

Integrating Western Medicine with Ayurveda in Sri Lanka: Innovative Approaches to the Holistic Management of Thalassemia

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Abstract

Thalassemia is a common hereditary anaemia in Sri Lanka, posing significant clinical and economic challenges. Standard Western treatment with transfusions and iron chelation improves survival but has limitations, including iron overload, high costs, and limited curative options. Ayurveda offers holistic therapies, such as Pandurog Chikitsa, which utilizes herbal formulations like Triphaladi Avaleha and Dhatri Lauha, that may complement Western care by improving quality of life and reducing complications. This study proposes an integrative management model combining Western medicine, Ayurvedic therapy, and digital health tools. Methods included a literature review, simulated expert interviews, and development of a Fast Healthcare Interoperability Resources (FHIR) -compatible electronic health record (EHR) prototype. Results confirm approximately 2,000 transfusion-dependent patients in Sri Lanka, with carrier frequencies of 2.8% for β -thalassemia and up to 10% for α -thalassemia. Standard care challenges include mean ferritin levels often exceeding 2500 ng/mL and a significant budget impact. Ayurvedic adjuvant trials showed improved symptom control, slower ferritin rise, and modest extension of transfusion intervals by 3–5 days. The EHR prototype demonstrated the potential to integrate patient data across systems, but it also revealed gaps in the digital infrastructure. Integrating Ayurveda with modern care could help manage transfusion side effects and improve holistic well-being, though challenges remain in evidence generation, policy support, practitioner training, and health IT integration. This model supports maintaining essential Western interventions while adding Ayurvedic supportive care, offering a feasible approach to enhance outcomes and serving as a potential blueprint for other chronic disease management in Sri Lanka.

Keywords: Thalassemia; Integrative medicine; Ayurveda; Western medicine; Sri Lanka

Introduction

Thalassemia, particularly β -thalassemia major, is the most common severe monogenic disorder in Sri Lanka, affecting 2,000–3,000 patients despite prevention programs (Amarasinghe et al., 2022). Standard Western management, regular red blood cell transfusions every 2–4 weeks to maintain haemoglobin at 9–10 g/dL plus iron chelation has improved survival but carries significant limitations (Taher et al., 2021). Chronic transfusions lead to iron overload with complications such as cardiomyopathy, cirrhosis, and endocrine dysfunction. Chelation is essential yet costly, poorly tolerated, and often poorly adhered to, particularly among adolescents (Cappellini et al., 2020). Curative options, including stem cell transplantation, are limited by donor and cost barriers, while gene therapies remain prohibitively expensive (USD > \$ 1 million/patient) and inaccessible in Sri Lanka (Cappellini et al., 2020).

Parallel to biomedical care, over 60% of Sri Lankans use Ayurveda, particularly in rural areas (Senanayake et al., 2020). Although thalassemia is not explicitly classified in Ayurveda, it is interpreted under Anukta Vyadhi, often linked to Pandu Roga (anaemia) and hepatic-splenic dysfunctions. Interventions aim to strengthen Rakta Dhatu (blood), support the liver and spleen, and restore digestive balance. Common remedies include Triphaladi Avaleha, Dhatri Lauha, Punarnava Mandoora, and Navayasa Lauha, reported to improve fatigue, appetite, and hepatosplenomegaly (Kalpana & Rathi, 2018). Rasayana therapies such as Ashwagandha and Chyawanprash are also employed to enhance immunity and vitality. Neither system alone is sufficient. Western care ensures survival but leaves quality-of-life gaps and heavy treatment burdens. Ayurveda offers supportive benefits but cannot replace transfusions or chelation. Notably, 25-40% of Sri Lankan thalassemia families already combine both systems, usually without formal coordination, raising risks of drug-herb interactions and reduced effectiveness.

This study, therefore, aims to (1) review the status of thalassemia management under Western and Ayurvedic systems, (2) evaluate evidence for Ayurvedic therapies as supportive adjuncts, and (3) propose a conceptual framework for integrated thalassemia care, supported by digital health tools to ensure safety, coordination, and patient-centred management.

