Texila International Journal | Open Access | Peer Reviewed

Journal: Texila International Journal of Medicine
https://doi.org/10.21522/TIJMD.2013.09.04.Art012

ISSN: 2520-3118
Volume 9 Issue 4, 2026

Integration of Traditional Medicine into the Management of Malnutrition in Mali: A Pilot Study in Bamako District

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Cite this article as: Claude C, Abel N, Sergio G, Toumanio B, Some J, Célestin M, Inès K, Korotimi T, MC Muyer, Rokia S, Integration of Traditional Medicine into the Management of Malnutrition in Mali. A Pilot Study in Bamako District. Texila Int J Med. 2026;9(4). **https://doi.org/10.21522/TIJMD.2013.09.04.Art012**

Received: 07.05.2026
Accepted: 21.10.2026
Published: 29.10.2026

Article Type: Original Research

Abstract *Childhood malnutrition remains a major public health challenge in Mali, where acute malnutrition affects nearly 9% of children under five, conventional treatment coverage remains low, and 70–80% of the population first seeks traditional medicine. This pilot study aimed to describe practices, perceptions, and interactions among traditional pediatric practitioners (TPPs), mothers, healthcare workers, and community leaders regarding childhood malnutrition in Bamako, and to identify factors enabling or hindering collaboration between traditional and conventional health systems. A descriptive qualitative study was conducted from February to April 2021 in three Bamako communes (II, IV, and V), combining semi-structured interviews and focus group discussions with 4 TPPs, staff from 3 community health centers (CHCs), and 13 community leaders, alongside anthropometric screening (mid-upper arm circumference, weight-for-height, and height-for-age) of 302 children aged 6–59 months attending traditional consultations. TPPs reported substantial daily attendance for common pediatric conditions, while malnutrition was rarely recognized by families or practitioners. Screening nevertheless identified 15.8% global acute malnutrition and 14.2% stunting. TPPs, mothers, and healthcare workers were generally receptive to strengthened collaboration, including MUAC training and bidirectional referral. Key barriers included the absence of formal referral pathways, divergent understandings of malnutrition, and limited feedback to TPPs. Involving TPPs in nutritional screening and awareness-raising appears feasible and could facilitate earlier detection among children who may otherwise remain outside the formal health system. Operational research with quantitative impact evaluation is warranted to confirm these findings.*

Keywords *Child Malnutrition, Intersectoral Collaboration, Mali, Primary Health Care, Traditional Medicine, Traditional Practitioners.*

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https://doi.org/10.21522/TIJMD.2013.09.04.Art012

Introduction

Childhood malnutrition remains a major public health problem in Mali and more broadly across sub-Saharan Africa. In 2018, the prevalence of global acute malnutrition (GAM) among children under five years of age was still approximately 9% in Mali, including around 2% with severe acute malnutrition (SAM), while approximately 27% suffered from chronic growth faltering or stunting [1]. Despite a slight improvement compared with previous years, these rates remain concerning and are close to the WHO emergency threshold in some regions. In addition, infant and young child feeding practices remain inadequate: fewer than 10% of children aged 6–23 months receive a minimum acceptable diet according to national surveys [1]. This situation contributes to high child mortality, with malnutrition being associated with nearly half of all deaths among children under five years of age [2].

In response to this burden, Mali has integrated the management of acute malnutrition into its health system for more than a decade. A National Protocol for the Integrated Management of Acute Malnutrition (IMAM) has been in place since 2011 and was revised in 2017. It includes simplified approaches aimed at decentralizing treatment to the community level. These approaches involve community health workers (CHWs), who use mid-upper arm circumference (MUAC) as the sole diagnostic criterion and a single ready-to-use therapeutic food (RUTF) product to treat both moderate and severe acute malnutrition. A pilot study conducted in 2020 in Commune I of Bamako (the OptiMA Bamako project implemented by the NGO ALIMA) suggested that this MUAC-only strategy using a single product was effective, achieving a recovery rate of approximately 90% and mortality below 1% among treated malnourished children [3]. However, the study highlighted low program coverage: among an estimated 3,000–5,000 children with acute malnutrition in the area, only 615 actually received treatment [4]. This finding reflects a broader problem: in many high-prevalence settings, fewer than one in five children with severe acute malnutrition has access to available nutritional treatment services [4]. Multiple barriers to access - including distance to health facilities, transportation costs, limited RUTF stocks, mothers' workload, inadequate knowledge, and cultural perceptions - reduce the effectiveness of conventional malnutrition control programs [5].

At the same time, traditional medicine plays a prominent role in health-seeking behavior in Mali. According to the World Health Organization, approximately 80% of the African population initially seeks care from traditional healers for common health conditions [6-8]. In Mali, an estimated 70–80% of the population consults traditional medicine practitioners and uses traditional pharmacopoeia before turning to the conventional health system [8, 9]. This preference can be explained by several factors, including proximity to and trust in traditional practitioners, who have long been embedded within communities; the relatively low cost of traditional treatments; and strong cultural and religious considerations [2]. Traditional healers, including traditional pediatric practitioners (TPP) and herbalists, are often perceived as more accessible and attentive, with knowledge rooted in local traditions and beliefs, whereas modern medicine may sometimes be perceived as distant or foreign [6]. There is also a very dense network of traditional practitioners: in some areas of Ghana, there is reportedly one traditional healer for every 200 inhabitants, compared with one physician for every 25,000 inhabitants, illustrating their de facto role as first-contact providers [7].

