

Pediatric Liver Diseases and its Management by Herbs: A Traditional Siddha Medicine Treatise

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ABSTRACT

Siddha medicine is one of the oldest (5000 years old, pre vedic period) well-documented Indian traditional medicines, compared to Ayurveda, Unani, and traditional Chinese medicine, by way of keen observation and experimentation. It mentions 108 diseases that occur in childhood, which are further classified and described into various subtypes based on the clinical features and different stages of a particular disease. The objective of this review was to collect literature details on pediatric liver diseases and its management as per Siddha medicine. We have referred all the published Siddha books related to the pediatric practice. There were 37 Siddha literature deals pediatric diseases and they use the term *kaamaalai* or *chenkamaari* to describe the liver diseases. Most of the literature classifies liver disease into 3 types, but few texts describe 5-6 subtypes. Thus, a total of 9 subtypes of liver diseases in pediatric age group have been described in Siddha literature with a list of herbs to be used for each type. Mostly, the drug therapy is polyherbal formulations of internal and/or external application. A total of 113 herbs, 6 animal products (including black chicken liver, dairy products, donkey's dung, honey) and 7 mineral based products (including iron, rock salt) were listed as potential agents to treat liver diseases. The safety and efficacy of all the above mentioned herbal/mineral products have not been fully explored in children, but may be a great potential for clinical development.

Key words: Ayurveda, Traditional Medicine, Herbs for Children, Liver disease, Agastya.

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INTRODUCTION

'Children are not small adult'—this concept is very important in pharmacology research field. Mostly, the drug used in adult are intended to be tested in children or used in children at lesser doses. While considering the children's physiology, in which the body organs are not same as adult, the pharmacodynamics and pharmacokinetic parameters for each drug will vary when compared to adult. Thus, special attention should be paid while developing drugs for children.

The drug discovery from natural products for children is delayed as there is lot of research involved in finding safe herbs for children.

Complementary and alternative medicine (CAM) is defined by the National Center for Complementary and Alternative

Medicine (NCCAM, part of the US Department of Health and Human Services) as "a group of diverse medical health care systems, practices, and products that are not presently

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considered to be a part of conventional medicine.^[1] The use of CAM among children has increased dramatically in the western population,^[2] in which phytotherapy was preferred to homeopathy, and parents with higher education used more CAM for their children.^[3] To facilitate communication on specialized information regarding CAM in Canada, the pediatric CAM Research and Education Network (<http://www.pedcam.ca/>) was created in 2004.^[4] Liver disease in pediatric age group is one of the most dangerous health issues in developing countries.

The systematic Siddha literature review on liver disease and its herbal therapy in pediatric age group is lacking. Thus, the aim of the current review was to collect and summarize the liver diseases and its herbal therapies mentioned in Traditional Siddha literature.

Traditional Siddha medicine

Siddha medicine is one of the oldest and most well documented of Indian traditional medicines, which had its origin in India and Sri Lanka. The period of Siddha tradition was pre-vedic and it is unique for its own specialization such as treatments for fetus, children, women, pregnancy care, post natal care, cancer, skin, varmam, alchemy etc.^[5] In 1997, the United Nations Educational Scientific and Cultural Organization (UNESCO) recognized such Tamil medical palm manuscript collections as part of the UNESCO Registry.^[6] Siddha literature describes a total of 4448 disease which can occur for man and animals.

Pediatrics in Siddha medicine

Among 4448, 108 diseases occur in childhood age period. Siddhar Agastyar, the father of Siddha medicine further classified the pediatric disease into many subtypes based on the clinical symptoms/signs.^[7] Siddha literatures describe a group of herbals suitable for pediatric population based on the pediatric organ developments, keeping pharmacokinetic and pharmacodynamics in mind, which indicates the in depth knowledge of Siddha medicinal system in pediatric diseases management.

