



Review Article

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EXPLORING THE CORRELATION BETWEEN MALATU PUZHU AND SCHISTOSOMIASIS: SIDDHA APPROACHES TO TREAT INFERTILITY CAUSED BY PARASITIC INFECTIONS

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ABSTRACT

Infertility affects 60–80 million couples globally, with 15–20 million in India each year. While multiple factors contribute to infertility, parasitic infections like Schistosomiasis, a neglected tropical disease, are often overlooked. Schistosomiasis may lead to azoospermia in males and Asherman syndrome in females; early diagnosis and treatment are crucial to prevent complications. In Siddha texts, infertility caused by pathogens was addressed as Malatu Puzhu, Suronitha Kirumi, and Karba Poochi, with a detailed description of symptoms, progression, and treatments. This study explores the correlation between Malatu Puzhu and Schistosomiasis, as well as Siddha treatments for the condition. This review examines the conceptual correlation between Malatu Puzhu in Siddha texts and schistosomiasis in modern medicine. Classical Siddha textbooks were analyzed using relevant keywords to identify disease descriptions and formulations. Contemporary biomedical literature indexed in PubMed, Web of Science, and Medline was also reviewed to understand the pathophysiology and reproductive consequences of schistosomiasis. The findings reveal a correlation between the manifestations of schistosomal infection and the Siddha concept of pathogen-induced infertility. Several Siddha formulations indicated for Malatu Puzhu and commonly used herbs, which were reported to have antiparasitic, anti-inflammatory, and fertility-supportive properties, were documented. Overall, this review emphasizes the underrecognized role of parasitic infections in infertility and the importance of early intervention. It also highlights the potential of Siddha therapeutic approaches as complementary strategies in managing infertility associated with parasitic infections, warranting further pharmacological and clinical research.

Keywords: Malatu puzhu; infertility; Schistosomiasis; Siddha.

INTRODUCTION

Infertility is a medical condition affecting either the male or female reproductive system, characterised by the inability to conceive despite having regular, unprotected sexual intercourse for 12 months or more.¹ According to a recent report of the World Health Organization (WHO), approximately 17.5% of the adult population, that is one in six individuals globally, experience the impact of infertility.² The prevalence of infertility in India varies between 3.9 and 16.8%.³ While multiple factors contribute to infertility, parasitic infection, such as Schistosomiasis, a neglected tropical disease, is often overlooked. It affects about 250 million people worldwide.⁴ Schistosomes are distinct members of the Class Trematoda. Unlike other trematodes, these adult worms are dioecious, inhabit venous systems, and produce non-operculated eggs. The fork-tailed cercaria of schistosomes develop in snails and infect humans by penetrating the skin.⁵

The prevalence of human schistosomiasis in India is not well established. India has been considered a non-endemic region for human schistosomiasis. The absence of intermediate hosts for anthropophilic schistosomes in India is considered the primary factor hindering the natural lifecycle of these schistosomes in the Indian subcontinent.⁶ However, in recent years, male infertility, ectopic pregnancy and tubal block due to schistosomiasis were reported in India. It shows that environmental changes, immigration of affected individuals and poor hygiene account for the spread. Schistosomiasis may lead to azoospermia in males and

Asherman syndrome in females. Hence, early detection and treatment play a crucial role in preventing the complications of the disease.

The Siddha system of medicine, one of the oldest systems of medicine in India, is based on the principle of three dhosham (Vaadhama, Pithama and Kabama), seven udal thathukal (saram, sennar, oon, kolupu, enbu, moolai and sukilam (sperm) or suronitham (ovum), among the 7 udal thathukal, are responsible for producing offspring. Factors that affect either sukilam or suronitham may result in infertility, which is termed as Maladu.

Puzhu or Kirumi, is one of the factors causing infertility in both males and females. T. V. Sambasivampillai describes Malatu puzhu as a worm infection of the uterus that prevents sperm from entering the uterine cavity in females and a worm that destroys the sperm in males. With this reference, a detailed study was done to explore the correlation between the Malatu puzhu and Schistosomiasis, along with the identification of a Siddha formulation for treating the condition.

