

Implementation Research on Multiple Micronutrient Supplementation for Non-Anaemic Pregnant Women in Sri Lanka

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Family Health Bureau
Ministry of Health & Mass Media
Sri Lanka



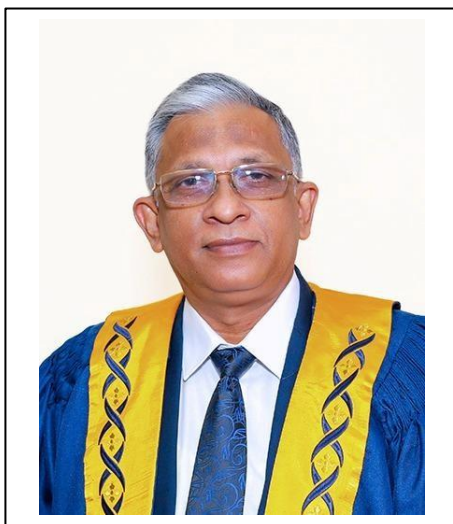
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MESSAGE FROM THE DIRECTOR GENERAL OF HEALTH SERVICES



Maternal nutrition remains a cornerstone of ensuring healthy pregnancies and optimal birth outcomes. The introduction of Multiple Micronutrient Supplements (MMS) for non-anaemic pregnant mothers as part of Sri Lanka's antenatal care programme reflects the Ministry of Health's commitment to strengthening evidence-based maternal and child health interventions. Since the nationwide implementation of this programme in 2024, valuable experience has been gained in integrating MMS into routine maternal healthcare services.

The successful implementation of any public health intervention, however, extends beyond its introduction. It is equally important to evaluate whether the programme is achieving its intended objectives, reaching the target population effectively, and delivering measurable health benefits. Post-implementation evaluation provides valuable evidence on programme coverage, adherence, acceptability, effectiveness, and operational challenges. Such evidence is indispensable for strengthening implementation strategies, ensuring efficient use of resources, and guiding future.

I extend my sincere appreciation to all those who engaged in this National Outcome Assessment Survey on MMS implementation for pregnant mothers and to the final report. The benefit of this report should reach every corner of the country to maximize the benefit of investment. I look forward to the recommendations in this final publication, which will help ensure high-quality maternal care services related to MMS throughout the country.

Dr. Asela Gunawardena
Director General of Health Services
Ministry of Health & Mass Media

MESSAGE FROM THE UNICEF COUNTRY REPRESENTATIVE



Every child deserves the best possible start in life, and that journey begins well before birth. Maternal nutrition during pregnancy is fundamental to the health, growth and development of both mothers and children. Ensuring that pregnant women receive the essential nutrients they need is an investment in safer pregnancies, healthier births and the long-term wellbeing of Sri Lanka's children.

Sri Lanka has a strong record in maternal and child health, supported by an established public health system and routine antenatal care. At the same time, low birth weight, preterm birth and micronutrient deficiencies remain important concerns. The introduction of Multiple Micronutrient Supplements (MMS) through the national maternal care programme is an important step in strengthening maternal nutrition services and responding to these continuing challenges.

As national programmes are taken to scale, evidence is essential. This implementation research provides timely insight into coverage, adherence, acceptability, supply-chain performance and the practical challenges that affect women's access to and use of MMS. Its findings point both to the feasibility of MMS within Sri Lanka's maternal health system and to the areas that require further attention, including equitable coverage, counselling, side-effect management, provider engagement and uninterrupted supply.

UNICEF is pleased to have provided technical and financial support to the Ministry of Health and the Family Health Bureau for this important initiative. I extend my sincere appreciation to the Family Health Bureau, the research team, the Technical Working Group, healthcare professionals and all partners who contributed to this assessment and the generation of evidence to guide implementation.

I hope policymakers, programme managers, healthcare professionals and partners will use the findings and recommendations of this report to strengthen the MMS programme, close remaining implementation gaps and ensure that quality maternal nutrition services are available equitably and without interruption across Sri Lanka. UNICEF remains committed to working with the Government of Sri Lanka and partners to advance maternal and child nutrition, so every mother has a healthy pregnancy and every child has the opportunity to survive, grow and thrive.

Emma Brigham
Representative, UNICEF Sri Lanka

MESSAGE FROM THE DEPUTY DIRECTOR GENERAL/ PUBLIC HEALTH SERVICES II



Maternal nutrition at conception and during pregnancy influences the growth and potential development of the foetus and a healthy baby. Foetal development can be suboptimal if certain nutrients are not available during sensitive windows of development. Low birth weights, stillbirths and pre-term births are priority issues that Sri Lanka faces, with high and stagnant levels of low birth weight over the last several years. The cost of nutritious meals has significantly increased in recent months.

Recently, clear and consistent evidence has started emerging from clinical trials that Multiple Micronutrient Supplements (MMS) provide additional benefits over Iron Folic Acid supplements in reducing adverse pregnancy outcomes. Therefore, the addition of MMS to the National Maternal Care programme can be considered as an important strategy in addressing the key challenges of low birth weights, stillbirths and pre-term births. The survey is expected to shed light on the implementation of this important intervention in Sri Lanka.

I extend my sincere appreciation to the Family Health Bureau as the Lead Institution and to all those who technically and financially contributed to this endeavour on the evaluation of MMS implementation among pregnant mothers and the final publication. I recommend that the findings of this report be used in policy making and planning of the National Maternal Care programme. All stakeholders in the Maternal Care programme need to work together to maximize the use of the findings of this survey and ensure implementation of the recommendations of this report for the betterment of pregnant mothers.

Dr. Vindya Kumarapeli
Deputy Director General/ Public Health Services II
Ministry of Health & Mass Media

FOREWORD



There is clear and consistent evidence that Multiple Micronutrient Supplements (MMS) reduce the risk of low birth weight (LBW) and small for gestational age (SGA) compared to Iron Folate Supplements (IFA) during pregnancy. In addition, literature evidence shows that MMS reduce the risk of stillbirths and preterm births. Findings from a recent National Nutrition and Micronutrient Survey in Sri Lanka revealed significant deficiencies in many micronutrients amongst pregnant women and not just Iron.

It is in this context that the Government of Sri Lanka introduced MMS for non-anaemic pregnant women from August 2023 in six districts with the highest incidence of low birth weight (Nuwareliya, Trincomalee, Anuradhapura, Kegalle, Ratnapura and Badulla). From April 2024 onwards, MMS is provided to pregnant mothers islandwide. This includes anaemic pregnant mothers also, who are administered MMS after completion of the therapeutic dose of iron.

Addition of MMS to the National Maternal Care programme makes a significant development in maternal nutrition. After passing 1 year of island-wide MMS implementation, it was necessary to understand the supportive factors and barriers of MMS implementation among pregnant mothers and supply chain issues for the smooth and uninterrupted functioning of this intervention. Therefore, it was decided to conduct the outcome assessment survey on MMS for pregnant mothers under the focal point of the Research Unit, Family Health Bureau along with the technical inputs of the Maternal Care Unit, Family Health Bureau and financial assistance of UNICEF.