In Tamil Nadu and Sri Lanka, even today, we can see the pediatric Traditional Siddha practitioners, who are successful in diagnosing and treating children based on Siddha principles. Vaidyar. Param Jothi Naadar (Kannaiyya Vaidyar) belongs to Murasancode, Kanyakumari, India, was a popular pediatric Siddha vaidyar, who was also the great grandfather of the author Dr. Arul Amuthan. Solomon Vaidayar family is another pediatric Siddha tradition at Kanchiracode, Kanyakumari, India, and still practicing

pediatric Siddha medicine. The literature review on pediatric liver disease management through Siddha Medicine is lacking. This work contributes on pediatric liver disease management especially focused on Traditional Siddha medicine.

METHODOLOGY

All the published Siddha literatures related to pediatric diseases were referred for the study. The terms '*Kaamaalai*' and '*chenkamaari*' are the Siddha terms described in literature to describe the liver diseases. Since these original literatures were written in Tamil language using ancient medical terminology, the authors carefully read thoroughly to understand the clinical symptoms related to liver diseases. The herbals mentioned under each liver disease were documented and summarized in a table with their botanical names.

RESULT

Siddha literatures dealing pediatric diseases

There were 37 Siddha literature deals with pediatric disease. Of which, 23 (no.1-23 in Table 2) are available as printed book and remaining 13 (no.24-36 in Table 1) are preserved in libraries as palm manuscript/paper written documentation. These palm manuscripts were originally documented few centuries ago in palmyra leaves. Many such leaves are preserved in libraries of India/Sri Lanka, thus we were not able to access it. In addition, many other pediatric Siddha literatures such as *kumara thanthiram* (by Ravanam, Sri Lanka) and *Chega Raaja Sekaram* (by King Chega Rajan, Sri Lanka) were destroyed due to natural calamities and war, thus not available today. One interesting thing observed was most of the pediatric literatures were written by Agastyar (the father of Siddha Medicine). Star Agastya (Canopus) was named after sage Agastyar (5000 BC), who also authored 25 hymns (nos. 166 to 190) of the first 'mandala' of the Rigveda.^[8] This gives an idea that possibly Agastyar could be the best pediatrician during prevedic period.

Different stages of pediatric age groups

Siddha system classifies the pediatric age group into three phases based on feeding habits as follows; feeding milk (*paalunnum paruvam*—1 to 3 years age), feeding milk and solid diet like rice (*paalum chorum unnum paruvam*—3-7 years age) and solid diet phase (*choruunnum paruvam*>7 years).

Based on the physical growth and activities, the phase 1 is further subdivided into 10 stages as given in the Table 2.

Table 1: List of Traditional Siddha pediatric literatures with their publishers/libraries

