10.	Lalaata (forehead)	6.	Gambhir swar
		7.	Mahanetra (wide eyes)
	c) Mamsa Sara- (Sthira,guru,subha, mansopchita of		
1.	Sankha (temples)		g) Sukra Sara
2.	Lalaata (forehead)	1.	Saumya (gentle face)
3.	Akshi (eyes)	2.	Saumya prekshi (gentle look)
4.	Ganda (cheeks)	3.	Ksheerpoorna lochana (white eyes)
5.	Hanu (jaw)	4.	Praharsh bahula (always happy)
6.	Griva (neck)	5.	Snigdha danta (unctuous teeth)
7.	Skandha (shoulders)	6.	Vritta danta (rounded teeth)
8.	Udara (abdomen)	7.	Saara danta (firm teeth)
9.	Kaksha (axillae)	8.	Sam samhat dasan (uniform strong teeth)
10.	Paani (upper extremities)	9.	Shikhir dasan (elevated teeth margins)
11.	Paada (lower extremities)	10.	Prasanna varna (clear complexion)
12.	Sandhi (joints)	11.	Snigdha varna (unctuous complexion)
		12.	Prasanna swar (clear voice)
	d) Meda Sara- (Snigdhata in-	13.	Snigdha swar (unctuous voice)
1.	Varna (complexion)	14.	Bhrajishnu (pleasant look)
2.	Swara (voice)	15.	Mahasphig (large buttocks)
3.	Netra (eyes)		
4.	Kesh (hairs)		
5.	Loma (body hairs)		
6.	Nakha (nails)		
7.	Danta (teeth)		
8.	Ostha (lips)		
9.	Mutra (urine)		
10.	Purish (feces)		

Statistical analysis

The information gathered on the basis of observation made about various parameters was subjected to statistical analysis in terms of Mean, Standard Deviation (SD) and Standard Error (SE). Wilcoxon signed rank method⁶ was used to check the significance of subjective criteria and Paired 't' test⁷ for objective criteria. The obtained results were interpreted as –

- Insignificant - > 0.05
- Significant - ≤ 0.05
- Highly significant - ≤ 0.001

RESULTS

Total 30 patients were registered in the present study. Out of which 28 patients were completed the treatment. 2 Patients had discontinued the treatment. It was found that maximum number of patients i.e. 53.3% belonged to age group of 31 – 45 years, followed by 43.3% patients to 16 - 30 years, 3.4% patients belonged to 46 -60 years of age group. Sex wise, the maximum i.e. 86.7% patients were female while rest of the patients i.e. 13.3 % were male. Religion wise maximum i.e. 86.7% patients were Hindus followed by 13.3% of Muslims. On considering the Nature of Occupation, it was found that maximum i.e. 40% were housewives and 20% were students. And 13.3% and 23.3% were doing their Service and business respectively and 3.3% were Labors. Considering indulgence of dominant Rasa in diet, Maximum patients i.e. 83.3% were taking Katu Rasa. 80% and 60% were taking Lavana &Amla Rasa; whereas, Madhura Rasa dominancy was found in 50% patients and Tikta Rasa dominancy in 13.3 % patients.

According to presence of symptoms of Dhatu Kshaya, >70% of symptoms of Rasa Kshaya were found in 33.3% patients, symptoms between 50-70% were found in 36.7% of patients and <50% of symptoms were present in 30% patients. Similarly, >70% of symptoms of Rakta Kshaya were found present in 26.7% patients, between 50-70% in 30% patients and <50% in 43.3% patients. Regarding Mamsa (muscle tissue) kshaya >70% symptoms were present in 16.7% patients, symptoms between 50-70% and <50% were found in 30% and 53.3% of patients respectively. Meda (fat tissue) Kshaya symptoms >70 were found in 20% patients, symptoms between 50-70% were present in 26.7% of patients and <50% of symptoms were present in 53.3% patients. Asthi (bone tissue) Kshaya symptoms >70% were present in 10% patients, symptoms between 50-70% and <50% were found in 23.3% and 66.7% of patients respectively. Concerning Majja (bone marrow tissue) and Sukra (reproductive fluids) kshaya >70% symptoms of kshaya were found in 6.6% and 0% patients, symptoms between 50-70% were present in 3.3% and 3.3% of patients and <50% symptoms was found in 90% and 96.7% of patients respectively.