I wish to express my sincere gratitude and appreciation to all stakeholders who engaged in this National survey from various aspects and, finally, to the Technical Working Committee, who have extensively contributed on developing and finalizing this publication. Proper utilization of this publication by the relevant healthcare professionals is of paramount importance in island-wide efficient practice of this cost-effective intervention.

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Dr. Asela Gunawardena, the Director General of Health Services, provided leadership, invaluable guidance, and administrative support to the initial activities of the National Outcome Assessment Survey on MMS implementation for pregnant mothers.

Dr. Vindya Kumarapeli, the Deputy Director General, Public Health Services II, provided guidance and continuous support throughout the successful completion of the MMS implementation survey for pregnant mothers.

Dr. Chandima Siritunga, the Director, Maternal and Child Health, provided leadership and guidance as chair of the working committee, whose direction and support were instrumental in the committee's successful functioning.

The Research Unit, Family Health Bureau, for serving as the focal point and for providing excellent overall coordination, progress assessment through regular working committee meetings and supervision of this National Outcome Assessment Survey on MMS implementation for pregnant mothers towards the successful completion, final report publication and dissemination of results.

The Maternal Care Unit, Family Health Bureau, was the major provider of technical input throughout the survey and the final report and providing research-related documents, including circulars, guidelines, and other essential reference materials, which greatly supported the successful completion of this study.

The working committee members for their expert guidance, constructive feedback, and encouragement during the planning, implementation, and analysis of the National Outcome Assessment Survey throughout and the preparation of this final publication.

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The Provincial and Regional Directors of Health Services, Provincial and Regional Consultant Community Physicians, Medical Officers of Maternal and Child Health, Medical Officers of Health, public health staff of the participating antenatal clinics, and all healthcare personnel who facilitated the successful conduct of this National Survey and facilitated access to the study sites.

The Monitoring and Evaluation Unit of the Family Health Bureau for providing the secondary data used in the analysis for the comparison, validation and monitoring of some data related to this National Survey.

The management team of the Medical Supplies Division (MSD) for providing the annual stock estimates by respective offices of Medical Officer of Health (MOH) island-wide and the stock distributions to relevant Regional Medical Supplies Division (RMSD) used in the analysis. The contribution of the Officers-in-Charge of the relevant RMSDs in selected districts for this survey in providing the MMS stock estimates and stock distribution to all MOH offices in their respective regions used in the analysis.

All pregnant mothers who willingly participated and all the participants involved in this outcome assessment survey as Key Informants and generously shared their time and experiences. Their valuable contributions made this study possible.

The development partner of the Ministry of Health, UNICEF, for its invaluable technical and financial support throughout this survey, the contribution made by Dr. Dammica Rowel, Health and Nutrition Officer, in the development of this final publication should be specially mentioned.

List of Abbreviations

ANC	Antenatal Clinics
CCP	Consultant Community Physician
CMC	Colombo Municipal Council
DDS	Divisional Drug Stores
FGD	Focus Group Discussion
FHB	Family Health Bureau
IFA	Iron and Folic Acid
KII	Key Informant Interviews
LBW	Low Birth Weight
LKR	Sri Lankan Rupees
LMIC	Low-and Middle-Income Countries
MCH	Maternal and Child Health
MMS	Multiple Micronutrient Supplements
MoH	Ministry of Health
MOH	Medical Officer of Health
MOMCH	Medical Officer of Maternal and Child Health
MRI	Medical Research Institute
MSD	Medical Supplies Division
NIHS	National Institute of Health Sciences
NMRA	National Medicines Regulatory Authority
PHM	Public Health Midwife
PHNS	Public Health Nursing Sister
POA	Period of Amenorrhea
RDA	Recommended Dietary Allowance
RDHS	Regional Director of Health Services
RMSD	Regional Medical Supplies Division
SDG	Sustainable Development Goals
SGA	Small for Gestational Age
SPHM	Supervisory Public Health Midwife
UN	United Nations
UNICEF	United Nations Children's Fund
UNIMMAP	United Nations International Multiple Micronutrient Antenatal Preparation
WHA	World Health Assembly
WHO	World Health Organization

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Executive Summary

As an evidence-based strategy to improve maternal nutritional status, Sri Lanka introduced Multiple Micronutrient Supplementation for non-anaemic pregnant women in 2024 through integration into the national maternal health programme, following a pilot study. The present study was conducted to assess implementation performance at the community level and generate evidence to inform policy decisions for further strengthening of the programme.

A mixed-methods approach was employed, incorporating quantitative surveys, key informant interviews, focus group discussions, and observational data collection. The study aimed to assess MMS coverage and adherence among non-anaemic pregnant women in the second and third trimesters; evaluate the efficiency and resilience of the MMS supply chain; explore the awareness, knowledge, perceptions, and experiences of pregnant women and healthcare providers; identify facilitators and barriers affecting programme uptake; and assess the contribution of MMS to improving nutrient adequacy. The findings are intended to support evidence-based recommendations for the continuation and scale-up of the Multiple Micronutrient Supplementation programme in Sri Lanka.

The study findings indicate that implementation of the Multiple Micronutrient Supplementation programme is both feasible and acceptable within Sri Lanka's well-established maternal healthcare system. The programme benefits considerably from the trust pregnant women place in Public Health Midwives (PHMs), who play a pivotal role in promoting uptake and adherence. Pregnant women demonstrated strong acceptance of the free government-provided MMS formulation, which contains 15 essential micronutrients and helps bridge dietary nutrient gaps. Recognition of these benefits by both healthcare providers and pregnant women further supports successful programme implementation.

The national weighted coverage of MMS among non-anaemic pregnant women in the second and third trimesters was 68.6% (95% CI: 63.2%-74.0%), indicating suboptimal programme reach. Significant sectoral disparities were observed, with the estate sector recording the lowest coverage despite demonstrating the highest utilization among recipients. Addressing this inequity should be a priority, as improved coverage in the estate sector has substantial potential to enhance maternal nutritional status among this vulnerable population.

While 70% of participants reported uninterrupted daily MMS intake, identifying and addressing the reasons for non-use and poor adherence remains critical. Gastrointestinal side effects, particularly nausea and vomiting, were among the main reasons for non-use, dose reduction, and discontinuation. Another major factor was the use of privately purchased micronutrient supplements, driven by perceptions that

government-provided products were of lower quality and associated with more adverse effects. Recommendations by some Obstetricians and Gynaecologists to switch to private formulations appeared to stem from limited awareness of the MMS initiative, highlighting the need for improved communication and engagement with specialist healthcare providers. Forgetfulness was also reported as a barrier and could be mitigated through regular follow-up by PHMs and support from family members.

The spread of misinformation through social media, influence from peers, language barriers, and inadequate counselling due to limited provider awareness were identified as additional challenges to programme implementation. Strengthening the knowledge and capacity of healthcare providers and ensuring timely dissemination of programme updates are essential to improving counselling, addressing misconceptions, and promoting informed use of MMS.

The supply chain assessment demonstrated that most Medical Officer of Health (MOH) offices and Regional Medical Supplies Divisions (RMSDs) maintained adequate stocks under recommended storage conditions, with generally satisfactory stock record management. However, reports of stockouts from both clients and healthcare providers undermined confidence in the programme. Challenges affecting supply chain performance included poor coordination among responsible institutions, transport constraints, unannounced bulk deliveries, and the occasional concurrent distribution of MMS and iron-folic acid supplements. Inadequate storage infrastructure at some MOH offices was also identified and requires prompt attention.

