

THERAPEUTIC USES OF COCONUT MILK IN AYURVEDIC PAEDIATRICS – A REVIEW

Rakhi Krishnan¹ & Lekshmi M. K.²

ABSTRACT: Introduction: Coconut fruit (*Cocos nucifera* Linn) has been used in medicinal formulations and nutritional supplements for ages. Classical references regarding *naarikela-phala* (Coconut fruit) are available in *bṛhatrayee* and *nighantū*, but that of *naarikela-ksheera* (Coconut milk) is lacking in ayurvedic *samhitaas*. Significant contributions have been made by many authoritative and practically oriented textbooks of Kerala, such as *Aarogya Raksha Kalpadruma* and *Vaidyataarakam*, to the field of *Baalacikitsa* (paediatrics).

Materials & methods: In this paper a review of these two *Malayaalam* textbooks, ie. *Aarogya Raksha Kalpadruma* and *Vaidyataarakam* is done with an attempt to compile all the contexts where coconut milk is used for therapeutic purposes in paediatric conditions. A systematic literature search was done in PubMed, Research Gate and Google Scholar. Several articles on the clinical use of coconut milk were also reviewed, and their multi-dimensional therapeutic implications were incorporated. **Conclusion:** A close review of these textbooks reveals that the authors have emphasised the clinical utility of coconut milk with diverse combinations of herbal drugs, from the post-natal care of the child to severe paediatric skin disorders like *karappan*. This is a unique contribution of traditional knowledge that is not found in any of the classical textbooks of *ayurveda*. This review paper aims to provide relevant documentation of the use of coconut milk in paediatric health care from ayurvedic literature with substantiating data from research articles that opens up the scope for future research in this field.

Keywords: Coconut milk, *Kaumaarabhr̥tya*, Ayurvedic paediatrics, *Aarogya Raksha Kalpadruma*, *Vaidyataarakam*, *karappan*

Introduction

Kaumaarabhr̥tya is the branch of *ayurveda* dealing with the care of infants and children, diseases and treatment of *dhaatri* (wet nurse or caretaker of the child), breast milk, its qualities and treatment of breast milk-related disorders and conditions due to *baalagrahaas*^[1]. It has been mentioned with prime importance as children are the most vulnerable group in the community that needs handling with utmost care and support.

The regional growth of indigenous medicine in Kerala significantly contributed to develop primary paediatric healthcare. Books written in vernacular languages were initially viewed with ambivalence, and eventually, they were stigmatised as non-authentic sources. The justification for this was that the vernacular texts were the redacted versions of the *samhitaas* texts that had been modified somehow.^[2]

The knowledge hidden in regional textbooks should be adopted by the scientific community and brought to mainstream practice to develop further this speciality.^[2] Additionally, these writings are unique and significantly contribute due to the exclusive formulations, treatment approaches, and numerous novel disorders they describe. Using such knowledge in clinical practice aids in the fight against many of the major epidemics that our society is currently dealing with.^[2]

Aarogya Raksha Kalpadruma and *Vaidyataarakam* are renowned *Keraleeya Baalacikitsaa granthaas* (pediatric textbooks) that have significantly contributed to the traditional knowledge of *ayurveda*. The Ayurvedic paediatric community still follows these textbooks for valuable herbal formulations in their day-to-day practice.^[2] In many contexts, coconut milk has been used as an adjuvant in different herbal combinations. This opens up the scope for researching the action of coconut milk in paediatric health care.

Materials and methods

In this article, two regional textbooks of *baalacikitsaa – Aarogya Raksha Kalpadruma*^[3] and *Vaidyataaraka*^[4] were thoroughly reviewed for collating the application of *naalikera- ksheera* (coconut milk) in various health conditions of children, especially in the skin disorders like *karappan*. *Aarogya Raksha Kalpadruma*, a unique literary resource on paediatric health care, was written by Kaikkulangara Raama Warriar, a renowned scholar who lived in Kerala in the 19th century^[2]. This textual resource is the only guiding light in the ancient Kerala tradition of Ayurvedic paediatric treatment, composed in the Sanskrit language using the Malayalam script. A translated version of this textbook by Dr Lal Krishnan is currently available. The Vaidya Kalaanidhi Sree C.N. Narayanan wrote the book *Vaidyataarakam* in Malayalam^[2].

Articles related to coconut were searched in online databases like Pub Med, Research Gate and Google Scholar with no time limits for collecting information to substantiate the current work. The search keywords included the following: Coconut, *Cocos nucifera*, coconut milk and health, coconut oil, *Aarogya Raksha Kalpadruma*, *Keraleeya Aayurveda*, *karappan*, *Visarpa*, etc.

A thorough Pub Med search yielded 7007 articles on the keyword ‘Coconut’ and only 523 articles using the keyword ‘Coconut milk’. Most of the articles were about the coconut oil, protein functionality and antioxidant activity of coconut milk, and some were related to the

food industry (ice cream). Health-related articles were very scarce, limiting the current work's literature search to hardly 25 articles.

An Introduction to *Cocos nucifera*

The coconut tree (*Cocos nucifera* Linn), a member of the Arecaceae (palm family), is one of nature's most important gifts to humanity, with a wide range of nutritional and therapeutic properties^[5]. All components of the palm, including the roots, leaves and in particular, its fruit, have unique uses in producing food, beverages, animal feed and as essential raw materials for numerous industries, including the oleo chemical industry^[6]. It contains various fractions of proteins that play a significant role in several biological applications, such as anti-microbial, anti-inflammatory, anti-diabetic, anti-neoplastic, antiparasitic, insecticidal, and leishmanicidal activities^[6].