Traditional Siddha literature name	Author/Editor, year	Publisher/ library name
<i>Balavaagadam (kuzhanthai maruthuvam)</i>	Dr. PonGurusironmani, 1992	Directorate of Indian Medicine and Homeopathy, Chennai, India.
<i>Pillaippini maruthuvam</i>	Dr. A. SoundaraRajan, 1993	Directorate of Indian Medicine and Homeopathy, Chennai, India.
<i>Uyirkaakkum Siddha maruthuvam</i>	S.P. Ramachandiran, 2000	Thamrai Noolagam, Chennai, India.
<i>Kuzhanthai noigal (part 1-5)</i>	Dr. S.ChithambarathanuPillai, 2003	Siddha Medical Literature Research Center, Chennai, India.
<i>Pappavukku paatti vaidyam</i>	T.S. JanakaKumari, 1963	Paavai printers (P) Ltd, Chennai, India.
<i>Kuzhanthaigalukkaana naattu vaidyam</i>	Dr. ThirumalaiNatarajan, 1989	Shree Indu Publications, Chennai, India.
<i>Madalai noi (Part 1-3)</i>	Dr. T. Mohana Raj, 2008	ATSVS Siddha Medical College & Hospital, Kanyakumari, India.
<i>Kumba muni baalavaagadam</i>	Dr. T. Mohana Raj, 2009	ATSVS Siddha Medical College & Hospital, Kanyakumari, India
<i>Bala Aachiriyam</i>	Dr. T. Mohana Raj, 2010	ATSVS Siddha Medical College & Hospital, Kanyakumari, India
<i>Balavaagada Aachiriyam</i>	Dr. T. Mohana Raj, 2010	ATSVS Siddha Medical College & Hospital, Kanyakumari, India
<i>Pillaipini balavaagadam</i>	Dr. T. Mohana Raj and Prof. P. Prema, 2013	Siddha Medical Literature Publisher, Kanyakumari, India
<i>Pararasasekaram balaroganithanam</i>	Pararasasekaram	University of Jaffna, Sri Lanka
<i>Pillaipini maruthuvam-kainool</i>	Dr. S. Shivashanmugaraja	Siddha MaruthuvaValarchikazhagam, Jaffna, Sri Lanka.
<i>Thamizhar vaalvil kuzhanthaigal nalam</i>	Dr. S. Shivashanmugaraja	Siddha MaruthuvaValarchikazhagam, Jaffna, Sri Lanka.
<i>Kuzhanthai maruthuvam</i>	Dr. S. Shivashanmugaraja, 2013	Siddha MaruthuvaValarchikazhagam, Jaffna, Sri Lanka.
<i>Agathiyar Balavaagadam</i>	Agastyar	University of Jaffna, Sri Lanka
<i>Kuzhanthai vaidyam: marunthum maanthireegamum</i>	-	University of Jaffna, Sri Lanka
<i>Pillaipini vaagadam</i>	Agastyar	Palm manuscript preserved in Government Oriental Library, Chennai, India.
<i>Vaalai vaagadam</i>	Agastyar	Palm manuscript preserved in Government Oriental Library, Chennai, India.
<i>Baala vaagadam</i>	Agastyar	Palm manuscript preserved in Government Oriental Library, Chennai, India.
<i>Baala vaagada seevigai 200</i>	Agastyar	Palm manuscript preserved in Government Oriental Library, Chennai, India.
<i>Vaalai vaagadam</i>	Thetchinamoorthi	Palm manuscript preserved in Government Oriental Library, Chennai, India.
<i>Pulathiyar vaidyam</i>	Pulastyar	Palm manuscript preserved in Government Oriental Library, Chennai, India.
<i>Vaalaarishtha vaidyam</i>	-	Palm manuscript preserved in Government Oriental Library, Chennai, India.
<i>Pillaipini Karpa Urpathi</i>	-	Palm manuscript preserved in Government Oriental Library, Chennai, India.
<i>Pillaipinikku vaagadam</i>	-	Palm manuscript preserved in Government Oriental Library, Chennai, India.
<i>Baala vaagadam 200</i>	-	Hand written document on paper by a vaidyar, which is preserved in Government Oriental Library, Chennai, India.
<i>Baala vaidya pothini</i>	-	Hand written document on paper by a vaidyar, which is preserved in Government Oriental Library, Chennai, India.

Continued.....

<i>Bala vaagadamennum Chimittu rathina churukkam</i>	-	Hand written document on paper by a vaidyar, which is preserved in Government Oriental Library, Chennai, India.
<i>Baala vaagada thirattu vaidyam kumara thanthiram</i>	Kandasamy Mudaliyar	India.
<i>Chega Raaja Sekaram</i>	Ravanan	Sri Lanka
	King Chega Rajan	Sri Lanka

Table 2: The sub classification (10 stages) of paalunnum paruvam based on the physical activity

Age range	Paruvam (Stages) in male child
<3 months	<i>Kaappu pruvam</i>
3-6 months	<i>Senkeerai paruvam</i>
6-9 months	<i>Thaala paruvam</i>
9-12 months	<i>Chappani paruvam</i>
12-15 months	<i>Muttha paruvam</i>
15-18 months	<i>Varugai paruvam</i>
1 ½-2 years	<i>Ambuli paruvam</i>
2-2 ½ years	<i>Sitiril paruvam</i>
2 ½-3 years	<i>Siruparai paruvam</i>
3-3 ½ years	<i>Siruthaer paruvam</i>

For a female child, 1-7 stages remain same. The 8, 9 and 10 stages are named as *ammaanai paruvam*, *kazhangu paruvam* and *Oosal paruvam* respectively.^[9]

