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The Efficacy of *Yogendra Rasa* in *Pakshaghata*

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ABSTRACT
Pakshaghata is Vata Vyadhi which according to NAMC Code AAB-52 is hemiplegia/ hemiparesis. Hemiplegia/hemiparesis is symptom of Cerebrovascular accident (CVA)/ stroke. Stroke is the major cause of long-term disability in adults and the second leading cause of death worldwide. Yogendra Rasa has been used by clinicians since ages to treat different Vatavyadhis and hence it opens up the possibility to repurpose its use in treating Pakshaghata (hemiplegia). Open label randomized clinical trial. 20 diagnosed patients of Pakshaghata were selected based on inclusion criteria and divided into two groups randomly. Patients of Group A were give Yogendra Rasa (powder form) 1 ratti (125 mg) with honey at 6:00 am and 6:00 pm along with Ecosprin AV (Aspirin-150mg + Atorvastatin-20 mg) at night. Patients of Group B were given Ecosprin AV (Aspirin-150 mg +Atorvastatin-20 mg) at night. The study was of 30 days with follow ups on 0, 7th ,14th, 21st, 28th and 30th day. There was significant improvement in NIHSS and VAS scale in group A with Yogendra Rasa. Also, in group B improvement in NIHSS and VAS was seen. But percentage of improvement in the group A is more as compared to group B. Yogendra Rasa is effective in Pakshaghata and also provide positive add-on effect in patients of group A.
KEYWORDS: *Pakshaghata, Stroke, CVA, Hemiplegia, Yogendra Rasa, NIHSS.*

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INTRODUCTION

Pakshaghata is V*ata vyadhi* which according to NAMC Code AAB-52 is hemiplegia/ hemiparesis.[1] Hemiplegia/hemiparesis is symptom of Cerebrovascular accident (CVA)/ stroke which may be ischemic or hemorrhagic.

Pakshaghata is one of the diseases included in 80 *vataja nanatmaja vikara.* This disease makes the patients unable to perform their daily work and also in some severe cases may cause death. Stroke is the major cause of long – term disability in adults and the second leading cause of death worldwide. Thirty-day mortality rate of ischemic stroke has been estimated at around 15% in high income countries [2]. The estimated adjusted prevalence rate of stroke in India ranges from 84-262/100,000 in rural and 334-424/100,000 in urban areas. The incidence rate is 119-145/100,000 based on recent population based studies. Of patient with first ever stroke approximately 80% are likely ischemic stroke [3].

Various clinical trials have already been conducted on patients of *Pakshaghata* using different classical ayuevedic formulations, (like *Ekangveer Ras, Shilajathuloha-rasayana, Vatagajankusha Rasa* with *Pippali churna* and *Manjishta kwatha, Maharasnadi Kashaya* with *Shunti Churna, Malla-sindur, Sameera pannaga rasa, Pakshaghatari guggulu*) with and without *panchakarma* procedures *(like snehana, swedana, virechana, shirodhara, shirobasti, nasya*). All the above clinical trials showed significant improvement in the motor power and different score for stroke like NIHSS, Hamilton D scale, Modified Rankin Scale, Scandinavian Stroke Scale.[4, 5, 6, 7, 8].

Yogendra Rasa is *rasa aushadhi* which is described in *Bhaishajyaratnawali* under *Vatavyadhichikitsaprakran.* It *contains Rasasindoor, Swarna bhasma, Kantaloha bhasma, Abharak bhasma, Mukta bhasma* and *Vanga bhasma*. *Pakshaghata* is one of the diseases which can be treated with this formulation written in its *phalashruti.* Importance of this formulation has been described from the line of shloka '*hanti bhaskarastimiram yatha*' that is it destroys the diseases given in *phalashruti* as the God Sun diminishes the darkness.[9]

Yogendra Rasa has been used by clinicians since ages to treat different *Vatavyadhis* and hence it opens up the possibility to repurpose its use in treating hemiplegia. An animal trial has already been done on Zebrafish Model in the Suppression of Drug-Induced Cardiac Hypertrophy by using *Yogendra Rasa*. Treatment of the ERY-stimulated D. rerio with different doses of *Yogendra Rasa* (0.6–18 μg/kg) showed

significant (p-value < 0.001) improvement by normalizing the decreased platelet aggregation time compared to control group.[10] It is possible that *Yogendra Rasa* will exhibit similar effect in *Pakshaghata*. Therefore, in this study efficacy of *Yogendra Rasa* on *Pakshaghata* along with its add-on effect was analysed.

MATERIAL AND METHODS

Materials

1) Patients

Patients suffering from *Pakshaghata.*

2) Drug

Yogendra Rasa was procured from 'Ayurved Rasayani' pharmacy. The Certificate of Analysis and No Objection Certificate was obtained.

Methods

The study was conducted after obtaining permission from the Institutional Ethics Committee (BVDUCOA/EC/MD./KC/02/2020-21) and registered in CTRI (CTRI/2022/02/040525), India. The Open label randomized Clinical trials were conducted on patients in OPD or IPD of Bharati Vidyapeeth (Deemed to Be University) College of Ayurved & Hospital, Pune. According to the data available in the Bharati Ayurved Hospital, the prevalence rate of *Pakshaghata* is 0.7%. Hence, the Clinical trial consists of 10 individuals between the age group of 18 to 70 years. Therefore, 20 patients were diagnosed according to Ayurvedic signs and symptoms as well as radiological investigation as required, after taking their consent. These 20 patients were further subdivided into 2 groups. Group A patients received *Yogendra Rasa* along with Ecosprin AV, while Group B patients received Tab. Ecosprin AV alone. Participants from both the groups were analysed on the selected days using the format.

