Research Article

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THERAPEUTIC EFFICACY OF CHUKKUCHUNDADI KASHAYA IN SHOPHA: AN EXPERIMENTAL EVALUATION

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ABSTRACT

Aim: To evaluate the Shophahara (anti-inflammatory) efficacy of Chukkuchundadi Kashaya through an experimental study. Method: A pharmaceutical study was conducted to prepare Chukkuchundadi Kashaya in college pharmacy following standard operating procedure. The experimental evaluation was carried out using the carrageenan-induced paw oedema model to assess the anti-inflammatory activity of the formulation. The reduction in paw oedema was measured and statistically analyzed. Results: The experimental study showed reduction in paw oedema with increase in Jarana shakti (time taken for ahara pachana) and Abhyavarana shakti (matra and frequency of ahara in relation to appetite) in the group treated with Chukkuchundadi Kashaya without any side effects when compared to standard and control group. The findings indicate that the formulation possesses appreciable anti-inflammatory activity. Discussion: Chukkuchundadi Kashaya is formulated based on classical Ayurvedic principles and contains drugs with Kaphavatahara, Amapachana, and Shothaghna properties. The observed anti-inflammatory effect may be attributed to the combined and synergistic action of its ingredients, which helps in improving Agnidipana, facilitating Vatanulomana and promoting Strotoshodhana. These actions collectively help in breaking the Samprapti of Shopha. Conclusion: The study concludes that the Chukkuchundadi Kashaya exhibits significant anti-inflammatory activity in an experimental model. The results support its potential utility as an effective Ayurvedic formulation for the management of inflammatory conditions associated with Shopha.

Keywords: Chukkuchundadi Kashaya, Anti-inflammatory, Shopha, Carrageenan- induced paw oedema.

INTRODUCTION

Chikitsa Chatushpada explains the importance of drug for any successful treatment. Medicine is the greatest tool of a physician. Bhaishajya Kalpana developed as a separate subbranch for the same reason. Though every plant available on the earth has some medicinal property, along with the minerals or without minerals wide range of medicines can be prepared, but the utility depends on the Yukti of the physician[1]. Further with the proper knowledge and discretion a physician can convert a poison into nectar for saving the life of his patient[2].

Shopha is mentioned in the classics as a characteristic of various diseases as well as a separate disease entity. The treatment for shopha which is prescribed separately in most of the classics of Ayurveda denotes the significance of this clinical condition. In modern medicine science, Shopha can be correlated with inflammation. [3]

It is mainly caused by poor dietary and lifestyle habits, as well as exposure to certain events such as an accidents or injury. Modern lifestyle habits have significantly contributed to the increased prevalence of Shopha by disrupting the body's natural balance.

Ayurveda emphasizes the importance of Ahara (diet) and Vihara (lifestyle) in maintaining health and preventing disease[4]. Shotha, referred to as Shopha or Svayathu, encompasses various conditions from local swelling to Inflammation. In Ayurveda, Shotha is described as an independent disease and also as a symptom of many diseases. It can be compared with Inflammation in modern science. Acharya Madhava says that due to its Prakupita Nidana, the Dushita Vayu affect the Rakta, Pitta and Kapha taking them to Bahya Sira and getting avrodha by them and causing Utsedha of the tissues. Due to the accumulation of all three doshas along with Rakta present in between the Twacha and Mamsa is known as Shotha[5]. Inflammation is a response of vascularised tissue to infections and damaged tissue that brings cells and molecules of host defence from the circulation to the sites where they are needed to eliminate the offending agents. [6]

A study conducted in India found that 35% of affected individuals were between 41-50 years old, with 70% cases of inflammation occurring in males. Additionally, 65% of cases involved the lower extremities[7].

In Modern Medicine, Shopha which refers to inflammation is often managed with diuretics to reduce fluid retention and painkillers to alleviates the pain. Diuretics are medications that

help the body get rid of excess sodium and water through urine. This process reduces swelling by decreasing the amount of fluid in the blood vessels. They are particularly useful in conditions where fluid retention is the main issue[8]. If treatment is stopped, the condition may reoccur, and longterm use of painkillers can lead to side effects such as gastric issues, kidney problems, etc.