Pediatric liver diseases in Siddha Medicine:

'Kaamaalai' and 'chenkamaari' are the two Siddha terms describe the liver diseases. Most of the Siddha literatures obtained from Sri Lanka^[10] and India classified pediatric liver disease into 3 subtypes based on clinical features. They are *manjal*, *varal* and *oothu (neer) kaamaalai*. Whereas, few Siddha literatures (written by Sage Agastyar) obtained from India, have additional two, thus five subtypes.^[11] They are *manjal*, *varal*, *neer (oothu)*, *maantha*, and *paandu kaamaalai*. These five liver diseases have been described between 757-776 stanzas of *Kumba muni baalavaagadam*. *Kamaalai nithanam*, another Siddha literature published from Kanyakumari district of India written by a disciple (name is not mentioned) of Sage Agstyar mentions 6 subtypes such as *manjal*, *varal*, *vaatha*, *pitha*, *silerpana (kaba)* and *thontha kaamaalai*.^[12] In all the above three types (3,5,6 subtypes) of classifications, *manjal* and *viral* kaamaalai are common. A total of 9 subtypes have been documented in different literatures with different clinical features.

Oothu (neer) kaamaalai

The cardinal clinical features include edema in legs, hands and face, hungry in the midnight, ulceration in tongue,

fever, diarrhea, and paleness of the conjunctiva. The polyherbal formulations described for the treatment of *oothu kaamaalai* include *Thiripalathi kashyam*,^[13] *Kitta karkam*,^[14] *Mudakkaruthaan kudineer*, *Neerkaamaalai kashyam*^[15] and *Neerkaamaalai nei*.^[16]

Manjal kaamaalai

The cardinal clinical features include yellowish discoloration (of tongue, conjunctiva, nail and urine) due to accumulation of biliary secretion, vomiting, fever with rigor followed by swearing, abdominal pain, anemia, deep breathing, and constipation. The polyherbal formulations described for the treatment of *manjal kaamaalai* include *Keezhanelli kudineer*, *athimathura karkam*, *Keezhanelli karkam*, *mutchankan maathirai*, *Kaattaamanakku karkam*, *karisaalai Kashayam* and *Parutthipaal nei*.

Varal kaamaalai

The cardinal clinical features include greenish discoloration of eye, diminished vision, excess thirst, loss of appetite, dark urine, white colored stool and body muscle wasting. The polyherbal formulations described for the treatment of *varal kaamaalai* include *Kittakarkam*, *Manithakkaali karkam*, *keezhanelli karkam*, *nannaari kashayam*, *Malaithaangi kashayam*, *Nelliparuppu karkam* and *Kaantha parpam*.

'Kaamaalai nithanam'^[17] mentions additional features such as fatigue, insomnia, less food intake, irritability, lower abdominal pain, burning micturition and yellowish discoloration of skin. If these severe symptoms appears, it leads to death. If the child with these symptoms survive (*avadhi* in Siddha) up to 36 days, then the child will not die. If untreated, child may develop hematemesis even after 7 - 10 months. However, it is better to start treatment before 48 days of onset to cure this condition. These might be the later observation of the disciple of Sage Agastyar, who documented the literature.

Maantha kaamaalai

The cardinal clinical features include ascites, edema, fever, excess thirst, headache, body pain, fatigue, fissures in lips and diarrhea. The polyherbal formulations described for the