Recognizing this reality, the Malian government is among the few governments in Africa to have officially recognized traditional medicine and sought to integrate it into the formal health system [6]. A Department of

Traditional Medicine was established within the National Institute of Public Health, and several plant-based remedies have been tested and officially approved, with seven already included on the national essential medicines list [6]. Nevertheless, this integration has so far focused primarily on product regulation, particularly improved herbal medicines, and collaboration for specific diseases. There are currently no national guidelines involving traditional practitioners in the detection or management of acute malnutrition. Given the magnitude of the nutritional problem and the high utilization of traditional healers by the population, it is relevant to assess the extent to which these community-based actors could contribute to nutritional surveillance, prevention, and even treatment of malnutrition, as a complement to the conventional health system.

In this contextual background, we conducted a pilot study in the Bamako health district to explore the integration of traditional medicine practitioners, practices, and products into nutrition activities within health services. The objective of this phase was to understand current practices, perceptions, and interactions between traditional and conventional medicine regarding childhood malnutrition, in order to identify enabling factors and barriers to potentially strengthened collaboration.

Materials and Methods

Study Design

This was a descriptive qualitative study conducted as part of a two-phase action-research process. The first phase (2020–2021) consisted of interviews and observations aimed at establishing a baseline assessment of practices and attitudes. The methodology combined individual semi-structured interviews, focus group discussions.

Study Setting

The study was conducted in the Bamako District, the capital of Mali, specifically in three urban communes (Communes II, IV, and V) where highly frequented traditional pediatric care sites are located. The Bamako health district is an administrative and health-management entity under the Ministry of Health and Public Hygiene through the National Health Directorate. Located on the left bank of the Niger River, the city comprises six communes (I to VI), each equipped with community health centers (CHC) and a referral health center (RHC) providing specialized care [10]. According to the 2009 General Population and Housing Census (RGPH), Bamako had approximately 1.81 million inhabitants, with a population density exceeding 3,500 inhabitants/km². By 2025, the population was estimated at 2.5–3 million due to a high annual population growth rate [11, 12]. (9,10). The population is young, with approximately 45% under 15 years of age, while around 25–27% are women of reproductive age, directly influencing demand for maternal and pediatric health services.

The health system is hierarchically structured. community health center (CHC) provide first-line healthcare and preventive services, while referral health center (RHC) provide specialized care and manage severe acute malnutrition. Referral hospitals such as Gabriel Touré Hospital and Point G Hospital provide tertiary care, including surgery and specialized pediatric services, although physician density remains relatively low (approximately one physician per 10,000 inhabitants) [10].

Bamako town faces major health challenges, including malaria, respiratory infections, diarrhea, and malnutrition, with an estimated prevalence of global acute malnutrition of approximately 9% among children under five years of age [13]. Rapid urbanization and inequalities in access to healthcare, particularly in peripheral communes, together with the persistence of traditional medicine and inadequate coverage of nutrition programs,

constitute major obstacles to local public health [14].

Study Population and Sampling

The study population consisted of traditional pediatric practitioners (TPP), mothers of children under five years of age, healthcare workers, and community leaders. In collaboration with the Malian Federation of Traditional Therapists and Herbalists (MFTTH), we selected four well-known and active traditional pediatric practitioners (TPP) - two women and two men, with a mean age of 52 years - who agreed to participate. Their treatment sites were located in the Médina-Coura and Bakaribougou markets (Commune II), Djikoroni Para (Commune IV), and Sabalibougou (Commune V).

In parallel, three corresponding community health centers (CHC) were included to interview conventional healthcare providers, one per commune. Finally, the local community was involved through 302 mothers of children under five years of age who attended consultations with the TPP during the study, as well as 13 community leaders, including members of community health associations, religious leaders, and teachers, identified with the assistance of community outreach workers.

Eligibility and Selection Criteria

Selection was Based on the Following Criteria:

The sample size was not determined a priori on the basis of a predefined theoretical data saturation threshold. Instead, the study adopted an exhaustive purposive sampling strategy, including all mothers and children attending the four selected traditional medicine practitioner (TMP) sites throughout the three-month data collection period, as well as all traditional medicine practitioners, healthcare providers, and community leaders who were accessible within the study municipalities. Thus, sampling was exhaustive within the predefined study sites rather than guided by data saturation. This approach is consistent with previous research investigating the capacity of Malian traditional medicine practitioners and herbalists to integrate nutrition-related activities [15]. However, it limits the potential for statistical extrapolation of the reported proportions.

For TPPs, sites providing traditional pediatric care and receiving the highest patient attendance were considered, with one TPP selected per site. When more than one traditional pediatric practitioner was operating at a given site, the practitioner receiving the largest number of children per day was selected. A total of four TPPs sites were selected in three communes of the Bamako District: two sites in Commune II, one in Commune IV, and one in Commune V. Health areas were selected based on the presence of TPP treatment sites providing care to children with various diseases.

A total of three corresponding community health centers were selected in the three communes hosting the selected TPPs. All mothers of children under five years of age who attended consultations during the study period were included. Community leaders were identified in collaboration with community outreach workers.

Data Collection Process

Two teams led by experienced supervisors conducted the interviews between February and April 2021.

Interviews with the four TPPs were conducted at their workplaces in Bambara, using an interview guide exploring, among other issues, the types of childhood illnesses they routinely managed; their response to a suspected case of malnutrition, including visible wasting and edema; possible referrals to hospitals; existing collaboration, or lack thereof, with health facilities; and their perceptions of why families preferentially seek traditional medicine.

Mothers and accompanying caregivers (302 participants, some participating in focus groups

of 5–8 people) were interviewed immediately after their child's consultation with the TPP. The interviews documented their therapeutic pathways: which symptoms or beliefs prompted them to take their child to a traditional healer or, alternatively, to a CHC; which home remedies had been administered before consultation; and which infant feeding and nutritional prevention practices were followed at home.