Chukkuchundadi Kashaya[9] appears to be a promising Ayurvedic formulation having Tikta, Katu Rasa, Sheeta Veerya, Katu Vipaka and have Laghu Rooksha Guna which inturn removing Margavarodha. These qualities make it effective in reducing Shopha without any side effects.

MATERIALS AND METHODS

A thorough review and screening of Ayurvedic literature and modern texts were conducted to evaluate the proposed hypothesis. Additionally, information was meticulously gathered from various credible sources, including textbooks of modern medicine, reputable websites, authentic journals, and relevant research studies. Genuine raw materials were carefully procured and scrutinized to ensure reliability and accuracy.

The formulation of Chukkuchundadi Kwatha Churna was prepared in the pharmacy attached to the institute. The standard operation procedure for Kashaya Kalpana was followed as told by Sharangdhara.[10]

Sample **source for experimental study:** Wistar albino rats were randomly taken and grouped into 3 groups consisting of 6 rats each – control group, standard group and trial group.

Inclusion Criteria: Healthy active albino rats of either sex taken weighing 180-250g are used in experiments.

Exclusion Criteria

Rats weighing below 180 grams and above 250 grams

Diseased and infected rats

Pregnant albino rats

Albino rats which are under trial for other experiments are excluded.

Grouping: 18 Albino rats of either sex were selected, and each grouped into 6 albino rats of 3 groups and was kept in separate cages.

Table 1: Grouping of rats for the study

Group Name	Drugs	Number of rats
Control group	Distilled water	6
Standard group	Diclofenac (100mg/kg)	6
Trial group	Chukkuchundadi kashaya	6

Preparation of the Trial Drugs

All the drugs were individually made into coarse powder through a Khalwa yantra separately. The coarsely powdered drugs were mixed together thoroughly and placed in a stainless-steel vessel and added with 16 parts of water. The vessel was placed over mild heat and boiled till the Kashaya is reduced to 1/8th of its original volume i.e. For 5 gm of Kwatha Churna, 80 ml water was added and reduced to 1/8 i.e. 10ml was prepared daily according to standard method of preparation of Kashaya as mentioned by Sharangdhara. The Kwatha was filtered through a clean cloth, and the remaining residue was discarded.

Table 2: Ingredients of chukkuchundadi kashaya

Drugs	Scientific Name	Family	Part Used	Proportion
Shunti	*Zingiber officinale*	Scitaminae	Moola	½ karsha (6 grams)
Bhunimba	*Andrographis paniculata*	Acanthaceae	Panchanga	½ Karsha (6 grams)
Apamarga	*Achyranthes aspera*	Amaranthaceae	Beeja	½ Karsha (6 grams)
Duralabha	*Fagonia arabica*	Zygophyllaceae	Panchanga	½ Karsha (6 grams)
Punarnava moola	*Boerhavia diffusa*	Nyctanginaceae	moola	½ Bilwa (24 grams)

Dose fixation of trial drugs: Rats dose was calculated from human dose by following standard conversion method or Paget and Barnes 1964 formula involving body surface area ratio[11].

Rat dose = Human dose X 0.018 X 5 per kg

Dose of Chukkuchundadi Kashaya given: Human dose x 0.018 x 5/ kg body weight i.e.

48ml x 0.018x 5 = 4.32ml /kg and on the seventh day, Carrageenan was injected into the left hind paw.

Dose of Standard drug: Diclofenac 25mg /kg body weight and on the seventh day, Carrageenan was injected into the left hind paw.

Route of drug administration: The drugs were administered by oral route with the help of syringe.

Procedure: Each group of rats was housed in a different cage, with daily supplies of food and water provided.

Group 1 - The control group, were administered distilled water.

Group 2 - Standard group, received Diclofenac (25mg /kg)

Group 3 - Chukkuchundadi Kashaya dose- 4.32ml/kg required per day for 6 rats

Experimental Study

The experimental study was conducted in SDM institute of Ayurveda and Research centre, Udupi. The ethical clearance was taken before the experiment and the ethical clearance number for the selected study was (SDMCRA| IAEC |SDC-1S).

Six albino rats in each group were taken and kept for acclimatization for some days.

Standard group: On the day of experiment mark was made at the ankle of each rat to measure the paw volume. The Standard group was administered with drug Diclofenac (25 mg/kg). A plethysmometer was used to measure the initial volume of the left hind paw for basal reading on the seventh day before the carrageenan injection. After one hour of drug administration, paw oedema was produced by injecting 0.1ml of freshly prepared 1% carrageenan in a sterile saline solution into sub-plantar aponeurosis of the left hind limb.

