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A clinical study to evaluate the efficacy of *Patoladi Kwath (SU. CH.)* with or without *Rasnadi Pradeh (CH. SU.)* in cases of *Vatarakta* (W.S.R. to Gouty Arthritis)

Dr. Deepika Gupta*[1] Dr. Kamal Sachdev[2] Dr. Richa Garg[3]

[1] Ph.D. Scholar, P.G. Dept. of Kayachikitsa, National Institute of Ayurveda, Jaipur, Rajasthan, India.

[2] MD (Ay.), Reader & HOD, P.G. Dept. of Kayachikitsa, State Ayurvedic College and Hospital, Faculty of Ayurveda, Lucknow University, Lucknow, Uttar Pradesh, India.

[3] MD (Ay.), Lecturer, P.G. Dept. of Kayachikitsa, State Ayurvedic College and Hospital, Faculty of Ayurveda, Lucknow University, Lucknow, Uttar Pradesh, India.

ABSTRACT

In *Ayurveda*, health means the state of *Doshasamya, Agnisamya, Dhatusamya* and *Samanya Malkriya* as well as wellness of *Atmendriya* and *Mana*[1], which according to *Acharya Charak* is necessary to achieve *Dharma, Artha, Kama* & *Moksha*[2], the ultimate aim of life. But it has become quite difficult due to the various health obstacles experienced by men during his routine life. The disease *Vatarakta* is one of them and the number of *Vatarakta* patient are increasing day by day. The status of *Vatarakta* is often compared with Gouty Arthritis in the allied sciences. As far as the treatment of *Vatarakta*/Gouty Arthritis is concerned various research works conducted from time to time, which had shown encouraging result, but still there are many *Ayurvedic* medicine whose effect has to be established in the management of *Vatarakta*/Gouty Arthritis based on latest scientific parameters. *Acharya Charak* has advocated the use of different *Ghrit Yog, Tail Yog, Lepa, Pradeha,* etc for external application in different types of *Vatarakta* for relieving pain, swelling, stiffness, burning, itching, etc. So, for this research work we selected *Patoladi Kwath* from *Susrut Chikitsa Sthana* 5 and *Rasnadi Pradeh* from *Charak Sutra Sthana* 3 to evaluate their efficacy in the management of *Vatarakta* (w.s.r. to Gouty Arthritis). For this research work 56 diagnosed patient of *Vatarakta* having age of 21 to 60 years were registered and sequentially randomized into two parallel groups. Leaving 6 dropout (3 from each group), 25 patients of group A were treated with 40 ml *Patoladi kwath* 2 times a day after meal for 90 days and 25 patients of group B were treated with 40 ml *Patoladi kwath* 2 times a day after meal with *Rasnadi Praddeh* for local application over affected joint in the evening for 90 days. The result of the treatment was accessed based on the improvement in terms of symptomatic relief and improvement in terms of Lab investigation i.e, decrease in Serum Uric Acid level and ESR.

Keywords: Vatarakta, Gouty Arthritis, Serum Uric Acid, ESR.

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***Address for Correspondence:**

Dr. Deepika Gupta, Ph.D. Scholar, P.G. Dept. of Kayachikitsa, National Institute of Ayurveda, Jaipur, Rajasthan, India.

INTRODUCTION

Vatarakta is a disease where both *Vata* and *Rakta* are afflicted by distinct etiological factors. According to *Acharya Charak*, when the vitiated *Vata Dosha* circulates through the *Srotus* the pre-vitiated *Rakta* forms an *Avarana* over *Vata* and further agitates *Vata Dosha*. Vitiated *Vata* and *Rakta* together lead to a complex effect on the joint and produces *Vatarakta*[3]. According to *Acharya Susruta*, the process of disease initiates from *Padamula* i.e. feet and sometimes from *Karamula* i.e. hand and spreads throughout the body like *Mushika vish*[4] (rat poison).

Vatarakta is one of the burning health problems of the present era as the number of *Vatarakta* patient are increasing day by day. The dramatic increase is presumably due to lifestyle and food habits. Now a day lifestyle is becoming more & more luxurious. People do not take proper diet and do not follow proper dietary rules as described in *Ayurveda* under *Dincharya*, *Ritucharya*, etc. Improper dietary habits such as *Adhyashana, Virudhashana, Ahitashana*, etc and use of meat of aquatic and marshy animals, more consumption of fast food, junk food, high protein diet, less tendency to exercise, more vehicle riding, long term vehicle riding over damaged road have increased the number of *Vatarakta* patient.

The disease *Vatarakta* has been described in *Garunpuran, Agnipuran* and in almost all *Ayurvedic* classics such as- *Brihatrayi, Laghutrayi, Vangsena, Chakradutta* and *Bhaisajya Ratnavali*, etc, which shows that this disease was prevalent widely in early era too.

The status of *Vatarakta* is often compared with Gout/Gouty Arthritis in the allied sciences due to the outstanding similarities and also because in previous research works hyperuricaemia has been observed as a common feature in patients of *Vatarakta*. Gout is a clinical syndrome and is a type of metabolic disease in which clinical manifestations are associated with tissue deposition of crystals of Monosodium Urate Monohydrate (MSUM) from hyperuricemic body fluids. Acute Gout affects mainly joints, synovial membrane, articular cartilages, tendon sheaths and burse but the local aggregation of Monosodium Urate Monohydrate crystals may also occur in non-articular cartilage. Acute Gouty attack mostly initiates from great toe but it may sometime initiate from ankle, knee, wrist, finger, elbow, etc. and is characterized by rapid onset of pain, swelling, redness, tenderness, itching and burning sensation and discoloration of skin over affected joint. Over the span of years, the progressive accumulation of urate crystal and recurrent attack of inflammation leads to chronic destructive arthritis leading to different kind of deformities.

The Vatarakta has attracted the attention of world's scientists working on the problem, not only due to the problem faced by patient during acute attack but due to its remote complications and sequels. If the chronic condition is not treated properly, the deformity of joints and cartilages cripples a person throughout his life.

Gout is more common in men than in women and more prevalent in black races than white. A number of factors have been found to influence rates of gout, including age, sex, race, and the season of the year. Gout is seen in only one-tenth of the patients of hyperuricaemia. The incidence of gout varies in population from 0.2 to 3.5 per 1000, with an overall prevalence of 2 to 26 per 1000. The prevalence of Gout has increased in recent years. It is rare in children and premenopausal females and the peak age of onset in male is between 40 years and 60 years. The chances of having gout raises with age in men, with a peak around 50 while in women, gout attacks usually occur after menopause.