According to presence of Sara, Avara Sara i.e. presence of Twak Sara symptoms <33% was found in 60% patients, Madhyam Twak Sara i.e. presence of Sara symptoms “between” 33% to 66% were present in 36.7% of patients and Pravara twak Sara (>66%) was found in 3.3% patients. Avara, Madhyama and Pravara Rakta Sara, was present in 46.7%, 46.7% and 6.6% patients respectively, likewise Avara, Madhyama and Pravara Mamsa Sara, was present in 16.6%, 80% and 3.4% patients, Avara, Madhyama and Pravara Meda Sara, was present in 30%, 70% and 0% patients, Avara, Madhyama and Pravara Asthi Sara, was present in 0%, 100% and 0% patients correspondingly, Avara, Madhyama and Pravara Majja Sara, was present in 30%, 70% and 0.0% patients, Avara, Madhyama and Pravara Sukra Sara, was present in 26.7%, 73.3% and 0.0% patients respectively.

Table 3: Effect of Amalaki rasayana on Dhatu kshaya

Symptoms	Mean Score		d	Relief %	W	p	Significance
	B.T	A.T					
Rasa Kshaya	6.46	3.85	2.60	40.2%	-406	< 0.001	HS
Rakta Kshaya	2.93	1.57	1.36	46.3%	-351	< 0.001	HS
Mamsa Kshaya	2.46	1.46	1.00	40.6%	-171	< 0.001	HS
Meda Kshaya	3.57	1.96	1.61	45.0%	-325	< 0.001	HS
Asthi Kshaya	3.46	2.57	0.61	17.5%	-120	< 0.03	S
Majja Kshaya	2.04	1.61	0.43	21.1%	-18	< 0.008	S
Sukra Kshaya	3.54	2.64	0.89	25.3%	-210	< 0.001	HS

*B.T – before treatment, A.T – After treatment, d – difference *W – Wilcoxon signed rank, p -probability, HS – Highly significant, S – Significant. Amalaki Rasayana showed statistically highly significant effect in decreasing symptoms of Rasa Kshaya (40.2%), Rakta Kshaya (46.3%), Mamsa Kshaya (40.6%), Meda Kshaya (45.0%) and Sukra Kshaya (25.3%) and significant effect in decreasing symptoms of Asthi Kshaya (17.5%), Majja Kshaya (21.1%)

Table 4: Effect of Amalaki rasayana on Rasa kshaya

Symptoms	Mean Score		d	Relief %	W	p	Significance
	B.T	A.T					
Hridpeeda	0.29	0.25	0.04	12.5%	-1.0	< 1.0	NS
Hridkampa	0.36	0.25	0.11	30.0%	-6.0	< 0.25	NS
Hritsunyta	0.54	0.25	0.29	53.4%	-36.0	< 0.008	S
Trishna	0.61	0.21	0.39	64.7%	-66.0	< 0.001	HS
Hritdravatvam	0.82	0.50	0.32	39.1%	-54.0	< 0.014	S
Shabdasahisunata	0.61	0.21	0.39	64.7%	-66.0	< 0.001	HS
Swalpchestaya api hridaya tamyati	0.82	0.61	0.21	26.1%	-21.0	< 0.031	S
Raukshya	0.75	0.36	0.39	52.4%	-66.0	< 0.001	HS
Shrama	0.75	0.50	0.25	33.3%	-28.0	< 0.016	S
Shosha	0.25	0.21	0.04	14.3%	-1.0	< 1.00	NS
Glani	0.68	0.50	0.18	26.4%	-15.0	< 0.063	NS

*B.T – before treatment, A.T – After treatment, d – difference, W – Wilcoxon signed rank, * p - Probability, HS – Highly significant, S – Significant, NS – Non significant

Table 5: Effect of Amalaki rasayana on Rakta kshaya

Symptoms	Mean Score		d	Relief %	W	p	Significance
	B.T	A.T					
Twakparushya	0.75	0.39	0.36	47.6%	-55	< 0.002	S
Amlasheetaprarthna	0.54	0.29	0.25	46.6%	-35	< 0.039	S
Shfutura twak	0.39	0.32	0.07	18.2%	-3.0	< 0.500	NS
Malaan twak	0.68	0.29	0.39	57.9%	-66	< 0.001	HS
Shirashaitihya	0.57	0.29	0.29	50.1%	-36	< 0.008	S

*B.T – before treatment, A.T – After treatment, d – difference, W – Wilcoxon signed rank, *p - Probability, HS – Highly significant, S – Significant, NS – Non significant