INCLUSION CRITERIA

Patients of ischemic stroke having hemiparesis; Patients of either gender having age above 18 years up to 70 years; Patients either in acute (2 weeks), subacute (2 weeks to 6 months) or chronic stage (6 months onwards) up to 3 years of hemiparesis [11; Patients befitting the signs and symptoms- *vama or dakshina cheshta nivritti, ruja, vakastambha, netra stambhata, nasa-bhru-lalata-akshi-hanu vakrata, sandhibandhana vimokshayan, Dina jihma samutshipta kala sajjati cha vak*a [12-15].

EXCLUSION CRITERIA

Patients below 18 years and above 70 years; More than 3 years chronicity; Patients of *Sarvangavata*; Ischemic stroke severe in nature; Hemorrhagic stroke, Subarachnoid hemorrhage, trauma - depressed fracture of skull, Intra cranial infection encephalitis, meningitis etc; Marked impaired mental function, Todd's post-epileptic hemiplegia; Patients with complications like convulsions, unconscious patients, cerebral tumor, cerebral abscess; Patients with co-morbid chronic kidney disease; Venous sinus thrombosis; Pregnancy, puerperal, feeding mothers.

INTERVENTION As per groups (Table 1)

Particulars	Group A	Group B
Number of patients	10	10
Medicine given with dose and timing	Tab. Ecosprin AV (Aspirin- 150mg + Atorvastatin-20 mg) at night + *Yogendra Rasa* (powder form) 1 ratti (125 mg) at 6:00 am and 6:00 pm	Tab. Ecosprin AV (Aspirin-150 mg +Atorvastatin-20 mg) at night
Route of administration	Oral	Oral
Anupana	*Yogendra Rasa* with Honey. Tab. Ecosprin AV with water	Water
Treatment period	30 days	30 days
Follow-up days	0,7th ,14th ,21st ,28th ,30th day	0,7th ,14th ,21st ,28th ,30th day

Table 1: Interventions in group A and B.

PARAMETERS OF ASSESSMENT

Subjective Parameter: NIHSS - 0 indicates marked improvement and 2,3, 4 indicates severity.

S.NO.	SYMPTOMS	SCORE-RANGE
1	*Achetan* (level of consciousness)	
	1A: May be assessed casually while taking history	0-3
	1B: Ask month and age	0-2
	1C: 'Blink eyes' & 'squeeze hands' (Pantomime commands if communication barrier)	0-2

2	*Akshi vakrata* (Horizontal extraocular movements - Only assess horizontal gaze)	0-2
3	*Netra stabdhata* – (Visual fields)	0-3
4	*Nasa-bhru-lalata-akshi-hanu vakrata* –(Facial palsy-ask patient to show teeth or raise eyebrows and close eyes, Use grimace if obtunded)	0-3
5	5A: *Vama hasta cheshta nivritti* (Left arm motor drift - Count out loud and use your fingers to show the patient your count)	0-4
	5B:*Dakshina hasta cheshta nivritti* (Right arm motor drift - Count out loud and use your fingers to show the patient your count)	0-4
6	*6a: Vama pada cheshta nivritti* (Left leg motor drift - Count out loud and use your fingers to show the patient your count)	0-4
	6b: Dakshina pada cheshta nivritti (Right leg motor drift - Count out loud and use your fingers to show the patient your count)	0-4
7	*Sandhibandhana vimokshayan* (Limb Ataxia -FNF/heel-shin)	0-2
8	*Vichetan* (Sensation)	0-2
9	*Vaka stambha (*Language/aphasia-Describe the scene; name the items; read the sentences)	0-3
10	*Dina jihma samutshipta kala sajjati cha vaka – (*Dysarthria - Read the words)	0-2
11	Vichetan (Extinction/inattention)	0-2
	Total score range	0-42

Table 2: NIHSS

Objective Parameter:

1) Hasta ruja - By using Visual Analog Survey Scale -Range from 0 -10 (0 indicates no pain and 10 indicates severe pain).

2) Pada ruja - By using Visual Analog Survey Scale -Range from 0-10 (0 indicates no pain and 10 indicates severe pain).

ASSESSEMENT OF EFFICACY

1) Primary end points: Improvement in sensory and motor function.
2) Secondary end point: Improvement in VAS scale and NIHSS scale.