The coconut palm is revered as "*kalpa vrksha*" (Tree of Heaven), and its fruit is known as "*lakshmiphala*" (Fruit of Wealth) throughout India. *Aacaarya* Bhela refers to coconut as "*sreephala*," or "fruit of auspiciousness". In the *nighantu* literature, such as *Kaiyyadeva Nighantu*, *Bhaavaprakaasa Nighantu*, *Raaja Nighantu*, *Dhanwantari Nighantu*, etc., all parts of the *Naarikela-phala* are described along with their properties. These unique properties and actions confined to various parts of *naarikela* can be attributed to their *paancabhoutika* constitution. It was discovered that different functional components of *Cocos nucifera* Linn differ in their *paancabhoutika* constitution and as a result, display unique medicinal properties, therapeutic benefits and specific indications for various diseases. The multifaceted therapeutic effects of *naarikela* on vital organs such as *hrdaya*, *vasti*, and *siras*, as well as its specific indications in related diseases, were well recognised. *Naarikela* is *madhura* in *rasa* with *guru*, *snigdha*, and *seeta* properties. Generally, the therapeutic actions attributed to *naarikela* are *brmhana*, *tarpana*, *preenana*, *balya*, *bala-maamsakrt*, *hrdya*, and *vasti-sodhana*. It is also *kshata kshaya-hara* and *vaata-pittaasra-naasanam*^[.5.]

Coconut milk

The most well-known product of coconut meat (endosperm) is coconut milk, the aqueous extract of scraped coconut kernel^[7]. Coconut milk is a white, oil-in-water emulsion^[8] extracted by the manual or mechanical extraction of fresh coconut endosperm with or without water^[9].

Approximately 25% of the world's coconut output is consumed as coconut milk^[10]. It is an important and necessary ingredient in a wide range of food products such as curry, desserts, coconut jam spread, coconut syrup, coconut cheese, bakery products and beverages^[9].

Composition

It is abundant in proteins including albumin, globulin, prolamin, and glutelin^[9]. Coconut milk has a fat composition of roughly 17%, of which 90 to 92% are saturated fats^[11]. Coconut milk contains more saturated fatty acids than most other oils and fats; around two-thirds of those are medium-chain fatty acids^[12]

The colour and rich taste of the milk can be attributed to the high oil content and sugars^[13]. It contains a complex blend of nutritional constituents like carbohydrates, vitamins and minerals^[14]. Coconut oil is the most important component in coconut milk, accounting for 38% of the total weight. It means that when we consume coconut milk, we consume coconut oil about one-third of it. Coconut oil is known as lauric oil because it contains about 50% lauric (CI) fatty acids. It is naturally saturated, containing around 92% saturated fatty acids, the majority of which are medium-chain fatty acids (MCFA)^[15].

According to a study conducted by M. Arivalagan, and T.K. Roy et.al, a total of 28 phenolics which comprise 12 flavonoids and 16 phenolic acids, were identified in coconut. Protocatechuic acid, *p*-coumaric acid and ferulic acid were the major phenolic acids identified whereas, catechin, apigenin and kaempferol were the major flavonoids identified^[6]. Because of its low calcium, potassium, sodium and oxalate content, coconut milk may be a good dairy substitute for people with chronic kidney disease as they are advised to consume a diet free from these^[16].

Lauric acid – An important Medium Chain Fatty Acid content in coconut milk

Because coconuts are primarily made up of MCFA (Medium Chain Fatty Acid), particularly lauric acid, some researchers have demonstrated that the saturated fat found in coconuts has no negative effects on humans^[17]. Lauric acid is a medium-chain fatty acid found naturally in the mother's milk. In the body lauric acid is converted into monolaurin, which is quite helpful. Monolaurin is the antiviral, antibacterial and antiprotozoal monoglyceride used by the body to destroy lipid-coated viruses such as cytomegaloviruses (CMV), HIV, herpes and influenza^[17].

Fatty acids and their ester have been known to have antimicrobial effects since 1966. Virgin Coconut Oil (VCO) is an example of an oil that is mostly made of MCFA (64%), which includes lauric acid (48-53%), capric acid (7%), caprylic acid (8%) and caproic acid (0.5%). Each MCFA is transformed in the body into monoglycerides (monolaurin, monocaprin, monocaprillin and monocaproin), which have antibacterial properties^[18]. The monolaurin contributes most significantly to VCO's antibacterial action. MCFA and monoglyceride, which are hydrolysis products of medium-chain triglyceride, are essential compounds in killing and inactivating pathogenic micro-organisms^[19].

Though diets rich in saturated fats are known to cause dyslipidemia, medium-chain fatty acids differ from other saturated animal and dairy fats in their metabolism in the body. Medium-chain fatty acids are rapidly absorbed in the intestines, even without pancreatic lipase. They are quickly oxidised to release energy after being transported to the liver via the portal vein^[12]. Furthermore, studies have revealed that medium-chain fatty acids do not enter the cholesterol cycle and are not stored as fat in contrast to long-chain fatty acids. Lauric acid may help lower triglyceride and cholesterol levels, which lowers the risk of heart disease and stroke. As the body does not store coconut fats, they are less likely to clog arteries, making coconut milk a better choice for heart health than cow's milk^[9]. Therefore, consuming coconut milk may not increase the risk of cardiovascular ailments in people who do so for its nutritional value or therapeutic benefits^[20].

Table. 1: Use of coconut milk in miscellaneous paediatric conditions

Sl. No	Disease context	Condition	Mode of use/yoga containing coconut milk	Route of administration
1.	<i>Sadyojaatabaala upacaranam</i> (Newborn care)	i. To enhance breast milk production in mother	Gruel prepared with <i>jeevanti</i> is added to coconut milk	Internal administration
		ii. Massage before bathing (for baby)	Apply coconut milk on the head and body before bathing	External Application (E/A)
2.	<i>Kshayaroga cikitsa</i>	Intoxication due to <i>dhoopapatra</i> (tobacco)	1. The powdered drug <i>kataka</i> is ground well in coconut milk & given internally.	Internal administration
			2. Coconut milk added with sugar.	Internal administration
3.	<i>Kaphajasiraṣoola</i> (Headache due to <i>kapha dosha</i>)		3. <i>Bhagottara gutika</i> – ground with coconut milk and applied over the forehead.	E/A

