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"Effectiveness of *Goghrita*and*Shuktyadilepa* in the Management of *Padadari*(Crack heels) – A Comparative Study."

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ABSTRACT

Padadari (crack heels) is a disease, occurs due to vitiation of *VataDosha*. It manifests with symptoms like *dari* (fissures/cracks on the foot), *Saruja* (Pain) and *Rukshata*(dryness). In*Gadanigraha*various *Lepas* aredescribed for the management of *Padadari* in the *Kushtharogadhikar.Shuktibhasma*, *Sarpi*, *Sarjarasa*, *Saindhav*, *SnuhiKsheer* is one of the formulations of *Lepas* indicated in *Padadari*. **Aim and Objectives::** Effectiveness of *Goghrita* and *ShuktyadiLepa* in the management of *Padadari*. **Methodology:** Patients reported to OPD and IPD of Kayachikitsa department were enrolled fulfilling inclusion criteria for the study. Total 40 patients were enrolled and divided 20 in each group. Patients in Group A (n=20) were treated with ShuktyadiLepa and Patients in Group B (n=20) were treated with GoghritaLepa for 15 days. After completion of treatment both the groups were assessed for objective (*Ruja*, *Kandu*) and subjective (*Sphutan*, length and de[3]pth of dari) criteria. **Results:** Significant improvement was observed in all parameters after completion of treatment in both groups**.** In

comparison *ShuktyadiLepa*showed better improvement than *Goghrita*in all parameters except depth of *dari.*

Conclusion- From this study it can be concluded that *Goghrita*and *ShuktyadiLepa*both are effective in the management of *Padadari*. In comparison patients in group A showed more improvement than patients in group B which may be due to additional effect of ingredients of *ShuktyadiLepa*like *Shuktibhasma, Snuhiksheer, Ral*and *Saindhav.*

Key words- *Padadari*, Crack heels, Kshudraroga, *Shuktyadilepa, Goghrita*

Introduction

In Ayurveda most of the skin diseases are described under the term *Kushtha* and *Kshudrarogas*. *Padadari* is one of the type of Kshudrarogas.*Padadari* is one of the commonest occurring diseases in our society. *Padadari* is a disease, occurs due to vitiation of *VataDosha*. Intake of *Vata*aggravating diet like dry, rough, sharp, hot and spicy food, certain activities like excessive walking, bare foot walking, walking with hard improper footwear and lack of a daily routine (*Dinacharya*) are *hetu*of *Padadari* . All these *hetu* eventually leads to *SthanikaVatadushti* and increases *rukshatwa,* in the *Padapradesha,* causing *Daree*(cracks/fissures) at *Padapradesha.* It manifests with symptoms like *dari* (fissures/cracks on the foot), *Saruja* (Pain) and *Rukshata*(dryness). [1,2]

Padadari can be correlated with cracked feet or heel fissures. It is a common condition where cracks form in the skin around the rim of the heel. Heel fissures occur predominantly as a result of dry skin (xerosis), which can have many contributing factors like lack of moisture, ageing and pressure by long standing, obesity, poor hygiene, waterexposure, soil, heat, genetics and certain conditions. The medical ailments like Athlete's foot, psoriasis, eczema, hypothyroidism, diabetes and some other skin conditions can cause cracked heels.The condition is more serious if the skin (callus) is thick and the cracks are deep. Complications can include bleeding and infection.[3]

According to the NPD Group's 2012 National Foot Health Survey for the Institute for Preventive Foot Health, 20 percent of US adults aged 21 and older (about 44 million people) have cracked skin on their feet. The problem is more serious among women registered the condition higher than men at a rate of 50 percent.[4]

In modern medicine, treatment measures include use of moisturizers or heel repair products like occlusive agents (e.g., beeswax, lanolin) which act as physical barrier, checking water loss from heel, with other keratolytic agents, use of heel cups and glue to hold the skin together to help cracks heal.

