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A CLINICAL STUDY TO EVALUATE THE EFFICACY OF *KATIVASTI* AND *SUNTHI-ERAND YOGA* IN THE MANAGEMENT OF *KATISHOOLA* WITH SPECIAL REFERENCE TO LUMBOSACRAL ARTHROPATHY

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ABSTRACT

The study was conducted in 30 clinically diagnosed patients of *Katishoola* with an objective of "clinical evaluation of the efficacy of *Kativasti* and *Sunthi-erand yoga* in the management of *Katishoola* with special reference to Lumboacral Arthropathy". These patients were divided into three groups of 10 patients each. Patients of Group-I were administered *Kativasti* with *Rasnadi taila* in two courses of 15 days with an interval of 7 days (The complete course of 30 days), patients of Group-II were recommended *Sunthi-erand yoga* (10 ml of *erand taila* with 50 ml of *Sunthi Kashaya*) given orally twice daily empty stomach for 30 days and patients of Group-III were administered *Kativasti* with *Rasnadi taila* and *Sunthi-erand yoga* simultaneously in the dose and fashion as mentioned above. It was observed that the patients of *Katishoola* of Group-III treated with *Kativasti* and *Sunthi-erand yoga* showed maximum percentage of improvement i.e. 67.12%, whereas it was 56.94% in the patients of Group-I and 54.46% in patients of group-II. No side effect was noted in any of the patients during the trial period.

Keywords: *Katishoola*, *Kativasti*, *Lumbosacral Arthropathy*

INTRODUCTION

At present the human society is leading with mechanical life, frequent changing of lifestyle, environmental factors, climate etc.

The critical busy schedule, restless, anxiety, stress & strain, running after comfortable life, comparing to higher group courses different psychosomatic disorders.

The major somatic disorders involves, the constant work schedule in improper sitting posture, continuous & over exertion, prolonged traveling by different vehicles, less sports activities, exercises, etc. which in fact cause undue pressure on spinal cord & produce low backache.

Katishoola is a commonest un-pleasurable feeling affecting a man's daily routine. Though *Katishoola* has not been described as a separate disease entity by any text, it has been categorized under *Vata Nanatmaja Vyadhi* in *Charaka Samhita* as *Prishta graha* / *Trika graha* 1. *Katishoola* is *Shoola* predominant *Vyadhi*.

As correctly said by *Sushruta Acharya* 2 without vitiation of *Vata*, *Shoola* (pain) cannot be produced. So, due to vitiated *Vatadosha*, *katishoola* has to be considered within *Vaatvyadhi*.

The preparations which have *Vatanulomana*, *Vedanasthapana*, *Shothahara*, and *Aampachana* properties are likely to produce effective remedy for the management of *Katishoola* and therefore can be used to manage it.

Aims and Objectives

With this background, the current research project was undertaken with the following objectives:

- To study the disorder *Katishoola* according to literature and recent advancement available in Ayurveda and Modern medicine.
- To evaluate the effect of *Kativasti* and *Sunthi-erand yoga* in the management of *Katishoola*.
- To compare the efficacy of *Kativasti* and *Sunthi-erand yoga* in the management of *Katishoola*.

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MATERIALS AND METHODS

Following materials and methods were adopted for conducting the present clinical trial:

Kati Pradesha (Sacral region) has been stated to be one of the seats of *Vata dosha* (Vagbhata, 1989; Bhavamisra, 1999) by most of the *Acharyas*, so for current research project the drug has been chosen for the management of *Vatavyadhi*. *Sunthi* a very potent drug in *Ayurveda* and is well known for its *Shoathaghna*, *Vednasthapaka*, and *Aampachana* properties. *Erand* is the best *Vatahara* (Sarangadhara, 1979) drug. There by combining these two drugs (*Sunthi-erand yoga*) (Yoga Ratnakara, 1993) which is a synergistic combination of *Vatahara* drugs is selected from *Chakradatta Vata Vyadhi Chikitsa* for evaluating its role and efficacy in the management of a series of patient of *Katishoola* (lumbosacral arthropathy) on certain scientific parameters.

The treatment of *Vatavyadhi* is not just confirmed to *Antahparimarjan* (internal treatment) but *Bahir parimarjana* (external treatment) has been considered equally important. As *taila* is the best *Vatahara Dravya* (Sharma, 1994), hence *Kativasti* with *Rasnadi taila* was selected for the study.