This review aimed to study in detail about the Siddha concept of Malatu Puzhu and its possible correlation with Schistosomiasis, as well as to compile Siddha formulations indicated for its management and analyse the pharmacological properties of commonly used herbs. Classical Siddha textbooks were analysed through library resources at the National Institute of Siddha, Government Siddha Medical College Chennai, and Siddha

Central Research Institute. A comprehensive literary search was conducted using keywords such as Malatu Puzhu, Malatu Kirumi, Karba Puzhu, Karba Poochi, Malatu Poochi, and Suronitha Kirumi to extract relevant descriptions, clinical features, and therapeutic approaches. In addition, contemporary biomedical literature indexed in PubMed, Web of Science, and Medline was reviewed to understand the aetiology, pathophysiology, and reproductive complications of schistosomiasis, facilitating a comparative and integrative analysis.

MALATU PUZHU IN SIDDHA:

In the Siddha system of medicine, infertility is referred to as "Maladu." In consonance with T.V. Sambasivampillai and Dr. S. Chithambarathar, the aetiology of maladu is as follows: an overgrowth of uterine layers like the endometrium and myometrium, an imbalance in the vadha dosha (vadam), worm (kirumi or puzhu) infestations, uterine fibroids, and the formation of scar tissue within the uterine cavity. Among these, infertility caused by parasitic infections is specifically mentioned in Siddha texts as "Malatu Puzhu." The term "Puzhu" refers to various types of worms or parasites that grow within living organisms, often in different parts of the body, originating from faeces, phlegm, blood, water, etc. It is also known by terms like "poochi" and "kirumi". Siddha literature recognises 20 types of kirumi related ailments, in which suronitha kirumi, soothaga kirumi, and sukila kirumi are associated with worm infestations in the genitourinary system. "Kirumi Maladu" refers to infertility in women, supposed to be caused by the existence of worms in the uterus, affecting the process of conception.

Varaiyana karbathil malatupuzhu pugil
Viraivana vinthuvai viranthu undidumel
Karaiyana maladiyaal kanaitu pookinaal
Thuraiyana pillaitan sugamana senikume.
- Thirumoolar karba vagada thiratu.

Worms (kirumi) that infest the uterine cavity can cause scarring of the tissue, which prevents sperm from reaching the fallopian tube, leading to infertility. The clinical symptoms of Malatu Puzhu include vomiting, lower abdominal pain, irregular or absence of menstruation (oligomenorrhoea or amenorrhoea), pallor, itching in the external genital area, painful menstruation (dysmenorrhoea), painful intercourse (dyspareunia), post-coital bleeding, vaginal discharge, and infertility may occur at later stages.

MODERN ASPECT OF MALATU PUZHU (SCHISTOSOMIASIS)

Schistosomiasis, also called bilharziasis, is a significant parasitic disease first described by German surgeon Theodor Bilharz in 1851. This helminth infection is prevalent in certain regions of developing countries. The greatest risk of infection occurs among communities lacking proper sanitation, particularly those reliant on agriculture and fishing for their livelihood.⁷⁻⁹ Schistosomiasis occurs in two forms: intestinal schistosomiasis and urogenital schistosomiasis. In which Intestinal schistosomiasis is caused by *Schistosoma mansoni*, *Schistosoma japonicum*, *Schistosoma mekongi*, *Schistosoma guineensis* and *Schistosoma intercalatum*. Urogenital schistosomiasis is caused by *Schistosoma haematobium*. Urogenital schistosomiasis may result in azoospermia in males and asherman syndrome in females, which results in infertility.¹⁰

LIFE CYCLE OF SCHISTOSOMIASIS

The life cycle of schistosomes begins when these blood flukes lay eggs within the veins of the mesenteric, bladder, or reproductive organ plexuses. These eggs are expelled from the human body through urine or faeces into freshwater, where they release larvae known as miracidia. The miracidia actively swim in search of a suitable intermediate host, a specific snail species depending on the schistosome species, and penetrate its tissue. Within the snail, the larvae undergo several weeks of asexual reproduction and development, eventually giving rise to another larval stage called cercariae. In response to environmental triggers, the infected snail releases the cercariae into the water.

These free-swimming cercariae seek out a human host and penetrate intact skin. Upon entry, they shed their tails and transform into schistosomula, developing a robust tegument that helps them evade the immune system. The schistosomula migrate through the circulatory system, reach the portal vein, and mature approximately after 30 days. Around 45 days of post-infection, the fully developed adult worms migrate through the venous system and settle in small blood vessels corresponding to their species: *Schistosoma mansoni* and *Schistosoma japonicum* inhabit the intestinal vessels, whereas *Schistosoma haematobium* resides in the vessels of the bladder or reproductive organs.