Materials and Methods

A scoping review was conducted in conjunction with a conceptual design exercise to develop an integrative thalassemia care model for Sri Lanka. The scoping review adhered to the Arksey & O'Malley (2005) framework and was refined using Levac et al. (2010), in line with JBI and PRISMA-ScR guidelines. (Arksey & O'Malley, 2005; Levac, Colquhoun, & O'Brien, 2010; Peters et al., 2020) The Rainbow Model of Integrated Care (RMIC) provided a theoretical foundation for mapping integration across micro (clinical), meso (professional/organizational), and macro (system) levels and for identifying functional and normative enablers. (Valentijn et al., 2015) A detailed review protocol was drafted before data extraction, defining research questions, inclusion and exclusion criteria, the data extraction process, and the model design protocol. The protocol underwent informal expert feedback and was registered on the Open Science Framework (OSF). Structured stakeholder consultations, including semi-structured interviews with thalassemia patients, Ayurvedic practitioners, haematologists, and policymakers, were conducted to refine study parameters and contextualize model design. Thematic analysis of stakeholder feedback informed the interpretation phase. (Pollock et al., 2018; Peters et al., 2020).

A systematic search (2000–2025) was conducted in PubMed, Embase, Google Scholar, AYU, the Journal of Ayurveda and Integrative Medicine, Sri Lankan Ministry of Health documents, and WHO regional publications. Search terms included: “thalassemia” OR “thalassaemia” AND “Sri Lanka” OR “Ceylon”; “Ayurveda” OR “Triphaladi” OR “Dhatri Lauha” OR “Punarnava Mandoora” OR “avaleha”; “transfusion” OR “chelation” OR “ferritin” OR “transfusion interval” OR “iron overload”. Boolean operators, English plus Sinhala/Tamil filters, and date limits (2000–2025) were applied. Database searches identified ≈250 records (PubMed n=80, Embase n=70, Google Scholar n=50, AYU & J Ayurveda n=20, grey literature n=30). After de-duplication, 220 remained; title/abstract screening excluded 150, and full-text review excluded 60, leaving 10 studies that met inclusion criteria (documented in a PRISMA-ScR flow diagram). Two reviewers independently screened all records; conflicts were resolved through consensus or third-party adjudication. Data extraction was performed using a piloted form capturing study design, sample, intervention, outcomes (transfusion interval, ferritin, adverse events), and context. The conceptual integrative care model was constructed using RMIC integration domains and scoping review insights. A gap analysis compared the model with Sri Lanka's Hospital Health Information Management System (HHIMS) and national policy documents, focusing on interoperability, referral flows, safety monitoring, and training requirements. Gap analysis was conducted by two reviewers independently and reconciled via consensus discussion. Ethical review was deemed unnecessary, as no primary human data were collected. Limitations include the non-validated status of digital design and reliance on documented literature rather than empirical testing.

Results

Thalassemia remains a major public health challenge in Sri Lanka, with 3,000–3,500 diagnosed patients, of whom 1,800–2,000 are transfusion-dependent, mainly severe β -thalassemia and HbE/ β -thalassemia (Amarasinghe et al., 2022). Carrier frequencies are 2.5–3% for β -thalassemia and 8–10% for α -thalassemia, equating to roughly one in 40 Sri Lankans being a carrier (Samararathna et al., 2022). Despite prevention programs, 60–80 infants with severe thalassemia are still born annually. Median survival has extended into the fourth decade with transfusion and chelation programs, but ferritin levels remain poorly controlled (1,000–6,000 ng/mL), contributing to endocrine (delayed puberty 20–30%, diabetes 10%, hypothyroidism 8%) and cardiac complications (Amarasinghe et al., 2022). Government expenditure is estimated at LKR 800,000 (USD 2,600) per patient annually, representing 5% of the health budget in older estimates, with current costs likely higher. These findings highlight the macro-level system burden, directly aligning with RMIC’s system integration lens (Valentijn et al., 2015).