Interviews with healthcare personnel - physicians or nurses responsible for nutrition activities at the CHC - focused on their experience with patients arriving after consultation with a traditional healer, the existence of communication or referral mechanisms with traditional practitioners, and their suggestions for improved collaboration.

Finally, 13 community leaders were consulted regarding collective attitudes toward both forms of medicine, beliefs surrounding malnutrition, and possible community-based actions for its prevention.

Data Processing and Analysis

Interviews were transcribed and subsequently subjected to manual thematic analysis. Responses were coded to identify major patterns and significant quotations (verbatim) illustrating participants' views.

Given the qualitative nature of the study and the empirical sampling approach, no statistical generalization was attempted. Any numerical proportions derived from the sample - for example, the percentage of mothers mentioning a particular reason - are presented for illustrative purposes only and should not be extrapolated to the wider population.

Ethical Considerations

To ensure respect for human rights throughout the study, an authorization request was submitted to the ethics committee of the Malian Federation of Traditional Therapists and Herbalists (MFTTH), which issued a favorable opinion. To facilitate integration within the health areas, a separate data-collection authorization request was submitted to the local health authorities and approved.

During the interviews, particular attention was paid to obtaining informed consent from participants and protecting the confidentiality of the information collected. The anonymity of each participant was strictly maintained. All information collected was used exclusively for the purposes of this research.

Results

Profile of Traditional Pediatric Practitioners and Working Conditions

The four traditional pediatric practitioners (TPPs) interviewed, including two women, were aged between 45 and 65 years, with a mean age of 52 years, and had been practicing traditional pediatrics for an average of 21 years.

They received a substantial flow of pediatric patients. According to their estimates, they saw approximately 30 children under five years of age per day on average, although attendance varied considerably by site, ranging from five children per day in Bakaribougou to approximately 100 per day in Djikoroni Para, a highly frequented market.

The traditional healers conducted consultations themselves, established traditional diagnoses, and administered plant-based remedies, including infusions, decoctions, powders, and ointments, which they either prepared or sold on site.

When asked about the origin of their knowledge, all participants emphasized intergenerational family transmission.

One participant stated:

> *"I inherited my knowledge of traditional pediatrics from my grandfather and then my father, and I am now training my daughter so that she can preserve the tradition."*

Another well-known herbalist explained:

> *"My mother taught me everything. Today, together with my sisters, we train our own children as well as our family assistants in this knowledge."*

This family-based transmission ensures continuity of traditional practices but also indicates that each TPP operates within a relatively closed family network, potentially limiting knowledge sharing outside this circle. This may represent a challenge for integration with the formal health system.

Diseases Managed in Traditional Pediatric Care

The most frequent reasons for consultation reported by the TPPs were remarkably similar to those encountered in CHC among children.

Malaria and disorders associated with teething, including infant gingival syndromes, were the most frequently cited conditions, mentioned by all four traditional practitioners.

These were followed by oral candidiasis (thrush), abdominal pain and suspected parasitic infections, tonsillitis and cough associated with acute respiratory infections, common cold, and otitis.

This pattern indicates that, from the perspective of traditional healers, they primarily manage common childhood illnesses.

Notably, malnutrition itself was not spontaneously mentioned among the most common conditions. In other words, traditional practitioners did not appear to consider visible wasting or nutritional edema as a primary reason for consultation. Such manifestations are likely interpreted differently, for example as "loss of appetite" or as a symptom of an underlying disease, rather than being recognized as a distinct clinical condition by healers or parents.

However, when asked about their management of visibly malnourished children who were severely wasted and/or had bilateral foot edema, their responses varied.

Two TPPs reported systematically referring such children to hospitals or CHC because they did not have appropriate therapeutic foods:

> *"I refer every child I see who is too thin to the health center because I do not have Plumpy'Nut or other products to treat them."*

These practitioners appeared to have incorporated messages received through previous nutrition-awareness activities. They reported having previously participated in training organized by the Ministry of Health on malaria and diarrhea management, during which malnutrition had also been discussed.

By contrast, the other two traditional healers acknowledged that they personally managed some cases of moderate malnutrition:

> *"I receive few malnourished children, but when they come, I treat them with plants that stimulate appetite and strengthen the child."*

According to these practitioners, such plants "give strength" or act as rehydrating agents, although no further details were provided.

None of the practitioners had an enriched therapeutic formula or specific nutritional supplement. Instead, they used empirical remedies such as broths made from nutrient-rich leaves, revitalizing roots, and other traditional preparations whose efficacy has not been documented.

Referral to Health Facilities and Existing Collaboration

All traditional practitioners interviewed stated that they had previously referred patients to hospitals or CHC, at least for certain severe conditions.

Severe malaria was the most frequently cited reason for referral, followed by acute diarrhea with dehydration and persistent vomiting.

One healer also reported referring patients with severe anemia, particularly infants with marked pallor, as well as infants with dehydration.

However, the interviews revealed that there was no formal referral or counter-referral system between the two medical systems.

Referrals were informal and one-directional:

> *"I write a short note that the mother gives to the doctor, or I tell her to go quickly, but I am not informed about the follow-up."*

None of the TPPs received feedback regarding the outcomes of patients they had

referred to hospitals, and no official referral forms were used.

Similarly, healthcare providers at health centers confirmed that they had no formal protocol for referring patients to traditional practitioners—which would in any case be inconsistent with official practice—even though they acknowledged that, informally, they might recommend herbal teas or traditional massage as supportive measures.