Based on these findings, several strategic recommendations are proposed. These include strengthening supply chain management to ensure uninterrupted availability of MMS; building the capacity of healthcare providers at all levels, including PHMs, Medical Officers of Health, Obstetricians and Gynaecologists, and pharmacists; and implementing targeted behaviour change communication strategies through educational materials, community awareness programmes, mass media, and digital platforms to promote MMS and address misconceptions. Given the substantial nutrient gaps identified in dietary intake, expanding programme eligibility to all pregnant women, regardless of baseline anaemia status, should also be considered. Such an approach may help address nutritional deficiencies before they contribute to adverse maternal and foetal outcomes.

CHAPTER 01

INTRODUCTION



1.1 Background

Maternal nutrition refers to the nutritional status and dietary requirements of women during the preconception, pregnancy, and postpartum periods (UNICEF, 2022). Adequate maternal nutrition contributes to favourable pregnancy outcomes, supports foetal growth, and promotes long-term child development. Maternal malnutrition not only increases the risk of maternal morbidity and mortality but also the risk of giving birth to infants who are LBW. Starting life with LBW puts infants on a trajectory of potentially long-term negative consequences ranging from impaired growth and development in early childhood through chronic diseases in adulthood (UNICEF-WHO, 2019). Pregnant women and young children are most vulnerable to micronutrient malnutrition due to their increased nutrient requirements, the small amounts of food they consume, and the fact that deficiencies during this life stage can lead to lifelong disabilities.

Maternal malnutrition, especially anaemia, remains a significant public health challenge globally, particularly in low- and middle-income countries (LMICs). In 2012, the 65th World Health Assembly (WHA) specified six global nutrition targets for 2025 maternal, infant, and young child nutrition, with a commitment to halve anaemia prevalence in women of reproductive age (15–49 years) by 2025 (WHO, 2014). WHO and UNICEF proposed extending this target to 2030 to align with the UN Sustainable Development Goals (SDGs) (UNICEF 2019).

Inadequate intake of key nutrients such as iodine, iron, folate, calcium, and zinc during pregnancy can result in anaemia, pre-eclampsia, haemorrhage, and maternal mortality. In addition to the adverse maternal outcomes, these deficiencies are proven to be associated with adverse foetal and neonatal outcomes, including increased risk of infant mortality, preterm delivery, low birth weight, and stillbirth (Engle-Stone et al., 2019; UNICEF, 2022).

The primary causes of anaemia in pregnancy include nutritional deficiencies (iron, folate, and vitamin B12), haemoglobinopathies, chronic blood loss, insufficient dietary intake, and parasitic infections (WHO, 2025).

The Family Health Bureau (FHB) reports that anaemia is among the most prevalent nutritional problems affecting pregnant women in Sri Lanka (Family Health Bureau, 2021). A national nutrition and micronutrient survey found that 15% of pregnant women were anaemic, with only 2.5% of cases attributable to iron deficiency. Furthermore, multiple micronutrient deficiencies—including iron, zinc, vitamin A, calcium, and folate—have been documented in this population. The prevalence rates of vitamin D, zinc, and vitamin B12 deficiencies among pregnant women were 35.6%, 24.5%, and

16.6%, respectively (Jayatissa, Perera and De Alwis, 2023). The survey concluded that micronutrient deficiencies remain a significant public health concern among pregnant women and recommended the provision of multiple micronutrients through fortified foods or supplementation.

The Rajarata Pregnancy Cohort study among first-trimester pregnant women in the Anuradhapura District reported an anaemia prevalence of 14.4%. Iron deficiency anaemia accounted for 41.9% of cases. Vitamin B12 deficiency was detected in 23.8% (Amarasinghe et al., 2022). A clinic-based study conducted in the district of Colombo reported that the proportion of first-trimester anaemia was 13.6 %, of whom 90.5% had iron deficiency anaemia (Heiyanthuduwa et al., 2025).

The Ministry of Health (MoH) addresses maternal nutrition through routine antenatal care, which includes micronutrient supplementation. Additional nutrition interventions in the maternal and child health (MCH) programmes include provision of Thriposha, dietary counselling, regular screening, referrals, and anaemia management (Family Health Bureau, 2021). Until the year 2022, non-anaemic pregnant women were provided with a daily dose of 60 mg elemental iron, 1 mg folic acid, 100 mg ascorbic acid (vitamin C), and 600 mg calcium lactate (Ministry of Health, 2017). Pregnant women with mild to moderate anaemia were given a therapeutic dose of oral iron (120 mg elemental iron per day). Since 2022, the iron dose for non-anaemic pregnant women has been reduced to 30 mg, while the regimen for anaemic pregnant women remained unchanged (Ministry of Health, 2021).

The coverage of iron and folic acid (IFA) supplementation through antenatal clinics (ANC) was high. The national nutrition and micronutrient survey reported that 92.3% of pregnant women received IFA via ANC services, while some women preferred commercially available micronutrient supplements prescribed by their Obstetricians and Gynaecologists. Overall, 96.8% of pregnant women received iron supplements by any method (Jayatissa et al., 2023).

The Family Health Bureau (FHB) supplied IFA as combined tablets, which are distributed to Divisional Drug Stores (DDS) in each district. The Medical Officer of Health (MOH) is required to submit quarterly estimates to the FHB. Additionally, MOHs prepare annual estimates and submit them directly to the Swastha system of the Medical Supplies Division (MSD).

Multiple Micronutrient Recommendations

Based on an accumulating body of evidence from systematic reviews and meta-analyses, multiple micronutrient supplements (MMS) have emerged as a more cost-effective modality than IFA, offering additional health benefits for pregnant women—particularly in LMICs where micronutrient deficiencies are highly prevalent (Keats, et al., 2017; Smith et al., 2017). Therefore, in 2020, the World Health Organization (WHO) updated its antenatal care recommendations (WHO, 2020) to include a conditional

recommendation for MMS during pregnancy as a potential alternative to standard iron and folic acid (IFA) supplementation. This recommended MMS contains 13 to 15 essential vitamins and minerals, including 30 mg of elemental iron and 400 µg (0.4 mg) of folic acid, consistent with the United Nations International Multiple Micronutrient Antenatal Preparation (UNIMMAP) formulation.

One MMS tablet usually contains:

Vitamin A (800 µg), Vitamin D (5 µg), Vitamin E (10 mg), Vitamin B1 (1.4 mg), Vitamin B2 (1.4 mg), Vitamin B6 (1.9 mg), Vitamin B12 (2.6 µg), Vitamin C (70 mg), Niacin (18 mg), Folic Acid (400 µg), Zinc (15 mg), Copper (2 mg), Selenium (65 µg), Iodine (150 µg), Iron (30mg)

(Source: Nutrition International, 2020a)

Key aspects of the 2020 WHO MMS guidelines:

- MMS in ANC: recommend the use of MMS, particularly during pregnancy, as a preventative measure.
- Iron and Folic Acid: MMS should contain iron and folic acid, crucial for preventing maternal anaemia.
- Implementation research: The guidelines emphasize the need for implementation research to assess the effectiveness and feasibility of MMS in different settings.
- Context-Specific Recommendations: The guidelines also highlight the need for further research to address remaining clinical questions and to tailor recommendations to specific contexts.
- Positive Pregnancy Experience: The overarching goal of the guidelines is to ensure a positive pregnancy experience for all women, moving beyond just survival to maximising health and well-being.
- Superseded 2016 Guidelines: The 2020 update replaces the 2016 WHO ANC guidance on MMS, reflecting new evidence and programmatic insights.