Table 6: Effect of Amalaki rasayana on Meda kshaya

Symptoms	Mean Score		d	Relief %	W	p	Significance
	B.T	A.T					
Sandhi sfutana	0.64	0.43	0.21	33.3%	-21	< 0.031	S
Sandhi sunyata	0.32	0.29	0.04	11.1%	-1.0	< 1.00	NS
Raukshya	0.79	0.29	0.50	63.6%	-105	< 0.001	HS
Pleeha abhivridhi	0.14	0.14	0.00	0.0%	0.00	< 1.00	NS
Akshno aayas	0.79	0.21	0.57	72.6%	-136	< 0.001	HS
Katiswap	0.11	0.07	0.04	33.4%	-1.00	< 1.00	NS
Udar tanuta	0.29	0.21	0.07	25.0%	-3.00	< 0.500	NS
Krishangata	0.50	0.32	0.18	35.8%	-15.0	< 0.003	S

*B.T – before treatment, A.T – After treatment, d – difference, W – Wilcoxon signed rank, *p - Probability, HS – Highly significant, S – Significant, NS – Non significant

Table 7: Effect of Amalaki rasayana on Dhatu sara

Symptoms	Mean Score		d	Relief %	W	p	Significance
	B.T	A.T					
Twak Sara	2.39	3.21	-0.82	34.3%	159.0	< 0.001	HS
Rakta Sara	3.50	4.79	-1.29	36.7%	300.0	< 0.001	HS
Mamsa Sara	4.86	5.07	-0.42	8.6%	21.0	< 0.031	S
Meda Sara	4.00	5.18	-1.18	29.5%	263.0	< 0.001	HS
Asthi Sara	4.93	5.11	-0.18	3.6%	15.0	< 0.063	NS
Majja Sara	2.89	3.21	-0.32	11.1%	45.0	< 0.004	S
Sukra Sara	5.71	6.75	-1.04	18.1%	300.0	< 0.001	HS

*B.T – before treatment, A.T – After treatment, d – difference, W – Wilcoxon signed rank, *p - Probability, HS – Highly significant, S – Significant, NS – Non significant. Amalaki Rasayana showed statically highly significant result in improving Rasa Sara (34.3%), Rakta Sara (36.7%), Meda Sara (29.5%) and Sukra Sara (18.1%) and significant results were found in Mamsa Sara (8.6%), Majja Sara (11.1%)

Table 8: Effect of Amalaki rasayana on Rasa sara

Symptoms	Mean Score		d	Relief %	W	p	Significance
	B.T	A.T					
Snigdha twak	0.32	0.46	-0.14	44.5%	10.0	< 0.125	NS
Mridu twak	0.29	0.46	0.14	50.0%	28.0	< 0.016	S
Prasanna twak	0.25	0.43	0.18	71.6%	35.0	< 0.039	S
Sukshma twak	0.43	0.43	0.00	0.0%	0.00	< 1.0	NS
Alpalomatwak	0.36	0.36	0.00	0.0%	0.00	< 1.0	NS
Sukumaarloma	0.39	0.39	0.00	0.0%	0.00	< 1.0	NS
Saprabhevtwak	0.36	0.54	-0.18	50.1%	15.0	< 0.063	NS

*B.T – before treatment, A.T – After treatment, d – difference, W – Wilcoxon signed rank, *p - Probability, HS – Highly significant, S – Significant, NS – Non significant

Table 9: Effect of Amalaki rasayana on Rakta sara

Symptoms	Mean Score		d	Relief %	W	p	Significance
	B.T	A.T					
Karna	0.46	0.57	-0.11	23.1%	6.0	< 0.250	NS
Akshi	0.32	0.36	-0.04	11.1%	2.0	< 0.750	NS
Mukha	0.29	0.43	-0.14	50.0%	10.0	< 0.125	NS
Jihwa	0.32	0.54	-0.21	66.7%	21.0	< 0.031	S
Nasa	0.32	0.50	-0.18	55.8%	15.0	< 0.063	NS
Ostha	0.36	0.64	-0.29	80.1%	36.0	< 0.008	S
Panitala	0.54	0.61	-0.07	13.3%	3.0	< 0.5	NS
Paadtala	0.25	0.29	-0.04	14.3%	1.0	< 1.0	NS
Nakha	0.25	0.39	-0.14	57.2%	10.0	< 0.04	S
Lalaata	0.39	0.46	-0.07	18.2%	3.0	< 0.5	NS

*B.T – before treatment, A.T – After treatment, d – difference, W – Wilcoxon signed rank, *p - Probability, HS – Highly significant, S – Significant, NS – Non significant