Despite the absence of a formal framework, a minority of healthcare workers and traditional practitioners had established personal contacts.

For example, a head nurse at a CHC reported:

"I helped two traditional therapists from my neighborhood obtain their MFTTH membership cards. Since then, we have known each other well, and they do not hesitate to refer complicated cases to me."

Such individual initiatives remain rare and depend largely on interpersonal relationships. Most healthcare workers interviewed acknowledged that they did not personally know the traditional practitioners working in their health areas, and vice versa.

Mothers' Perceptions and Therapeutic Pathways

Among the 302 mothers or caregivers interviewed at traditional medicine sites, a very large majority reported regularly consulting TPPs for their children's healthcare.

More than 40% stated that they had consulted the same healer "for as long as they could remember" and could not quantify the number of visits. Some reported coming to the market every week and taking the opportunity to seek advice or obtain remedies.

Approximately 24% were visiting the practitioner for the first time, often because of the practitioner's reputation or a recommendation from a female relative. The remainder had consulted the practitioner two or three times within the previous six months.

This demonstrates strong client loyalty toward traditional practitioners perceived as effective, effectively providing an alternative form of continuity of pediatric care.

When asked why they preferred traditional medicine for their children, mothers primarily cited perceived quality of care and treatment outcomes.

The most frequently recurring theme was the warm reception and attention given to the child:

"At the TPP site, we are welcomed well; they take time to listen to the mother and reassure her. At the health center, they rush through the consultation."

The perceived effectiveness of traditional remedies, particularly for certain conditions, was another major reason:

"Modern medicines do not completely cure my child's illnesses, whereas with the TPP's plants, the child gets better faster and the illness does not come back."

Several mothers cited recurrent oral candidiasis or difficult teething episodes:

"The plants used to paint the mouth are much more effective than the syrups they sell in pharmacies."

Another stated:

"A child washed with plants against 'badigenou' [convulsions/teething] becomes stronger, whereas children treated at the hospital remain fragile."

Affordability was another frequently cited reason. Traditional consultations cost between 500 and 1,000 CFA francs - less than €2 - and remedies were often prepared on site from inexpensive local ingredients, whereas:

"At the pharmacy, the syrup costs 5,000 CFA francs."

Finally, many mothers expressed strong cultural beliefs:

"Traditional medicines treat the root of the problem; they drive away what causes the illness - the evil spirits, the evil eye."

Thus, beliefs and protective practices played an important role. Some childhood illnesses were perceived as resulting from witchcraft or

the “djatigi” (evil eye), requiring rituals and protective herbs that only traditional medicine could provide.

Some mothers reported bringing their children periodically to the TPP even when they were healthy, in order to “strengthen them and protect them from disease.”

It is important to note that very few mothers spontaneously mentioned distrust of modern medicine. Their preference for TPPs appeared to be based primarily on positive perceptions of effectiveness and cultural trust rather than active rejection of health centers.

Nevertheless, when asked what discouraged them from attending CHC, several mothers described the “accessing healthcare was an uphill battle” associated with public health facilities, including waiting times, paperwork, prescriptions that had to be purchased, injections, and occasionally brusque attitudes from healthcare personnel.

One mother summarized this as follows:

“At the hospital, they make you pay to tell you that the child is not seriously ill, or they give you two medicines. Here at the market, the traditional medicine practitioner takes the child on her lap and immediately gives you something to relieve him.”

Household Prevention Practices and Use of Home Remedies

The interviews provided greater insight into how these families attempt to prevent malnutrition and illness in their daily lives before seeking professional healthcare.

Regarding the feeding of young children, mothers reported a variety of foods given to children aged 6–23 months, but overall, few were nutrient-dense.

Breastfeeding was widely practiced and was mentioned by 18% of respondents as a basic food source, which is a positive practice. However, complementary feeding was often based on a limited variety of foods.

Rice was the most frequently mentioned food (17% of responses), followed by cereal porridges made from millet or sorghum and the *dégués* sweetened porridges, as well as low-nutrient foods such as industrial chips and snacks (9%), bread soaked in tea (7%), and others.

Protein- and micronutrient-rich foods such as meat, fish, eggs, fruits, and vegetables were rarely mentioned spontaneously or were mentioned by only a small proportion of respondents. A few mothers mentioned fish soup or potatoes, while almost none mentioned green vegetables or eggs.

This confirms low dietary diversity among young children in our sample, probably related both to culinary practices - where children are often fed the same basic foods as adults, such as rice with sauce - and to economic constraints.

Some mothers acknowledged this deficiency and reported trying to “give foods rich in vitamins” whenever possible, such as fish or small amounts of meat added to the child's porridge.

For the prevention of malnutrition, mothers' responses mainly focused on well-known good feeding practices:

“Feed the child regularly and monitor what he eats.”

“Do not wait; give him enriched porridge and soup in addition to the family meal.”

“Exclusive breastfeeding until six months, followed by gradual introduction of porridges and soups.”

These responses clearly reflect the impact of health-center and community-based education campaigns promoting exclusive breastfeeding and dietary diversification.

However, few mothers mentioned more specific practices such as adding oil or peanut butter to porridge to increase its energy density, or growing vegetables. This may indicate insufficient knowledge of nutrient-dense recipes or limited access to the necessary ingredients.

Regarding general disease prevention, mothers combined modern and traditional approaches.

More than half reported systematic use of insecticide-treated bed nets for children at night to prevent malaria, indicating that this public health message has been widely adopted.

However, traditional remedies also played a major role. Many mothers reported regularly giving their children herbal decoctions as preventive preparations, such as "strengthening" herbal teas after birth or weekly anti-malaria decoctions based on neem or mugwort.