Control group: For ensuring proper hydration rats were provided with tap water of 2ml/ 100gm body weight.

Test or trial group: The test drug was administered once daily for seven Consecutive days. The rats were administered with Chukkuchundadi Kashaya with a dose of 4.32ml/kg of body weight. The intensity of oedema was measured after 1-hour, 3-hour, 6-hour, and 24 hours of carrageenan injection.

The percentage increase in paw volume relative to original values was used to express the results. By deducting the initial paw volume from the paw volumes acquired after injecting phlogistic agent, the percentage increase in the paw volume was computed. The number whatever we get after deducting was multiplied by 100 after being divided by the initial paw volume.

Percentage change in 1st hour = 1hour basal paw volume /basal paw volume x 100

Similarly, percentage change in 3-hour, 6-hour, and 24 hours was calculated.
For normal group, after injection of Carrageenan, normal food and water was provided and paw volume was measured with plethysmometer after 1-hour, 3-hour, 6-hour, and 24 hours.
For standard group, after injection of Carrageenan, Diclofenac injection was administered with dose of 25mg/kg body weight to the albino rats and paw volume was measured with plethysmometer after 1-hour, 3-hour, 6-hour, and 24 hours.
For the test group, Chukkuchundadi Kashaya was administered orally, and paw volume was measured with plethysmometer after 1-hour, 3-hour, 6-hour, and 24 hours.

Table 3: Effect of Chukkuchundadi Kashaya on change in paw volume in 1st, 3rd, 6th, 24th hour

Group	Basal	1st hour	3rd hour	6th hour	24th hour
Control	0.80 ±0.029	1.2±0.1074**	1.10±0.063**	1.32±0.091**	0.965±0.061
Standard	0.74±0.03	1.003±0.02**	1.31±0.08**	0.93±0.011*	0.87±0.016
Test	0.751±0.038	1.425±0.129**	1.115±0.062**	1.05±0.035*	0.935±0.02

Data: *p<0.05 **p<0.01 MEAN±SEM

Table 4: Chukkuchundadi Kashaya impact on the % change in the paw volume in the first hour

Group	% change in paw volume	% change
Control	48.77±11.72	
Standard	37.41±10.05	23.29↓
Test	96.10±27.83	97.04↑

Table 5: Effect of Chukkuchundadi Kashaya on % change in paw volume in 3rd hour

Group	% change in paw volume	% change
Control	38.17±9.375	
Standard	80.17±16.60*	110.03↑
Test	49.48±8.340	29.62↑

Data: Mean±SEM A vs B *P<0.05

Table 6: Effect of Chukkuchundadi Kashaya on % change in paw volume in 6th hour

Group	% change in paw volume	% change
Control	66.30±14.05	
Standard	27.35±7.20*	58.74↓
Test	41.91±10.19	36.78↓

Data: Mean±SEM A vs B*p<0.05

Table 7: Effect of Chukkuchundadi Kashaya on % change in paw volume in 24th hour

Group	% change in paw volume	% change
Control	39.26±3.354	
Standard	19.63±7.84	50↓
Test	23.086±6.395	41.19↓

Data: Mean±SEM A vs B*p<0.05

RESULTS

The Table 3 shows the impact of Chukkuchundadi Kashaya on the change in paw volume in the first, third, sixth, and twenty-four hours.
In comparison to the basal paw volume, the results indicates that the test drug caused a statistically significant change in paw volume during 1st, 3rd, 6th, 24th hours.
According to the statistics, the standard group's paw volume changed statistically significant between 1st and 3rd hour when compared to the basal paw volume.
According to the data, the control group's paw volume changed statistically significant between 1st and 3rd hour when compared to basal volume.

According to the statistics, during the first hour, the standard group's percentage inhibition of paw oedema was lower than that of the control group. It was determined that the observed decline was not statistically significant.
According to data, during first hour, the test group's percentage inhibition of paw oedema was higher than that of control group. It was determined that the observed rise was not statistically significant. (Table 4)

The effect of Chukkuchundadi Kashaya in % change in paw volume in 3rd hour has been depicted in the Table 5.
The data reveals that the standard group has shown a increase in % inhibition of paw oedema when compared to control group during 3rd hour. The observed increase was found to be statistically significant.
The data reveals that the test group has shown a increase in % inhibition of paw oedema when compared to control group during 3rd hour. The observed increase was found to be statistically not significant.