Table 3 : List of herbals used for the management of pediatric liver diseases

Siddha name	Botanic name	Parts used
Aadathoda	<i>Justicia adathoda</i>	Leaf
Aathaaliarisi	<i>Linum usitatissimum</i>	Seed
Aavaarailai	<i>Cassia auriculata</i>	Leaf
Ada pathiyam	<i>Holastemma adakodien</i>	Rhizome
Aamanakku	<i>Ricinus communis</i>	Leaf, oil
Agil	<i>Aquilaria agallocha</i>	Wood
Ammaanpaccharisi	<i>Euphorbia hirta</i>	Whole plant
Amukkooram	<i>Withania somnifera</i>	Root
Arathai	<i>Alpinia galanga</i>	Rhizome
Arithagi (kadukkai)	<i>Terminalia chebula</i>	Fruit
Athimathuram	<i>Glycyrrhiza glabra</i>	Root
Brahmi	<i>Bacopa monnieri</i>	Whole plant
Avuri	<i>Indigofera tinctoria</i>	Leaf
Boomithaalam	<i>Curculigo orchioidea</i>	Rhizome
Chanthanam	<i>Santalum album</i>	Wood
Chukka (Inji)	<i>Zingiber officinalis</i>	Rhizome
Chinni	<i>Acalypha fruticosa</i>	Leaf
Chitthamutti	<i>Pavonia zeylanica</i>	Root
Cithara paalaadai	<i>Euphorbia thymifolia</i>	Whole plant
Devadharam	<i>Cedrus deodora</i>	Wood
Elam	<i>Elettaria cardamomum</i>	Seed
Eerulli	<i>Allium cepa var. aggregatum</i>	Rhizome juice
Ellennai	<i>Sesamum indicum</i>	sesame oil
Elumichai	<i>Citrus medica</i>	lemon juice
Jeeragam	<i>Cuminum cyminum</i>	Seed
Kirampu	<i>Myrtus caryophyllata</i>	Flower bud
Kaarkolarisi	<i>Psoralea corylifolia</i>	Seed
Karisalankanni	<i>Eclipta prostrata</i>	Leaf, root
Kadugurohini	<i>Picrorhiza kurroa</i>	Seed
Kandankaari	<i>Solanum xanthocarpum</i>	Whole plant
Kallililai	<i>Euphorbia ligularia</i>	Leaf
Karunjeeragam	<i>Nigella sativa</i>	Seed
Karumbu (sarkarai)	<i>Saccharum officinarum</i>	Juice and sugar
Kasthoorimanjal	<i>Curcuma aromatic</i>	Rhizome
Keezhanelli	<i>Phyllanthus niruri</i>	Whole plant
Kontrai	<i>Albizia procera</i>	Root bark
Koraikizhangu	<i>Cyperus rotundus</i>	Rhizome
Koovaineeru.	<i>Maranta arundinacea</i>	Starch from the rhizome
Kuppaimeni	<i>Acalypha indica</i>	Whole plant
Kuttivizhaathi	<i>Limonium crenulatum</i>	Leaf, root bark
Kodikkali	<i>Sarcostemma intermedium</i>	Latex
Kottam	<i>Costus speciosus</i>	Rhizome
Maavilangam	<i>Crataeva magna</i>	Bark
Kumari	<i>Aloe vera</i>	Dried leaf
Malaithaangi	<i>Cissampelos pariera</i>	Root
Manithakkali	<i>Solanum nigrum</i>	Whole plant