Nearly 20% of mothers stated that they "regularly consulted the TPP even when the child was well, for a check-up and advice."

Some mothers also reported using amulets "gris-gris" to protect their children against any misfortune.

By contrast, only a few mentioned hygiene-related measures such as:

"Avoid giving yesterday's leftovers to the child."

"Give the child clean water."

"Keep the child warm and protected from drafts."

Such responses were less common than traditional preventive practices.

When a child became ill, most mothers initially used home-based treatments before seeking external medical care.

More than half - approximately 53% - reported administering traditional home remedies as soon as symptoms appeared.

For example, in cases of fever or suspected malaria, mothers administered decoctions made from local bitter leaves. For diarrhea, they used herbal teas prepared from roots or baobab juice, which was believed to have antidiarrheal properties.

For teething problems, they used herbal mouth rinses or applied traditional ointments to the gums. For oral thrush, some used gauze swabs soaked in guava-leaf decoctions.

These family recipes are transmitted across urban communities in Bamako.

Approximately 14% of mothers also used modern medicines through self-medication, generally over-the-counter bought syrups such as cough syrup, paracetamol syrup, or teething preparations.

Nearly one in five mothers administered no treatment before consultation, often because the illness was considered immediately severe or unusual, or because they did not know what to do.

Symptoms prompting consultation with traditional practitioners largely overlapped with those reported by the TPPs.

Many mothers sought care for recurrent oral candidiasis, presumed malaria-related fever, persistent diarrhea, vomiting, loss of appetite or weight loss, skin rashes, or unexplained crying that some attributed to an "evil spell or curse" requiring a herbal bath.

Loss of appetite was particularly common: "He no longer eats anything. I am afraid he will waste away, so I take him to the TPP to restore his appetite."

Behind this notion of "loss of appetite" may lie cases of moderate or severe malnutrition that mothers do not recognize as such, instead interpreting the symptom as evidence of illness or a supernatural influence.

This confirms the importance of raising awareness about the signs of malnutrition. Many mothers never use the term "malnutrition" (kujanginé in Bambara) and may not understand the medical concept, even though they notice that their child is becoming thinner.

Finally, a non-negligible proportion of mothers - approximately 5% - reported combining the two medical systems according to their needs.

For example: "I first go to the CHC for vaccinations, fever, and so on, but if the child does not improve, or for certain illnesses such as 'da [signature]', I prefer the TPP."

Another mother stated: "The two systems complement each other. I have no hesitation in going to the hospital for serious problems, but I always return to the traditional therapist to consolidate the recovery."

These accounts and testimonies demonstrate that, in practice, some families already adopt a pragmatic complementary approach. They are not necessarily opposed to biomedicine but consider that it does not always meet all their healthcare needs.

Perceptions of Conventional Healthcare Providers and Community Leaders

Healthcare workers at the health centers confirmed that they occasionally received patients who had previously sought traditional medical care, although they believed that these cases were not always disclosed.

> *"Many parents do not tell us that they first saw a traditional healer, perhaps because they are afraid of being reprimanded," explained one nurse.*

Nevertheless, healthcare workers reported receiving some patients late, with complications. Examples included:

> *"A case of measles that had initially been treated with herbal decoctions, or a severely malnourished child brought to the hospital after a lot of time had been lost with a traditional practitioner."*

According to the healthcare workers, families generally turned to the CHC after "failure of traditional treatment."

Healthcare providers partly understood the initial preference for TPPs, citing the same economic and cultural factors mentioned by mothers: cost, proximity, and customs.

They also recognized that formal health-system coverage remains insufficient, particularly in disadvantaged urban settings where entire neighborhoods may be far from a CHC, contributing to the widespread presence of herbalists in markets.

When asked about possible collaboration with traditional practitioners in the management of malnutrition, healthcare workers expressed cautious support.

Several emphasized that community outreach workers and CHWs already exist and could incorporate trained traditional healers:

> *"If we train these traditional practitioners to measure MUAC and recognize danger signs, they could screen children in their neighborhoods and refer malnutrition cases earlier."*

One healthcare worker recalled that, during a previous government initiative for integration under a former Minister of Health, joint training sessions had been organized with traditional practitioners on malaria and diarrhea. According to him:

> *"It created a climate of trust, and they referred more complicated cases to us than before."*

However, healthcare workers emphasized the need for clear protocols and follow-up:

> *"There would need to be some kind of referral form, a way of tracking the cases they identify, and ensuring that they do not administer inappropriate remedies that delay treatment."*

They were particularly concerned about diagnostic errors, such as interpreting nutritional edema associated with kwashiorkor as having a mystical cause, and about inadequate dosing of traditional treatments.

One physician suggested:

> *"We could formalize a two-way referral system: the TPP identifies and refers a malnourished child to the CHC with a referral note, and after stabilization, the health center could return the child to the community for follow-up, with dietary counseling based on locally available foods."*

The concept of returning stabilized children to the community with the support of trained traditional practitioners is potentially valuable, but it would require national guidelines to become operational.

Community leaders consulted - including members of community health associations and local notables - strongly supported involving traditional practitioners in nutrition activities.

They themselves recognized the importance of cultural beliefs:

"In our community, many people believe that certain illnesses such as "Kono" [severe malnutrition] are caused by djinns or sorcerers/witches, so they go to the healer to remove the spell."

They believed that combating malnutrition requires household nutrition education and that traditional healers could contribute because:

"People listen to them in the community."