For the treatment of *Vatarakta*/Gouty Arthritis, along with different drugs for internal use, Acharya Charak has advocated the use of different ghrit yog, tail yog, lepa, pradeha, etc for external application in different types of Vatarakta for relieving pain, swelling, stiffness, burning, itching, etc. so for this research work we selected two medicines mentioned in Ayurvedic classics-

1. Patoladi Kwath (Susrut Chikitsa -5/13)
2. Rasnadi Pradeh (Charak Sutra -3/22)

Aims and Objectives

1. To establish an effective herbal formulation for *Vatarakta*/Gouty arthritis.
2. To establish the efficacy of *Patoladi Kwath* & *Rasnadi Pradeh* in cases of *Vatarakta*/Gouty arthritis.
3. To observe clinical improvement of the disease during the follow up period.
4. To study any adverse effects of the trial drug.

MATERIALS AND METHODS

Protocol of Research

1. **I.E.C. Approval**- Approving of synopsis for human trial was obtained from Institutional Ethical Committee of S.A.C. & Hospital, Lucknow, U.P.
2. **Consent-** Written and informed consent of study subjects was taken before inclusion in the trial.
3. **Proforma-** Proforma incorporating detailed profile of study subjects with complaining history, signs and symptoms and assessment was prepared.

Selection of Patients

For purpose of this clinical trial, patients of Vatarakta (Gouty Arthritis) were selected regardless of sex, religion, occupation and socio-economic conditions, with the age group of 21-60 year from O.P.D. & I.P.D. of State Ayurvedic College & Hospital, Lucknow and the referred cases which fulfill criteria of our clinical proforma were also included.

After careful clinical history, examination & laboratory investigations as per proforma, patients were selected and screened for their suitability of getting enrolled in this clinical trial as per specific inclusion and exclusion criteria.

Inclusion Criteria

1. The patients of Vatarakta having serum uric acid >7 mg/dl in males & >5.7 mg/dl in females and at least 3 of the 4 essential symptoms with or without nonessential symptomatology.
2. Sex : Both male & female.
3. Socioeconomic status : All
4. Age : 21-60 years
5. Patient willing to sign the consent.

Exclusion Criteria of the Patient

1.Patients below 21 year and above 60 years of age.

2. Complicated cases of *Vatarakta* by other chronic systemic disorders like RA, OA, SLE, Diabetes, Tuberculosis, Renal disease, Hepatic diseases.
3. Complicated cases of *Vararakta* by its *Updravas* like *Hikka, Moorchha, Moha, Visarpa, Mansa-Koth, Angulivakrata* etc.
4. Complicated cases of gout with Chronic joint deformity, marked dysfunction, discharging tophi, etc.
5. Pregnancy and lactation.
6. Patients not willing to sign the consent.

Criteria for Withdrawal

1.Personal matters

2.Aggravation of complaints

3.Inter current illness

4.Any other difficulties

5.Will of the patient

Symptoms [5]

Essential Symptoms-

1. Sandhishu Ruk (pain in the affected joint)
2. Sandhishu Rag (redness in the affected joint)
3. Sandhishu Swathu (swelling in the affected joint)
4. Sparsh-asahatvam (tenderness in affected area)

Nonessential Symptoms-

1. Sandhishu Kathinya (Stiffness / decreased / restricted movements of joint)
2. Sandhishu Twagbahaya Tamra (Discoloration of skin of affected area)

3. Sandhishu Kandu (Itching in affected joint)
4. Sandhishu Daha (Burning sensation over joint)

Investigations-

- **Blood–** TLC , DLC , Hb% , ESR
- **Urine-** Routine (R) and Microscopic (M)
- **Serum Uric Acid**
- **R.A. Factor**
- **Liver Function Test-** Sr. Bilirubin, SGOT, SGPT, Sr. Alkaline Phosphatase
- **Renal Function Test-** Blood Urea, Sr. Creatinine
- **Blood Sugar -** F/PP
- **X-ray of involved joint** (if possible)- AP view and Lateral view
- **Synovial Fluid Analysis** (if possible)

Contents of Formulations-

1. ***Patoladi Kwath***[6]**-** it contains *Patol Patra, Trifla (Haritaki, Vibhitaki, Amalki), Satavari, Guduchi & Katuka.*
2. ***Rasnadi Pradeh***[7]**-** it contains *Rasna Patra, Guduchi, Yastimadhu, Bala, Atibala, Vidari Kanda, Godugdha, Goghrita* and *Madhuchhista* (bee-wax).

Preparation and Packing of the Trial Drugs

All the drugs mentioned above was taken from the central drug store of State Ayurvedic College & Hospital, Lucknow and from nearby market. All the ingredients were then authenticated by the Department of Dravyaguna State Ayurvedic College & Hospital, Lucknow.

The drugs, *Patoladi Kwath* and *Rasnadi Pradeh* were then prepared according to the classical drug preparation method described in the text by the department of Rasashastra & Bhaisajyakalpana State Ayurvedic College & Hospital, Lucknow.

Patoladi Kwath

Preparation and packing-

Dried contents were taken in equal ratio. *Yavkut* was done & packed in 600 gm packs for 15 days. Patients were advised to make *Kwath* at home by classical method as told by *Acharya Sharangadhara*[8].

Rasnadi Pradeh

In this *Yog*, instead of *Jeevak* and *Risbhak*, *Vidari Kand* was taken, as these two drugs are not available in present time and according to *Acharya Bhav Prakash*[9] due to similar properties (*Gudaistat-tulyam*) *Jeevak* and *Risbhak* can be substituted by *Vidari*. So instead of one part *Jeevak* and one part *Risbhak*, two parts of *Vidari Kand* was taken.

Ratio of Ingredients-

1.	Rasna	→	1 part
2.	Guruchi	→	1 part
3.	Yastimadhu	→	1 part
4.	Bala	→	1 part
5.	Atibala	→	1 part
6.	Vidari kand	→	2 part
7.	Goghrit	→	8 part
8.	Godugdha	→	32 part
9.	Jala	→	32 part
10.	Madhuchhista	→	1 part

Preparation and packing –

The *Pradeh* (*Ghrit Yog*) was prepared according to the classical method given by the *Acharya Sharangdhar*[10] and then bee wax was added in ratio equal to one of the ingredient of *Kalka Dravya*. After *Samyak Paka* it was drained and decanted into a container through a filter and the final product "*Rasnadi Pradeh*" was packed in well for 15 day in 100 ml container.

Type of Study: Phase-2, Rational, Randomized (sequential pattern) Parallel group study.

Period OF Study: Total duration of clinical trial is of 90 days.

Sample Size: Total 56 patients were registered including 6 dropouts.