Manjal	<i>Curcuma longa</i>	Rhizome
Milagu (sevviyam)	<i>Piper nigrum</i>	Fruit, root
Mudakaruthan	<i>Cardiospermum helicacabum</i>	Root
Munthiri	<i>Vitis vinefera</i>	Dried fruit
Mutsangan	<i>Azima tetracantha</i>	Root
Murungailai	<i>Moringa oleifera</i>	Leaf
Mara manjal	<i>Coscinium fenestratum</i>	Stem
Mullikeerai	<i>Amaranthus spinosus</i>	Root
Musumusukkai	<i>Melothnia maderaspatana</i>	Whole plant
Maathalai	<i>Punica granatum</i>	Fruit
Malaithaangi	<i>Cissampelos pareira</i>	Root
Naarathai	<i>Citrus aurantium</i>	Fruit
Nannaari	<i>Hemidesmus indicus</i>	Root
Naayuruvi	<i>Achyranthus aspera</i>	Root
Neermulli	<i>Hygrophila auriculata</i>	Whole plant
Nellikai	<i>Emblica officinalis</i>	Fruit
Nervaalan	<i>Croton tiglium</i>	Kernel
Nilampirandi	-	Root
Nubthiri	-	Whole plant
Notchi	<i>Vitex negundo</i>	Leaf, root
Orilaithamarai	<i>Hybanthus enneaspermus</i>	Whole plant
Omam	<i>Trachyspermum ammi</i>	Seed
Paagal	<i>Momordica charantia</i>	Leaf juice
Paruthi	<i>Gossypium indicum</i>	Seed juice
Pazhampaasi	<i>Sida humilis</i>	Root
Perunjeeragam	<i>Foeniculum vulgare</i>	Seed
Perungaayam	<i>Ferula asafetida</i>	Gum (resin)
Pirandai	<i>Cissus quadrangularis</i>	Root, tender stem, leaf
Poongathali	<i>Pandanus tectorius</i>	Bark, rhizome, fruit
Poovangurunthal	<i>Vernonia cinerea</i>	Whole plant
Puliilalai	<i>Tamarindus indica</i>	leaf stem
Raamiccham	<i>Andropogon muricatus</i>	Root
Seemainila vembu	<i>Justicia paniculata</i>	Whole plant
Sankankuppi	<i>Clerodendron inerme</i>	Leaf, root
Sangupushpam	<i>Clitoria ternatea</i>	Root
Saathikkai (saathipathiri)	<i>Myristica fragrans</i>	Seed, aril
Sevvalli	<i>Rubia cordifolia</i>	Whole plant
Sirupunalarisi	<i>Celastrus paniculatus</i>	Seed
Sivadhai	<i>Operculina turpethum</i>	Root
Sivannar vembu	<i>Indigofera aspalathoides</i>	Whole plant
Sivappu chanthanam	<i>Pterocarpus santalinus</i>	Wood
Seetnhil	<i>Tinospora cordifolia</i>	Stem
Seenappaavu	<i>Smilax china</i>	Stem
Sirukeerai	<i>Amaranthus tricolor</i>	Root
Sirupeelai	<i>Aervalanata</i>	Whole plant
Soothailai	-	Leaf
Thennai maram	<i>Cocos nucifera</i>	tender coconut water, coconut milk, oil
Thetraan	<i>Strychnus potatorum</i>	Seed

Thumbai	<i>Leucas aspera</i>	Whole plant
Thippili	<i>Piper longum</i>	Fruit
Thazhuthaazhai	<i>Clerodendron phlomidis</i>	Root
Thaantrikai	<i>Terminalia belerica</i>	Fruit
Thaamarai vazhayam	<i>Nelumbo speciosum</i>	Stem, fruit
Thanneer vittaam	<i>Asparagus racemosus</i>	Root
Thoothuvelai	<i>Solanum trilobatum</i>	Leaf, root
Thulasi	<i>Ocimum sanctum</i>	Whole plant
Uluvaarisi (Venthayam)	<i>Trigonella foenum graceum</i>	Seed
vasampu	<i>Acorus calamus</i>	Rhizome
Vallaarai	<i>Centella asiatica</i>	Whole plant
vaaluzhuvai	<i>Ammonium subulatum</i>	Seed
Vaazhai	<i>Musa paradisiaca</i>	Flower, rhizome
Velipparthi	<i>Pergularia daemia</i>	Whole plant
Vellai venkaayam	<i>Allium cepa (white)</i>	Rhizome
Vellai poondu	<i>Allium sativum</i>	Rhizome
Vetpaalai arisi	<i>Wrightia tinctoria</i>	Seed
Vishnu mooligai	<i>Evolvulus alsinoides</i>	Whole plant
Vizhaalarisi (vaividangam)	<i>Embelia ribes</i>	Seed

Table 4: Minerals and animal derived products used as drugs for the management of pediatric liver diseases

Siddha Name	English name
<i>karungozhieeral</i>	Black chicken liver
<i>Velladu</i>	Goat urine, milk
<i>Pasu</i>	Cow milk, ghee, buttermilk, urine
<i>Erumai</i>	Buffallow butter
<i>Kazhuthai</i>	Donkey dung
<i>Thaen</i>	Honey
<i>Arappodi, chenooram</i>	Iron powder and sulphide form
<i>Kittam, chendooram</i>	Iron ore, sulphide form
<i>Gaantham, chenooram</i>	Magnetite ore of iron, sulphide form
<i>Induppu</i>	Rock salt
<i>venkaaram</i>	Sodium tetraborate
<i>savarkaaram</i>	A type of natural salt
<i>porikaaram</i>	A type of natural salt

treatment of *Maantha kaamaalai* include *Karisaalai kashayam*, and *maantha kamaalai nei*.