Some leaders suggested organizing educational sessions involving both healthcare workers and traditional practitioners, for example in mosques after prayers or during women's meetings, to teach appropriate infant and young child feeding practices, including exclusive breastfeeding for six months, dietary diversification, and avoidance of excessively diluted foods.

They also emphasized the importance of promoting nutritious local recipes:

"Our women no longer know how to prepare bènèdèn [a fortified porridge made from millet, peanuts, and cowpeas]. We need to teach them again with the help of grandmothers and herbalists."

Several cited "tigadéné ni muso," a traditional fortified porridge, which they considered comparable to Plumpy'Nut in effectiveness, as well as mixtures of cereal flour and peanut paste historically used during the lean season.

These traditional food practices could potentially be rehabilitated for malnutrition prevention, with support from community leaders and traditional practitioners.

Finally, community leaders noted that communities had already undertaken activities such as home visits by volunteers or community outreach workers to identify children who were becoming wasted and advise their parents.

According to them, formally involving TPPs and herbalists in these efforts would strengthen families' trust in prevention messages and help overcome cultural barriers:

"If the respected traditional practitioner tells the mother to go to the health center for nutrition care, she will go."

They therefore called for official collaboration in which each party would retain its defined role while supporting the other.

Nutritional Status of Children Consulting Traditional Practitioners

Among the 302 children aged 6 - 59 months measured at traditional practitioner sites, anthropometric findings revealed a significant prevalence of malnutrition in this consulting population.

Based on weight-for-height (WHZ) using WHO growth standards, combined with assessment for edema, 15.8% of children presenting to TPPs had global acute malnutrition (GAM), including 6.0% with severe acute malnutrition (SAM).

Although indicative, these rates are high. For comparison, national GAM prevalence was estimated at approximately 7 - 9% in 2020.

This suggests that children presenting to traditional practitioners are often already in a vulnerable health condition, with malnutrition potentially underlying their other illnesses.

Girls and boys were affected at similar levels, with no statistically significant difference in GAM prevalence by sex in our sample.

Nearly all cases of acute malnutrition detected were cases of marasmus, characterized by severe wasting without edema. No clear case of kwashiorkor, defined by nutritional edema, was observed in the field, although some mothers reported swollen feet that were subsequently diagnosed as kwashiorkor at the hospital.

Using the simple MUAC indicator with a threshold of <125 mm, the prevalence of acute malnutrition was 4.5% among these children, including 0.7% with severe acute malnutrition defined by MUAC < 115mm.

The lower prevalence compared with WHZ is explained by the fact that many children with moderate wasting had MUAC values just above 125 mm, corresponding to the borderline or "yellow" zone, while still being classified as wasted according to WHZ.

This illustrates the limitations of MUAC-only screening for borderline cases. Nevertheless, MUAC remains a practical tool and, in this setting, allowed rapid identification of a proportion of children at nutritional risk.

These 4.5% of children presenting with red or markedly yellow MUAC measurements should have been referred to a nutrition treatment program. However, outside our measurement intervention, they would probably not have been identified because neither mothers nor traditional practitioners routinely measured MUAC before our training.

Furthermore, height-for-age demonstrated that 14.2% of children seen by TPPs suffered from chronic malnutrition, or stunting (height-for-age z-score <−2 SD).

This stunting prevalence was somewhat lower than the national urban average, estimated at approximately 20–25%, which may be explained by selection bias. Our sample included a large proportion of infants younger than 18 months: 53% of children were aged 6–17 months, whereas stunting generally becomes more apparent after two years of age.

Indeed, age-specific analysis showed that younger children aged 6–17 months were less affected by stunting, with approximately 8% having moderate stunting and 2% severe stunting, compared with children aged 18–29 months, among whom severe stunting reached approximately 13% and moderate stunting 18%.

This pattern is consistent with national trends in which chronic malnutrition increases with age, reflecting repeated nutritional deficiencies after the introduction of inadequate complementary foods.

Boys appeared slightly more affected by stunting than girls in our sample (18.8% versus 9.9%, respectively), a difference consistent with national statistics, which generally show somewhat higher malnutrition rates among boys.

The reasons for this disparity remain unclear but may involve biological or sociocultural factors. For example, in some societies girls may receive slightly better nutrition or protection, while boys may be more susceptible to infections contributing to undernutrition.

Regarding overweight, approximately 3% of children seen by TPPs were overweight (WHZ > +2 SD), including 0.7% who were obese (WHZ > +3 SD).

These proportions remained low and were concentrated among younger children, including a few infants under two years of age who were relatively plump. Overweight was therefore not a major concern in this cohort compared with acute malnutrition.

In summary, the anthropometric findings confirm that traditional practitioners frequently receive children who, beyond their apparent acute illnesses such as malaria or diarrhea, have underlying malnutrition.

Without systematic nutritional screening, these children may fail to receive appropriate nutritional care, potentially compromising their overall recovery.

Our study also indicates that the weight-for-height distribution among consulting children was clearly shifted to the left compared with WHO reference standards, suggesting that this population was generally thinner and more nutritionally vulnerable.

This finding underscores the importance of integrating nutritional screening into every consultation, including traditional medical consultations.

Discussion

The findings of this exploratory study demonstrate a real opportunity for integration between traditional and conventional medicine to improve the management of childhood malnutrition in Mali. On the one hand, traditional pediatric practitioners receive large numbers of sick children every day for conditions similar to those treated in health centers, particularly common childhood infectious diseases. They therefore represent a key point of contact for the population, often before any contact with the formal health system. On the other hand, we found that a substantial proportion of children brought to traditional healers suffer from acute malnutrition that is generally not recognized as such. This finding is consistent with observations from other countries. For example, a recent qualitative study in Ethiopia found that parents of malnourished children frequently sought care from traditional healers, partly because they did not recognize malnutrition as a distinct disease and attributed its manifestations to traditional causes [2]. Our findings confirm that many mothers describe "loss of appetite" or "weakness" without linking these symptoms to the biomedical concept of malnutrition and therefore turn to TPPs for these problems. Strengthening early detection through traditional practitioners could therefore address an important weakness in the current system.