The effect of Chukkuchundadi Kashaya in % change in paw volume in 6th hour has been depicted in the Table 6.
The data reveals that the standard group has shown a decrease in % inhibition of paw oedema when compared to control group during 6th hour. The observed decrease was found to be statistically significant.
The data reveals that the test group has shown a decrease in % inhibition of paw oedema when compared to control group during 6th hour. The observed decrease was found to be statistically not significant.

The effect of Chukkuchundadi Kashaya in % change in paw volume in 24th hour has been depicted in the Table 7.
The data reveals that the standard group has shown a decrease in % inhibition of paw oedema when compared to control group during 24th hour. The observed decrease was found to be statistically not significant.

The data reveals that the test group has shown a decrease in % inhibition of paw oedema when compared to control group during 24th hour. The observed decrease was found to be statistically not significant.

Assessment Criteria

Table 8: Assessment Criteria based on signs of Inflammation

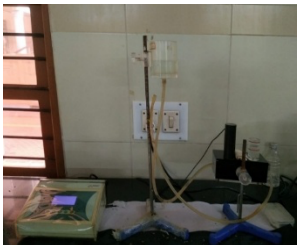
Subjective parameter	Grade 0	Grade 1	Grade 2	Grade 3
Calor	No warmthless	Mild increase in warmth compared to surrounding area	Moderate noticeable warmth on palpation	Severe increased heat felt without touch
Rubor	No redness	Slight redness compared to surrounding area	Clearly visible redness but not dark or widespread	Intense or deep redness possibly spreading
Dolor	No tenderness	Slight discomfort or tenderness	Noticeable pain interfering activity	Intense pain limiting activity or rest
Tumor	No swelling	Slight swelling barely noticeable	Clearly visible swelling	Marked swelling and tension
Loss of function	No limitation	Minimal limitation	Noticeable limitation of movement	Marked or complete loss of function

Table 9: Signs of inflammation during the time of experiment

Signs of inflammation	Group	1 hour	3rd hour	6th hour	24th hour
Calor	Control	1	2	2	2
	Standard	0	2	2	1
	Test	0	2	1	0
Rubor	Control	0	2	2	2
	Standard	0	2	2	1
	Test	0	2	1	0
Dolor	Control	1	2	3	2
	Standard	1	2	2	2
	Test	1	2	2	1
Tumor	Control	1	2	3	1
	Standard	2	2	2	1
	Test	2	2	2	1
Loss of function	Control	0	1	2	2
	Standard	0	1	2	3
	Test	0	1	1	0

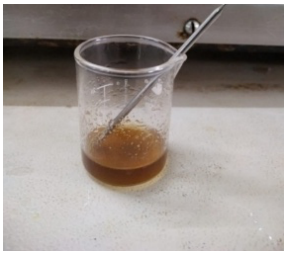
Figure 1: Rat Identification (Marking)

Figure 2: Preparation of Chukkuchundadi Kashaya

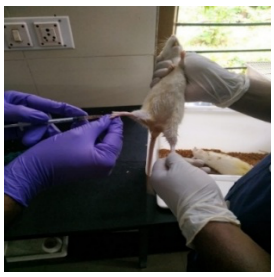


Plethysmometer

Caging of rats



Heating carrageenan injection on hot plate after dilution with saline water

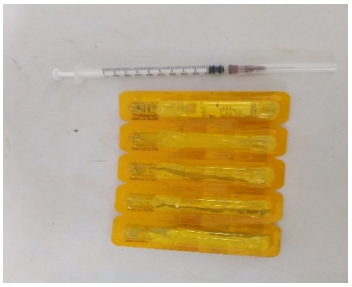


Inducing paw oedema by injecting carrageenan injection

Measuring paw oedema using plethysmometer

Figure 3: Experimental study: Carrageenan induced paw oedema of left hind paw apparatus and method

Figure 4: Administration of Chukkuchundadi Kashaya (Test Group)



Diclofenac injection

Injecting Diclofenac injection

Figure 5: Diclofenac Injection to Standard Group

DISCUSSION

The study was conducted to evaluate the anti-inflammatory property of Chukkuchundadi Kashaya. For this study model used was Carrageenan induced paw oedema. The paw oedema was measured by plethysmometer based on the Archimedes principle. The Kashaya was administered to *in-vivo* animal for an experimental module of anti-inflammatory effect of Carrageenan induced inflammation in Wistar albino rat with the dose of Human dose x 0.018 x 5/ kg body weight i.e. 48ml x 0.018x 5 = 4.32ml /kg and after 7th day Carrageenan injection was given to left hind paw.