RESULTS

Study population

Total 34 patients were assessed for the eligibility out of which 12 were excluded and the rest 22 included patients were allocated randomly in both the groups. In group A 11 patients were allocated out of which one dropped out and the rest 10 completed the follow up. In group B also out of 11 allocated patients one dropped out and 10 completed the follow up. Total 20 number of patients who completed the follow up were analysed for the result. (Figure 1)

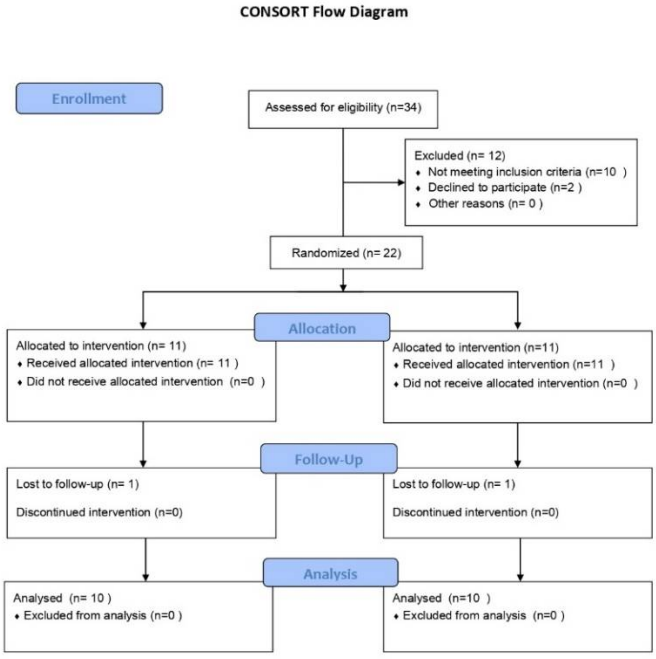


Figure 1: CONSORT flow diagram

In the study population, 86% patients were above 60 years of age, 68% patients were males, maximum patients were of *vatapittaj prakrati* (50%) followed by *pittakaphaj* (36%) and *vatakaphaj* (14%). 59% patients were having one or more habbits like tobacco, alcohol, misri, bidi etc. 75% patients were having comorbidities like hypertension, diabetes mellitus type 2 or both.

Clinical presentation

Achetan (level of consciousness) was seen in 20% patients, 5% patients with *Akshi Vakrata* (Horizontal extraocular movements), 5% with *Netra stabdhata* (Visual fields), 40% with *Nasa-bhru-lalata-akshi-hanu vakrata* (Facial palsy), 55% with *Vama hasta cheshta nivritti* (Left arm motor drift), 30% with *Dakshina hasta cheshta nivritti* (Right arm motor drift), 50% with *Vama pada cheshta nivritti* (Left leg motor drift), 35% with *Dakshina pada cheshta nivritti* (Right leg motor drift), 25% with *Sandhibandhana vimokshayan* (Limb Ataxia), 15% with *Vichetan* (Sensation), 5% with *Vaka stambha* (Language/aphasia), 30% with *Dina jihma samutshipta kala sajjati cha vaka* (Dysarthria) and no patient was having *Vichetan* (Extinction/inattention).

Effect of intervention

On NIHSS

Effect of YR on NIHSS in group A showed significant improvement as observed by "paired t test". Post analysis group A produced significant difference at different time points like 7th day (p=0.003), 14th day (p=0.001), 21st day, 28th day and 30th day (p<0.001). Group B also showed significant improvement at different time points like 7th day (p=0.025), 14th day (p=0.017), 21st day, 28th day and 30th day (p<0.001). At 7th day and 14th day group A showed more significant p values than group B. Group A showed 18.17% additional improvement in NIHSS.

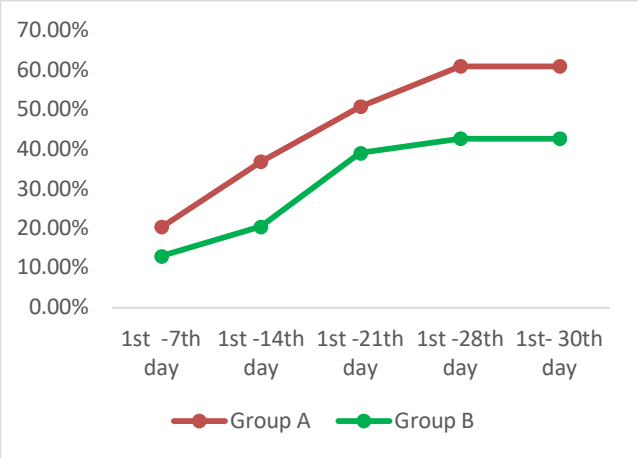


Figure 2: Effect on NIHSS

Parameter	Follow-up Days	Group	Mean		x	% of improvement	t	P VALUE
			BT	AT				
NIHSS	1st day-7th day	A	7.9	6.3	1.60	20.25%	4	0.003
		B	5.4	4.7	0.70	12.96%	2.689	0.025
	1st day - 14th day	A	7.9	5	2.90	36.71%	5.118	0.001
		B	5.4	4.3	1.10	20.37%	2.905	0.017
	1st day- 21th day	A	7.9	3.9	4.00	50.63%	6.508	0
		B	5.4	3.3	2.10	38.89%	6.034	0
	1st day - 28th day	A	7.9	3.1	4.80	60.76%	8.97	0
		B	5.4	3.1	2.30	42.59%	6.273	0
	1st day - 30th day	A	7.9	3.1	4.80	60.76%	8.97	0
		B	5.4	3.1	2.30	42.59%	6.273	0