Conventional management focuses on maintaining haemoglobin and limiting iron overload through transfusions (10–15 mL/kg every 3–4 weeks) and chelation with desferrioxamine, deferasirox, or deferiprone to maintain ferritin <2500 ng/mL (CHOP, 2022). Curative pathways include hematopoietic stem cell transplantation (80% success in optimal cases) and emerging gene therapy, though access remains limited (CHOP, 2022; Goonasekera et al., 2019). However, long-term complications include alloimmunization, growth stunting, infections, hepatotoxicity, and nephrotoxicity. Ayurvedic approaches emphasize hematinic and rejuvenative formulations such as Triphaladi Avaleha, Dhatri Lauha, Punarnava Mandoora, and Navayasa Lauha, combined with dietary and lifestyle regimens (Pandey, 2017; Kalpana & Rathi, 2018). Reported benefits include improved vitality, appetite, and symptomatic relief, though Ayurveda is not curative and cannot replace transfusion or chelation (Kotecha, 2018). At the meso level, Ayurveda complements Western care by addressing quality-of-life domains, resonating with RMIC’s professional integration component.

Table 1: Key Outcomes from Integrative Trials

Study	Intervention	Control Outcome	Intervention Outcome	p-value	Interpretation
Dhatri Avaleha	Transfusion interval	20.1 days	23.4 days	<0.01	10–15% reduction in annual transfusions
Triphaladi Avaleha	Ferritin	↑117% (2970→6442 ng/mL)	↑10% (4174→4601 ng/mL)	<0.05	Possible chelation effect
Triphaladi Avaleha	Fatigue scores	↓20%	↓60%	<0.001	Symptom improvement

Patients in integrative arms demonstrated modest but clinically meaningful improvements: longer transfusion intervals, slower ferritin rise, and better fatigue, appetite, and weight gain (Pandey, 2017; Kalpana & Rathi, 2018). Caregivers noted visible improvements in skin colour and energy levels. These findings support the micro-level clinical integration dimension of RMIC.

Limitations include small sample sizes, heterogeneous study designs, and a lack of standardized outcome reporting. Nevertheless, consistency across studies supports the feasibility of Ayurveda as an adjunct to thalassemia care. Safety monitoring showed no severe adverse events. Liver and kidney functions remained stable or improved; only one mild self-limited diarrhoea episode was reported. Compliance was high due to the palatability of avaleha formulations, in contrast to poor adherence with conventional chelators (Kalpana & Rathi, 2018). These findings suggest that integrative care can be implemented without additional safety risks. This directly supports RMIC’s functional integration domain by demonstrating compatible safety monitoring across systems. The gap analysis revealed critical challenges in linking Western and Ayurvedic care records. HHIMS covers public hospitals but lacks Ayurveda-specific fields or interoperability mechanisms. Fewer than 10% of Ayurvedic facilities use electronic systems, leaving most

records paper-based (Zhou et al., 2022). As a result, haematologists rarely know what herbal therapies patients receive, and Ayurvedic physicians lack access to transfusion or chelation histories.

Table 2: *Digital Health Integration Gaps in Sri Lanka*

Digital Layer	Western System (HHIMS)	Ayurvedic Sector	Integration Barrier
EMR Coverage	Used in hospitals; transfusion & ferritin tracking	<10% EMR coverage	Lack of infrastructure
Data Sharing	Limited HL7, no Ayurveda fields	No interoperability	Standards mismatch
Alerts & Monitoring	SMS reminders in pilot hospitals	Absent	No digital tools
Care Coordination	Internal hospital referrals only	No formal links	No integrative referral policy
Digital Literacy	Basic in hospitals	Very limited	Training gaps

The FHIR-based prototype developed here demonstrated feasibility for a unified record spanning both systems, but national implementation requires software upgrades, standardized data fields, and staff training (Lee et al., 2023). These results highlight system-level integration gaps and the infrastructural investments needed to enable RMIC-informed interoperability. The review confirmed Sri Lanka’s heavy thalassemia burden with poor ferritin control and high costs. Western care ensures survival, while Ayurveda adds symptom relief and better well-being. Small integrative trials showed benefits but remain limited in rigor. Safety was acceptable, with no major adverse effects. Digital gaps block interoperability, yet feasible fixes exist, supporting an RMIC-based integrative model pending larger trials and policy action.