Grouping of the Patients and Drug Administration- All the selected patients registered for the clinical trial were divided in two groups-

1) Group A: In group-A 25 patients were kept on-

i. Patoladi Kwath- 40 ml *Kwath* 2 times a day after meal.

Duration- 90 days

Follow up- At every fortnight from day of registration till day 90

2) Group B : In group B-25 patients were kept on-

i. Patoladi Kwath- 40 ml *Kwath* 2 times a day after meal.

ii. Rasnadi Pradeh- about 2 mm thick *Pradeh* was applied over the affected joint in the evening.

Duration - 90 days

Follow up – At every fortnight from day of registration till day 90.

The assessment of subjective and objective parameters for each patient was done on 0^{th}, 15^{th}, 30^{th}, 45^{th}, 60^{th}, 75^{th} and 90^{th} day.

Parameter for Assessment of Clinical Symptomatology:

(A). Subjective Parameters:

All the subjective parameters were graded 0, 1, 2, 3 (nil, mild, moderate & severe) on the basis of its intensity & severity given by patients on history taking & confirmed by clinical examination before starting the trial drugs.

B). Objective Criteria:

The quantitative analysis of the values of the **Serum Uric Acid** and **ESR** were done before & after the treatment and during the follow up to compare the inflammatory condition of the affected joints.

Criteria for assessment of result:

The results of the treatment were accessed on the basis of improvement in terms of:

1.Symptomatic Relief

2.Improvement in terms of Lab investigation i.e, decrease in Serum Uric Acid level and ESR value.

RESULT

The results of the present clinical trial were grouped as follows:

1) Relieved:

1) Patients having> 75% relief in terms of symptoms.

ii) Normal range of pathological findings.

2) Improved:

i) Patients having improvement between 40-75% in clinical symptoms

a) Mild Improvement- Improvement between 40- <57.5% in clinical symptoms

b) Moderate Improvement- Improvement between 57.5-75% in clinical symptoms

ii) Pathological findings are improved but not within normal limit and may be up to higher side.

3) Unchanged:

i) Patients having improvement less than 40% in terms of clinical symptoms.

ii) Pathological findings remain same as before trial.

iii) Disease may reoccur.

4) Worsened:

i) Patients having no improvement in terms of clinical symptoms.

ii) Pathological findings gets disturbed (serum uric acid level may get increased).

iii) Disease may get worsen or symptoms may increased.

Statistical tools:

The information gathered based on observation made about various parameters were subjected to statistical analysis in terms of **Mean (X)** and **Standard Deviation (SD).**

For intragroup comparison **Wilcoxon signed rank test** and **Paired t-test** were used while for **intergroup** comparison **Mann Whitney test** and **Unpaired t-test** were used. The results calculated were interpret as below-

- Not significant : P > 0.05
- Significant : P < 0.05
- Very significant : P < 0.01
- Extremely significant : P <0.001

Observations

(a) Demographic observations-

For the trial total 56 patients were registered. The demographic data was assessed for all the patients-

Patients were selected from age group of 21 to 60 years. It was found that the age group of 41 to 50 years comprises the maximum number of patients 21 (37.5%) followed by 20 (35.7%) from the age group 31 to 40 years and 11 (19.6%) from the age group 51 to 60 years while 21 to 30 years of age group have least number of patients 4 (7.1%). According to sex, 33 (58.9%) patients were male and 23 (41.1%) patients were female. Considering the relationship of the disease with the religion 44 (78.6%) patients were Hindu and 12 (21.4%) were Muslims and out of 56 patients 53 (94.60%) were married.

Occupation, educational status, economic status, residential & environmental condition plays a very important role in the causation of disease. 17 (30.405) were from service class, 18 (32.10%) from business class, 18 (32.10%) were housewives & only 3 (5.45) were students. Out of total 94.60% (53) patients were literate. High-income group were 34 (60.70%), medium class were 19 (34.0%) & only 3 (5.3%) were poor. Most of the patients 53 (94.60%) were from urban area which strongly supports that *Vatarakta* is a disease of affluent people which supports its synonym '*Adhayavata'* of *Acharya Charak*.

Considering the diet and addiction habits of the patients, it was observed that 19 (33.90%) patients were vegetarian and 37 (66.10%) were having mixed diet pattern of diet. Out of 56 patients, 23 patients were having no addiction, 24 patients were addicted to tea/coffee, 9 were addicted to smoking, 8 were alcoholic and only 2 patients were addicted to tobacco chewing.

Considering the *Deha Prakriti* of the patients 26 (46.40%) were *Vata-Pittaj*, 19 (33.90%) patients were *Pitta-Kaphaj* and 11 (19.70%) patients were of *Vata-Kaphaj Prakriti.*

State of *Agni* and *Kostha Prakriti* when assessed before the trial, 34 (60.70%) patients were having *Vishamagni*, 11 (19.60%) had *Mandagni*, 7 (12.50%) patient had *Samagni* and only 4 (7.2%) had *Tikshnagni*. Out of 56 patients, 39 (69.70%) had *Madhyama Kostha*, 11 (19.60%) had *Mridu Kostha* and 6 (10.70%) had *Krura Kostha*. Among these patients 23 (41.10%) had irregular bowel habit, 19 (33.90%) had regular bowel habit, 8 (14.70%) patient had tendency to pass hard stool while 6 (10.70%) passes loose stool.

Considering nature of work predominantly performed by patients and pattern of exercise they execute, working pattern of 21 (37.50%) were of standing nature, sitting in 18 (32.10%), walking in 13 (23.20%) and travelling type of work in only 4 (7.20%) patients. Among these patients 29 (51.80%) do not perform exercise, 20 (35.70%) perform exercise irregularly while only 7 (12.50%) patients were performing regular exercise.

Considering the associated illness and past history, maximum patients 39 (69.60%) had no associated illness, only 7 (12.50%) patient had hypertension and 7 (12.50%) had associated back pain & only 3 (5.4%) had hypothyroidism. 37 (66.0%) patient had no history of past illness, 11 (19.60%) patient had past history of Gout attack, 3 (5.40%) had history of UTI, 2 (3.60%) had renal stone in past, 2 (3.60%) had history of trauma and only 1 (1.8%) patient had history of cholelithiasis.

Considering the family history of disease, 15 (26.8%) patient had no family history of any disease but family history of gout in 14 (25.0%), osteoarthritis in 9 (16.0%), diabetes in 3 (5.4%), rheumatoid arthritis in 1 (1.8%) and diabetes in 1 (1.8%) patient as family history.

