

Original Article

Implementing a programme to treat severe acute malnutrition in Indonesia: What works?

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Background and Objectives: Indonesia, a middle-income country with a large population of young children, is predicted to have a demographic bonus in 2045. However, to benefit from this bonus, the government must optimally manage the triple burden of malnutrition to prevent long-term effects that can significantly decrease quality of life. National data in 2023 showed an increased prevalence of acute malnutrition compared to previous years, a wake-up call for the government to address important contributing factors. This article aims to identify the current position of Indonesian guidelines on acute malnutrition (AM) and to provide recommendations. **Methods and Study Design:** A document analysis was conducted to examine the existing guidelines for the treatment of acute malnutrition in children under 5 years of age in Indonesia and their implementation. **Results:** The Ministry of Health published the latest guidelines in 2019 and a technical guideline for the treatment of moderate acute malnutrition (MAM) in 2024. National guidelines were not uniformly implemented across regions due to several factors, such as funding availability, human resources, and logistics. Of the four main components of the latest severe acute malnutrition (SAM) guideline, hospitalisation management has been adequately implemented. Meanwhile, community mobilisation, the availability of outpatient therapeutic regimens, and treatment for moderate acute malnutrition faced numerous challenges. **Conclusions:** The implementation of three of the four components of SAM treatment should be improved, with a focus on screening and early detection of acute malnutrition, strengthening the referral system, providing therapeutic regimens, and developing a sustainable reporting system.

Key Words: severe acute malnutrition, Indonesia, management, RUTF, guidelines

INTRODUCTION

Accelerating the decrease in the prevalence of stunting is one of the global targets within the framework of achieving the Sustainable Development Goals (SDGs) in 2025 and 2030.¹ The Indonesian government aimed to reduce the prevalence of stunting from 30.8% in 2018 to 14% in 2024.² Unfortunately, with the focus of all stakeholder groups on stunting reduction, the prevention and treatment of acute malnutrition have been neglected. This is reflected in the increase in wasting prevalence from 7.7% in 2022 to 8.5% in 2023, surpassing the average wasting

prevalence in the Southeast Asia region (7.8%).^{3–5} Globally, Indonesia ranks second in the caseload of severe acute

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malnutrition after India, with an estimated 2,360,000 cases per year.⁶

Acute malnutrition, or wasting, includes moderate acute malnutrition (MAM) and severe acute malnutrition (SAM). In children less than 5 years of age, MAM is diagnosed if the weight-for-height z-score (WHZ) is between -3 and -2 according to the World Health Organisation (WHO) growth charts for specific age and gender, and/or mid-upper arm circumference (MUAC) between 11.5 and 12.5 cm, while SAM is diagnosed when the WHZ <-3 SD and/or MUAC is less than 11.5 cm, or presence of nutritional oedema.⁷ Recent research has shown that acute malnutrition and stunting are closely associated, with episodes of acute malnutrition preceding stunting.⁸ Therefore, it is imperative to treat and prevent acute malnutrition to reduce later growth faltering and subsequent stunting. Given the current situation in Indonesia, efforts to reduce the incidence and prevalence of acute malnutrition will further decrease stunting prevalence. Moreover, an update on guidelines and regulations for the prevention, detection, diagnosis, and treatment of acute malnutrition is urgently needed. Ideally, programmes to treat children with SAM should also consider screening and early detection, as well as prevention, through interventions for children at risk of failure to thrive and MAM. This article presents the current SAM management programme in Indonesia, with reference to national and international guidelines, and highlights several barriers and potential solutions for the effective treatment of SAM.

METHODS

Document identification

We conducted a structured document analysis of national policies and technical guidelines related to the treatment of SAM among children under five in Indonesia. Documents were identified between January and June 2024 through systematic searches of the official website and document repositories of the Indonesian Ministry of Health (MoH) (<https://repository.kemkes.go.id/>), and at health care facilities for older versions that were not yet digitalised. Eligible documents included national clinical practice guidelines, operational manuals, and national nutrition action plans published between 2000 and 2025.

Data extraction

The documents were identified by capturing the year of publication (2000-2025), children under five years of age, diagnostic criteria for SAM, treatment protocols (inpatient and outpatient), recommended therapeutic interventions, and treatment results. Two reviewers independently extracted data from each document, and discrepancies were resolved by consensus.