Table 1: Showing the Ingredients of Sunthi-Erand Yoga (Chakradatta Vata Vyadhi Chikitsa)

S. No.	Drugs	Botanical Names	Parts used	Approx. Qty. in 50 ml Kashaya
1.	<i>Sunthi</i>	<i>Zingiber officinales Roxb.</i>	<i>Rhizome</i>	10 gms
2.	<i>Erand</i>	<i>Ricinus communis Linn</i>	<i>Oil</i>	10 ml

Method of Preparation of Sunthi-Erand Yoga

Yavkuta of *Sunthi* (10 gms) was taken and boiled into 800 ml of water and was reduced it up to 50 ml. It was then used along with 10 ml of *Erand taila*.

Table 2: Showing the Ingredients of Rasnadi Taila (Charaka Vata Vyadhi Chikitsa)

S. No.	Drugs	Botanical Names	Parts Used	Approx. Qty. in 1 ltr. Oil (in gms/ltr)
1.	<i>Rasna</i>	<i>Pluchea lanceolata</i>	Leaf	2000 gms
2.	<i>Ela (choti)</i>	<i>Elettaria cardamomum</i>	Seed	2 gms
3.	<i>Jatamanshi</i>	<i>Nordostachys jatamansi</i>	Root	2 gms
4.	<i>Tagar</i>	<i>Valeriana wallichii</i>	Root	2 gms
5.	<i>Usheer (Khas)</i>	<i>Vetiveria zizanioidis</i>	Root	2 gms
6.	<i>Sariba</i>	<i>Hemidesmus indicus</i>	Root	2 gms
7.	<i>Kutha</i>	<i>Saussurea lappa</i>	Root	2 gms
8.	<i>Rakta Chandana</i>	<i>Pterocarpus santalinus</i>	Heart wood	2 gms
9.	<i>Bala</i>	<i>Sida cordifolia</i>	Root	2 gms
10.	<i>Tamlaki</i>	<i>Phyllanthus urinaria</i>	Whole plant	2 gms
11.	<i>Satavari</i>	<i>Asparagus racemosus</i>	Stem	2 gms
12.	<i>Satpuspa</i>	<i>Anethum sowa</i>	Fruit	2 gms
13.	<i>Vidarikand</i>	<i>Pueraria tuberosa</i>	Stem	2 gms
14.	<i>Asvagandha</i>	<i>Withania somnifera</i>	Root	2 gms
15.	<i>Gorakhamundi</i>	<i>Sphaeranthus indicus</i>	Whole plant	2 gms
16.	<i>Jivanti</i>	<i>Lettdadenia reticulate</i>	Root	2 gms
17.	<i>Kapikacchu</i>	<i>Mucuna prurita</i>	Seed	2 gms
18.	<i>Vacha</i>	<i>Acorus calamus</i>	Root	2 gms
19.	<i>Tila Taila</i>	<i>Sesamum indicum</i>	Oil	1 Liter

Method of Preparation of Rasnadi Taila

Yavkuta of *Rasna* leaves were taken and *Kashaya* was prepared by boiling it into 8 times of water and

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was reduced it up to $\frac{1}{4}$ parts.

All the components of *Rasnadi taila* were taken to form *Kalka*. This *kashaya*, *kalka* and *tila taila*, were mixed simultaneously as per ratio mentioned in the text (*Charaka Vata Vyadhi Chikitsa Prakarana*) and boiled it continuously till the sign of *samyaka paka* of *taila* appeared.

Administration of Drugs and Treatment Schedule

30 registered, clinically diagnosed and confirmed patients of *Katishoola* (Lumbosacral arthropathies) were selected for the present clinical trial and randomly divided into following three groups of 10 patients each as shown in the following table.

Table 3: Administration of Drugs and Treatment Schedule

Groups	No. of Patients Registered	Treatment Given	Duration of Treatment
GROUP-I	10	<i>Kativasti</i>	In two courses of 15 days with an interval of 7 days (The complete course of 30 days).
GROUP-II	10	<i>Sunthi-Erand Yoga</i>	Given orally twice daily empty stomach for 30 days
GROUP-III	10	<i>Kativasti</i> and <i>Sunthi- erand yoga</i>	In the dose and fashion as described above.