Previous studies on Shopha

Ayurvedic Management of Shopha w.s.r to oedema by Dr. Poonam Verma and Dr. Ravi Sharma, PG. Scholar Dept of Kayachikitsa, MMM Govt Ayu College, Udaipur.

Anti-inflammatory activity of siddha herbomineral formulation ajamothastaka maathirai on carrageenan induced paw edema in wistar albino rats by Dr. Jayapriya R. first PG Scholar, Department of PG Pothu Maruthuvam, Government Siddha Medical College, Chennai, India.

Mode of action

Chukkuchundadi is having drugs like Shunti which is having Katu Rasa and Agni and Vayu Mahabhuta predominancy. The active constituents of Shunti, such as gingerol and shogaol, are responsible for its anti-inflammatory, carminative, and digestive properties. [12]

Duralabha is having Kashaya, Tikta, Madhura, katu rasa; Laghu, Snigdha guna; Sheeta virya; Madhura vipaka; Tridoshagna, so having Prithwi and jala mahabhuta. [13]

Punarnava mula having Katu Vipaka, Laghu Ruksha guna and Agni and Vayu mahabhuta and Punarnava Mula contains several flavonoids and alkaloids, which exhibit potent anti-inflammatory properties. [14]

Apamarga is having Katu Rasa, Katu Vipaka Ushna veerya and Laghu Ruksha guna so having Agni Vayu Mahabhuta helps to reduce Shopha and Chemical constituents of Apamarga like alkaloids, saponins, flavonoids, phenolic compounds, tannins, proteins all are having anti-inflammatory activities. [14]

Bhunimba is having Tikta rasa, Katu rasa, Laghu Ruksha guna,Ushna Veerya and Agni Vayu mahabhuta. and Akasha Mahabhuta predominancy and Sheeta Virya reduces the Daha and have Rooksha Guna so help in Shoshana of Pitta and Kapha Doshas. Chemical constituents are Andrographolide, Flavonoids these contribute to its anti-inflammatory effects. [15]

All the above ingredients commonly have Tikta Katu Rasa in predominantly. Tikta rasa is associated with cooling, drying and detoxifying properties i.e. Tikta Rasa helps to remove toxins and reduce inflammation, promotes tissue repair, antimicrobial effects. On other hand Katu Rasa is having warming, stimulating properties and pain-relieving effects. Both helps in reducing inflammation and can modulate the immune system, improve blood circulation which is crucial for healing and reducing inflammation.

Thus, ingredients of Chukkuchundadi Kashaya, endowed with Shothahara properties, effectively penetrate up to the Sukshma Srotas owing to their Laghu, Ruksha, and Sukshma gunas, along with Katu-Tikta Rasa and Ushna Virya. This facilitates a reduction in capillary permeability, thereby contributing to the alleviation of oedema.

Dipana and Pachana activity were estimated by assessing the Abhyavaharana shakti of animals by daily food consumptions and Jarana Shakti by means of faecal output.

Acharya Sushruta has mentioned that the Dravyas with the dominance of Agniguna are Dipana. Dipana Dravyas have capacity to ignite Agni in living body. This may be observed by the feeling of hunger and increased intake of food due to enhanced Abhyavaharana shakti[16].

On other hand Pachana Dravyas are Panchabhautika Dravyas which have dominance of Agni or Vayu Mahabhuta. Pachana dravyas help to increase digestive power and helps to convert the food consumed into body tissues.

Gallic acid present in Chukkuchundadi Kashaya found to inhibit the NF-κB, MAPK, and Akt pathways—key regulators of inflammation in immune and skin cells. It reduces histamine release from mast cells, thereby helping to alleviate allergic and inflammatory responses[17].