Analytical approach

Extracted data were summarised descriptively, and the national guideline content was compared against international guidance issued by the WHO to assess concordance. To compare the Indonesian guidelines on SAM treatment with ongoing programs in South-East Asia, South Asia, and Africa, we also conducted a literature search (PubMed) on SAM treatment programs in general. The purpose of this search was to provide context, rather

than completeness. Changes over time were analysed chronologically to identify shifts in diagnostic criteria, service decentralisation, introduction of digital applications and community-based management approaches.

Rigour

An audit trail was maintained documenting document selection, version control, and analytical decisions. To enhance trustworthiness, preliminary findings were shared with two national experts for validation.

RESULTS AND DISCUSSION

Over the last 2 decades, the guidelines for the treatment of SAM have evolved both globally and in Indonesia. Figure 1 summarises these changes over time as well as barriers to their implementation. Below, we will discuss the most important barriers we have identified.

Unlike the 2011 and 2013 guidelines, which covered only inpatient management, the 2019 guideline includes four components: a) community mobilisation to improve the detection of acute malnutrition, b) outpatient treatment for malnutrition without medical complications, c) inpatient treatment for malnutrition with medical complications, and d) advice on feeding children under five years of age and providing additional food for moderate acute malnutrition (MAM). It also covers the treatment of malnutrition in infants under six months of age.⁹

In general, Indonesia's health system features a well-structured design that facilitates equitable access to appropriate health services at all levels.^{10,11} It consists of: a) community level (*posyandu*), b) first-level health care facilities, *pusat kesehatan masyarakat* (*puskesmas*), c) advanced level, consisting of three types of hospitals according to their medical services and facilities, and d) the back-referral programme or the top-down referral system.¹⁰

Barriers at the community level

At the community level, cadres (health volunteers, the vast majority of whom are women) are empowered to actively promote healthy lifestyle behaviours and disease prevention.¹² They could be involved in implementing community treatment for SAM and in the subsequent monitoring of children in their homes after discharge from the hospital.¹² Indeed, besides vaccination campaigns, cadres could play a central role in screening and early detection of malnutrition, e.g. by performing MUAC measurements, along with weight and height.¹¹

Mid-upper arm circumference (MUAC) measurement is a simple technique using a tape measure that can be performed by cadres and even taught to caregivers. Research in Nigeria, involving nearly 13,000 mothers and caregivers, assessed MUAC and oedema at 3- to 4-month intervals. Results showed that MAM and SAM were detected earlier, and fewer children with SAM required hospitalisation. In addition, the detection effectiveness of mothers and caregivers was comparable to that of Nigerian community health workers.¹³

To date, although early case-finding using MUAC is included in the national guideline, implementation remains highly variable across facilities. A survey in the Kupang district, East Nusa Tenggara Province, showed