In *Sushruta Samhita* management of *Padadari* comprises *Snehan, Swedan, Siravedha* and application of *Lepa*prepared out of *snigdhadravyas*like *Madhuchisthi, Ghrita, Tail, Vasa, Majja,* and *Raal.*[5] In Ayurveda for *bahyachikitsa*use of various drugs in the form of *Lepas* having *kushthghna, kandughna, vranaropaka*and *snigdha* properties are described for *Padadari*.

In*Gadanigraha*[6]various *Lepas* aredescribed for the management of *Padadari* in the *Kushtharogadhikar.Shuktibhasma, Sarpi, Sarjarasa, Saindhav, SnuhiKsheer* is one of the

formulations of *Lepas* indicated in *Padadari*.

Aim:

Effectiveness of *Goghrita*and *ShuktyadiLepa*in the management of *Padadari (cracked heels)*

Objectives:

1. To assess the Effectiveness of *Goghrita*and *ShuktyadiLepa*in the*Ruja,Kandu*at heel region.
2. To assess the Effectiveness of *Goghrita*and *ShuktyadiLepa*in number, depth and length of the cracksat heel region.
3. To compare the Effectiveness of *Goghrita*and *ShuktyadiLepa*in the *Padadari*.

MATERIAL AND METHODS

Material:
Patients reported to OPD and IPD of *Kayachikitsa* department and also peripheral specialized camps were enrolled for the study.
Method:
First approval from institutional ethical committee (reference no. DMIMS (DU)/ IEC/2017-18/7258) was taken. The clinical trial was registered under Clinical Trial Registry of India and registration number (CTRI/2019/05/019055) was obtained before starting the study.
Study Design: Double Armed Open Label.
Study Type: Randomized Interventional Study.
Sample Size: 40 patients. (20 in each group)
Grouping: Two Groups
Group A (n=20) - *ShuktyadiLepa*
Group B (n=20) –*GoghritaLepa*

Inclusion Criteria:

- Subjects of either sex in the age group of 20 - 60 years.
- Subjects were having *Sphutan*with*Ruja*or*Kandu*will be selected.

Exclusion Criteria:

- Known cases of Diabetes mellitus, Plantar Keratoderma and Athlete's Foot.
- Subjects suffering from skin disorders like psoriasis, Hyperkeratotic eczema.
- Subjects having excessive discharge from cracks of the heel.

Selection of Material:

The raw material required for *GoghritaLepa*&*ShuktyadiLepa*as shown in Table no. 1 and 2was procured from market and was verified by department of *Dravyaguna*. *GoghritaLepa*&*ShuktyadiLepa*were prepared in *DattatrayaAyurvedRasashala*of MGAC & RC Salod (H) as per standard protocol and were analyzed in Analytical Laboratory.

Composition of Material:

Table No.1: Ingredients of *ShuktyadiLepa*

Sr no.	Drug	Scientific name	Part used
1.	*Shuktibhasma*	*Pearl oyster*	Bhasma
2.	*Sarjarasa*	*Shorearobustac.f.Gaertn*	Gum resin (*Niryas*)
3.	*Goghrita*	-	-
4.	*Saindhav*	*Rock salt*	Powder
5.	*Snuhi*	*Euphorbia nerifolia*Linn.	Latex
6.	Bee wax	-	-

Table No.2 : showing ingredient of*GoghritaLepa*

Sr no.	Drug	Scientific name	Part used
1.	*Goghrita*	-	-
2.	Bees wax	-	-

Posology: Quantity sufficient of *Lepa* to apply at night.

It was advised to clean the feet by washing it thoroughly and to dry it completely. After that it was advised to apply the lepauniformly over the feet till all the fissures of feet get filled with lepa.Then it was advised to cover it with bandage or by wearing socks to avoid loss of medicine. The lepa was kept overnight [7,8,9]

Total study duration: 15 Days

Follow Up Period:

Follow up was done on 7th and 15th day.