These WHO recommendations advocate for the use of MMS during ANC throughout pregnancy as a preventative intervention. Furthermore, the guidelines emphasize the need for implementation research to assess the effectiveness and feasibility of MMS in diverse settings and recommend further research to address unresolved clinical questions and to tailor recommendations to specific local contexts. Although MMS offer the potential to address multiple nutrient deficiencies concurrently and enhance birth

outcomes, its implementation requires strategic, evidence-based planning to ensure that benefits surpass potential risks within specific national contexts.

Benefits of MMS

Multiple micronutrient supplements (MMS) have demonstrated greater effectiveness than iron and folic acid (IFA) supplementation in reducing adverse pregnancy and birth outcomes (Smith et al., 2017). Several meta-analyses indicate that MMS are associated with reductions in low birth weight, small for gestational age (SGA), and stillbirths compared to IFA supplementation alone (Keats, et al., 2017; Smith et al., 2017). Cost-effectiveness analyses further suggest that MMS are a highly cost-effective intervention in LMICs, with an estimated cost of \$3 to \$5 per pregnancy and substantial potential to improve population-level outcomes (Kashi et al., 2019).

Multiple micronutrient supplements (MMS) during pregnancy provide significant benefits that extend beyond the prevention of anaemia. While IFA supplementation primarily addresses anaemia, MMS deliver a broader spectrum of essential nutrients, including vitamins A, D, B12, and zinc, which are vital for maternal and foetal health regardless of anaemia status (Bhutta et al., 2013). Deficiencies in these micronutrients are prevalent even among non-anaemic mothers and can negatively affect pregnancy outcomes by increasing the risk of low birth weight, preterm birth, and intrauterine growth restriction (Keats et al., 2019). Evidence demonstrates that MMS are more effective than IFA alone in improving birth outcomes, even in populations with moderate anaemia prevalence (Haider and Bhutta, 2017). Furthermore, addressing subclinical or non-anaemia-related micronutrient deficiencies can strengthen maternal immunity, lower the risk of pregnancy complications, and promote neonatal development (WHO, 2024).

A systematic review of trials comparing MMS to IFA, which evaluated infants' anthropometric outcomes at birth and at 3, 6, 12, 18, and 24 months of age, found that MMS improved birth size and early infant growth, and reduced the risk of vulnerable newborns and early undernutrition in LMICs. The authors conclude that these results support the implementation of MMS for all women in LMICs to reduce maternal and infant undernutrition (Gomes et al., 2025).

MMS Implementation Status

The most widely used MMS formulation is UNIMMAP, which provides 15 essential nutrients, including iron, folic acid, vitamin A, B-complex vitamins, vitamin D, iodine, and zinc (UNICEF, 2020). UNIMMAP meets WHO recommendations for safe daily intake during pregnancy. Many LMIC policies recommend a daily dose of 60 mg elemental iron, especially where anaemia is common. However, most MMS formulations contain only 30 mg elemental iron (WHO, 2020).

Although strong evidence supports MMS, only a few countries have fully integrated it into national antenatal programs because of supply chain challenges, costs, and policy requirements. Implementation in Bangladesh, Ethiopia, Ghana, and Pakistan

demonstrates that integrating MMS into routine ANC is practical and effective. These efforts underscore the need for community engagement, provider training, strong supply chains, and political support (UNICEF, 2025a).

Multiple micronutrient supplementation programmes have expanded across South Asia, demonstrating growing policy level interest and positive maternal and neonatal outcomes.

All eight south Asian countries are in the different stages of implementing the MMS programme for pregnant women.

Implementation status of MMS during pregnancy in South Asian countries are given below:

Afghanistan

- Afghanistan distributed MMS to nearly 350,000 pregnant women in 2023 and piloted a combination of MMS and cash transfers to encourage use (UNICEF South Asia, 2024). That intervention included counseling on diet and health during pregnancy alongside the MMS distribution.

Bangladesh

- In Bangladesh, a pilot programme was implemented in 2022-2023 that resulted in improved birth weights and high acceptability among pregnant women and providers (Bhutta et al., 2013; UNICEF South Asia, 2024).
- MMS in ANC platforms by government was piloted in 2022 within government health facilities, covering ~65,000 women across 279 centres, and extended to garment factories (UNICEF South Asia, 2024)
- They leveraged robust community health delivery systems and local academic institutions to support rollout (Speaking of Medicine, 2025)

Bhutan

- Bhutan's Ministry of Health has incorporated MMS into its Accelerating Mother and Child Health strategy, linking it with conditional cash support that benefits approximately 25,000 mothers (UNICEF South Asia, 2024).

India

- The programme is positioned as a pathway to inclusion of MMS on the national essential medicines list and for sustainable health-system financing (UNICEF South Asia, 2024).
- MMS is recognized for its potential benefit and there is an interest in using MMS during pregnancy. However, a national programme replacing IFA with MMS has not yet been fully adopted (Mukherjee et.al., 2024).

- The Indian Council of Medical Research (ICMR) convened a national expert group to design an India specific MMR formulation and agreed on a formulation that differs in the quantities of several nutrients of UNIMMAP standard except for Zinc, Vitamin E and Vitamin B6. The expert group recommends finalizing the formulation and to conduct further research prior to programmatic application in India (Mukherjee et al., 2024).

Maldives

- Maldives continues the IFA supplementation in antenatal care and has not yet adopted MMS into national programme. (UNICEF, 2024).

Nepal

- The ministry of Health and Population (MoHP) in Nepal is preparing to switch from IFA to MMS. In 2024, with the support from Helen Keller International MoHP Nepal conducted research to find out feasibility, acceptability and adherence of MMS among pregnant and lactating mothers in all seven provinces of the country (Eleanor Crook Foundation (ECF), 2024).

Pakistan

- Maternal Nutrition Strategy 2022-2027 aims to integrate MMS into antenatal care and emergency responses to reach 50 per cent of all pregnant women by 2027 (UNICEF South Asia, 2024).
- Starting in 2022, MMS was piloted within selected provinces through antenatal care, supported by UNICEF, Gates Foundation, and local partners (Speaking of Medicine, 2025)
- By October 2023, MMS was formally added to Pakistan's Essential Medicines List, with a goal of reaching 50 % of pregnant women by 2027 (Speaking of Medicine, 2025)
- In Pakistan's Thatta district, health workers report that MMS contributed to substantial increases in infant birth weight—e.g., mothers gaining 7 kg in late pregnancy and giving birth to > 3 kg babies (UNICEF South Asia, 2024)

Sri Lanka

- Following a decision taken by the National Committee on Family Health in February 2023, Sri Lanka initiated a shift from the long-standing use of IFA supplements to MMS (Family Health Bureau, 2024a).
- A pilot programme was implemented across six districts, enabling early-stage learning around supply logistics, adherence, and acceptability reaching 37,000 pregnant women (UNICEF South Asia, 2024).