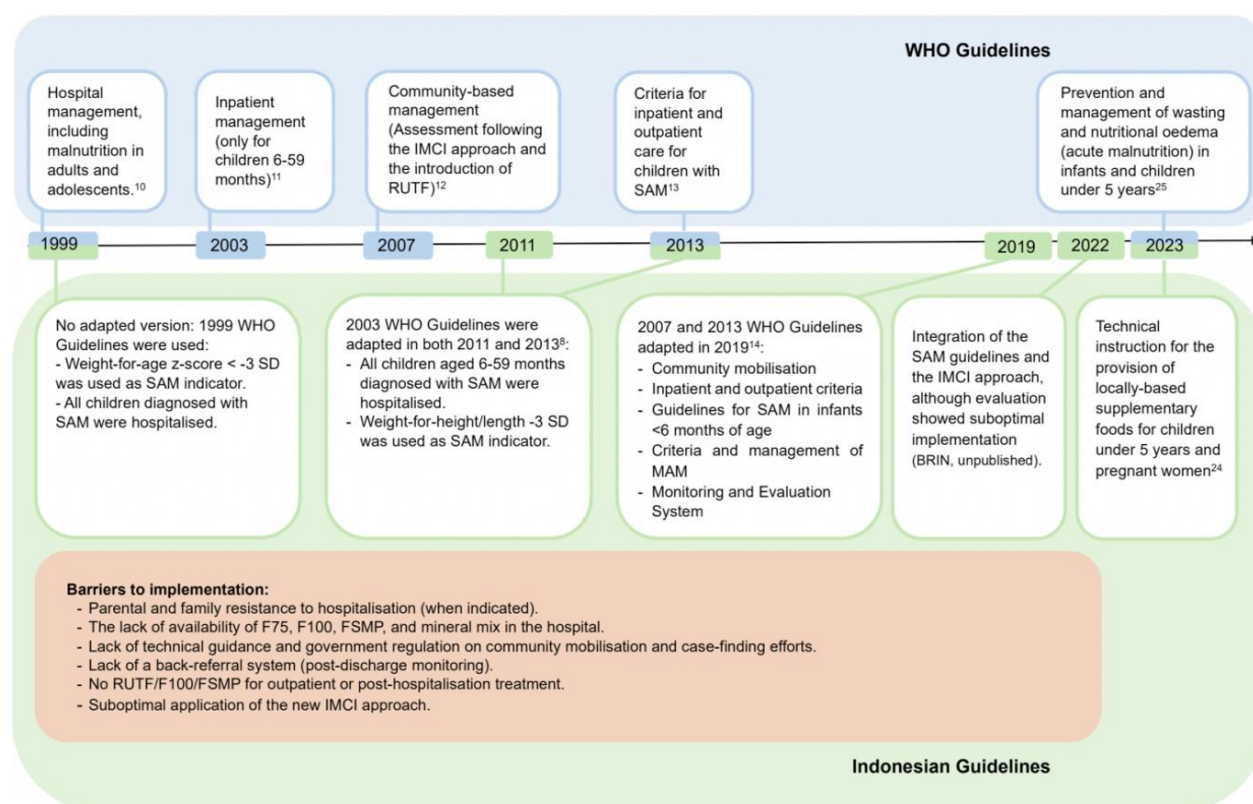


Figure 1. The implementation and barriers of the guidelines for SAM management in Indonesia (FSMP food for special medical purposes, IMCI integrated management of childhood illness, MAM moderate acute malnutrition, RUTF ready-to-use therapeutic food, SAM severe acute malnutrition)

that community mobilisation increased the SAM screening rate from 17% in 2015 to 66% in 2018. Moreover, it increased the recovery rate from 11% in 2015 to 79% in 2017, with a mortality rate below 1%.¹⁴ Unfortunately, this initiative has not been followed up by the government to the same extent as efforts dedicated to identifying childhood stunting.¹⁵

However, screening for MAM or SAM using MUAC has several limitations, including low sensitivity in detecting older children with a WHZ < -2. The effectiveness of screening can be increased by using a higher MUAC screening cut-off point. Laillou et al. found in Cambodia that using a MUAC screening cut-off point of 115 mm resulted in more than 90% of children with WHZ < -3 not being identified, whereas using a cut-off point of 133 mm led to more than 65% being confirmed as having WHZ < -3 SD.¹⁶ Indeed, the discrepancy between MUAC and WHZ in identifying children with SAM is an important global health issue, where children are not receiving treatment because they are not properly diagnosed. A study in Bogor district, Indonesia, used a MUAC screening cut-off of 135 mm (instead of 115 mm) to screen for children at risk of SAM. Of the 2,379 children identified as at risk for acute malnutrition, 560 (23.4%) had SAM, showing the potential of having a higher screening cut-off for MUAC.¹⁷ Research to identify the optimal MUAC screening cut-off point for Indonesia is urgently needed to optimise screening and early detection of SAM and MAM cases.

Barriers at first-level, advanced-level health care facilities and the referral system

In addition to minimal case-finding efforts, the referral system between *posyandu* (village-level growth-monitoring posts), *puskesmas* (sub-district level community health centres), and hospitals was suboptimal.^{11,18} To minimise coordination and collaboration gaps between *puskesmas* and hospitals, the government developed an application called *Pelita Kesmas* to report SAM cases.^{9,19} Data on the treatment outcome from 2020 to 2025 from the Directorate of Family Health Services of the Indonesian Ministry of Health support this study.²⁰