Table 2: Use of Coconut milk in *vaatika visarpa*

Sl.no	Types	Mode of use/yoga containing coconut milk	Route of administration
1.	<i>Tila –visarpa</i> (Bluish red papular lesions in the size of sesame seeds)	1. Either the drug <i>gopaatmaja moola</i> (root) or <i>varnaavati-twak</i> (bark) is ground in coconut milk	External/Application
		2. <i>Kumbhotbhava</i> (<i>Trivrt</i>) <i>coorna</i> (powder) added with coconut milk	Internal Administration
2.	Kulatha visarpa (Reddish white papular lesions with size of horse gram seeds)	1. Drugs like <i>bala, raasna, devadaaru, nata, candana, pathya, kaalaarimeda, twak, jata</i> are made into a paste with coconut milk	E/A
		2. Or else, the drugs like <i>laaksha, abda, candana, or the drugs kuhalipushpa, sataahwa, jeevaka, rshaabhaka</i> ground with coconut milk	E/A
3.	<i>Kapisa visarpa</i> (Blackish red papular lesions)	<i>Moola valkala</i> (root bark) of <i>virala</i> is triturated with coconut milk	E/A
4.	<i>Kapila visarpa</i> (Bluish papular lesions resembling camel's hair)	1. Drugs like <i>candana, paaranti-twak, sataahwa&punarnava</i> are ground with coconut milk.	E/A
		2. Drugs like <i>swetabandhooka- moola, daarvi, and triphala</i> are ground with coconut milk.	E/A
5.	<i>Renuka visarpa</i> (Severe fever for 3 days followed by powder like lesions on body)	1. Bark of <i>udumbara & sataahwa</i> are ground with coconut milk.	E/A
		2. Drugs like <i>saariba, madhuka, aswatha-twak</i> (bark) are ground with coconut milk.	E/A
		3. Drugs like <i>paaranti-moola</i> (root), <i>daarvi-twak</i> (bark) & <i>amruta</i> are ground with coconut milk.	E/A
6.	<i>Ksharaka visarpa</i> (Oedema resembling black gram, feels like kshaara (alkali) spread in between the lesions)	1. <i>Manjistha & hareetakiasthi</i> (seed) are ground with coconut milk.	E/A
		2. <i>Virala moola twak</i> (root bark) & <i>manjistha</i> are ground with coconut milk.	E/A
		3. <i>Paaranti -moola</i> (root), <i>daarvi-twak</i> (bark), <i>yasti, candana</i> are ground with coconut milk.	E/A
7.	<i>Neela visarpa</i> (Bluish oedema with blackish red papular lesions)	1. <i>Daarvi & karanja</i> or the drug <i>kaalaarimeda</i> are ground with coconut milk.	E/A
		2. <i>Madhuka, ambhoda, haridra, gajapaadika</i> are ground with coconut milk.	E/A
		3. <i>Triphala & musta</i> are ground with coconut milk.	E/A

Table 3: Use of coconut milk in *paittikaa visarpa*

Sl. No	Types	Mode of use/yoga containing coconut milk	Route of administration
1.	<i>Maashaka visarpa</i> (Yellowish red swelling resembling black gram)	1. <i>Paaranti- moola valka</i> (root bark) or <i>Madhuka & Candana</i> are ground with coconut milk.	E/A
		2. <i>Madhuka, useera, saariba, jeeraka</i> , the seed of <i>aksha</i> , or the drug <i>varnaavati</i> are ground with coconut milk.	E/A
2.	<i>Kola visarpa</i> (3 days fever followed by yellowish red papular lesions)	1. <i>Badara-valkala</i> (bark) is ground with coconut milk.	E/A
		2. <i>Karaveera-pushpa</i> (flower) is ground with coconut milk.	E/A
3.	<i>Krimighna visarpa</i> (Eruptions in the size & shape of drug <i>krimighna</i>)	Juice of the drug <i>doorva & khadirasaaram</i> is added with coconut milk & ground well.	E/A
4.	<i>Udumbara visarpa</i> (Swelling with blackish red colour resembling <i>udumbara</i> fruit)	Drugs like the seed of <i>aksha, manjistha & madhuka</i> are ground with coconut milk.	E/A
5.	<i>Cincapaka visarpa</i> (Eruptions with immediate suppuration & fissuring of skin)	Drugs like <i>manjistha, virala & paaranti</i> are ground with coconut milk.	E/A
6.	<i>Valli visarpa</i> (Pustules resembling <i>saalirice</i>)	1. Drugs like the bark of <i>bakula</i> or <i>varnaavati & saariba</i> are ground with coconut milk.	E/A
		2. Drugs like <i>virala moola</i> (root), <i>madhuka, akshaasthi</i> (seed), <i>saariba & musta</i> are ground with coconut milk.	E/A
7.	<i>Lohita visarpa</i> (Reddish eruptions)	<i>Paaranti moola-valka</i> (root bark) or <i>varnaavatidwaya (dinesavalli, saariba)</i> is ground with coconut milk.	E/A
8.	<i>Pravaala visarpa</i> (Coppery red lesions)	The bark of drug <i>hemadugdha</i> or <i>varnaavati</i> is ground with coconut milk.	E/A
9.	<i>Saraavaka visarpa</i> (Boils with depressed centre & elevated edges)	Drugs <i>arkaraaga & yashti</i> are ground with coconut milk.	E/A
10.	<i>Rasaala visarpa</i> (Eruptions resembling tender leaves of <i>cutha</i> & colour resembling <i>cutha</i> flower)	<i>Ksheerivrksha-valka</i> (bark) ground with coconut milk.	E/A
11.	<i>Vindumaalika visarpa</i> (Fever followed by reddish eruptions)	<i>Triphala, ghana, paaranti</i> , and <i>amrta</i> are ground with coconut milk.	E/A

12.	<i>Kantaki visarpa</i> (3 days fever followed by swelling in joints associated with thorn like eruptions)	Dried <i>Nyagrodha-twak</i> is ground in coconut milk.	E/A
12.	<i>Valmeeka visarpa</i> (Black / red eruptions)	<i>Vairi- moola twak</i> (root bark), & <i>candana</i> are triturated in coconut milk.	E/A