All the patients were advised spinal exercises to strengthen the spinal muscles irrespective of the group in which they were registered.

Patients were followed up after 15 days and 30 days and any changes improvement / deterioration and other effect produced, if any were recorded.

Selection of Cases

Classical 30 clinically diagnosed patients of *Katishoola* were selected from the O.P.D. / I.P.D. department of *Panchkarma* and *Kayachikitsa*, Rishikul State Ayurvedic (P.G.) College and Hospital, Hardwar.

A regular record of the assessment of all patients was maintained according to a special proforma prepared for the purpose.

The study was conducted on randomly divided three groups on the basis of criteria of inclusion and exclusion depending on detailed clinical history and physical examination followed by necessary / desired investigation.

(a) Inclusion Criteria -

- Age: 20 – 60 years.
- Clinical features suggesting lumbosacral arthropathy / radiculopathy manifesting as low backache (*Katishoola*).
- History of lumbosacral sprain / strain / Lumbago for more than one month.
- Patients with Traumatic vertebral disorder without paralysis or radiating pain.

Arthritis of lower spine.

(b) Exclusion Criteria –

- Age 20 Years and 60 Years
- Referred pain from visceral or abdominal origin.
- Sacral pain with gynecologic and urologic disease.
- Lumbar disc disease with herniation of nucleus pulposus.
- Fractures: Traumatic- falls, motor vehicle accidents.
- Atraumatic- Osteoporosis, neoplastic infiltrations.

Criteria of Assessment

Katishoola has been described in Ayurvedic texts as a symptom in various diseases not as a single

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ailment, but efforts have been made to give some symptoms related to *Katishoola* for the assessment of the patients. The scoring pattern adopted for assessment of clinical features is as follows:

(a) Kati Vedana

0	No pain
1	Localized, recurrent, mild pain in back, not radiating to legs, exaggerated by walking, completely relieved by rest.
2	Recurrent, mild but uncomfortable pain in back, radiating to one or both legs, exaggerated by movements, subsided by rest.
3	Moderate but dreadful pain in the back, with/without radiation, exaggerated by bending, not relieved by rest.
4	Severe (Horrible) pain in the back with/without radiation to legs, unchanged by rest, relieved by lower analgesics.
5	Severe (Agonizing) continuous pain in the back, radiation to both legs requires higher analgesics or major injections.
6	Intense degree of continuous pain not relieved by any measures.

(b) Kati Stambha

0	No restriction of movements (forward, backward or lateral)
1	Restriction in any one movement of above
2	Restriction in any 2 movements
3	Restriction in any 3 movements
4	Restriction in all 4 movements

(c) Kriyahaani

0	Normal movements without pain
1	Mild pain with slight restriction of movements
2	Moderate degree of pain with considerable restriction of movements
3	Absolute restriction of movements

(d) Katisandhi Shoth

0	No tenderness
1	Mild tenderness without any sudden response on pressure
2	Wincing of face on pressure due to tenderness
3	Wincing of face, withdrawal of affected part on pressure
4	Resists touch due to tenderness

(e) Pain in Changing Posture

0	No complaint
1	Patient can walk without difficulty but experience difficulty from getting up from squatting posture
2	Difficulty to squat
3	Difficulty in climbing upstairs
4	Limping gate
5	Can Stand on both limbs but with pain

(f) Walking Time / Distance (Time Taken to Cover 20 Meters)

0	Up to 20 sec.
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1	Up to 21-40 sec
2	Up to 41-60 sec.
3	More than 60 sec.

(g) Freedom of Degree of Movement

0	Forward Bending up to toes
1	Forward bending up to knee
2	Forward bending up to mid-thigh
3	No bending at all

(h) SLR Test

0	Not positive
1	Positive on one leg without lasague sign
2	Positive on one leg with lasague sign
3	Positive on both legs with lasague sign present on one leg or absent on both
4	Positive on both legs without lasague sign present on both legs
5	Positive on both legs with lasague sign present on both legs

(i) X- Ray Changes (Kellgren-Lawrence Grading Scale for Degenerative Changes)

Grade 1	Doubtful narrowing of joint space and possible osteophyte lipping
Grade 2	Definite osteophytes, definite narrowing of joint space
Grade 3	Moderate multiple osteophytes, definite narrowing of joints space, some sclerosis and possible deformity of bone contour.
Grade 4	Large osteophytes, marked narrowing of joint space, severe sclerosis and definite deformity of bone contour

RESULTS AND DISCUSSION

The clinical study carried out in the present series of patients have revealed that majority of these cases were of middle class (53.33%), urban area (70.00%), married (90.00%), higher educated (36.33%), with dominance of female sex (66.66%). Out of 30 patients 13 patients (43.33%) were of *Vatakaphaja prakriti*, 16 patients (53.33%) were of *Kroora kostha*, 3 patients had history of trauma on their back while 9 patients (30.00%) had the history of heavy weight lifting.