Data showed that since completing the application became a requirement for hospital accreditation in 2023,²¹ its use has increased, leading to a significant increase in data recording for children with SAM. For example, in 2022, only 94 in-patient children with SAM were recorded in the application, whereas in 2023 and 2024, 2278 and 3019 in-patient SAM cases were recorded, respectively (Sheet: "Rawat RS", column: "D"). However, the application has not yet been systematically used across all levels of the health system, and data on recovery, relapse, drop-out, or death are very limited. For example, in 2022 and 2023, less than 10% of cases have had an outcome recorded. According to the same database, in 2023, a total of 736 children with SAM were referred by *puskesmas* to hospitals (Sheet: "Rawat PKM", column: "G"), while 10,846 children were referred from hospitals to *puskesmas* or to higher-level hospitals (Sheet: "Rawat RS", column: "G"). However, data on recovery are available

for less than 5% of these cases (both sheets, column “J”).²⁰

Many parents are commonly reluctant to have their children referred to hospitals. The main reason could be related to financial constraints on transportation and daily expenses during hospital stays. This is further aggravated by the fact that many families struggle to pay for health insurance.^{22,23} The geographical remoteness of many small islands in Indonesia creates additional logistical challenges for travelling to the health facilities (*puskesmas* and/or hospitals).¹¹

Barriers in the training of health workers in programme implementation

The core team for managing children with SAM in *puskesmas* and hospitals consists of physicians (paediatricians or general practitioners), nutrition officers, and nurses or midwives.⁹ The MoH routinely conducts offline training using the WHO integrated management of SAM modules for these core teams.²⁴ For example, 613 health workers (HW) from various districts in Indonesia were certified after training in 2022-2023 (Komdat Ditjen Kesprimkom

/https://share.google/kMuYme9nAgqENh3JP). However, the teams' performance was hampered by the high turnover of trained HWs as they are transferred to other locations, and by the limited availability of mineral mix, F75, F100, ready-to-use therapeutic food (RUTF), and medication (see below), which significantly reduced the likelihood of compliance with the guidelines.^{23,25}

To overcome these obstacles, in 2022, the MoH integrated the training modules on outpatient treatment of SAM with integrated management of childhood illness (IMCI).²⁶ While this can be a successful method to underline the link between the most common causes of morbidity and death in infants and young children, such as diarrhoea, pneumonia and malnutrition, the limited data available suggested that the training on malnutrition was marginalised.²⁷ So far, more than 1700 HWs have received hybrid mode training (online modules and offline workshop at *puskesmas*) by using the combined module, and they are expected to manage not only SAM, but also other forms of malnutrition in children under five.

Barriers to standard therapeutic foods for SAM

Standard therapeutic foods for SAM in children include F75 for the stabilisation phase in hospitalised patients, F100 for the transition phase, and F100 or RUTF for the rehabilitation phase and catch-up growth.⁷ In many cases of disease-related malnutrition as the aetiology of SAM, a formula for special medical purposes (FSMP) is often given based on indication and must be prescribed by the paediatricians.²⁸

The effectiveness of F75 and F100 in the treatment of SAM has been shown in numerous studies conducted in lower-middle-income countries (LMICs), with mortality rates of <2% in optimal treatment centres. Qamer et al. in Karachi found significant increases in body weight (750 g), upper arm circumference (9.3 mm), and body mass index (1.12 kg/m²) over approximately 12 days of hospital treatment with standard F75 and F100 therapy.²⁹ A prospective study conducted in India involving 84 chil-

dren found significantly greater weight gain among those receiving hospital-administered F75/F100 than among those receiving home-prepared food for 4-8 weeks. Specifically, patients with SAM treated in the hospital with formula F75/F100 gained 7.52 g/kg BW/day, whereas those who received traditional food at home gained only 1.01 g/kg BW/day.³⁰ A study in Palembang, Indonesia, showed that the median weight gain during the 14-day rehabilitation phase with F100 was 2.1 g/kg BW/day in children aged 6-59 months, while infants gained 7.6 g/kg BW/day.³¹

Several manufacturers in Indonesia produce commercial F75 and F100, which are used by some *puskesmas*. However, these products do not adhere to the standard composition, including the micronutrient content outlined in the latest WHO guidelines.¹⁵ Although no studies from Indonesia have directly compared the effectiveness of industrially produced versus self-prepared F75 and F100, research found no significant differences in effectiveness between self-mixed F75 and F100 and similar formulations produced by industry.³² However, despite their apparent effectiveness, many of these industrial products do not fully comply with the WHO global standards. This presents a major challenge for the government in scaling up comprehensive nutritional treatment, particularly for inpatient care and outpatient or home-based rehabilitation.^{15,33}

The fourth component of the guideline emphasises the management of MAM, including nutritional counselling and the provision of supplemental therapeutic food.⁹ The government also released a national programme to treat pregnant mothers and children under five years old with nutritional problems, including weight faltering, underweight, and MAM, through the provision of locally produced supplementary food.³⁴ However, these were based on nutritional requirements for healthy children rather than being tailored to those with various nutritional problems.³⁴ Although the effectiveness of the programme was available for some districts,^{35,36} access to the national outcome data was limited.