Considering the nature of onset & pattern of involvement of joints, 31 (55.40%) patients were having sudden onset and 25 (44.60%) were having insidious onset of disease. Ankle joint was the most common site of origin of disease, it was present in 22(46.8%) patients. 35 (62.50%) patients were having asymmetrical involvement of joint while 21 (37.50%) were having symmetrical involvement of joint.

Considering the initial joint involvement, in 20 (35.7%) patients metatarsophalangeal joint (great toe) was first joint to get involved, knee joint in 12 (21.4%), ankle joint in 11 (19.7%), other phalangeal joints in 7 (12.5%) and wrist joint in 6 (10.7%) patient was first joint to get involved.

(b) Clinical observations-

Clinical Observation was done on 50 patients who completed the trial out of 56 patients selected and registered according to predetermined "Criteria of Selection".

Table 1: Showing prevalence of sign and symptoms in 50 cases of *Vatarakta* before the use of trial drug

S. No.	Sign & Symptoms	No. of Patients		Total (n=50)	Percentage
		Group-A (n=25)	Group-B (n=25)		
1	*Sandhishu Ruk* (Pain in the affected joint)	25	25	50	100%
2	*Sandhishu Rag* (Redness in the affected joint)	12	13	25	50%
3	*Sandhishu Swathu* (Swelling in affected joint)	25	25	50	100%
4	*Sparsh-asahatvam* (Tenderness in affected area)	25	25	50	100%
5	*Sandhishu Kathinya* (Decreased/Restricted movements of Joints)	25	25	50	100%
6	*Sandhishu Twagbahaya Tamra* (Skin discoloration of affected area)	6	8	14	28%
7	*Sandhishu Kandu* (Itching in the affected joint)	10	12	22	44%
8	*Sandhishu Daha* (Burning sensation in affected joint)	15	17	32	64%

Result

Result calculated for 50 patients, 25 in each group who completed the trial. We observed that action of the drugs was slow, steady & progressive. The trial drugs had shown the effect in almost all the symptomatology. Effect of trial drugs over various symptoms are as follows-

Effect of therapy on *SANDHISHU RUK* (Pain in the affected joint)

Table 2: Comparison of change in *Sandhishu Ruk* before and after the trial

Time interval	Group A (n=25)		Group B (n=25)		Inter Group	
	Mean	±SD	Mean	±SD	z-value[1]	p-value[1]
Day 0	2.23	±0.48	2.36	±0.49	-0.23	0.82
Day 90	0.72	±0.61	0.48	±0.59	1.26	0.21
Mean Change	1.51±0.58		1.88±0.44			
% of relief	68.96%		79.66%			
Intra Group	p-value[2] < 0.0001*		p-value[2] < 0.0001*			

[1]Mann-Whtiney U test, [2]Wilcoxon signed rank test, *Significant

Effect of therapy on *SANDHISHU RAG* (redness in the affected joint)

Table 3: Comparison of change in *Sandhishu Rag* before and after the trial

Time interval	Group A (n=12)		Group B (n=13)		Inter Group	
	Mean	±SD	Mean	±SD	z-value[1]	p-value[1]
Day 0	2.00	±0.85	2.08	±0.64	0.19	0.85
Day 90	0.42	±0.51	0.23	±0.44	-0.76	0.45
Mean Change	1.58±0.79		1.85±0.55			
% of relief	79.00%		88.94%			
Intra Group	p-value[2] = 0.001*		p-value[2] = 0.0002*			

[1]Mann-Whtiney U test, [2]Wilcoxon signed rank test, *Significant

Effect of therapy on *SANDHISHU SWATHU* (Swelling in the affected joint)

Table 4: Comparison of change in *Sandhishu Swathu* before and after the trial

Time interval	Group A (n=25)		Group B (n=25)		Inter Group	
	Mean	±SD	Mean	±SD	z-value[1]	p-value[1]
Day 0	1.56	±0.58	1.68	±0.69	-0.47	0.63
Day 90	0.32	±0.48	0.20	±0.41	0.72	0.47
Mean Change	1.24±0.44		1.48±0.51			
% of relief	79.50%		88.10%			
Intra Group	p-value[2] < 0.0001*		p-value[2] < 0.0001*			

[1]Mann-Whtiney U test, [2]Wilcoxon signed rank test, *Significant

Effect of therapy on *SPARSH-ASHAHATVAM* (Tenderness in the affected joint)

Table 5: Comparison of change in Sparsh-asahatvam before and after the trial

Time interval	Group A (n=25)		Group B (n=25)		Inter Group	
	Mean	±SD	Mean	±SD	z-value[1]	p-value[1]
Day 0	1.88	±0.73	2.12	±0.60	-1.12	0.26
Day 90	0.56	±0.51	0.32	±0.56	1.55	0.12
Mean Change	1.32±0.63		1.80±0.50			
% of relief	70.20%		84.90%			
Intra Group	p-value[2] < 0.0001*		p-value[2] < 0.0001*			

[1]Mann-Whtiney U test, [2]Wilcoxon signed rank test, *Significant

Effect of therapy on *SANDHISHU KATHINYA* (Decreased/ Restricted movements of the affected joint)

Table 6: Comparison of change in *Sandhishu Kathinya* before and after the trial

Time interval	Group A (n=25)		Group B (n=25)		Inter Group	
	Mean	±SD	Mean	±SD	z-value[1]	p-value[1]
Day 0	1.80	±0.41	1.96	±0.54	-0.81	0.41
Day 90	0.52	±0.59	0.36	±0.59	0.92	0.36
Mean Change	1.28±0.61		1.64±0.58			
% of relief	71.10%		81.63%			
Intra Group	p-value[2] < 0.0001*		p-value[2] < 0.0001*			

[1]Mann-Whtiney U test, [2]Wilcoxon signed rank test, *Significant

Effect of therapy on *SANDHISHU TWAGBAHAYA TAMRA* (Skin discoloration of affected area)

Table 7: Comparison of change in *Sandhishu Twagbahaya Tamra* before and after the trial

Time interval	Group A (n=6)		Group B (n=8)		Inter Group	
	Mean	±SD	Mean	±SD	z-value[1]	p-value[1]
Day 0	1.67	±0.52	1.88	±0.35	1.36	0.17
Day 90	1.17	±0.41	0.88	±0.64	-0.71	0.48
Mean Change	0.50±0.54		1.0±0.53			
% of relief	29.94%		53.20%			
Intra Group	p-value[2] = 0.25		p-value[2] = 0.0156*			

[1]Mann-Whtiney U test, [2]Wilcoxon signed rank test, *Significant

Effect of therapy on *SANDHISHU KANDU* (Itching in the affected joint)