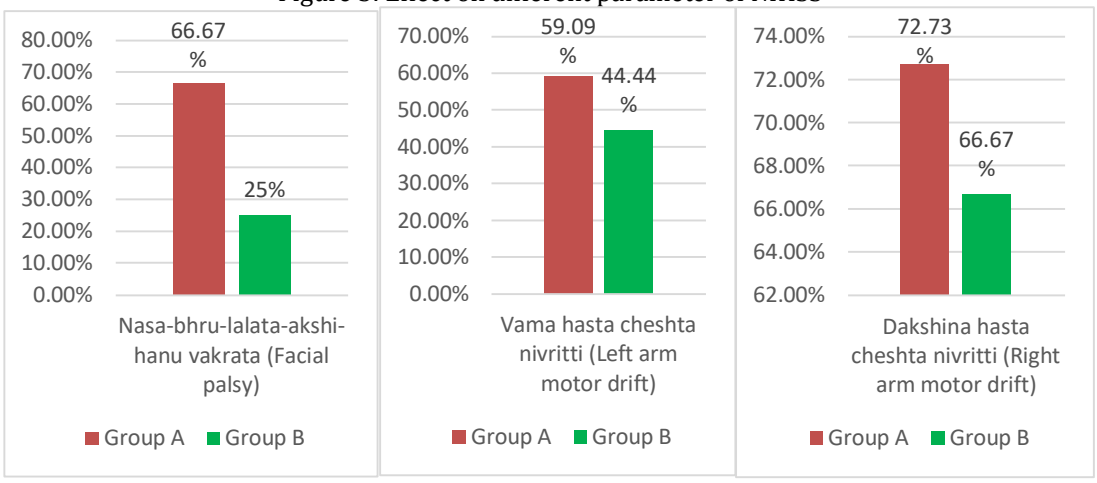
Table 3: Effect on NIHSS

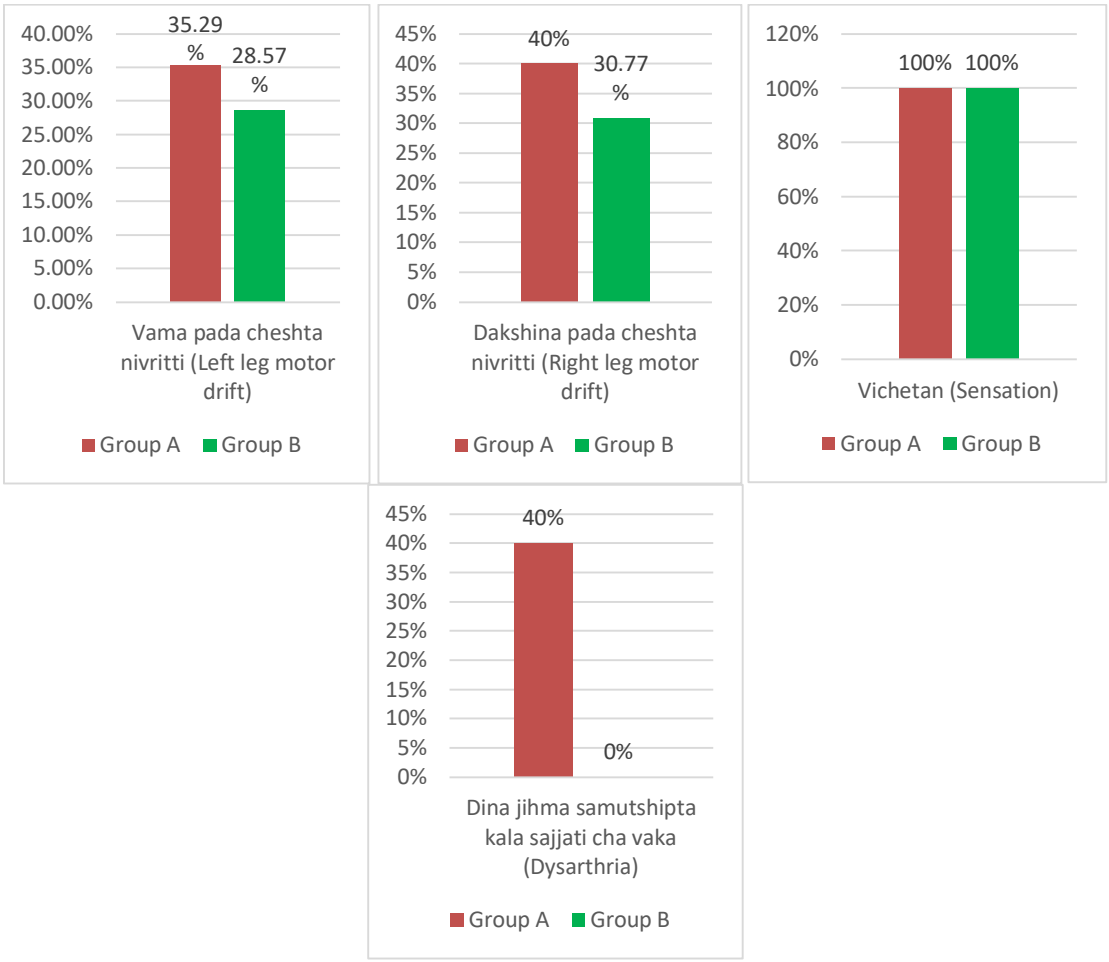
Effect on different symptoms of *Pakshaghata* mentioned in NIHSS (Figure 3)

1. *Achetan* (level of consciousness)
   Impaired level of consciousness was found in 4 patients of group A having 100% mean increment in score with p=0.067 as observed by Wilcoxon test.
2. *Akshi Vakrata* (Horizontal extraocular movements)
   In Group B only 1 patient was found with this symptom having mean increment in score of 100% with p=0.317 as observed by Wilcoxon test.