Lack of Ready-to-use therapeutic food (RUTF) for outpatient management

First developed by the Institut de Recherche pour le Développement (IRD) and Nutriset France, PlumpyNut was the prototype RUTF, a food with a high caloric and protein content (500 kcal/92 g) and a composition similar to F100.³⁷⁻³⁹ The advantage of RUTF over F100 is that it can be consumed immediately from the package and does not require water for preparation. This makes RUTF safer to consume in areas with limited access to clean water.

However, the RUTF available in Indonesia has not yet been adequately utilised. As a result, outpatient treatment for children with SAM was suboptimal because good nutritional quality and the amount of formula milk or food given at home cannot be guaranteed. Data on the results of outpatient SAM treatment in Indonesia are also limited. A study conducted in Banda Aceh in 2013 reported a recovery rate of 7.2%, a mortality rate of 0.9%, and a dropout rate of 9.9% among children with SAM.⁴⁰ The low recovery rate should be interpreted with caution, as the study was conducted in a single city, included a

small sample size, and was undertaken before the implementation of comprehensive SAM management protocols in Indonesia. Therefore, the findings may not be representative of national SAM treatment outcomes.

The importation of RUTF into Indonesia is currently hindered by prohibitive costs, the requirement for specific permits, and complex import regulations. Additionally, standard peanut-paste RUTF is poorly accepted in South-east Asia.^{17,41,42} Therefore, several countries have begun producing RUTF using locally sourced ingredients to increase acceptability and reduce costs.^{41–43} In Indonesia, the Southeast Asia Food and Agricultural Science and Technology (SEAFST) Centre of the Bogor Agricultural Institute (IPB) has developed several RUTF formulations using locally sourced ingredients, such as milk, fish, and legumes, which are rich sources of protein.^{41–43} Four types of RUTF bars were created, incorporating full-cream milk, maltodextrin, a blend of vitamins and minerals, and either coconut oil or palm oil. The aim was to achieve a nutritional composition that meets WHO standards, including 520–550 kcal/100 g of energy, 25–36% fat, and a protein digestibility corrected amino acid score (PDCAAS) of at least 90. Organoleptic tests indicated no significant differences among the four formulas, with the best energy and protein content found in the mixture of mung beans, rice flour, and coconut oil.⁴⁴ Variations in the macro- and micronutrient content, particularly fat, protein, selenium, lysine, omega-3, and omega-6, in the RUTF ingredients are adjusted in formulations using locally sourced ingredients to ensure they become an effective part of an implementation programme.⁴³

In 2021, the first randomised clinical trial in Indonesia compared the acceptability and efficacy of four locally produced RUTFs with Plumpy'Nut in 302 children under five years of age with SAM. The results indicated that local RUTFs were more acceptable than the standard Plumpy'Nut, as shown by significantly higher total consumption over 8 weeks (4.49 kg vs. 2.18 kg, $p < 0.05$). This was attributed to their form and texture, such as wafer-based products, which children are more familiar with in daily snacking contexts.¹⁷ Weight gain (1.6–2.32 g/kg BW/day) was comparable to the standard RUTF and similar to findings in Cambodia and Vietnam.^{42,45} Despite these encouraging results, large-scale production of RUTF has not yet been implemented in Indonesia.

Perspective from other countries

Although Asia has the highest prevalence of wasting, according to the 2025 WHO/UNICEF report⁶, some countries have made progress in reducing malnutrition, including severe wasting (SAM) (<https://globalnutritionreport.org>). Over the last decade, Vietnam has made significant progress through the Nation Plan of Action on Nutrition (NPAN), supported by the Scale Up Nutrition (SUN) funding, and through the implementation of nutrition-sensitive and nutrition-specific interventions.⁴⁶