- Following the pilot programme, the FHB issued a directive on 30 April 2024. Instructions to relevant officials specify that MMS should be provided to non-anaemic pregnant women at the start of the second trimester till the end of pregnancy. This directive recommended replacing IFA supplementation with one tablet of MMS containing 30 mg of elemental iron. The elemental iron content in the MMS is compatible with the current IFA supplementation practice for non-anaemic pregnant women in Sri Lanka.
- For anaemic pregnant women, the previous therapeutic regimen of an iron folate tablet containing 60 mg elemental iron, administered twice daily, should continue until further notice (FHB, 2024a).

Summary of implementation status is given in Table 1

Table 1: MMS Implementation Status in South Asian Countries

Country	Implementation Status	Target Group	Dosage / Composition	Key Features / Notes
Afghanistan	Pilot study done in 2023. scale-up in progress	Pregnant women	UNIMMAP-based	Distributed to ~350,000 pregnant women. Pilot also included conditional cash transfers to encourage use.
Bangladesh	Pilot implemented in 2022–2023	All pregnant women (pilot)	UNIMMAP formulation	Piloted in 279 government centres C garment factories (~65,000 women). Reported High acceptability. Supported by UNICEF and Nutrition International
Bhutan	Policy phase, integrated into maternal health strategy.	Pregnant women	UNIMMAP formulation	MMS implementation is linked with accelerating MCH strategy. Conditional cash transfer system in place and over 25,000 women benefitted.
India	No national MMS programme yet	-	-	Still relies on IFA. Discussions are ongoing on using an India-specific MMS formulation.

Maldives	No national MMS programme yet	-	-	No available documentation of MMS piloting. Health authorities have begun policy dialogue with UNICEF
Nepal	Advocacy and early planning stage	-	-	No formal MMS programme but Nepal is preparing to switch from IFA to MMS. Strong national leadership present. Focused on policy dialogue and research.
Pakistan	Piloted since 2022	All pregnant women (Goal is to achieve 50% coverage by 2027)	UNIMMAP formulation	MMS included in Essential Medicines List (2023) Implemented with support from Gates Foundation and UNICEF. Early results showed improved birth weights. Strong local government commitment.
Sri Lanka	National scale-up started in 2024	Non-anaemic pregnant women only	UNIMMAP: 15 micronutrients including 30 mg elemental iron, 400 µg folic acid	MMS provided from 2nd trimester; replaces IFA in non-anaemic women. Therapeutic IFA still used for anaemic women. Strong policy commitment and piloting completed.

Following a decision by the National Committee on Family Health in February 2023, Sri Lanka initiated a transition from IFA supplements to MMS (Family Health Bureau, 2024a), including it in its National Maternal Care Programme (Healthy Mothers Healthy Babies Consortium, 2025).

After the introduction of MMS to the National Maternal Care Programme in 2023, the programme reached 37,000 pregnant women in six districts by one year, and it was then scaled up to the 26 districts in the country, resulting in country-wide implementation of MMS (Healthy Mothers Healthy Babies Consortium, 2025). Family Health Bureau issued a directive on 30 April 2024 introducing MMS at national level to non-anaemic pregnant women from the start of the second trimester until the end of pregnancy. The directive advised replacing IFA with one MMS tablet containing 30 mg of elemental iron, consistent with the IFA practices for non-anaemic pregnant women at that time. For anaemic

pregnant women, the therapeutic regimen of an iron folate tablet with 60 mg elemental iron, taken twice daily, was to be continued (Family Health Bureau, 2024a).

In Sri Lanka, Swastha, a comprehensive, web-based medical supplies information management system incorporated into the country's national medical supply management framework, is capable of tracking precise stock positions of MMS from central level down to divisional hospitals and peripheral ANCs.

Implementation Barriers and Operational Challenges

Many countries face ongoing challenges with IFA supplement coverage. An analysis of seven countries (Afghanistan, Bangladesh, Indonesia, Ethiopia, Kenya, Nigeria, and Senegal) identified supply chain issues, poor coordination and quality control, and inadequate staff and patient counselling as key barriers (Siekman et al., 2018). Promotion of MMS in this context should align with cultural food practices during pregnancy and address the underlying reasons to improve acceptability and compliance (UNICEF, 2021). Behavioural factors related to MMS include food practices, misconceptions regarding iron supplementation during pregnancy, financial constraints, and competing livelihood demands. These elements affect pregnant women's access to antenatal care and their capacity to maintain healthy diets. At the institutional level, frequent stockouts present a persistent challenge. Formative studies indicate that clients prefer MMS to be provided free of charge through antenatal care at community clinics, family welfare centres, and other government facilities (UNICEF, 2021).

It has been cautioned in previous literature that a transition from IFA to MMS needs careful deliberation on sustainability, as current coverage challenges are likely to be inherited alongside the introduction of new implementation issues (Tuncalp et al., 2020). The initial switch from IFA to MMS may also increase costs related to procurement, supply chain management, healthcare worker training, and programme monitoring and evaluation. In this context, the Ministry of Health Sri Lanka decided to evaluate the implementation of the Multiple Micronutrient Supplementation programme among pregnant women.

1.2 Objectives of the current research

This study aims to evaluate community-level coverage, patient adherence, and supply-chain efficiency to ensure uninterrupted access. Additionally, the research explores the perspectives of both pregnant women and healthcare providers, systematically identifying key facilitators and barriers to MMS uptake to ultimately determine nutrient adequacy and provide programmatic recommendations for strengthening the intervention.

The specific objectives of the current research are as follows:

1. To determine the extent of MMS coverage and adherence among women in the second and third trimesters at the community level.
2. To examine the efficiency and resilience of the supply chain for MMS distribution to ensure uninterrupted access.
3. To capture the perspectives, experiences, and perceptions of both pregnant women and healthcare providers regarding MMS implementation.
4. To systematically identify the supportive factors that have facilitated the rollout of MMS, as well as the barriers hindering optimal uptake among non-anaemic pregnant women.
5. To evaluate how MMS intake contributes to nutrient adequacy among the target population, thus providing policy and programmatic recommendations on the continuation and scaling up of Multiple Micronutrient Supplementation programme in Sri Lanka.

CHAPTER 02

METHODOLOGY



A comprehensive desk review was conducted prior to planning the methodology of the implementation study. Conducting a desk review prior to the field study is vital to understand the socio-cultural factors, dietary habits, and health system bottlenecks specific to similar nutrient interventions locally and globally, which is essential for designing culturally appropriate and realistic field tools. The findings of this desk review were used in the conceptualization of this mixed-methods study.

Study Design and Conceptual Framework

The study adopted a mixed-methods approach, integrating both quantitative and qualitative research components. A mixed-methods framework was chosen because a single approach would be insufficient to capture both the operational metrics and the deeply nuanced contextual experiences surrounding health programmes. Specifically, this study utilized a convergent parallel design. The dual-paradigm approach allowed the team to concurrently assess empirical implementation indicators alongside the sociocultural beliefs, systemic behaviours, and logistical realities influencing the delivery of MMS among pregnant women in Sri Lanka. The methodological overview is presented in Figure 1.