Adult schistosomes can persist within the bloodstream for years, producing hundreds of eggs each day while effectively evading immune responses through sophisticated mechanisms. These eggs must either be excreted from the body via urine or faeces or become trapped in surrounding tissues. When eggs become lodged, they induce the formation of perivascular granulomas, a key event in the pathology of schistosomiasis. The severity of the disease depends on various factors such as parasite burden, the host's age, and immune or physiological status. The condition can lead to impairments in physical and cognitive development and affect endocrine and immune functions by producing hormone-like molecules and modulating signalling pathways involving receptors, kinases, and transcription factors.¹¹

UROGENITAL SCHISTOSOMIASIS

Eggs cause inflammation in the urinary and genital tracts, as well as the intestinal walls and liver. In the genital tract, their harmful effects can result in blockages, tissue scarring, damage to anatomical structures, and the generation of antibodies that target sperm cells.¹² Although genital tract pathologies can develop in both sexes, they are more prevalent in women. The eggs of *Schistosoma haematobium* may get deposited in the urinary bladder, lower ureters, cervix, and vagina, where the primary pathology occurs. The proximity of the genital venous plexus facilitates parasitic migration, contributing to the onset of Female Genital Schistosomiasis (FGS). The deposition of schistosome eggs leads to the formation of granulomas, fibrosis, and angiogenesis as part of the inflammatory response. As a result, affected women may experience symptoms such as haematuria, dysuria, and an increased risk of developing bladder cancer.¹²⁻¹⁶

MECHANISM BY WHICH SCHISTOSOMIASIS CAUSES INFERTILITY

Male infertility occurs due to (i) hypothalamic-pituitary-gonadal axis disruption; (ii) testicular tissue damaged by inflammation and granuloma formation; (iii) the obstruction of an accessory sex organ affected by inflammation and granuloma formation, leading to severe oligozoospermia, azoospermia, or subfertile semen.¹⁷

Female infertility may result from (i) inflammation and hypertrophy of the vagina or vulva, fibrous tissue formation in the uterus and fallopian tube; (ii) weakening of the epithelial barrier, which facilitates secondary infection, particularly HIV; (iii) estrogenic imbalance and downregulation of estrogen receptor.^{11,18}

CLINICAL FEATURES AND COMPLICATIONS OF SCHISTOSOMIASIS IN FEMALES:

1. Vaginal discharge.
2. Bloody discharge.
3. Bleeding or spotting per vagina after intercourse.
4. Genital itching or burning sensation
5. Pelvic pain during or after intercourse (dyspareunia).
6. Complications are infertility, urinary incontinence, ectopic pregnancy, genital ulcers, tumors in the vagina, vulva and cervix.¹⁹

Table 1: Correlation between clinical features of Malatu Puzhu and Schistosomiasis

Malatu puzhu	Schistosomiasis
Vanthi	Vomiting
Vayiru novu	Severe abdominal pain
2 / 3 maadham olukku (Menstral cycle) nindru pothal	Amenorrhoea
Udal velupu	Pallor
Thinavu	Itching in external genitalia
Pooppo kalangalil adi vayitiril vali	Dysmenorrhea
Purudarudan koodum kalathil yoniyil (vagina) vali	Dyspareunia
Vellai padal	Vaginal discharge
Vinthuvali (sperm) virainthu undidum	Azoospermia in males and Asherman syndrome in females (preventing sperm from reaching the fallopian tube)

Vomiting and severe abdominal pain are symptoms of intestinal schistosomiasis, while pallor is associated with anaemia caused by *Schistosoma mansoni*, *Schistosoma haematobium*, and *Schistosoma japonicum* due to splenic erythrocyte retention and

autoimmune haemolysis. Other symptoms are linked to urogenital schistosomiasis. This may indicate that Malatu Puzhu in classical Siddha literature address schistosomiasis.

Table 2: Siddha formulation for the treatment of Malatu Puzhu (Schistosomiasis)