Clinical Improvement

The clinical improvements in clinical features of *Katishoola* in 30 patients of all the three groups are described in table 4, 5 and 6.

Discussion

Out of 30 patients it was found that maximum patients were of age between 41- 50 years which is 46.66%, closely followed by 23.33% in the age group of 51-60 years. This is the *Vata Prakopaka Kala* and according to modern science there is progressive decrease in degree of hydration of the intervertebral disc with age that lead to the conditions related to lumbosacral arthropathy. Hence, the prevalence of low back pain is high in old and middle aged people, which is supported by the findings of the present study. Maximum number of patients (53.33%) was belonged to middle economic status closely followed by 40.00% in poor class and minimum in upper class. Higher economic status allows better living conditions, travelling facilities and nutrition. On the other hand, middle classed people have stressful job, lack of job satisfaction, fear of family security etc. many physical as well as mental burdens over crowd a person. This may lead to poor nutrition, poor absorption of whatever available nutrition, lack of rest and fatigue syndrome leading to lumbosacral arthropathy. Data shows that in present study the incidence of *Katishoola* was maximum in housewives 13 (43.33%) followed by service class 09 (30.00%). It was observed that in housewives the incidence of *Katishoola* was maximum because of their nature of work. In kitchen, women use to work in standing position for long hours which puts lot of strain on their

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vertebral column. Secondary they give back seat to nutritious diet or milk intake for themselves, which leads to malnutrition or deficiency mainly of calcium which leads to *Katishoola* (lumbosacral arthropathy).

Table 4: Showing the Pattern of Clinical Recovery in 10 Patients of *Katishoola* Treated with Therapy *Kativasti* (Group-I)

S. No.	Symptoms	N	Mean		Diff.	% of Relief	SD	SE	t	P
			BT	AT						
1.	<i>Kativedana</i> (Pain in LS region)	10	2.50	0.80	1.70	74.83	0.675	0.213	7.965	0.000 <0.001
2.	<i>Katistambha</i> (Stiffness)	10	2.70	1.00	1.70	65.00	0.483	0.153	11.13	0.000 <0.001
3.	<i>Kriyahani</i> (Limitation of lumbar movements)	10	1.70	0.50	1.20	70.59	0.422	0.133	9.00	0.000 <0.001
4.	<i>Katisandhi Shoth</i> (tenderness on deep palpation)	09	1.67	0.44	1.22	77.78	0.441	0.147	8.32	0.000 <0.001
5.	Pain in changing Posture	09	1.33	0.55	0.778	58.33	0.441	0.147	5.29	0.000 <0.001
6.	Walking time/ Distance	8	1.00	0.62	0.375	37.50	0.518	0.183	2.049	0.080 > 0.05
7.	Freedom of degree of movement	10	1.60	0.50	1.10	68.75	0.316	0.100	11.00	0.000 < 0.001
8.	Straight Leg Raising sign	08	2.50	1.50	1.00	34.38	1.07	0.378	2.646	0.033 < 0.05
9.	X-ray on KL Scale	09	2.11	2.11	0.00	-	-	-	-	-

Table 5: Showing the Pattern of Clinical Recovery in 10 Patients of *Katishoola* Treated with *Sunthi-erand Yoga* (Group-II)