Assessment criteria–

- **Subjective and ObjectiveParameter:**

Table No. 3: Gradation of Ruja, Kandu and Sphutan

Grade	***Ruja*(pain)**	***Kandu*(Itching)**	***Sphutan*(Cracks/fissures)**
0	No pain	No itching	No cracks/fissures in the feet
1	Pain on digital pressure/walking	Occasional itching (1 to 2 times in day)	1 to 3 cracks in the feet
2	Pain on touching	Frequent itching	4 to 6 cracks in the feet

3	Continuous pain	Continuous itching.	More than 6 cracks in the feet

Table No.4: Gradation ofLength and Depth of the cracks

Grade	Length	Depth
Mild	<1cm	< 2 mm
Moderate	1 to 2 cm	2 to 5 mm
Severe	> 2cm	> 5 mm

- Digital photographs of the affected areas were taken before and after treatment.

Statistical Methods: Statistical analysis was carried out usingchi square test and software used in the analysis was SPSS 24.0 version and Graph Pad Prism 7.0 version and $p<0.05$ is considered as level of significance.

OBSERVATION AND RESULTS

In this study, age wise distribution of patients showed that, 19 (47.5%) patients were in the age between 30-40 years followed by 15(37.5%) patients were between 41-50 years of age among them 25 (62.5%) were female and 15 (37.5%) were male. According to occupation,16(40%) patients were Housewives,11 (27.5%) patients were Farmers. 19(47.5%) patients belonged to lower socio economic class, followed by 18 (45%) patients to middle socio economic class. Distribution according to *Ritu* wise occurrence in both groups showed that 15 (37.5%) patients were having occurrence of *Padadari* in *GrishmaRitu* followed by 21(52.5%) patients were having occurrence in *Hemant Ritu*.

In this study, distribution of patients according to history of exposure showed that, 18 (45%) patients were having history of soap water exposure, 29 (72.5%) patients were having exposure to soil, 20 (50%) patients were having exposure to water. According to *Prakruti*showed that, 11 (27.5%) patients were having *KaphapittajPrakruti*, 8 (20%) patients were having *VatakaphajPrakruti* and 21 (52.5%) patients were having *VatapittajPrakruti*.

Assessment of all subjective and objective parameters was done as per gradation shown in Table no. 3 and 4.

TableNo.5: Comparison of *Ruja* in two groups at BT and AT

	Group A		Group B	
Ruja	**BT**	**AT**	**BT**	**AT**
Grade 0	0(0%)	18(90%)	1(5%)	7(35%)
Grade 1	4(20%)	2(10%)	6(30%)	11(55%)
Grade 2	12(60%)	0(0%)	11(55%)	2(10%)
Grade 3	4(20%)	0(0%)	2(10%)	0(0%)
χ2-value	-	34.67,p=0.0001,S	-	14.20,p=0.0026,S

Mean±SD	**2.00±0.64**	**0.10±0.30**	**1.70±0.73**	**0.75±0.63**
Comparison between Group A and Group B				
	BT		**AT**	
χ2-value	2.11,p=0.54, NS		13.07,p=0.001,S	

Table No6: Comparison of *Kandu* (itching) in two Groups BT and AT

Group A			**Group B**	
Kandu	**BT**	**AT**	**BT**	**AT**
Grade 0	1(5%)	19(95%)	0(0%)	9(45%)
Grade 1	12(60%)	1(5%)	10(50%)	11(55%)
Grade 2	7(35%)	0(0%)	10(50%)	0(0%)
Grade 3	0(0%)	0(0%)	0(0%)	0(0%)
χ2-value		32.51,p=0.0001,S		19.05,p=0.0001,S
Mean±SD	**1.30±0.57**	**0.05±0.22**	**1.50±0.51**	**0.55±0.51**
Comparison between Group A and Group B				
	BT		**AT**	
χ2-value	1.71,p=0.42, NS		11.90,p=0.0006,S	