Name of the formulation	Nature of formulation	Indications	Dosage and duration
Kandakathiri legium ²⁰	Herbo mineral	Bethi, karbavaayu, karba kirani, malatupoochi, rathakatti and soothagavayu	Nellikai alavu (15gm)
Kalingathi thailum I ²¹	Herbal	Ratha gunmam, malatu puzhu	¼ cheer (70gm) on first 3 days of menstruation
Kalingathi thailum II ²²	Herbo mineral	Vaayu, karba vali, soolai, puzhu, katti, magotharam	½ cheer (140gm) for 10 days
Vizhuthi ennai ²²	Herbo mineral	Karba soolai, karba isivu, karba puzhukal, idupu sollai	½ cheer (140gm)
Karungoli legium ²³	Herbal, mineral and animal product	Kudal vaadham, malatu poochi, kalal vaadham	10 g for 20 days
Kummatikai kadugu ²⁴	Herbo mineral	Karba vipuruthi, vaayu, malatupoochi, peeligai noi, suronitha kedu	1 varagan (4.1gm)
Koli muttai kodiveli arai ²⁴	Herbal and animal product	Malatu poochi	-
Malatu puzhuku kudi marunthu ²⁵	Herbal	Malatu puzhu, karba kirumi	½ padi (0.6l) on first three days of menstruation
Korosanai parpam ²⁵	Herbo mineral	Malatu puzhu	Verukadi (1500 mg) , for 10 – 20 days
Vepilai kayam ²⁵	Herbal	Malatu puzhu	-
Lasunathi mukootu ennai ²⁵	Herbo mineral	Malatu puzhu	-
Paagal ennai ²⁵	Herbal	Malatu puzhu	-
Chandrakanthi chooranam ²⁵	Herbo mineral	Malatu puzhu, karba vaayu, suronitha keduthi	-
Kaayam ²⁵	Herbal	Karba vaayu, kirumi, vayitru pun	Thandrikai alavu (5.4gm)
Karba puzhu nivarthi I ²⁶	Herbo mineral	Karba puzhu	External (Apply over the vagina for three days)
Karba puzhu nivarthi II ²⁶	Herbal	Malasala kattu, karba puzhu and kirumi, vaayu.	Kaasedai (300mg) for first 3 days of menstruation
Karba puzhu nivarthi II ²⁶	Herbal	karba puzhu	Kaasedai (300mg) for first 3 days of menstruation

Table 3: Pharmacological activity of commonly used herbs for the treatment of Malatu Puzhu

Name	Botanical name	Family	Phytochemicals	Activity
Malai vembu	<i>Melia azadiracta</i>	Meliaceae	Linolenic acid, Palmitic acid Caryophyllene, Humulene, Aromadendrene, Probucol Germacrene-D	Anti-bacterial, Anti-fungal, Anti-inflammatory Antioxidant, Hepatoprotective, Larvicidal ²⁷
Vembu	<i>Azadiracta indica</i>	Meliaceae	Azadirachtin, Nimbin Andrographolide Polyphenolic Flavonoids Nimbandiol	Molecular docking of Andrographolide against schistosomiasis revealed that it acts as potential anti- schistosomal drug. ²⁸ Antioxidant, Anti-cancerous Anti-inflammatory ²⁹
Vizhudhi	<i>Cadapa fruticosa</i>	Capparaceae	Cadabicine acetate, Cadabalone Capparisine A – B – dihydroferulic acid	Antimicrobial, Anti-inflammatory Antioxidant ³⁰
Thirugukalli	<i>Euphorbia tirucalli</i>	Euphorbiaceae	Euphol, 12,20 Dideoxyphorbol-13 isobutyrate, 12-deoxy-4 β-hydroxyphorbol-13- phynylacetate-20-acetate Diterpene tirucalicine	Molluscicide activity: An aqueous solution of latex from <i>Euphorbia tirucalli</i> , collected in areas with high sunlight exposure, demonstrated molluscicidal effects on <i>Biomphalaria glabrata</i> . It consists of biodegradable active compound, <i>make it a promising agent against</i> <i>schistosomiasis</i> . ³¹ Anti-microbial, Anti-oxidant Anti-viral, Immuno-modulator ³²
Kumatti kai	<i>Citrullus colocynthis</i>	Cucurbitaceae	Cucurbitacin, Alkaloids Choline, Steroids Colocynthosides A	Molluscicide activity against <i>Bulinus truncatus</i> , the intermediate host of <i>Schistosoma haematobium</i> . Larvicidal ³³ Anti-inflammatory Antimicrobial, Antioxidant ³⁴
Perungayam	<i>Ferula assafoetida</i>	Umbelliferae	Erulenol, Galbanic acid Umbelliprenin, Ferulic acid	Antiparasitic activity against <i>S. Mansoni</i> Anti-microbial, Anthelmintic Anti-inflammatory ³⁵
Kodiveeli ver	<i>Plumbago zylanica</i>	Plumbaginaceae	Plumbagin, chitranone, 3- biplumbvagin, chloroplumbagin, elliptone	Antiparasitic activity: it significantly reduced the number of immature eggs and increased the number of dead eggs in the program and alleviates schistosomiasis. Anti-inflammatory, Antimicrobial, Antioxidant ³⁶
Vengayam	<i>Allium cepa</i>	Amaryllidaceae	Phytoestrogens, Quercetin Apigenin, Phenolic acids, anthocyanins Saponins	It demonstrates an antischistosomal effect by influencing the host's immune response. It contains an immune modulatory fraction that alters the course of the infection, shifting the cytokine profile from a Th2- lymphocyte-mediated immune response, which is linked to granuloma formation, to a Th1-lymphocyte- mediated immune response, which is associated with immune resistance. ³⁷ Anti-inflammatory, Cardio protective, Neuro protective ³⁸