Although the programme to treat SAM in Cambodia has been in place since 2000 and involves multisectoral interventions and community-based management, many factors have hampered the implementation.⁴⁷ This results in a higher country prevalence of wasting than the South-

east Asia prevalence.⁵ India's government restricted the import of RUTF and has begun developing alternative, locally produced, nutrient-dense foods tailored to Indian children, acceptable in the community.^{48,49} In Eastern and Southern African countries, community management of acute malnutrition (CMAM) has been applied since 2007, including MUAC screening by caregivers, simplified RUTF dosages, and treatment of uncomplicated SAM by community health workers,⁵⁰ even though the effectiveness of programmes was sometimes affected by factors such as service delivery or financial restraints.⁵¹

Conclusions

The current Indonesian guidelines for the treatment of SAM largely follow the latest WHO/UNICEF recommendations, but face several challenges, including low case detection, resistance to referral, poor implementation by healthcare workers, the use of non-standardised food products, a lack of affordable outpatient food options, and a suboptimal reporting system. Furthermore, despite improved inpatient care, continuous monitoring by lower-level health facilities and the local government is lacking. Thus, strengthening treatment and prevention programmes for SAM needs to be done at all levels of the health system.

Recommendations for implementation

We have identified four key components of the current programme that need prioritisation (Figure 2).

Screening and early detection of acute malnutrition

Given their essential role at the grassroots level, a significant consideration for the Indonesian government should be the consolidation and strengthening of the cadres' position. Currently, cadres are not routinely involved in screening for acute malnutrition, although they regularly visit families with children under five years of age. Regular MUAC measurements and oedema examinations by cadres to identify children at risk of acute malnutrition could be a strategy to increase case detection. Screening using MUAC could also be taught to mothers or caregivers to involve them more in their children's routine care and increase their interest in monitoring treatment effects if their children have acute malnutrition. A higher MUAC cut-off to screen children at risk in the community should be piloted to determine the optimal screening cut-off for sensitivity and specificity, while ensuring the health system is not overburdened.

Availability of therapeutic foods

The Indonesian Ministry of Health should issue regulations on nutritional therapy for acute malnutrition, such as F75, F100, and RUTF, that are effective, safe, and easy to distribute nationwide. The traditional F75 and F100, which are difficult to prepare, can be replaced with a ready-to-use formula when access to safe, clean water sources is guaranteed. However, (local) RUTFs are needed as an alternative nutritional therapy for outpatient care. Indonesia has institutions capable of formulating products that meet the WHO standards; however, local production is hindered by a lack of standardisation. The MoH should establish guidelines for the composition, formula, and