3. *Netra stabdhata* (Visual fields)
   In Group B only 1 patient was found with this symptom having mean increment in score of 50% with p=0.063 as observed by Wilcoxon test.
4. *Nasa-bhru-lalata-akshi-hanu vakrata* (Facial palsy)
   In Group A, this symptom was found in 4 patients which had a 66.67% mean increment in score with p=0.067 while in Group B, this symptom was found in 4 patients which had a 25% mean increment in score with p=0.157 as observed by Wilcoxon test.
5. A. *Vama hasta cheshta nivritti* (Left arm motor drift)-
   In Group A, this symptom was found in 7 patients which had a 59.09% mean increment in score with significant p value (p=0.016) while in Group B, this symptom was found in 4 patients which had a 44.44% mean increment in score with p=0.046 as observed by Wilcoxon test.
   B. *Dakshina hasta cheshta nivritti* (Right arm motor drift)-
   In Group A, this symptom was found in 3 patients which had a 72.73% mean increment in score with p=0.102 while in Group B, this symptom was found in 3 patients which had a 66.67% mean increment in score with p=0.102 as observed by Wilcoxon test.
6. A. *Vama pada cheshta nivritti* (Left leg motor drift)
   In Group A, this symptom was found in 6 patients which had a 35.29% mean increment in score with significant p value (p=0.034) while in Group B, this symptom was found in 4 patients which had a 28.57% mean increment in score with p=0.157 as observed by Wilcoxon test.
   B. *Dakshina pada cheshta nivritti* (Right leg motor drift)
   In Group A, this symptom was found in 2 patients which had a 40% mean increment in score with p=0.317 while in Group B, this symptom was found in 5 patients which had a 30.77% mean increment in score with p=0.046 as observed by Wilcoxon test.
7. *Sandhibandhana vimokshayan* (Limb Ataxia)
   In Group B, 5 patients were found with this symptom having mean increment in score of 37.5% with p=0.083 as observed by Wilcoxon test
8. Vichetan (Sensation)
   In Group A, this symptom was found in 1 patient which had a 100% mean increment in score with p=0.157 while in Group B, this symptom was found in 2 patients which had a 100% mean increment in score with p=0.157 as observed by Wilcoxon test
9. *Vaka stambha* (Language/aphasia)
   Language/aphasia was found in 1 patient of group A having 66.62% mean increment in score with p=0.157 as observed by Wilcoxon test.
10. *Dina jihma samutshipta kala sajjati cha vaka* (Dysarthria)
    In Group A, this symptom was found in 3 patients which had a 40% mean increment in score with p=0.15 while in Group B, this symptom was found in 3 patients which had a 0% mean increment in score with p=1 as observed by Wilcoxon test
11. *Vichetan* (Extinction/inattention)-This symptom was not found any group.

Figure 3: Effect on different parameter of NIHSS





On *Hasta Ruja* (Vas scale)

Effect of YR on *Hasta Ruja* (Vas scale) in group A showed significant improvement as observed by "paired t test". Post-analysis, group A produced significant difference at different time points like 7th day (p=0.004), 14th day, 21st day, 28th day and 30th day (p=/<0.001). In Group B, p value was not significant (p= 0.345) on 7th day. At different time points like 14th day, 21st day, 28th day and 30th day, group B also showed significant improvement (p<0.01). But on 30th day in group A, p-value was less than 0.001 and in group B, it was less than 0.01. Group A showed 29.21% additional improvement in *Hasta Ruja* (Vas scale).

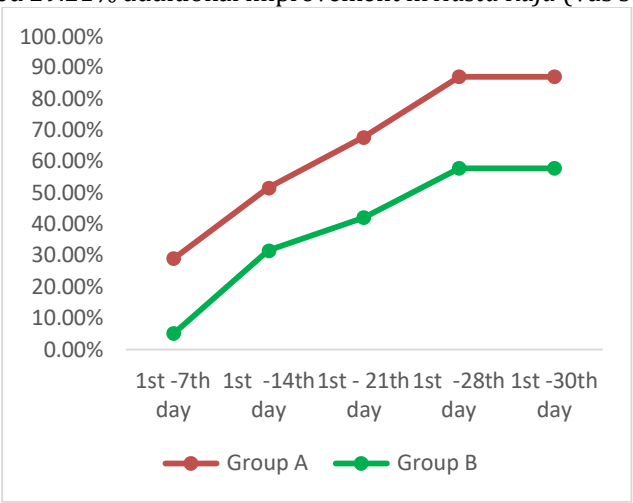


Figure 4: Effect on *Hasta Ruja* (Vas scale)