The study design is structured across two primary operational components:

- **Component 1 (Quantitative):** Designed to yield measurable, statistically representative cross-sectional data regarding MMS coverage, adherence, dietary intake, and the private sector availability of MMS substitutes.
- **Component 2 (Qualitative):** Designed to elicit experiential, descriptive narratives regarding programme acceptability, systemic compliance barriers, frontline delivery challenges, and supply-chain logistics.

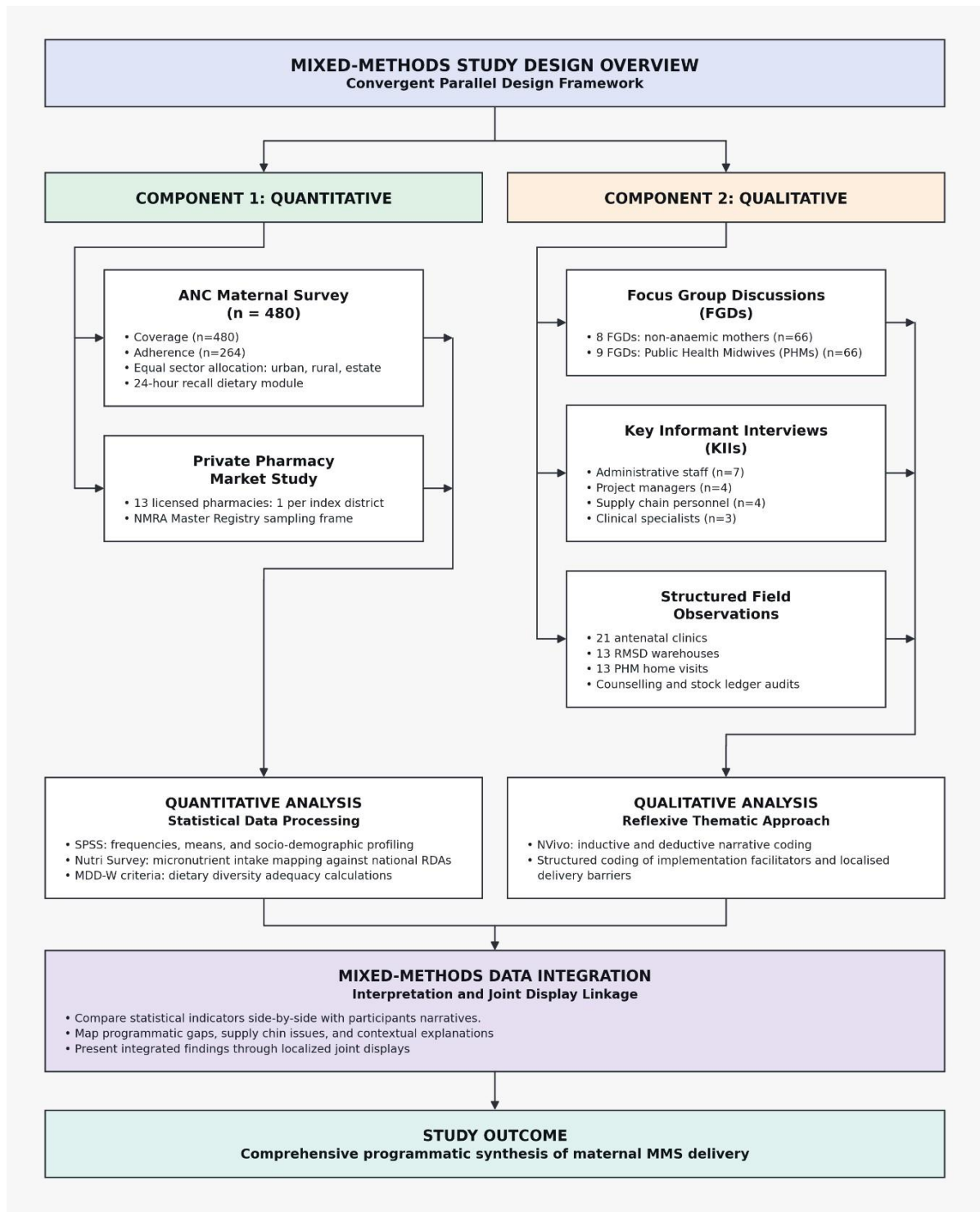


Figure 1: Methodological overview

2.1 Component 1: Quantitative Research Strand

2.1.1. Subcomponent 1: Survey Among Non-Anaemic Pregnant Women

- **Study Design:** Descriptive cross-sectional study design.
- **Study Setting:** The study was conducted across 13 districts representing all 9 provinces (Anuradhapura, Badulla, Batticaloa, Colombo, Gampaha, Puttalam, Kalutara, Kurunegala, Rathnapura, Nuwara Eliya, Jaffna, Galle, and Kandy), covering 15 health areas (13 RDHS areas, Colombo Municipal Council, and the National Institute of Health Sciences). Data was collected within antenatal clinics under selected MOH areas: 62 ANCs across 32 MOH areas for coverage metrics (Annex 01), and 58 ANCs across 34 MOH areas for adherence patterns (Annex 02) (Figure 2). This selection was guided by the need for national representativeness, sectoral diversity (urban, rural, and estate), and inclusion of high-burden, conflict-affected, and ethnically diverse regions. A detailed justification is provided in (Annex 03).

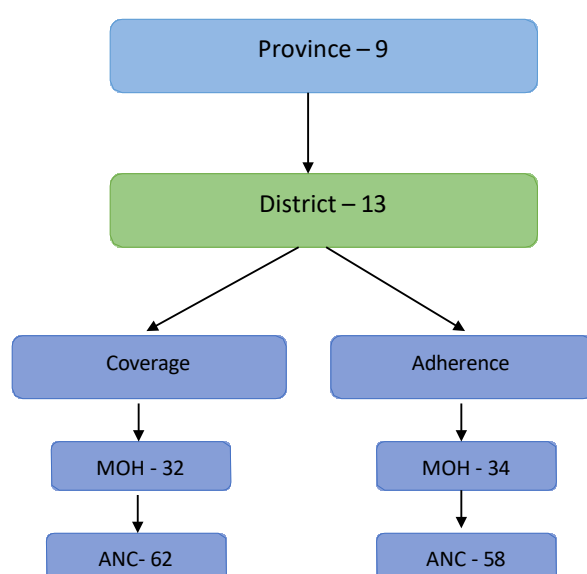


Figure 2: Study Setting

- **Study Population s Eligibility:** Considering the target population of the national MMS programme, for the coverage and dietary assessment, non-anaemic pregnant women in their second or third trimester attending the selected ANCs irrespective of whether they had received MMS were considered as study population. For the adherence assessment, the population was non-anaemic pregnant women who had been provided with MMS.
 - *Inclusion Criteria:* Documented non-anaemic status; currently in the second or third trimester of gestation.
 - *Exclusion Criteria:* Multiple gestations (twins/triplets); confirmed maternal co-morbidities (e.g., Pregnancy-Induced Hypertension, Gestational

Diabetes Mellitus, or pre-existing chronic non-communicable diseases like chronic hypertension and diabetes).