Table 8: Comparison of change in *Sandhishu Kandu* before and after the trial

Time interval	Group A (n=10)		Group B (n=12)		Inter Group	
	Mean	±SD	Mean	±SD	z-value[1]	p-value[1]
Day 0	1.30	±0.48	1.75	±0.62	1.51	0.13
Day 90	0.40	±0.52	0.33	±0.49	-0.23	0.81
Mean Change	0.90±0.32		1.42±0.51			
% of relief	69.23%		81.14%			
Intra Group	p-value[2] = 0.0039*		p-value[2] = 0.0005*			

[1]Mann-Whtiney U test, [2]Wilcoxon signed rank test, *Significant

Showing effect of therapy on *SANDHISHU DAHA* (Burning sensation in the affected joint)

Table 9: Comparison of change in *Sandhishu Daha* before and after the trial

Time interval	Group A (n=15)		Group B (n=17)		Inter Group	
	Mean	±SD	Mean	±SD	z-value[1]	p-value[1]
Day 0	1.53	±0.64	1.59	±0.71	0.11	0.91
Day 90	0.40	±0.51	0.24	±0.44	-0.77	0.44
Mean Change	1.13±0.74		1.35±0.49			
% of relief	73.85%		84.94%			
Intra Group	p-value[2] = 0.0002*		p-value[2] < 0.0001*			

[1]Mann-Whtiney U test, [2]Wilcoxon signed rank test, *Significant

Showing effect of therapy on SERUM URIC ACID (mg/dl)

Table 10: Comparison of change in Serum Uric Acid (mg/dl) before and after the trial

Time interval	Group A (n=25)		Group B (n=25)		Inter Group p-value[1]
	Mean	±SD	Mean	±SD	
Day 0	8.43	±1.65	8.22	±1.47	0.64
Day 90	6.68	±1.41	6.45	±1.13	0.53
Mean Change	1.75±1.00		1.78±0.77		
% of Relief	20.76%		21.53%		
Intra Group	t-value[2] = 8.72 p-value[2] < 0.0001*		t-value[2] = 11.45 p-value[2] < 0.0001*		

[1]Unpaired t test, [2]Paired t test *Significant

Showing effect of therapy on ESR (mm/1st hrs. by Westerngreen Method)

Table 11: Comparison of change in ESR before and after the trial

Time interval	Group A (n=25)		Group B (n=25)		Inter Group p-value[1]
	Mean	±SD	Mean	±SD	
0 Day	27.60	±4.43	28.40	±5.13	0.59
90 Day	20.64	±4.15	21.36	±4.39	0.596
Mean Change	6.69±2.71		7.04±2.83		
% of Relief	25.22%		24.79%		
Intra Group	p-value[2] < 0.0001*		p-value[2] < 0.0001*		

[1]Unpaired [2]Paired t-test *Significant

Showing effect of therapy on biochemical parameters

Table N12: Comparison of change in biochemical parameters before and after the trial

Hb (gm/dl)					
Time interval	Group A (n=25)		Group B (n=25)		Inter Group p-value[1]
	Mean	±SD	Mean	±SD	
BT	11.46	±0.90	11.40	±0.97	0.24
AT	11.80	±0.82	11.68	±0.87	0.56
Intra Group	M.C. = -0.34±0.22 p-value[2] < 0.0001*		M.C. = -0.28±0.28 p-value[2] <0.0001*		
ESR (mm/hr.)					
Time interval	Group A (n=25)		Group B (n=25)		Inter Group p-value[1]
	Mean	±SD	Mean	±SD	
BT	27.60	±4.43	28.40	±5.13	0.59
AT	20.64	±4.15	21.36	±4.39	0.596
Intra Group	M.C. = 6.96±2.71 p-value[2] < 0.0001*		M.C. = 7.04±2.83 p-value[2] < 0.0001*		
TLC (cells/mm3)					
Time interval	Group A (n=25)		Group B (n=25)		Inter Group p-value[1]
	Mean	±SD	Mean	±SD	
BT	10770	±1264.95	11070	±1105.59	0.56
AT	10020	±824.35	10280	±1074.76	0.61
Intra Group	M.C. = 750±501.66 p-value[2] = 0.0011*		M.C. = 790±430.63 p-value[2] = 0.0003*		

[1]Unpaired t-test [2]Paired t-test *Significant, M.C.= Mean Change

Showing effect of therapy on DLC (Differential Leucocyte Count)

Table 13: Comparison of change in DLC before and after the trial

NEUTROPHILS (%)					
Time interval	**Group A (n=25)**		**Group B (n=25)**		**Inter Group p-value[1]**
	Mean	**±SD**	**Mean**	**±SD**	
BT	75.30	±3.59	77.00	±4.03	0.996
AT	72.40	±2.22	73.20	±3.16	0.66
Intra Group	**M.C.** = 2.90±1.45 **p-value[2]** < 0.0001*		**M.C.** = 3.80±2.75 **p-value[2]** = 0.0018*		
LYMPHOCYTES (%)					
Time interval	**Group A (n=25)**		**Group B (n=25)**		**Inter Group p-value[1]**
	Mean	**±SD**	**Mean**	**±SD**	
BT	22.70	±5.29	21.00	±4.00	0.81
AT	25.90	±4.07	24.70	±2.98	0.75
Intra Group	**M.C.** = -3.20±1.81 **p-value[2]** = 0.0003*		**M.C.** = -3.70±4.14 **p-value[2]** = 0.02*		
EOSINOPHILS (%)					
Time interval	**Group A (n=25)**		**Group B (n=25)**		**Inter Group p-value[1]**
	Mean	**±SD**	**Mean**	**±SD**	
BT	1.70	±0.95	0.90	±0.74	2.10
AT	1.40	±0.52	1.10	±0.88	0.93
Intra Group	**M.C.** = 0.30±0.82 **p-value[2]** = 0.28		**M.C.** = -0.20±0.92 **p-value[2]** = 0.51		
MONOCYTES (%)					
Time interval	**Group A (n=25)**		**Group B (n=25)**		**Inter Group p-value[1]**
	Mean	**±SD**	**Mean**	**±SD**	
BT	0.90	±0.74	0.50	±0.53	1.39
AT	1.10	±0.74	0.70	±0.82	1.14
Intra Group	**M.C.** = -0.20±0.92 **p-value[2]** = 0.51		**M.C.** = -0.20±0.42 **p-value[2]** = 0.17		
BASOLHILS (%)					
Time interval	**Group A (n=25)**		**Group B (n=25)**		**Inter Group p-value[1]**
	Mean	**±SD**	**Mean**	**±SD**	
BT	0.30	±0.48	0.20	±0.42	0.49
AT	0.20	±0.42	0.30	±0.48	0.49
Intra Group	**M.C.** = 0.10±0.74 **p-value[2]** = 0.68		**M.C.** = -0.10±0.57 **p-value[2]** = 0.59		