S. No.	Symptoms	N	Mean		Diff.	% of Relief	SD	SE	t	P
			BT	AT						
1.	<i>Kativedana</i> (Pain in LS region)	10	2.00	0.70	1.30	68.33	0.483	0.153	8.510	0.000 <0.001
2.	<i>Katistambha</i> (Stiffness)	10	2.00	0.40	1.60	85.00	0.966	0.306	5.237	0.000 <0.001
3.	<i>Kriyahani</i> (Limitation of lumbar movements)	07	1.29	0.57	0.714	57.14	0.488	0.184	3.873	0.008 >0.001
4.	<i>Katisandhi Shoth</i> (tenderness on deep palpation)	08	1.62	0.50	1.125	75.00	0.641	0.277	4.965	0.002 >0.001
5.	Pain in changing Posture	08	1.38	0.62	0.750	56.25	0.463	0.164	4.58	0.003 >0.001
6.	Walking time/ Distance	04	1.25	1.00	0.250	12.50	0.500	0.250	1.00	0.391 > 0.05
7.	Freedom of degree of movement	08	1.62	0.62	1.00	70.83	0.535	0.189	5.295	0.001
8.	Straight Leg Raising sign	07	1.71	1.29	0.429	23.81	0.787	0.297	1.441	0.200 < 0.05
9.	X-ray on KL Scale	9	2.11	2.11	0.00	-	-	-	-	-

Table 6: Showing the Pattern of Clinical Recovery in 10 Patients of *Katishoola* Treated with Both *Kativasti* and *Sunthi-erand Yoga* (Combined Group-III)

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S. No.	Symptoms	N	Mean		Diff.	% of Relief	SD	SE	t	P
			BT	AT						
1.	Kativedana (Pain in LS region)	10	2.10	0.50	1.60	76.19	0.516	0.163	9.798	0.000 <0.001
2.	Katistambha (Stiffness)	09	2.89	0.56	2.33	85.19	0.707	0.236	9.899	0.000 <0.001
3.	Kriyahani (Limitation of lumbar movements)	09	1.78	0.44	1.33	75.00	0.707	0.236	5.657	0.000 <0.001
4.	Katisandhi Shoth (tenderness on deep palpation)	10	1.80	0.50	1.30	72.22	0.675	0.213	6.091	0.000 <0.001
5.	Pain in changing Posture	06	2.71	1.00	1.71	63.16	0.755	0.285	6.000	0.002 >0.001
6.	Walking time/ Distance	05	1.80	0.40	1.40	77.78	0.548	0.245	5.715	0.000 <0.001
7.	Freedom of degree of movement	10	1.70	0.40	1.30	80.00	0.483	0.153	8.510	0.000 <0.001
8.	Straight Leg Raising sign	08	2.50	1.63	0.86	35.00	0.834	0.295	2.960	0.015 <0.05
9.	X-ray on KL Scale	08	1.75	1.75	0.00	-	-	-	-	-

In business class and service class it was probably due to lack of physical exercise and sedentary type of jobs and lifestyle.

Patients of *Vata Kapha Dosha Prakriti* (43.33%) dominated the series. Since the diseases are mainly manifested due to vitiation of *Vata Dosha* which can easily materialize in persons of *Vata Dosha* predominant *Prakriti*. This finding is in accordance to *Dosic* theory of Ayurveda.

Probable Mode of Action of Katibasti with Rasnadi Taila:

The vitiation of *vata dosha* is the major factor in the development of disease, *Katishoola* either by itself or along with *Kapha dosha*. This vitiated *Vata dosha* torments the body with disorders of various kinds, particularly generating the sensation of pain. The *adhisthana* of disease *Katishoola* is *Kati Pradesh* which is the predominant site of *Vata dosha*, where *dosha-dushya sammurchana* is *prakruti samveta* type and *dosha pratyanyika chikitsa* is likely to be effective. Keeping this fact in mind the *Katibasti* with the *Rasnadi taila* has been selected for present study.

Taila itself being the principal pacifier of *Vata dosha* when processed with such *dravyas* having pharmacodynamic properties opposite to the qualities of *Vata dosha* becomes more potent *Vata* pacifier. By neutralizing the vitiated *Vata dosha* in turn it alleviates the pain. Majority of the drugs of *Rasnadi taila* are *Ushnaveerya* and *Vatashamaka*. So, the net effect of the combination is especially *Vatashamaka*. The herbs used in this *taila* have deep penetrating property right into the dermal layers soothing the nerves and cells beneath the skin resulting in relief of pain.

According to modern science therapeutic effects of heat are due to increased blood flow, increased metabolic activity, stimulation of neural receptors in the skin or tissue and effect of heating on nerves. Increased blood flow leads to better delivery of nutrients, efficient removal of waste products and hence hastening the natural repairing process (healing).