- **Sample Size and Allocation Strategy:** For the coverage assessment, a sample size of 480 non-anaemic pregnant women, was recruited. To ensure robust demographic stratification, equal allocation was applied across geographic sectors, yielding exactly 160 participants each from the urban, rural, and estate sectors. This equal allocation was purposefully selected over proportional allocation (which would have yielded an unrepresentative sample of only 21 estate-sector participants based on national census, 2021 metrics of 18% urban, 77.5% rural, and 4.5% estate distributions), thereby preserving statistical power for sub-sector evaluations. For the adherence assessment, a sample size of 264 mothers who had received MMS was evaluated (Annex 04).
- **Sampling Technique:** A multi-stage random sampling technique was implemented to select the primary MOH areas and ANCs. For the adherence subset, all pregnant women who received MMS across the three sectors were recruited. In addition to that, additional pregnant women who had received MMS were recruited from the estate sector for the adherence component.

2.1.2. Subcomponent 2: Private Pharmacy Market Survey

- **Study Design and Setting:** A descriptive cross-sectional market survey conducted within private registered pharmacies across the same 13 index districts representing all nine provinces.
- **Study Population and Sample Size:** Data was collected from licensed pharmacists employed at private retail establishments in 13 pharmacies (one per district).
- **Sampling Technique:** Utilizing the master registration lists maintained by the National Medicines Regulatory Authority (NMRA) as the sampling frame, one private pharmacy was randomly drawn from each district to serve as the primary site. A secondary pharmacy was randomly drawn concurrently to serve as an operational buffer site.

2.2 Component 2: Qualitative Research Strand

2.2.1. Subcomponent 1: Focus Group Discussions (FGDs)

- **Study Design and Setting:**
- A qualitative descriptive study design was adopted, using focus group discussions (FGDs) as the primary data collection method. These discussions were conducted within antenatal clinics across purposively selected MOH areas. For pregnant women, FGDs were carried out in 8 MOH areas representing 8 districts across 8 provinces (Annex 05), while for Public Health Midwives (PHMs),

FGDs were conducted in 9 MOH areas representing 9 districts across 8 provinces. The study settings were deliberately selected to cover urban, rural, and estate sectors (Annex 06), ensuring diversity in geographic location, health service accessibility, and socio-cultural context. This sectoral representation strengthens the richness and applicability of the qualitative findings, allowing for a comprehensive understanding of maternal health experiences from both service user and provider perspective.

- **Study Population and Sample Size:** Structured focus groups were conducted separately for two target cohorts until data saturation was achieved:
 - Non-anaemic pregnant women in their 2nd or 3rd trimester currently or previously consuming MMS, excluding multiple pregnancies and chronic co-morbidities. A total of 8 FGDs were completed (6–10 participants per session).
 - Public Health Midwives with a minimum service period of 6 months. A total of 9 FGDs were completed (6–8 participants per session).
- **Sampling Technique:** Purposive sampling was applied to maximize geographic, sector-specific, and experiential diversity among participants.

2.2.2. Subcomponent 2: Key Informant Interviews (KIIs)

- **Study Design, Setting, and Population:** Qualitative descriptive inquiries conducted across national, provincial, regional, and divisional health administrative tiers to capture administrative, expert, and logistical insights. Target informants were restricted to officers with >6 months of active service in their current position.
- **Sample Size and Sampling Technique:** Informants were purposively selected, with interviews conducted until the data saturation was reached, resulting in the following distributions:(Annex 07)
 - *Frontline Administrative Staff (n=7):* MOH, Additional MOHs, Public Health Nursing Sisters (PHNS), and Supervisory Public Health Midwives (SPHMs).
 - *Technical Programme Managers (n=4):* Family Health Bureau programme managers, Consultant Community Physicians, and Medical Officers of Maternal and Child Health (MOMCH).
 - *Logistics and Supply Chain Personnel (n=4):* Officials within the central Medical Supplies Division (MSD), Divisional Pharmacists, and Regional Medical Supplies Division (RMSD) storekeepers.
 - *Clinical Specialists (n=3):* Consultant Obstetricians and Gynaecologists practicing in both government and private sector, representing specialist healthcare delivery.

2.2.3. Subcomponent 3: Structured Field Observations

- **Study Design and Population:** A descriptive observational framework designed to systematically audit service delivery mechanics, storage conditions, and clinical counseling fidelity. The observed population encompassed clinic providers (PHNS, SPHM, PHM), supply chain storekeepers, and maternal beneficiaries receiving home visits.
- **Setting and Sample Size:** Purposively sampled across 21 ANCs across 16 MOH areas (spanning 9 districts), 13 regional RMSD warehouses, and 13 home-visits conducted by PHMs.

2.3 Data Collection Instruments and Field Protocols

2.3.1. Instrument Engineering, Translation, and Validation

All quantitative surveys (Annex 08,09), market inventory guides (Annex 10), qualitative interview guides (Annex 11,12,13), and observational checklists (Annex 14,15,16) were constructed purposefully for this evaluation. Tools were translated into Sinhala and Tamil for the survey and for the FGDs.

Validation and testing were finalized through a pilot study executed at the ANCs of D2A and 2A of the Colombo Municipal Council. Feedback from the pilot phase optimized the logical flow, reading comfort, and structural pacing of the instruments prior to final deployment.

2.3.2. Field Implementation Protocols

Data collection across both components was executed by independent field teams comprised of medical graduates and public health professionals trained by the principal investigators.

- **Quantitative Collection:** Undertaken via structured, interviewer-administered questionnaire. For dietary adequacy evaluations, a rigorous single multiple pass 24-hour dietary recall module was deployed utilizing standardized portion-size measurement guides and culturally calibrated food models (Jayawardena, 2019) to track micronutrient consumption densities
- **Qualitative Collection:** Executed by trained moderators using semi-structured interview guides, FGD and KIs were audio-recorded with explicit participant consent and subsequently transcribed and translated verbatim.
- **Observational Audits:** Documented concurrently via structured clinical and warehouse checklists focusing on counseling dynamics, stock ledger precision, and storage conditions.

- **Quality Control Mechanisms:** Fieldwork was governed by real-time supervision protocols managed by the IPID, incorporating unannounced spot checks, and data entry verification.

2.4 Data Analysis

2.4.1. Quantitative Analysis (Component 1)

Cleaned data fields were subjected to double-entry verification protocols. Statistical computational procedures were executed utilizing SPSS software (21)

- **Descriptive Statistics:** Frequencies, percentages, and mean distributions were calculated to profile socio-demographic indicators, basic MMS coverage rates, adherence, retail cost parameters, and packaging preferences.
- **Nutritional Metrics:** Data on 24-hour dietary recalls were processed via FoodBase 2000 software, which includes commonly consumed Sri Lankan food, allowing accurate estimate of nutrient intake. Micronutrient intake levels were compared against national Recommended Dietary Allowances (RDAs) for pregnancy (MRI, 2022). The micronutrients included in the analysis were Thiamin, Riboflavin, Niacin, Vitamin B6, Vitamin B12, Vitamin A, Vitamin C, Folic acid, iron and Zinc. Although Vitamin E, Selenium, copper and iodine are included in MMS, they were excluded in the analysis due to database limitations.