TableNo 7: Comparison of *Sphutan* in two groups BT and AT

Group A			**Group B**	
Sphutan	**BT**	**AT**	**BT**	**AT**
Grade 0	0(0%)	12(60%)	0(0%)	0(0%)
Grade 1	1(5%)	8(40%)	0(0%)	16(80%)
Grade 2	8(40%)	0(0%)	11(55%)	4(20%)
Grade 3	11(55%)	0(0%)	9(45%)	0(0%)
χ2-value		36.44,p=0.0001,S		25.57,p=0.0001,S
Mean±SD	**2.50±0.60**	**0.40±0.50**	**2.45±0.51**	**1.20±0.41**
Comparison between Group A and Group B				
	0^{th} day		**15^{th} day**	
χ2-value	1.67,p=0.43, NS		18.67,p=0.0001,S	

TableNo 8: Comparison of length (in cm) in two groups BT and AT

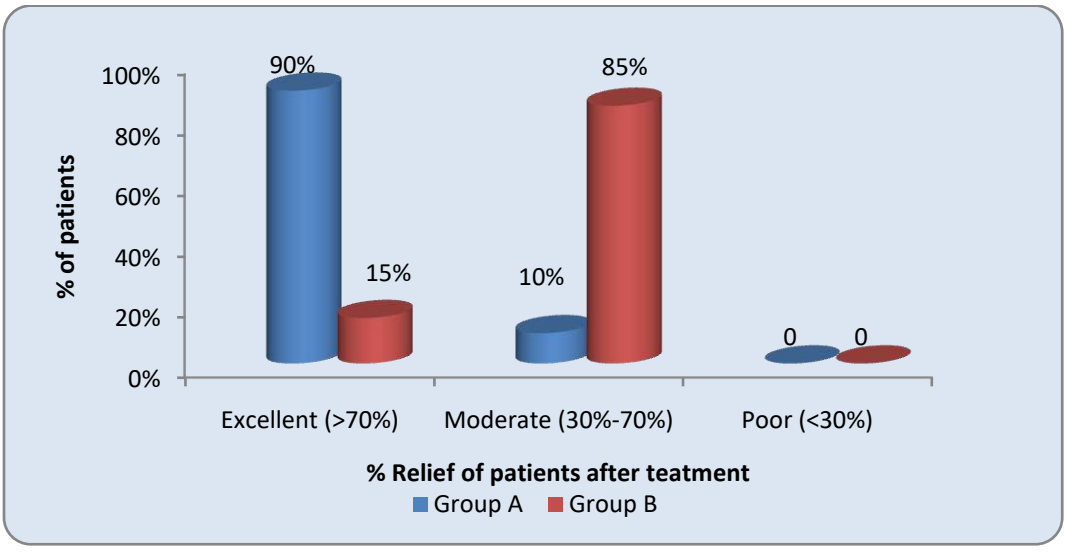
Group A			**Group B**	
Length(in cm)	**BT**	**AT**	**BT**	**AT**
Mild	1(5%)	13(65%)	0(0%)	4(20%)

Moderate	12(60%)	7(35%)	9(45%)	15(75%)
Severe	7(35%)	0(0%)	11(55%)	1(5%)
χ2-value		18.60,p=0.0001,S		13.83,p=0.001,S
Mean±SD	**2.14±1.01**	**0.42±0.56**	**2.25±0.73**	**1.47±0.62**
Comparison between Group A and Group B				
	BT		**AT**	
χ2-value	2.31,p=0.31, NS		8.67,p=0.01,S	

TableNo9: Comparison of depth (in mm) in two groups BT and AT

Group A			**Group B**	
Depth (in mm)	**BT**	**AT**	**BT**	**AT**
Mild	14(70%)	20(100%)	13(65%)	19(95%)
Moderate	6(30%)	0(0%)	7(35%)	1(5%)
Severe	0(0%)	0(0%)	0(0%)	0(0%)
χ2-value		7.05,p=0.007,S		5.62,p=0.01,S
Mean±SD	**1.26±0.77**	**0.15±0.32**	**1.06±0.94**	**0.52±0.67**
Comparison between Group A and Group B				
	BT		**AT**	
χ2-value	0.11,p=0.73, NS		1.02,p=0.31,NS	