Paandu kaamaalai

The cardinal clinical features include fatigue, excess thirst, body pain, fever with rigor followed by sweating, paleness of body due to anemia, numbness, ascites, fluid collection in lower abdomen, regurgitation, shrunken eyes and reduction in size of all four limbs. The polyherbal formulations

described for the treatment of *paandu kaamaalai* include *thazhuthaazhai vaer Kashayam*.

Vaathak kaamaalai

The cardinal clinical features include emaciation of body, nausea, paleness of eye, loss of appetite, excess fatigue, constipation and insomnia. The polyherbal formulations described for the treatment of *vaatha kaamaalai* include *vaatha kaamaalai kudineer*, *garlic*, *aya chendooram*, *gaantha chenooram* and *kittam chendooram*.

Pitha kaamaalai

The cardinal clinical features include numbness of limbs, yellowish discoloration of conjunctiva, indigestion, vomiting, emaciation of body, fatigue and anemic paleness. The polyherbal formulations described for the treatment of *pitha kaamaalai* include *thumbai karkam* and *kuppaimeni kashayam*.^[18]

Silerpana (kaba)

The cardinal clinical features include yellowish discoloration (of tongue, conjunctiva and urine), excess sweating (in scalp, face, nose), swelling in small joints, insomnia, dyspnea on exertion, shrunken eyes due to muscle wasting, hiccough and cough. The polyherbal formulations described for the treatment of *Silerpana kaamaalai* include *karungozhi eeral* (black chicken liver) *chooranam* and *silerpana kaamaalai nei*.

Thontha kaamaalai

The cardinal clinical features include yellowish urine, paleness of conjunctiva, severe body pain (similar to inflammatory pain), excess thirst, dryness of mouth, dizziness, mental tiredness and flatulence. The polyherbal formulations described for the treatment of *thontha kaamaalai* include *Sangupushpam* root *karkam*, *chitthamuttivaer kashayam* and *Seeraga karkam*.

Polyherbal formulations for all types of kaamaalai

Chitthamutti vaer kashayam, *mandoorathi kashayam*, *Mandoora adai kudineer*, *kuppaimeni kashayam* and *arithagi chooranam* are the different polyherbal formulations administered orally for the treatment of pediatric liver diseases. *Avuriilai thailam*, *Bharmmi nei* and *kaiyaan thailam* are administered orally as well as to be applied on scalp. Such topical oil preparations are believed to be absorbed systemically. These topical oils are comparable with current transdermal drug delivery system.

Herbals used for liver diseases

A total of 113 herbals have been listed to be useful in pediatric liver disease management (Table 3). Most of the herbals have been proven for their hepatoprotective activity, liver cell regeneration property and diuretic activity. Earlier studies have proven the hepatoprotective activity of many plants which have been listed in Siddha literature, which include *Phyllanthus niruri*, *Aloe vera*, *Curcuma longa*, *Eclipta prostrata*, *Solanum nigrum*, *Asparagus racemosus*, *Azima tetracantha*, *Indigofera tinctoria*, *Cuminum cyminum*, *Withania somnifera*, *Nigella sativa*, *Ricinus communis*, *Moringa oleifera*, *Hemidesmus indicus*, *Tinospora cordifolia*, etc.^[19] *Amaranthus spinosus* and *Hygrophila auriculata* have been proven as the best diuretic plants.^[20] Many plants listed here have antioxidant activities and nutritional value as well. Thus, the polyherbal formulation described for each types of liver disease could have multiple targets in the management of liver diseases.