Training traditional healers to measure MUAC and recognize nutritional edema could increase the likelihood that malnourished children are detected and referred earlier to appropriate services. The example of neighboring Niger is particularly informative. In the Zinder region, the NGO GOAL trained more than 350 traditional healers and volunteer mothers in MUAC screening, enabling approximately 15,000 malnourished children to receive treatment within only 18 months through an expanded community-based network [16]. One Nigerien traditional healer who subsequently became a community health worker reported that, before receiving training, he "saw many children with signs of malnutrition without recognizing them" and attempted to treat them with herbs for presumed evil spirits [16]. After learning to detect nutritional edema and use MUAC, he was able to save his own daughter and ultimately refer 13 children from his village to the nutrition center [16].

This account illustrates the potential impact of such integration: once traditional practitioners understand malnutrition and are appropriately equipped, they can become valuable allies in referral and community education rather than parallel providers operating in isolation. The diagnostic performance of mid-upper arm circumference (MUAC) alone should, however, be interpreted with caution. A meta-analysis of studies conducted in African settings reported that MUAC had limited sensitivity (38.1%), despite high specificity (94.9%), for the detection of acute malnutrition when compared with weight-for-height (WHZ). This finding is consistent with our own observations, whereby the prevalence of acute malnutrition identified using MUAC (4.5%) was substantially lower than that identified using weight-for-height (15.8%) in our study sample [17]. Accordingly, training traditional medicine practitioners to rely solely on MUAC for nutritional screening may result in a substantial proportion of children with moderate acute malnutrition being missed. MUAC-based screening should therefore ideally be complemented by training in the recognition of other clinical signs, including bilateral pitting oedema and visible wasting, together with systematic referral of children presenting with suspected malnutrition or for whom diagnostic uncertainty remains or whenever there is any doubt. Our study also highlights factors that could facilitate or hinder this collaboration.

Enabling Factors

Traditional practitioners were generally receptive to referring cases beyond their capacity to manage. They already do so, particularly for severe malaria. They recognize their material limitations, including the absence of therapeutic foods, and are willing to cooperate when this serves the child's best interests. Their enthusiastic participation in the brief MUAC training we provided is an encouraging sign. The population, for its part, has a high level of trust in traditional practitioners. If traditional practitioners incorporate malnutrition screening into their routine practices, mothers are likely to accept this approach readily. Indeed, the mothers interviewed overwhelmingly stated that they would follow the advice of a TPP, even if the practitioner advised them to go to the hospital. Traditional authority could therefore serve as a trusted bridge to increase utilization of nutrition services, particularly where an unfamiliar health worker might be ignored. Malian health authorities have also demonstrated a relatively progressive attitude toward traditional medicine [6, 18]. Existing institutions, including MFTTH and the Department of Traditional Medicine, provide structures that could support the development of national guidelines involving traditional practitioners in nutritional screening and prevention. The regulatory environment is therefore relatively favorable compared with that of some other countries.

Challenges

Nevertheless, several challenges must be addressed for integration to be effective and beneficial. The first challenge concerns harmonizing knowledge and concepts.

As highlighted by the Ethiopian study [2], there is a gap between conventional healthcare providers and traditional healers in their understanding of what malnutrition is, its causes, and its treatment. Among Malian traditional practitioners, malnutrition is often attributed to temporary feeding disorders or mystical influences and treated with appetite-stimulating plants rather than through a comprehensive nutritional approach. A substantial investment in training and dialogue will therefore be necessary to establish a common vocabulary. For example, in Bambara, malnutrition could be explained simply as:

“The child is too thin because he is not eating enough or is not digesting properly, and this weakens his body. He therefore needs a special food to help him to regain weight and recover”. Traditional practitioners need to understand the life-saving role of RUTF and fortified foods without necessarily rejecting their own traditional knowledge. One possible approach would be to work with them to identify locally available nutrient-rich plants or food preparations that could be incorporated into complementary feeding. Another major issue is preserving complementarity and avoiding situations in which children are transferred between providers or experience delays in receiving appropriate treatment.

Ideally, a bidirectional referral system should be established: the TPP identifies and rapidly refers children with SAM or medical complications to the health center, and the health center, after stabilization, returns the child to the community for follow-up, including food distribution and weekly MUAC monitoring, potentially supported by a trained TPP. For this to work, communication must be effective through referral forms, telephone communication, or other mechanisms.

Currently, the lack of feedback may discourage traditional practitioners from making referrals because they do not know whether “their” patients received appropriate treatment. CHC healthcare providers, meanwhile, may be suspicious of traditional practitioners if they perceive them as competitors or as sources of treatment delays. These mutual concerns will need to be addressed through joint workshops, mutual respect, and clearly defined roles. The

management of moderate acute malnutrition also requires consideration.

Even within Mali's conventional health system, moderate acute malnutrition is inadequately covered, with active treatment often focused primarily on SAM. Involving traditional practitioners could provide an opportunity to extend MAM management to the community level, potentially using a single therapeutic food product such as the OptiMA approach. However, this would require addressing RUTF supply constraints, as these products are currently imported and expensive, as well as ensuring appropriate supervision and use.

Another option would be to explore locally available solutions for MAM.