[1]Unpaired t-test [2]Paired t-test *Significant, M.C= Mean Change

Showing effect of therapy on Blood Sugar (F/PP)

Table 14: Comparison of change in Blood Sugar (F/PP) before and after the trial

Fasting B. Sugar (mg/dl)					
Time interval	**Group A (n=25)**		**Group B (n=25)**		**Inter Group p-value[1]**
	Mean	**±SD**	**Mean**	**±SD**	
BT	85.60	±13.19	84.00	±16.22	0.24
AT	83.10	±12.88	81.00	±12.45	0.37
Intra Group	**M.C.=** 2.5±2.46 **p-value[2]** = 0.67		**M.C.=** 3.0±6.05 **p-value[2]** = 0.15		
Post Prandial B. Sugar (mg/dl)					
Time interval	**Group A (n=25)**		**Group B (n=25)**		**Inter Group p-value[1]**
	Mean	**±SD**	**Mean**	**±SD**	
BT	140	±20.81	141	±19.71	0.15
AT	133.50	±23.72	134	±18.38	0.12
Intra Group	**M.C.=** 6.5±5.10 **p-value[2]** = 0.003*		**M.C.=** 6.8±4.24 **p-value[2]** = 0.0007*		

[1]Unpaired t-test [2]Paired t-test *Significant, M.C.= Mean Change

Showing effect of therapy on Kidney Function Test (KFT)

Table 15: Comparison of change in Kidney Function Test (KFT) before and after the trial

B. Urea (mg/dl)					
Time interval	**Group A (n=25)**		**Group B (n=25)**		**Inter Group p-value[1]**
	Mean	**±SD**	**Mean**	**±SD**	
BT	27.56	±3.19	30.03	±5.84	1.17
AT	24.54	±2.93	26.27	±5.02	0.99
Intra Group	**M.C.=** 3.02±1.32 **p-value[2] <** 0.0001*		**M.C.=** 3.67+1.97 **p-value[2] =** 0.0002*		
S. Creatinine (mg/dl)					
Time interval	**Group A (n=25)**		**Group B (n=25)**		**Inter Group p-value[1]**
	Mean	**±SD**	**Mean**	**±SD**	
BT	0.95	±0.17	1.06	±0.29	1.04
AT	0.86	±0.13	0.93	±0.18	0.99
Intra Group	**M.C.=** 0.09±0.10 **p-value[2] =** 0.019*		**M.C.=** 0.13±0.19 **p-value[2] =** 0.03*		

[1]Unpaired t-test [2]Paired t-test *Significant, M.C.= Mean Change

Showing effect of therapy on Liver Function Test (LFT)

Table 16: Comparison of change in Liver Function Test (LFT) before and after the trial

S. Bilirubin (mg/dl)					
Time interval	**Group A (n=25)**		**Group B (n=25)**		**Inter Group p-value[1]**
	Mean	**±SD**	**Mean**	**±SD**	
BT	0.84	±0.26	0.79	±0.30	0.396
AT	0.68	±0.14	0.70	±0.22	0.246
Intra Group	**M.C.=** 0.16±0.18 **p-value[2] =** 0.02*		**M.C.=** 0.09±0.12 **p-value[2] =** 0.04*		
S. Alkaline Phosphatase (IU/L)					
Time interval	**Group A (n=25)**		**Group B (n=25)**		**Inter Group p-value[1]**
	Mean	**±SD**	**Mean**	**±SD**	
BT	208	±45.90	223	±49.62	0.71
AT	175	±19.10	200.10	±42.12	1.71
Intra Group	**M.C.=** 33±32.27 **p-value[2] =** 0.01*		**M.C.=** 22.90±17.09 **p-value[2] =** 0.002*		
SGOT (IU/L)					
Time interval	**Group A (n=25)**		**Group B (n=25)**		**Inter Group p-value[1]**
	Mean	**±SD**	**Mean**	**±SD**	
BT	30.10	±8.17	29.10	±8.28	0.27
AT	27.40	±5.75	25.70	±4.85	0.71
Intra Group	**M.C.=** 2.7±3.37 **p-value[2] =** 0.03*		**M.C.=** 3.4±4.11 **p-value[2] =** 0.028*		
SGPT (IU/L)					
Time interval	**Group A (n=25)**		**Group B (n=25)**		**Inter Group p-value[1]**
	Mean	**±SD**	**Mean**	**±SD**	
BT	27.90	±5.59	31.60	±3.78	1.73
AT	24.10	±3.28	28.80	±2.35	3.68
Intra Group	**M.C.=** 3.8±3.46 **p-value[2] =** 0.007*		**M.C.=** 2.8±1.62 **p-value[2] =** 0.0004*		

[1]Unpaired t-test [2]Paired t-test *Significant, M.C.= Mean Change

Overall assessment of the result:

The result was assessed on the basic of symptomatic relief and improvement in terms of lab investigation. The efficacy of the drugs was divided in following categories-

1. Relieved (>75% relieve in all terms)
2. Moderate Improvement (75-57.5% relieve in all terms)
3. Mild Improvement (<57.5-40% relieve in all terms)
4. Unchanged (<40 % relief)
5. Worsens

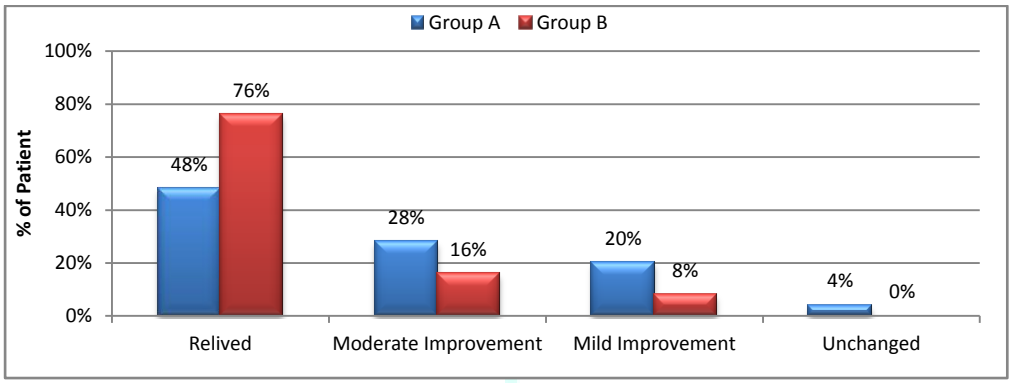
Table 17: Overall assessment of patients after the treatment

Group	Relieved (>75% relief)		Improved				Unchanged (< 40% relief)	
			Moderate (75-57.5% relief)		Mild (<57.5-40% relief)			
	No. of pts.	%	No. of pts.	%	No. of pts.	%	No. of pts.	%
Group A (n=25)	12	48.0%	7	28.0%	5	20.0%	1	4.0%
Group B (n=25)	19	76.0%	4	16.0%	2	8%	0	0%

In group 'A' 12 (48.0%) patients were relieved, 7 (28.0%) patients were moderately improved, 5 (20.0%) patient were mildly improved and 1 (4.0%) patient did not show any response by administration of drug therapy.