Graph No.1: Showing Overall Percentage of relief after treatment



DISCUSSION

In this study from these observations it is evident that the disease is more prevalent in middle age of life. This may be due to more involvement of this age group in causative factors like continue standing work, working bare foot and more exposure to water and soil.It was

observed that *Padadari* is predominant in females than males. This showed that females are more prone to this disease which may be due to more exposure of females to etiological factors during daily household work. Most of the patients were housewives followed by farmers. Femalesare engaged in many household activitiesthus get more exposed to etiological factors of *Padadari* hence more incidence in housewives. Farmers and workers are second group in which disease is more prevalent that may be due to continuous standing work, working with barefoot and exposure to heat, soil and water with unawareness of taking proper care of feet. The more occurrences in *Hemant* and*Grishmaritu* may be due to dry weather, causing more dryness leading to aggravation of *Vata*which is the main etiological factor for *Padadari*.

Majority patients were having *VatapittajPrakruti*having *Vata*dominant *Prakruti* are more prone to produce disease as aggravation of *Vata* is mainly seen in *samprapti*of the disease. As per history of exposure majoritywere exposure to soil, followed by exposure to water. Bare foot exposure to soil and water leads to occurrence of *Padadari* and if it continues for longer duration may lead to formation of deep and non healing cracks.

As shown in Table no. 5, 6, 7, 8 and 9Significant improvement ($p<0.05$) was observed in all subjective as well as objective parameters in both groups. In comparison of both the groups Group A treated with *ShuktyadiLepa*showed better improvement than group B in all parameters except depth of *dari.*

Ruja is a cardinal feature of *Vatadushti*. *ShuktyadiLepa*and *GoghritaLepa* both contains *Goghrita*and bees wax as ingredients having *Vatashamak, Snigdh, Mrudu, Pischil, Madhur Rasatmak*properties which leads to alleviation of aggravated Vata hence reduces *Ruja* at the local site. *Kandu* occurs due to *rukshata* (dryness) and roughness causing irritation at the cracks. Ingredients of the both *Lepa*s have *Madhur, Snigdha* properties which help in reducing dryness and roughness of foot thus reduces the *Kandu*.*Sphutan* i.e., number of cracks in heel region indicates chronicity and severity of the disease. *Sphutan* occurs due to vitiation of *VataDosha* and leads to roughness and dryness of skin. *ShuktyadiLepa*and *GoghritaLepa* both help in reducing *Sphutan*and in the formation of new one by alleviating *VataDosha.* Length and Depth of *Dari* indicate severity, chronicity, repeated exposure to the causative factors and not taking proper care of feet. Increasing Length means more area gets affected and increasing depth means cracks goes deeper involving dermis layer of the skin. Increasing Length and Depth of *dari* makes it prone to bleedcausing infection. These deep fissures causes increase in *Ruja* and *Kandu*. Regarding overall improvement, it can be said that overall improvement in Group A treated with *ShuktyadiLepa*was better than Group Btreated with *GoghritaLepa*as shown inGraph no 1. This may be due to the effect of additional ingredients of *ShuktyadiLepa*like *Shuktibhasma, Snuhiksheer, Saindhava*and*Ral.*

Probable Mode of action:

Goghrita–*Ghrita*hassweet, unctuous, cold and *Vatapitta*pacifying property.[10] It possesses nourishing, complexion enhancing and wound healingproperties. Nourishingproperty of *Ghrita*helps in strengthening body tissue and also leads to healthy scar formation.Unctuousproperty helps to pacify aggravated *Vata*and gives smoothening effect which help in reducing dryness and roughness. *Cold property* helps in reducing burning sensation.

In topical application of drugs penetration of drugs at cellular level is essential. To facilitate penetration of topical drugs into the skin there is need to use propervehicle. Cell membrane has a free passage for lipid & lipid soluble substances. *Ghrita*has been described as a best *Snehadravya*in Ayurvedabecause of its *'Yogvahitva'* and *"Samskaranuvarti"* property. Itenhances action of drugs mixed with it and also makes good medium for absorption of drugs when applied locally.