Traditional practitioners and local women possess knowledge of nutritious recipes, including fortified flours and peanut-soy porridges. Studies in Benin have documented numerous plants and mixtures traditionally used to manage childhood malnutrition [19].

These remedies could be scientifically evaluated and, if demonstrated to be effective and safe, promoted as supplements for prevention or MAM management, thereby reducing dependence on expensive imported products. It should be recalled that, in conventional programs, treatment costs are substantially driven by RUTF, which may account for up to 50–70% of the cost per child [20, 21]. Mobilizing validated local nutritional resources could therefore improve financial sustainability.

Finally, the involvement of traditional practitioners should be embedded within a broader strategy to strengthen the community health system. Traditional practitioners should work closely with community health workers and community outreach workers already operating in the system. These existing actors cover villages and neighborhoods through various activities, including malaria screening and child growth-monitoring visits.

Traditional practitioners should not replace them but rather complement them by reaching families that even community outreach workers may not reach—particularly families who rely exclusively on traditional healthcare pathways. Local coordination under the leadership of the CHC, bringing together all community-based actors, will be essential to prevent duplication and clarify roles. For example, a community outreach worker could accompany a trained TPP during a screening session at a weekly market.

Conclusion

This study conducted in the Bamako District provides new insight into potential linkages between traditional medicine and the management of malnutrition. Traditional practitioners emerged as highly utilized first-line healthcare providers who enjoy substantial community trust and accessibility that the formal health system does not always provide. We demonstrated that many malnourished children pass through their care without being identified as malnourished, representing missed opportunities for early referral to appropriate services.

Involving traditional healers in the fight against malnutrition through MUAC screening, nutrition education, and potentially community-based management of MAM could substantially improve coverage of nutrition interventions and contribute to an earlier and more integrated response to acute malnutrition.

Nevertheless, rapprochement between the two medical systems must be pursued rigorously and collaboratively. Traditional practitioners should be trained in the fundamentals of nutrition and modern clinical criteria without devaluing their traditional knowledge. This would enable them to become informed partners capable of recognizing their limitations and working collaboratively with health services.

Formal referral and follow-up mechanisms should be established and supported by health

authorities and traditional practitioner associations. Successful experiences elsewhere in Africa, including Niger and Ethiopia, together with Mali's longstanding commitment to integrating traditional medicine, provide encouraging conditions for such an approach.

In summary, integrating traditional practitioners, practices, and products into nutrition activities is neither a step backward nor a magical solution to cure-all (a magical cure-all). Rather, it represents an additional strategy or tool for reaching the most vulnerable children while respecting the local sociocultural context.

Our preliminary findings support the feasibility of this approach and encourage progression to the operational phase - Phase 2 of the research - in which these concepts will be implemented and quantitatively evaluated in terms of their impact on the detection and recovery of malnourished children.

If successful, such an innovation could serve as a model for other settings in West and Central Africa where malnutrition remains endemic and where health systems could benefit from engaging traditional actors for the benefit of communities.

Study Limitations

Several methodological limitations should be considered when interpreting these preliminary findings. First, this was an exploratory qualitative study based on a convenience sample. The sample size was not determined a priori according to a predefined criterion of theoretical data saturation; rather, it was determined by the number of mothers attending traditional medicine practitioner (TMP) sites during the data collection period.

Second, mothers were recruited exclusively from traditional medicine practitioners' places of practice, introducing an evident selection bias. Consequently, our sample may overrepresent families already engaged in the use of traditional medicine, and the findings cannot be generalized to all children in Bamako. The absence of a comparison group recruited from community health centres (CHCs) precludes determining whether the observed prevalence of malnutrition actually differs from that among children receiving care exclusively through the conventional healthcare system.

Finally, in the absence of a control or comparison group and longitudinal follow-up, this study cannot establish a causal relationship between the use of traditional medicine and children's nutritional status. Rather, it documents an association and reported perceptions at a specific point in time, within a particular urban context, thereby limiting the transferability of the findings to other regions of Mali, particularly rural settings.

Conflict of Interest

The author declares that there are no conflicts of interest related to this study. Every effort was made to ensure impartiality and objectivity throughout the research, data analysis, manuscript preparation and reporting processes.

Acknowledgements

The authors would like to thank the General Directorate of the School of Advanced Studies in Public Health of Mali, the Regional Directorate of Health of the Centre Region, and the Malian Federation of Traditional Therapists and Herbalists (MFTTH) for their assistance in carrying out this study. We also extend our appreciation to all field staff for their assistance with data collection, and to all mothers and fathers who participated in the study.

Ethical Approval

This study received ethical approval from the Ethics Committee of the the Malian Federation of Traditional Therapists and Herbalists (MFTTH), which issued a favorable opinion (Prot. N^{o} 01-10-04-2020/SG). Authorization was also obtained from the relevant local health authorities to conduct data

collection within the participating health areas (Prot. N°01-02-11/2019-RS].

All study procedures were conducted in accordance with national guidelines governing research involving human participants. Written informed consent was obtained from all participants prior to enrolment in the study. Participant confidentiality and anonymity were strictly maintained throughout the study. The Malian Federation of Traditional Therapists and Herbalists (MFTTH),

Authors' Contributions

All authors contributed to the conduct of this work. All authors reviewed and approved the final manuscript.

Data Availability

The datasets generated and analyzed during the current study are not publicly available due to ethical and confidentiality restrictions. However, they are available from the corresponding author upon reasonable request and subject to approval by the Ministry of Health of Mali.

Funding

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors. The study was self-funded, with institutional support from the School of Advanced Studies in Public Health of Mali.

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