In this experiment we can see during administration of Chukkuchundadi Kashaya to the test group, gradually Abhyavaharana Shakti is increased along with the Jarana shakti by seeing the amount of consumption of food and amount of faecal output when compared to control group. The food consumption by standard group which is given Diclofenac is decreased gradually and Jarana shakti was also decreased when compared to control group.

The pathophysiology of Shopha reveals that it is caused mainly due to vitiation of Tridosha, Rakta and Margavarodha. Chukkuchundadi Kashaya are having Tikta, Katu rasa, Sheeta Veerya, Katu Vipaka, and have Laghu, Rooksha gunas which in turn helps in removing Margavarodha.

The experimental data further support the presence of Dipana, Pachana, properties within the formulation. These findings also provide strong evidence for its Amahara properties which inturn helps to relieve Strotorodha or Margavarodha helps in proper formation of Purisha and excretion of mala which is one of the contributing factors for Shopha.

Following are the inference made out of the experimental study

From the observation and statistical report of control group, standard group, and test group (Chukkuchundadi Kashaya), it was found that there is a decrease in the paw volume of standard group by 37.41 and increase in the paw volume of the test group by 96.10 when compared to the control group in the 1st hour.

In the 3rd hour, it shows the standard group has increased paw volume to 80.17 when compared to the control group. The test group showed a decrease in paw volume when compared to control group to 49.48. The increase in standard group is found statistically very significant.

In the 6th hour, standard group showed a 27.35 decrease in paw volume and the test group also showed 41.91 decrease in paw volume. The decrease in standard group is found statistically very significant.

The test group showed gradual decrease in paw oedema, but standard group has shown immediate decrease with side effects like decrease in food and water consumption of rats and weight of rats.

On 24th hour as we can see from our result, control, standard and test drug has shown equivalent result were obtained.

The control group has shown decrease in Shopha on its own without giving any medicine but mild redness and warmthless was present on 24th hour also.

The standard group has also shown decrease in Shopha but the rats became so weak at the time of trial.

The chance of recurrence was lower in the control and standard drug groups compared to the Chukkuchundadi Kashaya group because the control and standard drugs provided faster and more sustained symptomatic relief. This immediate suppression of symptoms helped prevent early flare-ups that were recorded as recurrences. In contrast, Chukkuchundadi Kashaya, targets the root cause of the disease, reduces inflammation, and promotes tissue regeneration.

The test group has shown decrease in Shopha and faecal output was more and overall health was increased, warmthless and redness decreased.

In the manifestation of Shopha, Agnimāndhya is a primary causative factor that leads to numerous Vikāras. When Ahāra is not properly digested, the formation and elimination of Puriṣha becomes hindered, resulting in Vibandha which in turn contributes to the development of Shopha. In various disorders such as Ajīrṇa and Pāṇḍu, Vibandha and Shopha are commonly observed as clinical features. Hence, by administering Chukkuchundadi Kashaya, the Samprapti is addressed at its root cause that is preventing Agnimandhya and the subsequent Vikaras. Thus, helps to preventing Shopha. The test group there has very less chance of recurrence as the formulation Chukkuchundadi Kashaya acts as Deepana Pachana and Rasayana as the digestion, excretion and activeness of rats increased. Thus, the significant reduction in carrageenan-induced paw oedema observed with Chukkuchundadi Kashaya confirms its potent anti-inflammatory activity.

CONCLUSION

The present experimental evaluation of Chukkuchundādi Kaṣāya in Sopha (inflammatory conditions) underscores its multifaceted therapeutic potential. The formulation, rooted in classical Ayurvedic principles and rich in Kaphavātahara, Āmapācana, and Shothaghna dravyas, demonstrated significant efficacy in mitigating signs of Śhopha such as Śhotha (swelling), Ruk (pain), and Gaurava (heaviness), both subjectively and through objective parameters.

Observations from the study suggest that the synergistic action of ingredients contributed to enhanced Agni-dīpana, Vātānulomana, and Śrotośodhana, effectively addressing the Samprāpti of Śopha. The results validate its utility as a line of management in inflammatory pathologies with predominant Kapha-Vāta vitiation.

Thus, Chukkuchundādi Kaṣhāya emerges not only as a symptomatically effective formulation but also as a patho-physiologically rational intervention, supporting its classical reference and justifying its inclusion in clinical practice. Further studies with larger sample sizes and varied models could reinforce its scope and optimize its dosage and administration patterns.

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