Table 10: Effect of Amalaki rasayana on Meda sara

Symptoms	Mean Score		d	Relief %	W	p	Significance
	B.T	A.T					
Varna	0.36	0.50	-0.14	40.1%	18.0	< 0.250	NS
Swara (voice)	0.50	0.57	-0.07	14.3%	3.0	< 0.50	NS
Netra (eyes)	0.46	0.50	-0.04	7.7%	1.0	< 1.00	NS
Kesh (hairs)	0.39	0.43	-0.04	9.1%	1.0	< 1.0	NS
Loma	0.54	0.61	-0.07	13.3%	3.0	< 0.5	NS
Nakha (nails)	0.21	0.36	-0.14	66.8%	10.0	< 0.04	S
Danta (teeth)	0.50	0.61	-0.11	21.4%	6.0	< 0.25	NS
Ostha (lips)	0.29	0.50	-0.21	74.8%	21.0	< 0.03	S
Mutra (urine)	0.46	0.68	-0.21	46.1%	21.0	< 0.031	S
Purish (feces)	0.29	0.50	-0.21	74.8%	21.0	< 0.03	S

*B.T – before treatment, A.T – After treatment, d – difference, W – Wilcoxon signed rank, * p - Probability, HS – Highly significant, S – Significant, NS – Non significant

Table 11: Objective criteria

Investigation	Mean score		d	Relief%	S.D	S.E	‘t’	p	Significance
	B.T	A.T							
Hb gm%	8.39	9.56	1.17	13.96%	0.30	0.05	-20.0	< 0.001	HS
TRBC	3.24	3.48	0.25	7.57%	0.17	0.03	-7.68	< 0.001	HS

*B.T – before treatment, A.T – After treatment, d – difference, S.D – standard deviation, * S.E – standard error, t – paired ‘t’, p - Probability, HS – Highly significant. Amalaki Rasayana showed statistically highly significant effect on improving Hemoglobin (13.96%) and Total Red blood cell count (7.57%)

DISCUSSION

Pandu is Rasa pradoshaja vyadhi in which there is derangement in Jataragni, the digestive and absorptive ‘fire’ in the body due to which the nutrients are not absorbed. Pitta is one of the three Doshas that control all metabolic transformations in the body. Undigested or partially digested food by the deranged Agni causes the production of Ama (undigested materials) that blocks natural assimilative and eliminative processes due to which dhatu poshana (nutrition of bodily tissues) is affected qualitatively and quantitatively which is apparent in cases of Pandu as subsequent dhatu kshaya and derangement in dhatu sara.

In present study, 70% patients showed Rasa kshaya symptoms >50%, 56.7% patients showed Rakta kshaya, 46.7% patients showed Mamsa and Meda kshaya respectively, 33.3% patients showed Asthi kshaya and 10% and 3.3% patients showed Majja and Sukra kshaya correspondingly. Likewise, Avara Twak Sara was present in 60% patients, Avara Rakta Sara was present in 46.7%, Avara Mamsa Sara was present in 16.6% patients, Avara Meda Sara was present in 30% and Avara Asthi Sara was present in 0% patients, Avara Majja Sara was found in 30% and Avara Sukra Sara was present in 26.7% patients respectively. The data reveals that there was reduction in all the Dhatus qualitatively and quantitatively in progressive manner i.e. the maximum Kshaya was present in Rasa dhatu followed by Rakta and subsequent Mamsadi Dhatus

The Rasa is precursor of all the Dhatus. The immediate Dhatu to be nourished by the Rasa is the Rakta. All Dhatu Poshana Nyayas have accepted the fact that the Rasa is the cause of Rakta. In the case of Pandu, Chakrapani clearly mentions the role of Rasa in the nourishment of the Rakta. He comments that the Rakta-Kshaya is due to the diminution of the Rasa by the increased Pitta or the failure of the Rasa to produce the Rakta Poshaka part⁸ (nourishing portion to blood tissue). When the Ahara Rasa is distributed in the body firstly, Rasa Dhatu is nourished first followed by Rakta, Mamsa, Meda, Asthi, Majja and lastly Sukra Dhatu gets nourishment. According to Dalhana⁹, the commentator of Susruta, When Ahara Rasa is subjected to the digestion by the Rasagni, it split up into three Amsas (Parts). The Sthula Amsa nourishes the Rasa Dhatu, Suksma Amsa nourishes

Rakta Dhatu and residue part will contribute to production of waste product -Kapha. Pandu vyadhi is included in Rasapradoshaj vyadhi by Acharya Charaka, Excessive intake of Tikta (bitter), Katu (pungent) Rasa have an opposite Characters than Rasa Dhatu, which when subjected to the digestion by Rasagni will result into the depletion of Dhatu qualitatively and quantitatively.