Table 4:Use of Coconut milk in *kaphaja visarpa*

Sl. No:	TYPES	Mode of use/yoga containing coconut milk	Route of administration
1.	<i>Yava visarpa</i> (Hard whitish eruptions)	One drug among <i>khadira-saara</i> , <i>sthauneya</i> , or <i>kumkuma</i> is triturated with coconut milk.	E/A
2.	<i>Drona visarpa</i> (Whitish papules with reddish centre)	1. Drugs like <i>dronapushpa</i> , <i>vatsaka</i> & <i>dhanika</i> are ground with coconut milk.	E/A
		2. <i>Sweta paaranti -moola</i> (root) or <i>varnaavati&ksheerivrksa- valkala</i> (bark) is triturated with coconut milk.	E/A
3.	<i>Bisaangura visarpa</i> (Elongated swelling in joints Circular whitish papules, non-pitting, hard)	<i>Padma kanda</i> (tuber of lotus), the seeds of <i>jaya&aksha</i> , <i>varnini</i> , & <i>khadira</i> are ground with coconut milk.	E/A
4.	<i>Phalaka visarpa</i> (Swelling in the shape of flattened wooden piece)	Drugs like <i>saariba</i> , <i>vijaya</i> , <i>akshaasti</i> (seed), <i>payaswi</i> , <i>tila-twak</i> (bark) are ground with coconut milk.	E/A
5.	<i>Patala visarpa</i> (Swelling surrounded by boils in the region of muscles, bone marrow, etc.)	<i>Paaranti -moola valkala</i> (root bark), <i>madhuka</i> , <i>vijayaasthi</i> (seed) are ground with coconut milk.	E/A
6.	<i>Srangi visarpa</i> (Oedematous swelling with solid base surrounded with eruptions)	<i>Naktamaala-beeja</i> (seed), <i>manjistha</i> , <i>savarnika</i> are ground with coconut milk.	E/A
7.	<i>Gokhura visarpa</i> (Swelling resembling hoof of animals)	<i>Paaranti moola</i> is ground with coconut milk.	E/A
8.	<i>Udbuda visarpa</i> (Swelling associated with boils due to burns)	<i>Paaranti- moola valka</i> (root bark) & <i>vairi moola</i> (root) are ground with coconut milk.	E/A
9.	<i>Sasapaada visarpa</i> (Swelling resembling rabbit's paw)	<i>Sataahwa</i> is triturated with coconut milk.	E/A

10.	<i>Kirata visarpa</i> (Boils with outer covering resembling a creamy layer of milk)	<i>Madhuka</i> , seeds of <i>vijaya</i> and <i>aksha</i> along with <i>paaranti-valka</i> are ground with coconut milk.	E/A
11.	<i>Vaarigarbha visarpa</i> (Bubble like eruptions filled with water like fluid)	<i>Paaranti</i> , <i>badari</i> , <i>khadira</i> , <i>aksha</i> , & <i>haetaki</i> are ground with coconut milk.	E/A

Table 5: Coconut milk indwandaja and sannipaatika visarpa

<i>Agni visarpa</i> (<i>Vaata – pittaja</i>)		<i>Paaranti</i> -twak (bark) is triturated with coconut milk.	E/A
<i>Kardama visarpa</i> (<i>Pitta –kaphaja</i>)		<i>Amṛta rajas</i> & <i>aamalaka</i> are ground in coconut milk	E/A
<i>Aṣani visarpa</i> (<i>Sannipatika</i>)	In <i>pittaadhika</i> condition	<i>Amṛta</i> , <i>aamalaka</i> , <i>musta</i> & <i>paaranti</i> are ground in coconut milk	E/A
<i>Visarpa samanya cikitsa</i> (General management of erysipelas)		<i>Manjistha</i> , <i>kustha</i> , <i>yashṭimadhu</i> , <i>laaksha</i> , <i>varnaavati</i> -twak(bark), <i>vikamkata</i> , <i>vairi</i> , <i>abhaya</i> & <i>saariba</i> are triturated with coconut milk & added with the juice of <i>kimsuka-patra</i> (leaf).	E/A

Clinical applications of *Naalikera- ksheera* in *Aarogya Raksha Kalpadruma*

Right from the new born care of the healthy infants, the author has emphasized the use of *naalikera ksheera* mostly as a liquid medium in many conditions along with many herbal formulations. The most common mode of administration is triturating various combinations of herbal drugs and coconut milk. *Tailas*(medicated oil)are also mentioned, prepared with coconut milk as an ingredient in various disease conditions. Table 1 to Table 10 briefly illustrates the utility of *naalikera- ksheera* in various disease conditions which are mentioned in *Aarogya Raksha Kalpadruma*, whereas that of *Vaidyataraka* are discussed in Table 11.

Table 6: Use of coconut milk in paediatric skin disorders

Sl. No	Types	Mode of use/yoga containing coconut milk	Route of administration
1.	<i>Visphoṭa</i> (Suppurated boils with exudation & burning sensation due to pitta kopa)	1. <i>Paaranti- moola valka</i> (root bark) or <i>khadira</i> is triturated with coconut milk.	E/A
2.	<i>Kakshya</i> (Blisters in the shape of <i>laaja</i> (boiled rice) all over flanks, chest)	1. <i>Candana</i> or <i>gairika</i> (red oxide of iron)is ground with coconut milk	E/A

	etc.)	2. <i>Amṛta, candana & useera</i> are ground with coconut milk.	E/A
3.	<i>Paada-avadaranam</i> (Crack foot)	<i>Saindhava</i> (Rock salt), <i>triphala, veera, kadaḷi & vetasa</i> are ground with coconut milk and added to buffalo's milk.	E/A

Table 7: Use of coconut milk in disorders with *granthi* – *ṣopha* like manifestations

Sl.No	Types	Mode of use/yoga containing coconut milk	Route of administration
1.	<i>Rakta alasakam</i> (Elevated tumour-like swelling in various parts of the body)	1. Tender leaves of <i>naalpaamara, ananta, gudooḥci, tila & devadaaru</i> are ground with coconut milk.	E/A
		2. <i>Tila-valka, aṣoka-valka, hareetaki, devadaaru & ṣataahwa</i> are ground with coconut milk.	E/A
		3. <i>Laaja durvadi lepana</i> <i>Laaja, doorva, amṛta-patra, ṣataahwa, devadaaru, sthauneyaka, turushka, aṣwamaara-valka(bark) & triphala</i> are ground with coconut milk & added with <i>navaneeta</i> (butter) <i>caranaayudha-anda-drava</i> (egg white) – mixed well till the water content in it get evaporated.	E/A
2.	<i>Asraṣopha</i> (Red hard swelling)	<i>Kṛtamaalaka-twak</i> (bark) & <i>paaranti-moola valka</i> (root bark) are ground with coconut milk.	E/A
3.	<i>Jaalagardabha</i> (Non-suppurative oedematous lesion)	Coconut milk is applied externally, followed by a bath	E/A
4.	<i>Irigallika</i> (Round eruption formed on head)	<i>Triphala</i> is triturated with coconut milk	E/A