Parameter	Follow-up Days	Group	Mean		x	% of improvement	t	P VALUE
			BT	AT				
Hasta ruja (VAS)	1st day-7th day	A	3.1	2.2	0.90	29.03%	3.857	0.004
		B	1.9	1.8	0.10	5.26%	1	0.343
	1st day - 14th day	A	3.1	1.5	1.60	51.61%	5.237	0.001
		B	1.9	1.3	0.60	31.58%	3.674	0.005
	1st day- 21th day	A	3.1	1	2.10	67.74%	4.846	0.001
		B	1.9	1.1	0.80	42.11%	4	0.003
	1st day - 28th day	A	3.1	0.4	2.70	87.10%	5.713	0
		B	1.9	0.8	1.10	57.89%	3.973	0.003
	1st day - 30th day	A	3.1	0.4	2.70	87.10%	5.713	0
		B	1.9	0.8	1.10	57.89%	3.973	0.003

Table 4: Effect on *Hasta Ruja* (Vas scale)

On *Pada Ruja* (Vas scale)

Effect of YR on *Pada Ruja* (Vas scale) in group A showed significant improvement as observed by "paired t test". Post analysis group A produce significant difference at different time points like 14th day ($p<0.05$), 21st day, 28th day and 30th day ($p<0.01$). Also, group B showed significant improvement at different time points like 14th day ($p<0.05$), 21st day, 28th day and 30th day ($p<0.01$). Group A showed 44.98% additional improvement in *Pada Ruja* (Vas scale) and the difference was statistical significant ($p= 0.0183$) as observed by two sample t test.

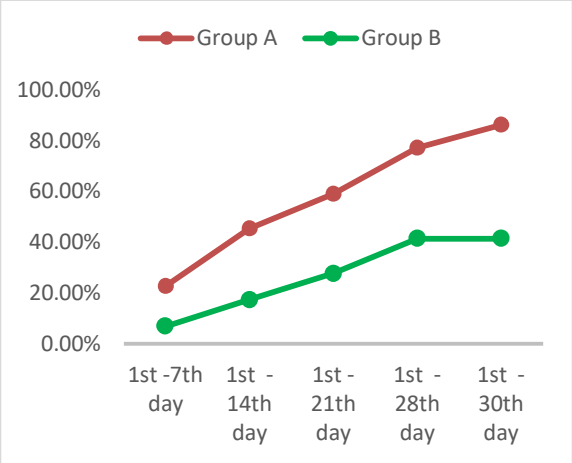


Figure 5: Effect on *Pada Ruja* (Vas scale)

Parameter			Mean		x	% of improvement	t	P VALUE
			BT	AT				
Pada ruja (VAS)	1st day-7th day	A	2.2	1.7	0.50	22.73%	1.627	0.138
		B	2.9	2.7	0.20	6.90%	1.5	0.168
	1st day - 14th day	A	2.2	1.2	1.00	45.45%	2.739	0.023
		B	2.9	2.4	0.50	17.24%	3	0.015
	1st day- 21th day	A	2.2	0.9	1.30	59.09%	3.284	0.009
		B	2.9	2.1	0.80	27.59%	6	0
	1st day - 28th day	A	2.2	0.5	1.70	77.27%	3.042	0.014
		B	2.9	1.7	1.20	41.38%	4.811	0.001
	1st day - 30th day	A	2.2	0.3	1.90	86.36%	3.243	0.01
		B	2.9	1.7	1.20	41.38%	4.811	0.001

Table 5: Effect on *Pada Ruja* (Vas scale)

DISCUSSION

Pakshaghata has been explained in *Sushruta Samhita* as *Pakshaghata* where as in *Charak Chakrapani teeka* it is explained as *Pakshavada/Ardhanga roga. Acharya Vagbhata* has named it as *Pakshavadha*. Symptoms like *vama or dakshina paksha chestha nivriti, ruja, vakastambha, sandhibandhan vimokshan, achetana, vichetana* are clearly mentioned in these *Samhita.* But symptoms mentioned under *Ardita* in *Charak Samhita* also match with those mentioned in the NIHSS for stroke like- *vakastambha, netra stabdhata, nasa-bhru-lalata-akshi-hanu vakrata, Dina jihma samutshipta kala sajjati cha vaka.* To understand the difference between the *Ardita* and *Pakshavadha, Acharya Chakrapani* differentiates them as, "*Ardito vegitaya na sarvakaalam bhavati, ardhangastu sarvakaalam vyapya bhavati*" i.e symptoms of Ardita are not visible all