In group 'B' 19 (76.0%) patients were relieved, 4 (16.0%) patients were moderately improved, 2 (8.0%) patient were mildly improved by administration of drug therapy. There was no case recoded in unchanged group and worsen group.

The overall relived was higher in group 'B' (76.0%) compared to group 'A' (48.0%). The moderately improved class was higher in group 'A' (28.0%) than group 'B' (16.0%) also the mildly improved class was higher in group 'A' (20.0%) than group 'B' (8.0%). In group 'A' one patient was recorded as unchanged while no patient was recorded as unchanged in group 'B'.



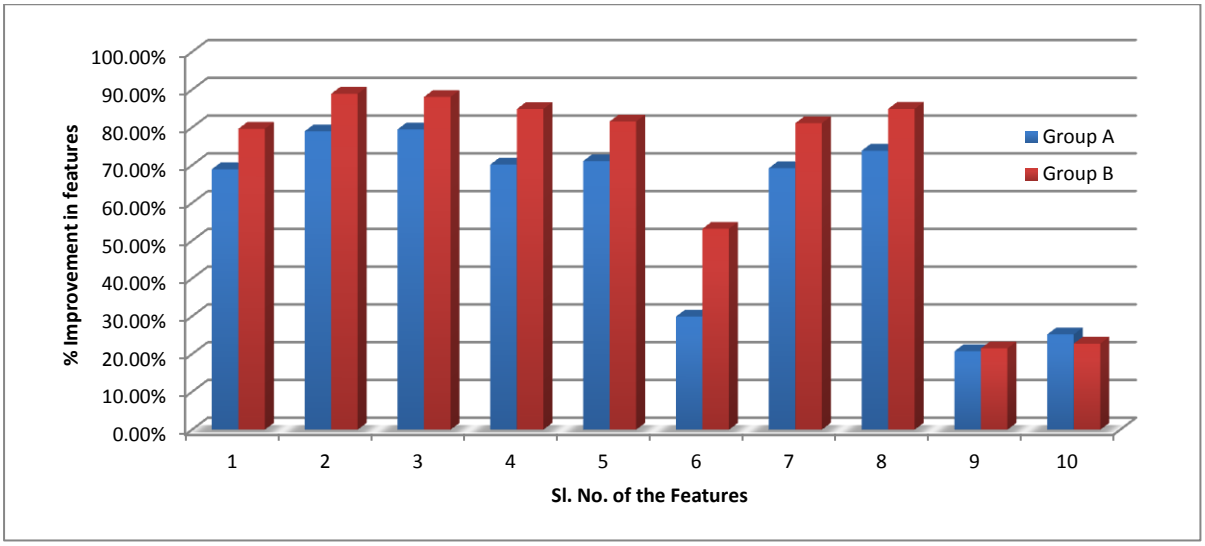
Graph 1: Showing overall assessment of patients after treatment in both the groups

DISCUSSION

Aim of this clinical trial entitled as "A clinical study to evaluate the efficacy of *Patoladi Kwatha* (S*u. Ch*i.) with & without *Rasnadi Prade*h (*Ch. Su*.) in cases of *Vatarakta* (w.s.r. to Gouty arthritis)" was to do comparative clinical evaluation of *Rasnadi Pradeh* as local application in cases of Vatarakta with special reference to gouty arthritis. Result calculated for 50 patients, 25 in each group who completed the trial. We observed that action of the drugs was slow, steady & progressive. The trial drug in both group had shown the effect in almost all the symptomatology but the overall relief was higher in group 'B'

Table 18: Summarization of improvement in all features

S. N.	Features	Percentage of relief	
		Group A	Group B
1.	*Sandhishu Ruka* (Pain in the affected joint)	68.96 %	79.66 %
2.	*Sandhishu Raga* (Redness in the affected joint)	79.00 %	88.94 %
3.	*Sandhishu Swathu* (Swelling in affected joint)	79.50%	88.10 %
4.	*Sparsh-ashatvam* (Tenderness in affected area)	70.20 %	84.90 %
5.	*Sandhishu Kathinya* (Decreased/Restricted movements of Joints)	71.10 %	81.63 %
6.	*Sandhishu Twagbahaya Tamra* (Skin discoloration of affected area)	29.94 %	53.20 %
7.	*Sandhishu Kandu* (Itching in the affected joint)	69. 23 %	81.14 %
8.	*Sandhishu Daha* (Burning sensation in affected joint)	73.85 %	84. 94 %
9.	Serum Uric acid (mg/dl)	20.76 %	21.53 %
10.	ESR mm/1st hrs. (Westerngreen Method)	25.22 %	24.79 %



Graph 2: Showing Percentage of improvement in different Features

Probable mode of action of Trial drugs:

In *Ayurveda*, the action of the drug is determined by Pharmacodynamic factors like *Rasa, Guna, Veerya and Vipaka* and some special property called as Pra*bhav*a, which cannot be explained on by four pharmacodynamic factors. These factors work against the *Dosha* and *Dushya* to break the pathogenesis (*Samprapti Vighatana*) causing relief in symptoms.

1. Patoladi Kwath-

Contents – *Patol Patra, Trifla (Haritaki, Vibhitski, Amalki), Satavari, Guduchi & Katuki*.