*Ghrita*contains Sterols, Vitamin A, Vitamin E and Vitamin K. These vitamins help in keeping epithelial tissue of the body intent which is very useful in wound healing and also reduces dryness and roughness of the skin. Vitamin E is helpful in preserving important morphological and functional features of biological membranes.In addition, vitamin E reported to have antioxidant and anti-inflammatory activity.Liolenic acid helps in granulation.[11, 12]Ghee contains several saturated and unsaturated fatty acids which takes part in various metabolic processes involved in healing of any wound.[13]

Madhucchista– Bees wax has soft, unctuous, bacteria, wound cleansing and wound healing property,and causing alleviation of skin disorders.[14,15] It consists of ester of fatty acid, various long chain alcohols, tricontanyl, and palmitate. It has antimicrobial, lubricant property which creates a barrier and helps to seal cracks.[16]

Shuktibhasma*- Shukti* is *chemically calcium carbonate* which is included in *Sudha Varga. Shuktibhasma*is prepared by*shodhana*and*marana*of*Shukti.* It has*sweet, bitter, unctuous*and*Vatapitta alleviating*properties. It is slightly alkaline andcontainsminerals like Ca, Mg, Mn, Fe, K, Al, Cu, Na, Si & Zn. After any skin injury, a series of events occurs to repair tissue damage. Three phases are involved in tissue repair namely inflammatory phase, a granulation phase and a scar remodeling phase. Wound healing process is a calcium-mediated so calcium based nanoparticle in the form of *Shuktibhasma* is used in *ShuktyadiLepa*.Calciumis the most important ion which contributes in the process of wound healing. Calcium acts as a messenger which is involved in various signaling during process of wound healing. [17]Clinically, the direct local application of calcium to chronic wound through calcium alginate dressings has been proved to be useful. [18]

Many research studies proved that calcium alginate dressings enhance the rate of wound healing.[19,20] The calcium alginate dressing has effect on cell proliferation which is mediated by the release of ionized calcium into the wound bed. This increase in the ionized calcium concentration in the wound bed thus accelerates wound healing. [21] It also contains vitamin A, B12 and vitamin C. Vitamin C and mineral like Zinc both have wound healing property. The particle size of *bhasma* is very small 45.16 μm hence it easily get absorbed. It

holds moisture and gives the smoothening effect thus help in reducing dryness and enhances healing of cracks.[22]

Snuhiksheer *–Snuhiksheer* has *hot potency, light, unctuous* and *Kaphavataalleviating*property.[23]*Unctuous property* reduces *dryness.Snuhiksheer* is rich in lupeol, a terpene that has a role in inhibiting ergosterol and having wound healing property. [24] It also reported for its antibacterial, antifungal, and antimicrobial property which helps to stop further infection though cracked heels. [25]Snuhiksheer has wound healing, anti inflammatory and analgesic properties of *Snuhiksheer* which is because of its chemical constituents like triterpenes euphol, nerifoliol and cytoartenol.[26]

Saindhav *–Saindhavlavan*has salty, slightly sweet taste, cold Potency,light, penetrating,spreading, subtle and unctuousproperty. It has *Tridoshaalleviating*, cleansing and detoxifying, scraping/exfoliating, wound healing and wound cleansingproperties.[27]*Vyavayi* (spreading) and *sukshma*(minute/subtle) properties help in deep penetration of the *Lepa*. Accumulation of dead skin cells is responsible for causing a roughness of the skin. Rock salt exfoliates the dead skin cells and protects the natural layer of the skin. It strengthens the skin tissue and helps to rejuvenate the skin. It has excellent cleansing properties which help in cleansing skin pores.

On topical application minerals and nutrients in the salt get delivered to the cells in the form of ions and facilitate their absorption by the body. This causes an improvement in the appearance of the skin by increasing circulation.It contains pure minerals such as Calcium, Iron, Zinc, Potassium, Magnesium, Copper and all the other 84 minerals.[28]In most of the topical formulations *Saindhav*is used as one of the ingredients. It enhances absorption, penetration, exfoliation of dead cell and rejuvenation of skin by increasing circulation. Thus *Saindhav* helps in reducing symptoms of *Padadari*.