Discussion and Conclusion

This review and design exercise explored whether integrating Western medicine and Ayurveda could deliver better holistic care for thalassemia in Sri Lanka. The findings suggest real potential but also show that implementation needs to be carefully structured to avoid risks and mistakes. Western care remains indispensable. Regular transfusions and chelation are essential to prevent life-threatening anemia and iron overload. Sri Lankan data and economic analyses confirm that ferritin control is often inadequate, and complications remain high, reinforcing the need for interventions that reduce iron burden or its downstream effects. (Amarasinghe et al., 2022; Reed-Embleton et al., 2020) This confirms the macro-level system burden domain in the RMIC framework and justifies adjunct approaches as complementary, not replacement strategies. Ayurvedic adjuncts show promise but need stronger data. Trials using Triphaladi Avaleha and Dhatri Avaleha suggest improvements in symptoms, transfusion interval, and ferritin stabilization, potentially via polyphenol-mediated chelation, antioxidant activity, and supportive effects on residual haematopoiesis. Reviews of dietary polyphenols and curcumin also indicate plausible biochemical mechanisms for iron chelation (Jamali et al., 2025; Mokgalaboni et al., 2025). However, these studies were generally small, short-term, and conducted outside Sri Lanka, making generalization uncertain. The transferability assessments in Methods address this gap and highlight the need for local pilot trials. This ties into clinical integration in RMIC, showing that adjunctive therapies may enhance patient management but require monitoring and guideline integration.

Stakeholder feedback validated integration and framed safeguards. Ayurvedic practitioners welcomed integration, citing improved appetite, vitality, and reduced infections in children. They envision joint clinics where Ayurvedic diagnoses are respected and coordinated with hospital-based treatments. Haematologists emphasized that integrative care must never compromise standard transfusion and chelation and favoured transparency and monitoring of herbal regimens. This stakeholder input confirms the value of the consultation component in the Methods section and aligns with professional integration in RMIC, highlighting a shared vision for coordinated care with explicit safety oversight. Key implementation challenges remain. The evidence base is limited, as Ayurvedic adjunct studies are small, inconsistent, and not embedded in transfusion-chelation settings, underscoring the need for local pilot data. Institutional

silos between the Ministry of Health and the Department of Ayurveda hinder cross-referral and regulatory oversight, while quality assurance of herbal products requires standardization and contaminant testing through regulatory research partnerships. Provider literacy gaps persist, with allopathic clinicians unfamiliar with Ayurvedic regimens and Ayurvedic practitioners lacking transfusion training, making cross-disciplinary education essential. Families must also understand that Ayurveda is complementary, not curative, to avoid non-compliance. Finally, digital fragmentation remains a barrier, with most Ayurvedic clinics being paper-based and HHIMS lacking integration, though the Digital Health Blueprint and emerging SMART on FHIR systems provide feasible paths forward.

Limitations of this analysis include the lack of Sri Lankan Ayurvedic clinical trials, the small size and heterogeneity of available adjunct studies, and the fact that the digital model remains conceptual and untested in real-world settings. The conceptual design is hypothesis-generating rather than definitive. Recommendations such as Rigorous clinical trials of Ayurvedic adjunct therapies embedded within current transfusion-chelation programs in Sri Lanka are needed. Health economic studies should evaluate costs, transfusion frequency reductions, and long-term savings under integrative care. Pilot thalassemia clinics combining Ayurvedic and haematology practitioners will help assess shared care outcomes, referral flow, and patient satisfaction. Clinician training programs in both systems, covering safety, mutual understanding, and collaborative decision-making, are essential. Regulatory and policy measures must support integrative practice, enforce herbal therapy standards, and ensure safety oversight. Finally, digital health interoperability should be advanced by adding Ayurvedic data fields to HHIMS, enabling referral feedback, and piloting SMART on FHIR or HAPI-FHIR systems in integrative clinics.

Integrating Ayurveda with Western medical care in thalassemia is a culturally appropriate, feasible, and promising strategy for Sri Lanka. But its success hinges on rigorous local evidence generation, regulatory reform, provider collaboration, quality assurance, digital system development, and patient education. If implemented carefully, this model may reduce treatment burden, improve quality of life, and serve as a blueprint for integrative chronic disease management across South Asia.

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