Table 8: Use of coconut milk in disorders affecting penis

Sl.No	Types	Mode of use/yoga containing coconut milk	Route of administration
1.	<i>Vyoodam</i>	<i>Kodrava</i> is triturated with coconut milk.	E/A
2.	<i>Sparsa-haani</i> (Loss of tactile sensation on penis due to rakta doṣa vitiation)	<i>Manjishṭha, yashṭi & candana</i> are ground in coconut milk	E/A

Table 9: Use of coconut milk in *vṛāṇa* (ulcers)

Sl. No	Types	Mode of use/yoga containing coconut milk	Route of administration
1.	<i>Naabhipaaka</i> (Suppuration of the umbilicus with foul-smelling discharge.)	Drugs like <i>doorva</i> & <i>yashṭi</i> are ground in the decoction of the drug <i>bala</i> or coconut milk and applied over the area of swelling.	E/A
2.	<i>Jaanu vṛāṇa</i> (Ulcer in and around the knee joint.)	<i>Koormapṛtshṭhaashti</i> (tortoise shell) is powdered well & added with coconut milk is applied.	E/A
3.	<i>Gopaavṛāṇa</i> (Ulcer in the groin region)	Burned ashes of <i>gopuccha-loma</i> (hair on cow's tail) are added with <i>tutha</i> & mixed with coconut milk.	E/A
4.	<i>Urovṛāṇa</i> (Ulcer in the chest region)	<i>Varnaavati-twak</i> & <i>madhuka</i> added with coconut milk is ground well.	E/A

Table 10: Tailas prepared with coconut milk are mentioned in the following conditions:

Sl. No	Disease	Taila yoga	Mode of administration
1.	<i>Dhaanyaka visarpa</i>	1. <i>Doorvaditaila</i> 2. <i>Vetra-pallavaaditaila</i>	Internal use Internal use
2.	<i>Vaata vyaadhi</i> (Disorders due to <i>vaata</i> doṣa)	1. <i>Balaacchinnaruhaaditaila</i> 2. <i>Kshaṇadaa-suradhooaditaila</i>	E/A
3.	<i>Naktaandhyam</i> (Night blindness)	<i>Kumaarimadhukaaditaila</i>	E/A
4.	<i>Dusta peenasam</i> (Rhinitis)	1. <i>Dhavapallavaaditaila</i> 2. <i>Amṛtaadi taila</i>	E/A E/A
5.	<i>Danta mamsabhava gada</i> (Gum disorder)	<i>Sairyeyakaadi taila</i>	Gargling
6.	<i>Vaatajaṣirobhitaapa</i> (Headache due to <i>vaata</i>)	<i>Br̥hateeswarasaaditaila</i>	E/A
7.	<i>Pittajaṣirobhitaapa</i> (Headache due to <i>pitta</i>)	<i>Manjishthaaditaila</i>	E/A
8.	<i>Thridoshajaṣirasoola</i> (Headache due to 3 <i>dosas</i>)	<i>Moordhaamṛtataila</i>	E/A
9.	<i>Kapalaarumshika</i> (Eruptions on scalp)	1. <i>Karpaasa-patraadikeram</i> 2. <i>Dhurddura-patraadikeram</i>	E/A E/A

Table 11: Clinical Applications of Coconut milk mentioned in *VaidyaTaaraka*

Sl. No	Different <i>oushadhakalpanas</i> with coconut milk as one of the ingredients	Disease condition / Context	The specific name of the <i>oushadha -yoga</i> (if any)	Mode of administration
1.	Medicated oil	1. <i>Sonita Karappan</i>	<i>Karalakaadi taila</i>	E/A
		2. <i>Chilanni Karappan</i>	<i>Neelinyaadi taila</i>	E/A
		3. <i>Tee Karappan</i>	<i>Neelakimsukaadi keram</i>	E/A
		4. <i>Cenkarappan</i>	<i>Nalpaamaraadi keram</i>	Both internal and external application
		5. <i>Karappan saamanyaadhikaara</i>	<i>Jaatyaadi taila</i>	E/A
		6. <i>Krimi roga</i>	<i>Kriminaasini taila</i>	E/A
		7. <i>Swaasa - Kaasa</i>	<i>Aswagandhaadi taila</i>	E/A
2.	<i>Lepana</i>	1. <i>Chilanni Karappan</i>	Leaf of <i>chilanniground</i> with coconut milk	E/A
		2. <i>Karappan saamanyaadhikaa ra</i>	<i>Manjishtha, kustha, madhuka</i> etc. ground in coconut milk.	E/A
3.	<i>Talam</i>	1. <i>Thontattaamara Karappan</i>	<i>Amrta, karpoora&vijaya ground in coconut milk.</i>	E/A
4.	Internal administration	1. <i>Peeta Vira (Naata Vira)</i>	Coconut milk with <i>Nisaacoornam</i> (Turmeric powder)	Internal administration

Discussion

In the context of neonatal care to enhance breast milk production, coconut milk is advised to be added to a specially prepared gruel (Table 1). It is the *madhura* and *snigdha* properties of the *naarikela* that help in its lactogenic action. Cindy A Francois and Sonja L Connor et.al conducted a study on 14 lactating women to determine the acute changes in breast milk fatty acids after the consumption of six test meals containing different fats and oils namely - menhaden oil, herring oil, safflower oil, canola oil, coconut oil or cocoa butter. The fatty acids of specific interest were elevated in the breast milk within 6 hours of ingesting the test meal, peaked between 10 and 24 h, and remained significantly elevated for 1–3 days. They arrived at the conclusion that diet composition also influences the fatty acid composition of breast milk^[20].

Because breast tissue is especially rich in the lipolytic enzyme lipoprotein lipase, Cindy A Francois and Sonja L Connor et.al, hypothesized that during lactation, dietary fatty acids would be transferred quickly from the plasma into human milk after their ingestion, absorption and subsequent incorporation into chylomicrons. Peak lipaemia or chylomicronemia usually occurs within 3–5 h of fat ingestion^[21]. The results from the above study clearly substantiate the use of coconut milk as a galactagogue agent by *AarogyarakshaKalpadruma*.