Ral *– Ral*having astringent, sweet, cold and analgesic, wound healing and wound cleansing,and antimicrobialproperty. [29] It contains flavonoids, saponins, steroids, tannins, phenols etc. It has wound healing, [30]antimicrobial, analgesic, anti-inflammatory, Anti nociceptive, antioxidant and anti-ulcer activity.[31]Analgesic property helps in reducing pain, *Sweet*and *cold property*help in relieving burning sensation. Wound healing and wound cleansingproperties help in wound healing thus showed improvementin length and depth of cracked heels. Reviewedthe related studies on this issue. [32-36]

CONCLUSION

From this study it can be concluded that*Goghrita*and*ShuktyadiLepa* both are effective in the management of *Padadari*but in comparison *ShuktyadiLepa*showed more improvement than *Goghrita*. No any adverse effect was observed during the study. Further study can be conducted on large sample size to prove the efficacy of drugs.

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PHOTOGRAPHS	BEFORE TREATMENT	AFTER TREATMENT
Group A (*Shuktyadilepa)*		
Group B *(Goghritalepa)*		

References

1. Srikantha KR, Susruta Samhita, Nidansthan, Vol 1. chapt 13, verse 29,Chowkhambia Krishnadas Academy Varanasi, 2000, p.549.
2. Srikantha KR, Bhavaprakasa, Madhyama Kanda, chapt 61, verse 122-126. Chowkhambia Krishnadas Academy, Varanasi; 2005, p.668-669.
3. https://entirepodiatry.com.au/information/skin-and-nail-conditions/cracked-heels/ (accessed 2020 Mar 20
4. https://www.medicalnewstoday.com/articles/316572Medically reviewed by Sarah Taylor, MD, FAAD on January 19, 2020 — Written by Hannah Nichols cited on 21.4.2020 at 9.35am

5. Srikantha KR, Susruta Samhita, chikitsasthan, Vol 2. chapt 20, verse 19, Chowkhambia Krishnadas Academy, Varanasi. 2000, p.331.
6. Tripathi I, Gadanigrah , second part, kushta adhyay, verse 163, Chaukhamba Sanskrit sansasthan, Varanasi, reprint 2016, p- 790.
7. Priya Bangar: A Clinical Study On Efficacy Of Madanphaladi Lepa In Pādadārī. International Ayurvedic Medical Journal,2017,5(12).4409-16.
8. Sunil .A. Arali, A Comparative Clinical Study of Grithayavakshara Lepa and Katutaila in Management of Padadari W.S.R Rhagades, IJARIIT,2017, 3(1),928-932.
9. Parashuram S. Suryawanshi, Dr. S. P. Managoli. A clinical study to evaluate the efficacy of Khaakhasadi Lepa in Padadari (Crack Heel). J Ayurveda Integr Med Sci 2018; 6:1-10.
10. Acharya Y T. Charaka Samhita , Sutrasthana, Chapt27, verse 232, Chaukhamba Surbharati Prakashan, Varanasi, 2013. p-528.
11. Komarcević A. The modern approach to wound treatment. Medicinski pregled. 2000; 53(7-8):363-8.
12. Osieki H. Nutrients in profile. Bioconcepts, 2nd edition. Kelvin Grove, Queensland, 1995.
13. Biyani DM, et al. A Case Report on Wound Healing Activity of Cow Ghee. IJAM 2011; 2(3): 115-118.
14. Sharma P, Kaiyyadeva Nighantu, Choukhambha Bharati Academy publication, reprint edition, 2009, page no.44.
15. Mishra B, Bhavaprakasha Nighantu, Choukhambha Bharati Academy publication, reprint edition,2004. Page no.761
16. Cornara L, et al ,Therapeutic Properties of Bioactive Compounds from Different Honeybee Products, Front. Pharmacol, 2017, 8:412.
17. Lansdown AB. Calcium: a potential central regulator in wound healing in the skin. Wound repair and regeneration. 2002 Sep;10(5):271-85.
18. Motta GJ. Calcium alginate topical wound dressings: a new dimension in the cost-effective treatment for exudating dermal wounds and pressure sores. Ostomy/wound management. 1989;25:52-6.
19. Limová M. Evaluation of two calcium alginate dressings in the management of venous ulcers. Ostomy/wound management. 2003 Sep;49(9):26-33.
20. O'Donoghue JM, et al. Calcium alginate dressings promote healing of split skin graft donor sites. Acta Chir Plast , 1997, 39: 53–55
21. Kawai K, et al. Calcium-based nanoparticles accelerate skin wound healing. PloS one. 2011;6(11).
22. Kottayil M, physico-Chemical Analysis Of Shukti Bhasma And Evaluation Of Its Antiulcer Activity On Ulcer Induced Albino Rats,2010, http://localhost:8080/xmlui/handle/123456789/4585,Cited on 8.5.2020 at 2.10 pm
23. Sharma P. Kaiyadeva Nighanthu, Aushadhi varga, chapt 1, verse 618- 621, reprint edition 2009. p- 189
24. Goyal M, et al. Wound healing activity of latex of Euphorbia caducifolia. J Ethnopharmacol 2012;144: p-786 - 90.
25. Goyal M, et al. GCMS analysis and antimicrobial action of latex of Euphorbia caducifolia. J Intercult Ethnopharmacol ,2012;1:119-23.