the time, but disappear once the *vega* subsides and patient becomes *swastha* or asymptomatic whereas in *Ardhang roga* symptoms stay for a longer time. Also "*Yathoktavishishthalakshano Aarditah, ardhange tu neetani sarvani bhavanti*" i.e during vega-avastha of *Ardita* all the symptoms mentioned under *Ardita* in *Charak Samhita* manifest clinically. However, in *ardhang roga* not all the symptoms are seen. From these statements *Ardita* mentioned in *Charak Samhita* may be compared with Transient ischemic attack where neurological symptoms last for less than 24 hours i.e completely resolve and patient becomes symptom free but when these symptoms last for more than 24 hours it is called as stroke as seen in *Pakshaghata.*[17] Most of the patients (86%) were more than 60 years of age. In old age, *vata dosha* is predominant and *dhatu bala* is poor. So even small amount *nidana sewan* will cause sudden *vata prakopa* and *sira sanayu vishosha* as compared to other age groups. 68% patients are male may be due to more habits like smoking, alcohol etc resulting atherosclerotic changes in the blood vessels which is one of the causative factor for stroke resulting in hemiparesis. In *Vatapittaja prakriti,* there is predominance of *vata* and *pitta dosha.* Hence consumption of factors responsible for vitiation of vata-pitta dosha will easily cause the same. *Pakshaghata* is a *Vata vyadhi* where vitiated Vata dosha causes *asriga upshoshana,* i.e. drying of Asrik (blood) and *asriga* is *sthana* of *pitta dosha*, so this disease is mostly seen in *Vatapittaja prakriti* patients. 59% patients were having habits of smoking, alcohol, bidi, misri; which causes injury to the blood vessels and leads to atherosclerotic changes, thrombus formation and occlusion of blood vessel causing ischemia changes in brain tissue and stroke. As *Pittavataj prakriti* is seen maximum in patients, it may be the reason for developing more *Pittavataanubandhi* type of *Pakshaghata*. Patient having comorbidities like DM Type2 and HTN develops atherosclerotic changes hence are at risk of developing *Pakshaghata*; here demographic data also shows that 75% patients were having those comorbidities [18-20].

In patients of group A with Yogendra Rasa, there was significant improvement in Vama hasta cheshta nivritti (left arm motor drift) with p value 0.016, Vama pada cheshta nivritti (left leg motor drift) with p value 0.034 and maximum number of patients were having left side hemiparesis*.* Sensory loss *(Vichetan*-sensation) was found only in 1 patient of Group A with 100% improvement. Therefore, it can be said that *Yogendra Rasa* is effective in achieving primary end point i.e., improvement in sensory and motor functions. Thus, primary end-point was achieved.

In Group A treated with Yogendra Rasa there was significant improvement in NIHSS as well as VAS for Hasta ruja and Pada ruja in subsequent follow ups as observed by "paired t test" (as p value<0.05). Therefore, *Yogendra Rasa* is also effective in achieving secondary end point i.e. improvement in VAS scale and NIHSS scale. In group B as well, there was significant improvement in both NIHSS and VAS.

In NIHSS, Group A with YR showed 60.76% improvement which is more as compared to Group B (42.59%) treated with Ecosprin-AV alone. Also when follow-up wise improvement was seen, on 7th and 14th day, Group A with YR showed more significant p values than Group B. In *Hasta ruja* (VAS), Group A showed early significant improvement on first follow-up and also on subsequent follow-ups. At the end of trial, p value of Group A (0.001) was more significant than Group B (0.01) with 87.1% improvement in Group A and 57.89% in Group B. In *Pada ruja* (VAS scale), Group A showed 44.98% additional improvement and the difference was statistical significant (p= 0.0183) as observed by two sample t test. This showed early and more significant improvement in patients of Group A with YR. Therefore, Yogendra Rasa was effective in Pakshagahata and also provided a positive add-on effect in patients of Group A.

Action of Yogendra Rasa in Pakshaghata (stroke) may be determined in accordance with the contents of Yogendra Rasa. The compound formulation Yogendra Rasa contains Rasa-sindoor, Suvarna bhasma*, Kanta loha bhasma, Abharaka bhasma, Mukta bhasma, Vanga bhasma* and *kumari swarasa* as *bhavna dravya*[16] The attributes of *Yogendra Rasa* can be found by the cumulative addition of the attributes of each of its ingredients. So, *Yogendra Rasa* will have the following attributes*: Rasa- Madhura, tikta, kashaya and ishata lavana; Vipaka –Madhura; Virya-Sheeta; Guna – guru, snigdha, sara*; *Karma (action) – Tridosha shaman, Pancha vata niyaman, pitta nisaraka, dipana, brihana, lekhana, budhi medha smritikaram, Vishanashak, Vrishya, hridya, netrya, rasayana, punsavanupyagi, kantikara, varnya, Dhamni swakriya prasarti, Nadikanamam jalam dridyati, visheshata karanani prakritim gamyati, vaga vishudhi* [17-23]

On the basis of these attributes of *Yogendra Rasa,* probable mode of action of YR on *Pakshaghata* may be understood. *Yogendra Rasa* is *tridosha-shamaka (*pacifies *vata, pitta* and *kapha doshas)* specially *pancha vayu niyaman* and *vattapitta shamaka* due to which it pacified *Vata dosha* as well as *Pitta anubandhi vataj* and *Kapha anubandhi vataj* types of *Pakshaghata.*

Vata dosha is prominently vitiated as it is *Vata vyadhi*. All the five types of *Vata* are involved in the samprapti in more or less amount; specifically, *Prana Vayu, Udana Vayu and Vyana Vayu*. *Prana vayu* is responsible for the deglutition of food which when vitiated during stroke manifests as dysphagia, dribbling of saliva. *Buddhi-hridaya-indriya-chitta dhrika* are the higher functions (like level of consciousness, orientation, intelligence) of *Prana vayu* manifested as *achetanta, vichetanta*. *Udana vayu* is responsible for

vakapravriti/ bhashita, geetaadi pravrta (production of sound for speaking and singing) which may be compared with Broca's area in frontal lobe resulting in dysphasia and aphasia (*Dina jihma samutshipta kala sajjati cha vaka / vaka stambha)*. *Vyana vayu* is responsible for five types of activities- *apakshepana* (downward movements of limbs), *utkshepana* (upward movements), *prasarana* (flexion/dilation), *akunchana* (contraction), *gamana* (walking), *nimesha-unmesha* (movements of the eyelids) all these are functions of motor area in frontal lobe which when hampered in *Pakshaghata* manifests as *cheshta nivritti* (hemiparesis/ hemiplegia). *Pancha vayu niyaman* action of YR helped in managing dysphagia, dribbling of saliva, altered higher functions of brain (level of consciousness, intelligence and orientation), dysphasia, aphasia, hemiplegia/hemiparesis.