A special contribution of *Aarogya Raksha Kalpadruma* is the disease *karappan* (*Baala visarpa*). 51 types of *karappan* have been explained with their sub-classifications based on the *dosha* dominance. *Visarpa* is an acute inflammatory skin disorder with a fast-spreading nature. Multiple skin eruptions associated with fever and other systemic manifestations are the peculiar features of this disease. The characteristics of the lesions and the symptoms vary according to the *doshas* involved^[22].

Coconut milk is used as a medium for external applications in *karappan*. It is *vaataharain* in action due to its *madhura rasa* and *snigdha guna*. Due to its *seeta veerya*, coconut milk is *pitta-rakta-hara* in action. Thus, the *vaata pitta-harakarma* of the coconut milk is responsible for pacifying the bodily eruptions and *paittika* features like fever accompanying the *visarpa*.

External application of herbal drugs along with coconut milk as a medium could be found in various other disease contexts such as *visphotam*, *kakshyaa*, *vipaadika*, *paada- avadaranam*, *paada-daaha*, *apabaahukam*, *rakta- alasakam*, *asra-sopham*, *naabhi- paakam*, *jaanu-vrana*, *gopa-vrana*, *uro-vrana*, *jaalagardabha*, *irigallika*, *vyudham*, *sparsa-haani*, *nisaandhyam*, *dushta-peenasam*, *dantamaamsa bhava-gada*, *siro-abhitaapa*, *kapaala arumshika* etc. Most of the above-mentioned conditions are cutaneous manifestations with especially *vaata-pitta* predominance. Apart from the ayurvedic view, finding a relevant scientific basis for supporting this traditional knowledge is necessary. The following data from reviewing several related articles help substantiate why both these authors have given such importance to *naarikela- ksheera* in *baalaroga cikitsa* (Paediatric health care).

Medium chain fatty acid (MCFA) and its derivative (monoglyceride) are effective against bacteria, fungi, viruses and protozoa, wherein the antibacterial activity is contributed by their ability to disrupt the lipid membrane of organisms^[18]. The National Center for Biotechnology Information claims that lauric acid contains numerous antibacterial, antiviral and antifungal properties that are very effective at ridding the body of viruses, germs and various

illnesses^[23]. It is therefore believed that consuming coconut milk may aid in defending the body against viruses and illnesses.

Studies have shown that lauric acid and monolaurin exert the highest antibacterial activity compared to other free fatty acids and monoglycerides^[18] and it may be because of this reason that coconut milk has wide actions on skin disorders like *karappan*.

Staphylococcus aureus frequently colonizes the infected eczema skin, which may result in chronic inflammation, skin barrier dysfunction and dry, flaky skin, which are often managed with antibiotic therapy and antiseptic lotion^[24]. However, Verillo Rowell et al^[25] discovered that lipases that were produced by *S. aureus* on the skin would hydrolyse triglycerides in virgin coconut oil to monoglycerides. These monoglycerides and medium-chain fatty acids could exhibit antibacterial, antifungal and antiviral activities. This discovery was made initially in monolaurin^{[25][26]}. It was explained that the small molecular size of the monoglycerides allowed them to penetrate the membrane barrier more easily, disintegrate the bacterial cell membrane, inhibit the action of enzymes and eventually cause bacterial cell death^[27].

Coconut testa, a brown skin covering of a coconut endosperm, is a rich natural source of multiple phenolic acids and flavonoids with potent antioxidant capacity and it can be used as a natural source of antioxidants^[6]. Plant compounds with antioxidant, anti-inflammatory and antibacterial characteristics are also thought to aid wound healing^[24].

T. Brown opines that a glass of coconut milk and other antioxidant-rich foods like pecans, raisins and cranberries may help the body rebuild its damaged cells and boost immunity^[28]. Antioxidant constituents of plant material act as radical scavengers, assisting in converting radicals to less reactive species^[29]. This antioxidant and wound-healing property of coconut milk may be the reason why the ayurvedic classics have discussed its use in *vrana* (ulcer) and other miscellaneous skin conditions.

A study was undertaken by Srivastava P, Durga Prasad S et.al, to evaluate the burn wound healing property of the oil of *Cocos nucifera* and to compare the effect of the combination of oil of *Cocos nucifera* and silver sulphadiazine with silver sulphadiazine alone in rats. This study concluded that the oil of *Cocos nucifera* is an effective burn wound healing agent. Many studies have been conducted in the past using natural products to treat burn wounds, but these were primarily aimed at infection control. Based on a clinical study that showed that the addition of another pro-healing agent like hyaluronic acid significantly overcame the

disadvantages of silver sulphadiazine in the treatment of superficial and deep second-degree burns, the authors suggested that the oil of *Cocos nucifera* could greatly expand the selection of topical medications available for the treatment of burns^[30].

R O Nneli et.al demonstrated the antiulcerogenic effects of a warm water crude extract of coconut milk and coconut water dispersion in male Wistar albino rats. Coconut milk (2 ml daily oral feeding) reduced the mean ulcer area by 54% compared to coconut water (39%). The effect of coconut milk in this study was similar to sucralfate, a conventional cytoprotective agent which decreased the mean ulcer area by 56%. A macroscopic examination of the results revealed that coconut milk and water had protective effects on the ulcerated gastric mucosa. It has been concluded that coconut milk provided better protection against indomethacin-induced ulceration in rats than coconut water^[31]. This supports the data in *Aarogya Raksha Kalpadruma* regarding applying coconut milk in various *vraṇa* conditions like *urovraṇa*, *jaanuvraṇa* etc.

Coconut milk is proven to be used as an alternative cosmetic ingredient to thin out hyperpigmentation on face skin. It contains a lot of vegetable fats, which can moisturize the skin and make it smooth and supple. Due to its high content of natural fatty acids and antiseptics, it can be used to soften skin and remove black spots from the face. Made from natural substances, it is safe to use on the face^[32].