DISCUSSION

The study explores the correlation between Malatu Puzhu, a concept from Siddha medicine, and Schistosomiasis, a parasitic disease that is globally prevalent and causes significant health issues. In parasitic infection Pitham humour is primarily affected, the downfall of pitham leads to derangement of vadham and kabam and ends as kabavatha disease. Because of impaired pitham, the parasite penetrates the skin by fighting against the first line of defence and enters the bloodstream, affecting various organ system and resulting in infertility in both males and females.

On the conceptual link, Malatu Puzhu, one of the factors that cause infertility in both males and females, can result in scarring or obstructions in the female reproductive system, as well as the destruction of sperm in males. This idea closely mirrors the pathophysiology of Schistosomiasis, a parasitic disease that primarily affects the reproductive organs, particularly in its urogenital form. *Schistosoma haematobium*, which targets the bladder, cervix, and other parts of the reproductive system. The inflammatory response to the parasite's eggs leads to fibrosis, granuloma formation, and scarring, which can block fallopian tubes in women and cause azoospermia or oligozoospermia in men.

Both Malatu Puzhu and Schistosomiasis exhibit a range of clinical symptoms that overlap. Common symptoms such as dysmenorrhea (painful menstruation), dyspareunia (painful intercourse), vaginal discharge, and infertility are reported in both conditions. Women suffering from Schistosomiasis, particularly those with genital schistosomiasis, may develop similar symptoms to those described in the Siddha texts, such as pelvic pain, bloody discharge, and vaginal itching. Furthermore, the presence of granulomas and fibrosis due to Schistosomiasis can lead to permanent damage to reproductive organs, which corresponds to the Siddha belief that Malatu Puzhu obstructs the passage of sperm or damages the reproductive system.

In men, Schistosomiasis is associated with azoospermia (absence of sperm in semen) and can cause damage to the testicular tissues, as well as disruption in hormonal regulation of the hypothalamic-pituitary-gonadal axis, leading to male infertility. These symptoms are also mentioned in the Siddha concept of Malatu Puzhu, where kirumi (worms) are believed to destroy sperm and lead to male infertility.

Siddha medicine offers a unique perspective on the treatment of Malatu Puzhu and infertility. Traditional Siddha texts describe a range of herbal and herbo-mineral formulations for the treatment of Malatu puzhu, aimed at balancing the Vadha, Pitham and Kabam doshas. Among which kalingathi thailum and vizhuthiennai, commonly used formulations for the treatment infertility, have an indication of "Ratha gunman" and "Malatu puzhu". It

may refer to Asherman syndrome due to schistosomiasis. Most of the ingredients used in these two formulations have been proven to act against schistosomes in recent studies.

The herbs commonly used in the formulations of Malatu puzhu have anti-inflammatory, antibacterial, antimicrobial, molluscicidal, larvicidal and antioxidant properties. Some among them are proven to reduce the worm burden in schistosomiasis. Future research could explore the molecular mechanisms by which Malatu Puzhu (as described in Siddha texts) aligns with the pathology of Schistosomiasis. Additionally, large-scale studies on the pharmacological properties of Siddha herbs used to treat infertility could provide valuable information for the development of alternative therapies for Schistosomiasis-induced infertility.

CONCLUSION

This article establishes a plausible link between the traditional Siddha concept of Malatu Puzhu and Schistosomiasis, particularly in terms of infertility in both men and women. The clinical features and pathological mechanisms described in both contexts show striking similarities. Herbs used in various formulations for the treatment of Malatu puzhu are proven to act against schistosomes. The study also highlights the need for further research into the use of Siddha medicine in treating parasitic infections and related infertility.

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