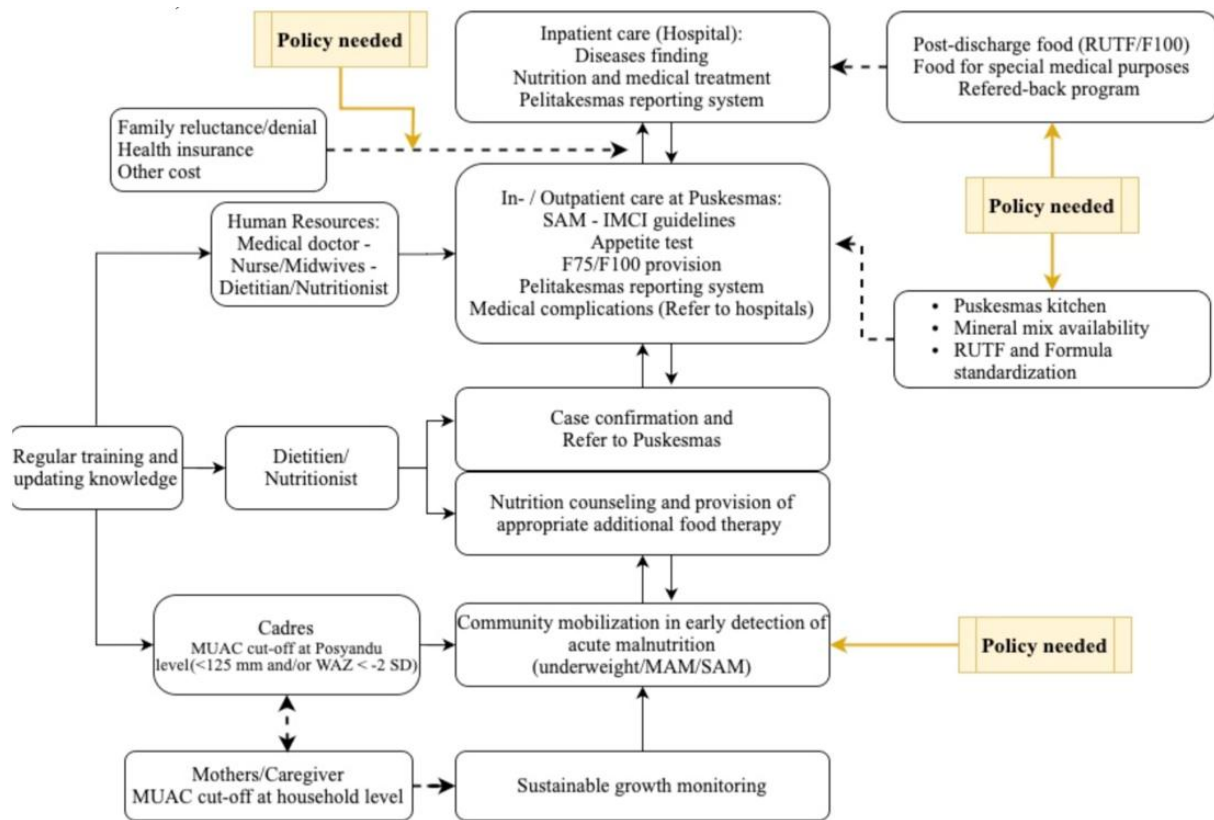


Figure 2. Key components of the recommendations. The recent programme to reduce acute malnutrition needs to be strengthened through some actions and supported by government policies at the household/community, health care service, and referral/health insurance system levels. RUTF: ready-to-use therapeutic food, SAM: severe acute malnutrition, IMCI: integrated management of childhood illness, MAM: moderate acute malnutrition, WAZ: weight-for-age Z score, MUAC: mid-upper arm circumference

packaging of RUTF to support industrial production and ensure quality. Additionally, the government must address logistics to ensure the proper storage and distribution of RUTF throughout the country.

Referral system

In line with the increasing efforts to detect cases, the referral system should also be strengthened. At the household level, sustainable education can encourage parents and caregivers to be more involved in their children's growth and development. This could be carried out by offering parenting classes led by various health workers and other related professionals, either at the *posyandu* or in the village hall. This approach ensures that families understand and are willing to visit the *puskesmas* or a hospital when necessary. Additionally, the local government should facilitate the referral process and provide vehicles to transport children and their families to and from the health facility. The participation of local governments and the community raises awareness of acute malnutrition within their jurisdictions, leading to more targeted planning and available budget.

Reporting system

The *Pelita Kesmas* reporting system is crucial for monitoring and evaluating acute and chronic malnutrition, serving as both a database and an evaluation tool. It provides essential data for research and government or non-governmental programmes, helping to diagnose, manage, and monitor malnourished children, even when they re-

late. Additionally, *Pelita Kesmas* should be used to track dropout, default, and cured cases, providing objective, accountable reports for programme evaluation. These comprehensive data are essential for evaluating treatment effectiveness and informing future strategies and regulations in Indonesia.

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DISCLOSURE ON THE USE OF AI AND AI-ASSISTED TECHNOLOGIES

The authors acknowledge the use of Grammarly (accessed since 2024) for language editing and clarity improvement. All AI-assisted revisions were reviewed and approved by the authors.

CONFLICT OF INTEREST AND FUNDING DISCLOSURES

The authors declare that they have no conflicts of interest. The corresponding author has been awarded a PhD grant (ARTS) by the Institut de Recherche pour le Développement (IRD).

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 12. World Health Organization. Guideline on the prevention and management of wasting and nutritional oedema (acute malnutrition) in infants and children under 5 years Thank you for your email and for bringing this to our attention.
 13. We sincerely apologize for the confusion caused by the decision letter. Upon checking, it appears that the incorrect decision letter template was used, which resulted in the reference to animal experimental studies. We confirm that your manuscript is a human clinical study, and it was not rejected on the basis of being an animal study.
 14. However, we regret to inform you that the decision to reject the manuscript remains unchanged. The main concern relates to the statistical analysis used in the study, which the Editor-in-Chief felt was not sufficiently appropriate to support the conclusions of the manuscript.
 15. We apologize again for the confusion caused by the incorrect wording in the decision letter, and we appreciate your understanding.
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