26. Pathak J, et al. Clinical efficacy of snuhi based formulation on *Padadari*, IJRMST 2019; 8 Jul-Dec.
27. Ghodela N, et al. Dietary regimen for wound healing - An Ayurveda Perspective. JAIMS 2017;1:154-161.
28. Khandelwal N, et al. Lavana (salt) – An Ayurvedic outlook on Saindhava (Rock salt), IJAMY, 2012;5(2):95-101
29. Singh A, Bhavprakash Nighantu, Karpuradivarga ,Chaukhamba Orientalia, Varanasi,1st edition,2007,p-201.
30. Khan M, et al, Wound healing activity of extracts derived from Shorearobusta resin, Pharmaceutical Biology,2016; 54:3,542-548.
31. Merish S, et al. Review of Shorea robusta with special reference to Traditional Siddha Medicine, RRJP, 2014;2(1)
32. Bhende S, Parwe S. Role of Nitya Virechana and Shaman Chikitsa in the management of Ekakushta with special respect to plaque psoriasis: A case study. Journal of Indian System of Medicine. 2020 Jan 1;8(1):57.
33. Vos, Theo, Stephen S Lim, Cristiana Abbafati, Kaja M Abbas, Mohammad Abbasi, Mitra Abbasifard, Mohsen Abbasi-Kangevari, et al. "Global Burden of 369 Diseases and Injuries in 204 Countries and Territories, 1990–2019: A Systematic Analysis for the Global Burden of Disease Study 2019." *The Lancet* 396, no. 10258 (October 2020): 1204–22. https://doi.org/10.1016/S0140-6736(20)30925-9.
34. Wang, Haidong, Kaja M Abbas, Mitra Abbasifard, Mohsen Abbasi-Kangevari, HedayatAbbastabar, Foad Abd-Allah, Ahmed Abdelalim, et al. "Global Age-Sex-Specific Fertility, Mortality, Healthy Life Expectancy (HALE), and Population Estimates in 204 Countries and Territories, 1950–2019: A Comprehensive Demographic Analysis for the Global Burden of Disease Study 2019." *The Lancet* 396, no. 10258 (October 2020): 1160–1203. https://doi.org/10.1016/S0140-6736(20)30977-6.
35. Kinyoki DK, Ross JM, Lazzar-Atwood A, Munro SB, Schaeffer LE, Abbasalizad-Farhangi M, et al. Mapping local patterns of childhood overweight and wasting in low- and middle-income countries between 2000 and 2017. Nat Med 2020;26(5):750-759.
36. Lozano R, Fullman N, Mumford JE, Knight M, Barthelemy CM, Abbafati C, et al. Measuring universal health coverage based on an index of effective coverage of health services in 204 countries and territories, 1990–2019: a systematic analysis for the Global Burden of Disease Study 2019. Lancet 2020.