This relieves the muscle spasm, results in alleviation of pain. Any chemical change capable of being accelerated by heat is accelerated by a rise in temperature (Vant Hoff's principle) consequently, heating of tissues accelerate the chemical changes i.e. metabolism. As a result of the increased metabolism there is an increased demand for oxygen and food stuff and an increased output of waste products including metabolites.

Pain receptors are localized in the skin and the motor end plates* of the muscles. These pain receptors are stimulated by application of heat at about 45 C. The pathways for transmission of thermal signals are

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almost parallel, but terminate at the same area. So, out of these two i.e. thermal and pain only the stronger one can only be felt.

So, on therapeutic application of heat, relief of pain can be explained by complete exclusion of pain impulses, due to occupying of final common pathway (Samson Wright's Applied Physiology). Thus, by above fact mode of action of *kativasti* can be explained on scientific line.

Probable Mode of Action of *Sunthi-Erand Yoga*:

The trial drug *Sunthi-erand yoga* contains only two drugs namely *Sunthi* and *Erand taila*. *Katishoola* is caused by vitiation of *Vata dosha* in body. Both the drugs in *Sunthi-erand yoga* having *Snigdha Guna* and *Madhura Vipaka*. So, they pacify *Vata dosha* due to their pharmacotherapeutic properties and thus produces relief in *Katishoola*.

All the drugs of *Sunthi-erand yoga* are *Ushnaveerya* which is opposite to the *Sheeta Guna* of *Vata dosha*, so they pacify *Vata dosha* and alleviates the symptoms of *Katishoola*.

Erand one of the constituents of *Sunthi-erand yoga* is *Tikshna* and *Sukshma* as well as considered best in *Vatahara* property, which is capable of pacifying the *Kapha dosha* along with *Vata dosha*. If there is obstruction of the path of *Vata dosha* by *Kapha* or *Aam*, it opens the channels by removing them and thus pacifies the *Vata dosha*. This is the fact that in present study maximum relief in *Katistambha* was observed (Stiffness of lower back) in Group-II i.e. in *Sunthi-erand yoga* group.

According to modern science anti-inflammatory drugs reduces the amount of prostaglandins (chemicals released by cells at the site of injury and at the nerve ending of sensitive nerves which causes pain). This may also be a probable mode of action of *Sunthi* and *Erand taila*. Observational studies indicate that Ricinoleic acid, the main component of castor oil, exerts remarkable analgesic and anti-inflammatory effects.

A pharmacological effect of Ricinoleic acid suggests a potential interaction of this drug on sensory neuropeptide-mediated neurogenic inflammation⁹.

No toxic or side effect were noticed in any of the patients registered in the series after administration of *Kativasti* with *Rasnadi taila* and *Sunthi-erand yoga* and all the patients registered for the study tolerated the preparation very well.

However, this project was time bound short study on a very small group of patients with many limitations.

It is proposed that clinical study should be carried out on a larger series of patients to draw a concrete conclusion, on several scientific parameters.

Conclusions

- ✚ Subjects of age group between 40-60 years are more prone to develop *Katishoola* (conditions related to lumbosacral arthropathy).
- ✚ The incidence of *Katishoola* is more common in females (especially housewives) as compared to males.
- ✚ The incidence of *Katishoola* is highest in the patients who belonged to urban areas.
- ✚ Amongst various causative factors of *Katishoola* the most common causes are *Asamyaka dincharya* (hectic and unbalanced life style), incorrect posture due to habit or profession, diet and activities which aggravate *Vata dosha*.
- ✚ *Sunthi-erand Yoga* is safe, economic and effective remedy for the management of *Katishoola*.
- ✚ *Kativasti* with *Rasnadi taila* is very effective in the management of *Katishoola*.
- ✚ *Kativasti* is more effective than *Sunthi-erand yoga* in the management of *Katishoola*.
- ✚ Combined therapy i.e. *Kativasti* with *Rasnadi taila* along with *Sunthi-erand yoga* orally is better in the management of *Katishoola* as the results found in the study are more encouraging.

“Therefore it can be concluded that *Katibasti* with *Rasnadi Taila* along with *Sunthi-Erand Yoga* are very effective treatment modalities and can be used effectively in the management of *Katishoola* (lumbosacral arthropathy)”.

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