Some limitations of this work must be acknowledged. Even though tremendous data is available about the drug *Cocos nucifera*, coconut oil and virgin coconut oil, very limited information regarding the clinical utility of *naarikela-ksheera* (coconut milk) in human health is available in scientific databases. Another challenge that the author faced while preparing this article is finding the most appropriate ayurvedic correlation of the diseases mentioned in *Aarogya Raksha Kalpadruma* like types of *karappan* and so. Equating these diseases with the most appropriate modern dermatological conditions is another challenging area of research and if done with accuracy, it might be an exceptional contribution to the field of *ayurveda* which helps the emerging ayurvedic practitioners to diagnose the conditions more precisely, so that those simple herbal formulations available in the vernacular textbooks like *Aarogya Raksha Kalpadruma* can be clinically utilized.

Conclusion

The coconut palm is renowned for its remarkable versatility, due to its variety of bioactive components and the therapeutic utility of its various parts, including fruit, flower, oil, root,

bark, spadix, *kshaara*(ash), coconut water, etc^[5]. It is found throughout India whose description dates back to the *Samhitaa* era. By its *madhura rasa*, *seeta veerya*, and *madhura vipaaka*, *narikela* is highly efficient in pacifying *vaata* and *pittadoshas*^[33]. Modern medical research has recently confirmed several health benefits of various coconut products^[34].

The medicinal value of coconut milk is an intriguing topic that requires in-depth research. To convey a thorough understanding of *Cocos nucifera* Linn's multifaceted therapeutic implications, a concise introduction to the drug in both modern and ayurvedic terms is meticulously discussed in this review. Most importantly, *KeraleeyaBaalacikitsa granthaas*, namely *Aarogya Raksha Kalpadruma* and *Vaidyatarakam*, have been carefully reviewed, and all the contexts where *naarikela ksheera prayoga* are mentioned have been tabulated for easy reference, which facilitates further research and references. Most of the formulations were recommended for external use. This demonstrates the importance that the authors have given to *naarikela- ksheera* in *baala cikitsa*, a topic that merits further study.

Numerous studies on coconut milk in the food industry are available, but there are few on the subject of health. The outcome of this work can contribute comprehensive knowledge and point the way to future studies focusing on the multifaceted pharmacotherapeutic potentials of Coconut milk. This work also points out research gaps that should help guide future research on Coconut milk's clinical utility.

Acknowledgement

The authors are grateful to the teaching faculties and the colleagues of the Department of Kaumarabhritya, Government Ayurveda College, Thiruvananthapuram for their continuous support. We do thank the PG scholars and faculties of the Department of Dravyaguna, Government Ayurveda College, Thiruvananthapuram for sharing their knowledge.

References

1. K. Acharya S. *Acharya's Textbook of Kaumarabhritya*. Vol 1. First. Chaukhamba Orientalia; 2016:1.
2. Chandran S, Dinesh KS, Patgiri BJ, Dharmarajan P. Unique contributions of Keraleeya Ayurveda in pediatric health care. *J Ayurveda Integr Med*. 2018;9(2):136-142. doi:10.1016/j.jaim.2017.10.008 Available from: <https://pubmed.ncbi.nlm.nih.gov/29471987/>
3. Kaikkulangara Rama Warriar. *Arogya Raksha Kalpadruma*. (1sted.). Kozhikode: Poorna Publications; c2018.
4. Vaidyakalanidhi C N Narayanan. *Vaidyatarakam*. (2nd ed.). Kottayam: Nalathra Printers; 1974.

5. Sreekala. V, Dwivedi K.N, Singh S. K. Exploring the multi-faceted pharmacotherapeutic potential of *cocos nucifera* linn.: a comprehensive review. *www.wjpr.net*. Published March. Accessed February doi: 10.20959/wjpr20224-23498., Available from: https://wjpr.s3.ap.south1.amazonaws.com/article_issue/e77adaaf097e1738fdc589c0907a9acf.pdf, 2022
6. Arivalagan M, Roy TK, Yasmeen AM, et al. Extraction of phenolic compounds with antioxidant potential from coconut (*Cocos nucifera* L.) testa and identification of phenolic acids and flavonoids using UPLC coupled with TQD-MS/MS. *LWT.*;92:116-126. doi:<https://doi.org/10.1016/j.lwt.2018.02.024> Available from: <https://www.sciencedirect.com/science/article/abs/pii/S0023643818301531?via%3Dihub>, 2018.
7. Karunasiri AN, Gunawardane M, Senanayake CM, Jayathilaka N, Seneviratne KN. Antioxidant and Nutritional Properties of Domestic and Commercial Coconut Milk Preparations. *Int J Food Sci.* 2020;2020:3489605. Published Aug 1. doi:10.1155/2020/3489605. Available from: <https://pubmed.ncbi.nlm.nih.gov/32832538/>, 2020
8. Patil U, Benjakul S. Coconut Milk and Coconut Oil: Their Manufacture Associated with Protein Functionality. *J Food Sci.* 2018;83(8):-2027. doi:10.1111/1750-3841.14223
Available from: <https://pubmed.ncbi.nlm.nih.gov/30004125/>, 2019
9. Alyaqoubi S, Aminah, Samudi MA, Norrakiah, Zuhair, Musa K. Study of antioxidant activity and physicochemical properties of coconut milk (Pati santan) in Malaysia. Sani A, Hamid. K, eds. *Journal of Chemical and Pharmaceutical Research*;7:967-973.
Available from: <https://www.researchgate.net/publication/279557100>. 2015
10. Ephraim Edem V. Optimization of Coconut (*Cocos nucifera*) Milk Extraction Using Response Surface Methodology. *International Journal of Nutrition and Food Sciences.* ;5(6):384. doi:<https://doi.org/10.11648/j.ijnfs.20160506.13>. Available from: <https://article.sciencepublishinggroup.com/pdf/10.11648.j.ijnfs.20160506.13.pdf>., 2016
11. Ijeh. consumption of coconut milk did not increase cardiovascular disease risk in mice. *www.academia.edu*. Accessed May 21., Available from: <https://www.academia.edu/6795829/>, 2023
12. Dayrit C. Coconut oil: Atherogenic or not? (What therefore causes Atherosclerosis?). *Philipp J Cardiol*;31.. Available from: <https://www.researchgate.net/publication/242514260>, 2003
13. Ishiaq O. Bio-nutritional constituents of coconut fruit and its possible medicinal applications. *African Journal of Plant Science.*;6(12). doi:<https://doi.org/10.5897/ajps11.021>,
Available from: <https://www.researchgate.net/publication/271187454>, 2012
14. Lu X, Su H, Guo J, et al. Rheological properties and structural features of coconut milk emulsions stabilized with maize kernels and starch. *Food Hydrocolloids.*;96:385-395. doi:<https://doi.org/10.1016/j.foodhyd.2019.05.027>. Available from: <https://www.sciencedirect.com/science/article/abs/pii/S0268005X18317776> , 2019
15. Kusianti N, Usodoningtyas S. Coconut Milk as an Alternative of Cosmetic Material for Thinning Hyperpigmentation on the Face Skin. *www.atlantis-press.com*. doi:<https://doi.org/10.2991/aer.k.201124.056>. Available from: <https://www.researchgate.net/publication/347409274>