Pitta dosha is also vitiated specially *Sadhaka* and *Alochaka pitta. Sadhaka pitta* is invoved in *buddhi* (intellect), *medha* (discriminating power) and may manifest as *achetanta*. *Alochaka pitta* is of two types: *chakshu vaisheshika* and *buddhi vaisheshika. Chakshu vaishehika Alochaka pitta* is responsible for vision function of optic nerve manifested as *Netra stabdhata* and *buddhi vaisheshika* for the memory, cognition and comprehension which when hampered results in *vichetan, achetana. Pitta shamaka* action helped in altered vision, memory, cognition and comprehension.

Kapha dosha is also involved specially *Tarpaka* and *Shleshaka kapha. Tarpaka Kapha* is situated in the *shira* (head) where the brain is located and nourishes the *Indriyas* (sense organs). Brain is the main site of pathology. *Shleshaka Kapha* is responsible for *shleshana* i.e., lubrication and integration of *sandhis,* and prevents *sandhi bandhana vimokshana* resulting in hemiparesis. *Kapha shamaka* action of YR on vitiated *kapha* helped in nourishing sense organs and managing hemiparesis.

Pitta nissaraka action removed vitiated *pitta* through purgation i.e *virechan* which is required as per *Chikitsa sutra* of *Pakshaghata*[24]. *Dhamni swakriya prasarti*- pacification of the vitiated *Vata dosha* made the *dhamanis* to perform its proper function of blood circulation which was hampered by the *upshoshana* of *rakta* as seen in its *samprapti.* By its *lekhana guna* it helped to remove the thrombus responsible for the ischemia. *Rasayan* and *brihana* (nourishing) action of YR improved the nourishment of *Rasa, Rakta, Mansa, Meda* and *Majja dhatus,* which are under-nourished in *Pakshaghata*. Neuroprotective activity was seen due to its *medhya karma*. "*Nadikanam jaalam dridayati",* it made the *sangyavahanama* and *cheshtavahanama nadikanama jaalam* i.e network of Ascending Reticular Activating System (responsible for the state of alertness and wakefulness) and motor nerve fiber strong (*dridha*) by enhancing the ability of action of impulse conduction *(karma kshamata sampadan)* and thereby improved the level of consciousness and motor power of the patient. "*Visheshata karanani prakritim gamyati",* it enhances the perceptive power of sensory organs. *"Vak vishudhi"karma* helped to improve the speech function of dysarthric patient. *Smritikara karma* helped to improve the memory and thereby improved cognition and comprehension.

According to modern science, one of the reasons for ischemic stroke is thrombus. Thrombus is formed due to platelet aggregation. An animal trial has already been done on Zebrafish Model in the Suppression of Drug-Induced Cardiac Hypertrophy by using *Yogendra Rasa*. Erythromycin (ERY) stimulation of the Zebra fish (D. rerio) led to a decrease in the platelet aggregation time as compared to the normal control fish which acts as a precursor to the development of thrombosis. Treatment of the ERY-stimulated D. rerio with different doses of *Yogendra Rasa* (0.6–18 μg/kg) significantly (p-value < 0.001) brought the platelet aggregation time back to normal as compared to the disease control fish. It is possible that *Yogendra Rasa* exhibits similar effect in ischemic stroke patient [24]. Various animal and clinical trials on the contents of *Yogendra Rasa* have been done like *Rasasindoor, Suvarna bhasma, Abharak bhasma, Loha bhasma. Rasasindoor* is having effect on dendritic spine densities which helps to manage cognitive functions and memory. *Suvarna bhasma* possesses antioxidant/ restoration effect against global and focal ischemia [25]. *Abharak bhasma* also has antioxidant activity to combat oxidative stress during ischemia [26]. It also helps in normalising the lipid profile and lowering blood sugar levels therefore may be helpful in preventing stroke [28]. *Loha bhasma* is also having antidiabetic effect hence may lower the risk of stroke [27].

All the above factors may have contributed to the positive add-on effect of *Yogendra Rasa* in *Pakshaghata*.

CONCLUSION

Thus from above study, it can be concluded that Yogendra Rasa has a positive add-on effect in management of patients with *Pakshaghata.* No clinical side effect was seen due to *Yogendra Rasa* in patients of *Pakshaghata.*

FURTHER SCOPE OF STUDY

Further clinical trial may be performed by increasing sample size for more significant statistical analysis. Comparative study may be done by increasing the duration of administration of *Yogendra Rasa.* Effect of alone *Yogendra Rasa* without Ecosprin AV can be studied.

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