Animal and mineral based drugs used for liver diseases

The six animal derived products include black chicken liver powder, dairy products of domestic animals, honey and donkey's dung (Table 4). Purified liver extract has antianemia factor, which is helpful in treating anemia in liver cirrhosis. Liver extract is believed to improve liver function, prevent liver damage and treat liver diseases, but currently not preferred. Donkey's dung (*Anbarnesa*) has an important role as a drug in Iranian Traditional Medicine.^[21] Iron supplements when appropriate can prevent chronic

liver diseases.^[22] Siddha medicine also favors using iron in *chendooram* (sulfide form preferably in *nanozie*).

Dietary advices for pediatric liver diseases^[23]

The porridge prepared using *Kovai ilai* (*Cephalandra indica*) leaf juice, *paruthi ilai* (*Gossypium indicum*) juice, cow milk, *pacharisi* (raw rice), *paasi payaru* (*Phaseolus mungo*) and sugar cane sugar is to be consumed as a diet. Sweetening agents to be added in the drugs to improve palatability include honey, sugar cane sugar and *Glycyrrhiza glabra*. Salt, sour, tobacco and alcohol should be avoided by the children during the therapy. If the patient is the feeding infant, then the feeding mother should follow these diet restrictions to prevent the pharmacokinetic/dynamic interactions with the herbal therapy given to the baby.

DISCUSSION

The original elegant prose in Tamil could not be retained in English and here the clinical description and treatment were directly translated. Liver disease is a common disease among Indian pediatric population. The detailed classification and description based on symptomatology along the herbal drug therapy is simply amazing. Though, many subtypes are not directly comparable with the liver diseases mentioned in modern medicine text books, it is remarkable that the documentation was based on ancient yogis clinical expertise.

The etiology of infantile liver diseases include physiological, hereditary, genetic abnormality, infections, autoimmune related and protein deficiency in diet. Anemia and anorexia are associated with hemolytic jaundice, whereas greenish (deep yellow) discoloration seen in obstructive jaundice. Deposition of indirect bilirubin in brain leads to neurological symptoms such as irritability, twitching and mental retardation. Further, the pediatric liver diseases are classified into three stages based on clinical phases; early (pre-ascitic stage), intermediate (ascitic or cirrhotic stage) and terminal stage. In early stage, there is a low grade fever, diarrhea, irritability and palpable liver. In pre-cirrhotic stage, there is a severe emaciation, jaundice, yellowish urine, edema, enlarged liver, liver tenderness and ascites. In terminal stage, jaundice becomes deep with hepatomegaly and bleeding episodes.^[24]

In contemporary pediatric liver practice, the severe forms would not usually be encountered, due to the preventive care, early diagnosis and advanced medical therapies. In modern medicine, there is no curative drug known till now for the liver diseases. Exposure to sunlight is the

best therapy for physiological jaundice. Blood transfusion and maintaining fluidity are other options for severe hemolytic jaundice. Liver extract, iron supplements, vitamin supplements and steroids are used as drug therapy to manage liver diseases based on the severity. Diuretics with potassium supplements are advised to reduce edema and ascites.^[25] It is noteworthy that even Siddha literature describes chicken liver, iron based formulations, diuretic herbals, hepatoprotective herbals and natural salts containing potassium. Most of the herbals listed in Table 3 have been proven for their hepatoprotective and hepatic regeneration property.

For the non-Tamil-speaking medical community, it is hoped that there will be more translations of pediatric and adult Siddha medicine. To date, there have been no notable reports of significant side effects or, for that matter, comparative studies for efficacy. The same herbal remedies could be tried for liver diseases with similar clinical features. A glimpse into the world of the ancient Indian medical literature may provide some knowledge that many new diseases have been acknowledged as common pediatric conditions for centuries. And also some relief or cure may be possible through herbal medicine, though further exploration into the utility and safety of these agents in small children would be particularly advisable before widespread usage in infants. Careful testing and purification to remove heavy metals is needed to demonstrate safety in infants. For the researcher or herbal manufacturer, this can give a hope for drug discovery.

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