16. Borin JF, Knight J, Holmes RP, Joshi S, Goldfarb DS, Loeb S. Plant-Based Milk Alternatives and Risk Factors for Kidney Stones and Chronic Kidney Disease. *Journal of Renal Nutrition*. Published online May doi:<https://doi.org/10.1053/j.jrn.2021.03.011>. Available from:<https://www.researchgate.net/publication/351843812,2021>
17. Suyitno T. Health benefit of coconut milk. *Indonesian Food and Nutrition Progress*. 10(2):106-12,2003
18. Margata L, Silalahi J, Harahap U, Suryanto D, Satria D. The antibacterial effect of enzymatic hydrolyzed virgin coconut oil on *Propionibacterium acne*, *Bacillus subtilis*, *Staphylococcus epidermidis* and methicillin-resistant *Staphylococcus aureus*. *Rasayan Journal of Chemistry*;12(02):987-993. doi:<https://doi.org/10.31788/rjc.2019.1225113>. Available from: <https://www.researchgate.net/publication/334110233,2019>
19. *B. Fife*, *Agro Food Industry Hi Tech*, 24(3), 5 ,2013.
20. ECC Ejike C, O Nwankwo O, I Ijeh I. Consumption of coconut milk did not increase cardiovascular disease risk in mice. *International journal of current research* . 2010;Vol. 6(ISSN: 0975-833X):pp.063-064,. Accessed May 17, Available from: <http://www.journalcra.com,2010>
21. Francois CA, Connor SL, Wander RC, Connor WE. Acute effects of dietary fatty acids on the fatty acids of human milk. *The American Journal of Clinical Nutrition*. 67(2):301-308. doi:<https://doi.org/10.1093/ajcn/67.2.301>. Available from: <https://pubmed.ncbi.nlm.nih.gov/9459379/,1998>
22. Yogesh, Kumar & Pandey, Yogesh & Meena, Abhilaasha& Gaur, Manubhai & Sabharwal, Pooja.A review article on vata predominant skin diseases in ayurveda. *European journal of pharmaceutical and medical research*. 5. 151-158.Available from:<https://www.researchgate.net/publication/328027867,2018>
23. M Baldioli; M Servili; G Perretti; GF Montedoro. *Journal of the American Oil Chemists 'Society*, 73: 1589–1593,1996
24. Chew, Yik-Ling. The beneficial properties of virgin coconut oil in management of atopic dermatitis. *Pharmacognosy Reviews*. 13. 24. 10.4103/phrev.phrev_29_18.Available from: <https://www.researchgate.net/publication/332226647,2019>
25. Verallo-Rowell VM, Dillague KM, Syah-Tjundawan BS. Novel antibacterial and emollient effects of coconut and virgin olive oils in adult atopic dermatitis. *Dermatitis*. ;19(6):308-315. Available from : <https://pubmed.ncbi.nlm.nih.gov/19134433/,2008>
26. EErna, Rafaela & Abraham, & Verallo-Rowell, Vermen& Rafaela, Erna & Abraham, L. . “Safety and efficacy of monolaurin, a coconut oil extract, versus ethyl alcohol in rinse-free antiseptic gels on healthcare personnel’s hands and microbial isolates” Third year Dermatology Resident.Available from: <https://www.researchgate.net/publication /342233156, 2020>
27. Shilling M, Matt L, Rubin E, et al. Antimicrobial effects of virgin coconut oil and its medium-chain fatty acids on *Clostridium difficile*. *J Med Food*. ;16(12):1079-1085. doi:10.1089/jmf.2012.0303. Available from:<https://pubmed.ncbi.nlm.nih.gov/24328700/,2013>
28. T Brown. The Health Benefits of Coconut Milk. *Demand Media*. <http://healthyeating.sfgate.com/healthbenefits-coconut-milk-2031.html>, 11-10-2014.

29. M Sulekha; Y Satish; Y Sunita; KN Rajesh. *Journal of Chemical and Pharmaceutical Research*, 1 (1):102-104,2009
30. Srivastava P, Durgaprasad S. Burn wound healing property of *Cocos nucifera*: An appraisal. *Indian J Pharmacol.*40(4):144-146. doi:10.4103/0253-7613.43159. Available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2792613/>,2008
31. Nneli RO, Woyike OA. Antiulcerogenic effects of coconut (*Cocos nucifera*) extract in rats. *Phytotherapy Research*;22(7):970-972. doi:<https://doi.org/10.1002/ptr.2318>. Available from: <https://pubmed.ncbi.nlm.nih.gov/18521965/>, 2008
32. Kusstianti N, Usodoningtyas S. Coconut Milk as an Alternative of Cosmetic Material for Thinning Hyperpigmentation on the Face Skin. www.atlantis-press.com. doi:<https://doi.org/10.2991/aer.k.201124.056> Available from: https://www.researchgate.net/publication/347409274_
33. Rabadia, Madhavi. *International Journal of Applied Ayurved Research* issn: 2347-6362 *narikela* (*cocos nucifera* linn.), a heigted palm tree with high medicinal value in ayurveda – a review. *Internation Journal of Applied Ayurved Research*. Available from: https://www.researchgate.net/publication/289519072_,2015
34. Joseph, Dhanish. *Cocos Nucifera: It's Pharmacological Activities*. *WorldJournal of Pharmaceutical Sciences*. 5. 195-200,2017

-
1. PG Scholar, Dept. of Kaumarabhritya, Govt. Ayurveda College, Thiruvananthapuram.
 2. Associate Professor, Dept. of Kaumarabhritya, Govt. Ayurveda College, Thiruvananthapuram
*Mail id of Corresponding Author: lekshmimk@gmail.com