Table 19: Properties of different ingredients of the *Patoladi Kwath*

Name of drug	Patol	Amalaki	Haritaki	Vibhitaki	Satavari	Guruchi	Kutki
Latin name	Trichosanthes dioica	Emblica offcinalis	Terminalia chebula	Terminalia bellirica	Asparagus racemosus	Tinospora cordifolia	Picrorhiza kurroa
Family	Cucurbitaceae	Euphorbiaceae	Combretaceae	Combretaceae	Liliacae	Menispermaceae	Scrophulariacae
Part used	Leaf	Fruit	Fruit	Fruit	Root	Stem	stem
Rasa	Tikta	Pancha rasa except lavana, amla rasa pradhan	Pancha rasa except lavana,kashaya rasa pradhan	Kashaya	Madhur, Tikta	Tikta, Kashaya	Tikta
Guna	Laghu, ruksha	Guru, ruksha , sheet	Laghu, ruksha	Ruksha, laghu	Guru, snigdh	Guru, snigdh	Ruksha, laghu
Veerya	Ushna	Sheet	Ushna	Ushna	Sheet	Ushna	Sheet
Vipak	Katu	Madhur	Madhur	Madhur	Madhur	Madhur	Katu
Chemical properties	—	Gallic acid, Tannic acid Calcium, Vit-C	Chebulagic acid, Chebulinic acid	Chebulic acid, Gallic acid, Tannic acid	Saponln	Berberin, Geloin	Picrorhizin, Kutkin, Kutkiol, Kutikisterol
Prabhav (special action)	Saravdosh shamak	Saravdosh shamak mainly pitta shamak	Saravdosh shamak mainly vatashamak	Saravdosh shamak mainly kaphashamak	Vata pitta shamak	Saravdosh shamak mainly pitta shamak	Kaph pitta shamak

Patol Patra is *Pitta Shamak, Haritaki* is *Vatarakta Nashak* & has anti-arthritic action[11]. *Vibhitaki* cures *Dhatu-Gata Dosha* & has analgesic effect[12]. *Amalki* is a *Rasayan, Pitta Shamak,* uricosuric due to presence of Vit-C & causes immunomodulation[13]. *Satavari* is *Balya & Vata-Pitta-Rakta Janya Shopha Nashak*, has anti-urolithic action[14] & causes immunomodulation[15], *Guduchi* is best drug to cure Vatarakta, it is *Tridosh Shamak*, it contains Tinosporin which has anti-uremic action[16] & its anti-inflammatory action resemble to NSAIDs[17]. *Katuki* is *Lekhaniya & Bhedaniya* which eliminates *Doshas* from the body, has *Shoth, Daha, Kusth Nashak* property & has anti-inflammatory property[18].

2. Rasnadi Pradeh-

Contents– *Rasna Patra, Guduchi, Yastimadhu, Bala, Atibala And Vidari*

Table 20: Properties of different ingredients of the *Rasnadi Pradeh*

Name of drug	Rasna	Guruchi	Yastimadhu	Bala	Atibala	Vidari
Latin name	Pluchea lanceolata	Tinospora cordifolia	Glycyrrhiza globera	Sida cordifolia	Abutilon indicum	Pueraria tuberosa
Family	Compositae	Menispermaceae	Leguminosae	Malvaceae	Malvaceae	Leguminosae
Part used	Leaf	Stem	Root	Root	Root	Rhizome
Rasa	Tikta	Tikta, kashaya	Madhur	Madhur	Madhur	Madhur
Guna	Guru	Guru, snigdha	Guru, snigdha	Laghu, snigdha, picchil	Laghu, snigdha, picchil	Guru, snigdha
Veerya	Ushna	Ushna	Sheet	Sheet	Sheet	Sheet
Vipak	Katu	Madhur	Madhur	Madhur	Madhur	Madhur
Chemical properties	Quersitine, Isoraimnetin, Pluchin	Berberin, Giloin	Glycyrrhizin, Isoliquiritin, Liquiritin, Asparagin	Ephedrine, Sterol, Phytosterol	Asparagin	Carbohydrate
Prabhav (special action)	Vata kapha shamak	Saravdosh shamak mainly pitta shamak	Vata pitta shamak	Vata pitta shamak	Vata pitta shamak	Vata pitta shamak

It was used for local application. *Rasna* is best *Vata Shamak* drug, it is *Shotha, Shoola & Vedanahar*. *Guduchi* is best drug to cure *Vatarakta*, it is *Tridosh Shamak* and contains Tinosporin whose anti-inflammatory action resemble to NSAIDs[17]. *Yastimadhu* is a potent *Shopha & Shotha Nashak*, has good anti-inflammatory[19] & analgesic action[20] when used locally. *Bala* & *Atibala* both are *Balya, Vatahar, Vatarakta Nashak* & has anti-inflammatory, analgesic property[21,22]. *Atibala* also has good anti-arthritic action[23]. *Vidari Kand* is *Balya, Vata-Pitta-Rakta Janya Shoph Nashak, Daha Shamak, Mutral* & has immunomodulatory action[24]. *Godugdha* and *Goghrit* both are *Vatapitta & Daha Shamak*. *Madhuchhista* is a potent *Vatarakta Nashak* & also cures *Kandu, Kustha & Vrana.*

Due to above properties both the selected drugs seem to be effective in *Vatarakta*.

CONCLUSION

- The drugs used in Trial are ***Patoladi Kwath*** which was given orally in both the groups and ***Rasnadi Pradeh*** which was given for local application in group B only.
- The trial drugs were given in 50 selected patients (25 in each group) & it was observed that the effect of drugs was high on the symptoms of pain (*Sandhishu Ruk*), redness (*Sandhishu Rag*), swelling (*Sandhishu Swathu*), tenderness (*Sparsh-ashahatvam*), stiffness (*Sandhishu Kathinya*), itching (*Sandhishu kandu*) and burning sensation (*Sandhishu daha*). Grade of all these symptoms shows statistically significant ($p<0.05$) decrease in both the groups but the response was slightly higher in group 'B' than group 'A'.
- *Rasnadi Pradeh* is useful in cases of both Acute Gouty Arthritis as well as Chronic Gouty Arthritis because along with good result in pain, redness, swelling it also showed good result in itching & discoloration.
- Estimation of change in Serum Uric acid (Percent change of 20.67% in group A & 21.53% in group B) & ESR (Percent change of 25.22% in group A & 24.79% in group B) was statistically significant in both the groups.
- The trial drugs probably showed- analgesic (*Vednahara*), anti-inflammatory (*Shothahara*), blood purifier (*Rakta Prasadak*), immunomodulator, uricosuric effects, etc. Drug used for local application also showed good effect on *Daha* (burning), *Kandu* (itching), etc.
- Trial drugs were well accepted & tolerated with good positive response except increased frequency of passage of stool in few cases. Probably Haritaki and Katuki in Patoladi Kwath has slight kostha sodhak property due to which 2 patient having mandagni and loose type of bowel habit complained of increased frequency of passage of stool & hence were withdrawn. So the dose of the drug should be titrated according to nature of kosthagni, type of kostha and type of bowel habit of patient in further trial. Other than increased frequency of passage of stool in few cases, the trial drug did not show any other major side effect regarding clinical and pathological parameters.
- It is suggested that both the drugs should be tested in large scale for the long duration trial and these drugs may prove a valuable contribution from Ayurveda towards the ailing humanity.

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