Amalaki Rasayana demonstrated 40.2% improvement in Rasa Kshaya and 34.3% improvement in Twak Sara which was statistically highly significant. Rasayana works at the level of Poshaka Rasa (nutrient supplements), Agni (metabolism), and Srotasa¹⁰ (tissue nourishment) and hence, has been stated to provide benefits of optimum quality and quantity of Rasadi Dhatus¹¹ (“*Labhopayo hi Sashtanama rasadinaam Rasayanam*”). In Pandu roga, main Dosha vitiated is Pitta and Amalaki is Tridosahara especially Pitta shamaka (pacifying pitta) dravya¹². Hence, it helps in correcting dhatu shaitilyata (flabbiness) and in improving metabolism resulting in proper formation of Rasa dhatu. Amalaki Rasayana is Ap (water element) and Prithvi (earth element) Mahabhuta dominant, madhura vipaki¹³ and Amalaki being rich in natural sugars such as D-glucose, D-fructose, D-galacturonic acid etc causes quantitative and qualitative escalation in the Rasa Dhatu. On Rakta kshaya 46.6% improvement was observed whereas, 36.7% improvement was observed in Rakta Sara. Amalaki¹⁴ being amla rasa pradhan dravya is swayonivardhan (auto enhancer) for Rakta Dhatu and being yakrituttejak (hepatic stimulator) enhances the secretion of Ranjak pitta (this transforms rasa dhatu into rakta dhatu) which leads to enhancement of quantity and quality of Rakta Dhatu. Amalaki is the rich source of Vitamin C, which helps in the absorption of iron through reduction of ferric iron to ferrous iron which seems to be the requirement for the uptake of iron into the mucosal cells¹⁵. Statistically significant improvement was also found in Mamsa, Meda, Asthi, Majja and Sukra Dhatukshaya and Sara of respective Dhatus. Rasa dhatu has been accepted as the first Dhatu having the precursors of all the Dhatus. Hence, it affects the formation of all the other Dhatus. Highly significant improvement in qualitative and quantitative aspect of Rasa dhatu might be the reason for qualitative and quantitative improvement of all subsequent dhatus. “*Poorvah poorvoativridhatvata vardhyedhi param param*” This principle has been mentioned as

“Sarvatantra Siddhanta” as this principle is accepted by all the experts of Ayurveda.

The manifestation of any disease depends upon the quality of Dhatu present in the body and the quality of Dhatu depends upon the nutrition they are drawing from Ahara Rasa. Amalaki is extremely nutritious and a chief dietary source of vitamin C, amino acids, and minerals. Amalaki Rasayana, mainly contains Amalaki, which is best Rasayana, Vatanulomaka and Pitta Shamaka, Tridosahara, Deepana, Pachana which helps to clear the Srotorodha (obstruction in the body channels). So, metabolism improves, ultimately digestion and absorption of nutrients improves which leads to proper Dhatu poshana which is demonstrable in the present study in the form of significant improvement in symptoms of dhatu kshaya and increased dhatu sara.

CONCLUSION

Pandu is a Rasapradoshaja vyadhi in which aggravation of Pitta brings about the diminution of the specific portion of Rasa (Rakta poshaka sara part) responsible for the nourishment of Rakta Dhatu as a result of which there is no production of the nutrient factor to nourish the Rakta, So there is subsequent qualitative and quantitative derangement in all the dhatus which is evident as subsequent dhatu kshaya and decreased dhatu sara.

Amalaki Rasayana offers highly significant improvement in all Dhatu kshaya i.e. Rasa, Rakta, Mamsa, Meda and Sukra Dhatu and Twak, Rakta, Meda and Sukra Sara.

Amalaki being Deepana, Pachana, Vatanulomaka and Pitta Shamaka, Tridosahara improves digestion and metabolism, clears Srotorodha leading to proper digestion and absorption of nutrients and being best Rasayana optimizes Dhatu poshana which is demonstrable in the present study in the form of significant improvement in symptoms of dhatu kshaya and increased dhatu sara. Amalaki Rasayana provides a complete nutrition supplement which enhances quality and quantity of dhatus and helps to correct Pandu.

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