2.4.2. Qualitative Analysis (Component 2)

Textual narratives generated from FGD and KII transcripts alongside observational field notes were loaded into NVivo software. Data analysis followed an inductive and deductive Reflexive Thematic Analysis approach. Data fields were iteratively coded, consolidated into structural categories, and synthesized into thematic architectures reflecting implementation facilitators and barriers, client and provider perspectives, systemic vulnerabilities, and programmatic recommendations.

2.4.3. Mixed-Methods Integration Protocol

In accordance with mixed-methods reporting conventions, data integration was achieved at the interpretation and reporting level. Rather than isolating findings into separate silos, quantitative metrics (such as coverage and adherence percentages) are explicitly cross-examined alongside matching qualitative themes (such as beliefs, structural supply failures, or behavioural insights).

This analytical synthesis is structured via Joint Displays within the results section, placing statistical sub-group findings side-by-side with illustrative thematic quotes to map points of structural convergence, data divergence, or contextual expansion.

2.5 Ethical Considerations

The study protocols were reviewed and approved by the Ethics Review Committee of the Faculty of Medicine, General Sir John Kotelawala Defence University, Sri Lanka (Approval No: RP/2025/31). Fieldwork was executed in alignment with the ethical principles of the Declaration of Helsinki.

A rigorous, informed consent protocol was implemented across all field strands:

- Participants were provided with comprehensive Information Sheets detailed in Sinhala, Tamil, or English, outlining study objectives, data management safety, and potential risks (Annex 17).
- Voluntary participation was emphasized, confirming the absolute right of any participant to terminate an interview or withdraw data post-hoc without administrative penalty or compromise to their routine antenatal care.
- Written informed consent was obtained and filed for all survey and interview participants; distinct authorization was secured for audio recording qualitative sessions (Annex 18).
- Anonymity and confidentiality rules were structurally enforced: personal identifiable information was stripped from all working datasets, and numerical indices or descriptive designators replace identity parameters across all thesis narratives, data matrices, and subsequent publications.

CHAPTER 03

RESULTS



The results depicted in this chapter are organized under the five objectives of the mixed methods study conducted. Quantitative data has been complemented by the findings of the qualitative study component.

3.1 Coverage of and adherence to MMS among pregnant women

The Multiple Micronutrient Supplementation programme has been targeting non-anaemic pregnant women in Sri Lanka from the start of the second trimester until the end of pregnancy. A survey was conducted among non-anaemic pregnant women in the second and third trimesters at the community level to determine the extent of MMS coverage among them. In order to assess the adherence, non-anaemic pregnant women who had received MMS were included as the study sample. Participants representing urban, rural and estate sectors were included into the sample to assess both coverage and adherence.

3.1.1. Overview of the study sample and the sociodemographic characteristics of the participants:

The component of the study assessing coverage was carried out among 480 non-anaemic pregnant women in their second and third trimesters, across 15 health areas in thirteen (13) districts in the country, covering all nine provinces. The majority of the participants represented the Western (36.5%, n= 175) and Central provinces (27.9%, n= 134).

Highest numbers of participants included in the study were from the districts of Nuwara-Eliya (n= 113) and Colombo (n= 107), while each of the other districts including Anuradhapura, Badulla, Batticaloa, Gampaha, Puttalam, Kalutara, Kurunegala, Rathnapura, Jaffna, Galle and Kandy were represented by more than 10 participants. Altogether, participants belonging to 32 MOH areas were included in this component of the study. The study was planned to ensure equal representation from all three sectors of urban, rural and estate, thus the final sample contained 160 participants from each sector.

The majority of the participants were in their second trimester: urban 60% (n= 96), rural 52.5% (n=84) and estate 58.8% (n=94).

Among the 480 participants, 18 (3.8%) were 20 years of age or less, while 54 (11.2%) were over 35 years. A multi-ethnic representation was seen in the sample, with 282 (58.8%) Sinhala participants, 138 (28.8%) Tamil participants, 57 (11.9%) Muslim participants and 3 (0.6%) other category participants. Half of the participants (n=240, 50%) had G.C.E. Advanced Level or higher education qualifications. Out of all participants, 134 (27.9%) were employed, either as employees in the government or private sector, self-employed or as estate workers. Around one tenth of the participants (n=50, 10.4%) had a monthly household income of less than 25,000 Sri Lankan Rupees (LKR), while 82 (17.1%) had a monthly household income of LKR 100,000 or more.

For assessing adherence, a sample of the 264 participants was selected, representing thirteen districts covering all nine provinces. This included 64 (24.2%) participants from the estate sector, 80 (30.3%) participants from the urban sector, and 120 (45.5%) participants from the rural sector who had received MMS. Most of these participants were those who participated in the above component assessing coverage, but some participants from the estate sector had to be recruited fresh, to ensure adequate participation from all sectors. The participants represented 58 ANCs belonging to 34 MOH areas (with the addition of Bogawanthalawa and Maskeliya MOH areas of Nuwara Eliya district, to the 32 MOH areas used for assessing coverage) (Annex 03). Out of them, the majority (n=150, 56.82%) were in their second trimester. Multi-ethnic representation was ensured in this component, too, with the inclusion of 152 Sinhala participants (57.58%), 71 Tamil participants (26.89%) and 39 Muslim participants (14.77%). The majority of the women were between 26-35 years of age (65.53%, n=173) and not engaged in income generating work (71.21, n=188). Around half of the participants declared a monthly household income of less than LKR 50,000 (50.38%, n=133).

3.1.2. Coverage of MMS

Table 2: Frequency distribution of participants by the status of receiving MMS during their current pregnancy

Residential sector	Yes		No	
	N	%	N	%
Urban	80	50	80	50
Rural	120	75	40	25
Estate	54	33.8	106	66.3
Total	254	52.6	226	47.1

Out of 480 participants, only 254 (52%) had received MMS during their current pregnancy. Participants from the rural sector showed the highest percentage of receiving MMS (75.0%, n=120). The estate sector exhibited the lowest coverage with only 33% (n=54) of

the participants ever receiving MMS during their current pregnancy (Table 1).

Based on the above findings, the calculated weighted national level estimate for MMS coverage is 68.6% (95% CI: 63.2%–74%).

3.1.3. Adherence of MMS

For assessing adherence, 264 pregnant women who had received MMS were interviewed.

The Period of Amenorrhea (POA) at which MMS was first received, was assessed here. The median POA at which the participants had first received MMS was 14 weeks (IQR = 7 weeks, 25th–75th percentile: 12–19 weeks).

Out of the 264 participants, 152 (57.6%) have received MMS by 15 weeks of POA. Sectoral distribution of the timing of the first receipt of MMS is shown in Table 2.

Table 3: POA at the first receipt of MMS by sector of residence

POA (weeks)	Urban		Rural		Estate		Total	
	N	% (out of urban)	N	% (out of rural)	N	% (out of estate)	N	% (out of total)
12 - 15	47	58.7	50	41.7	55	85.9	152	57.5
16 - 20	16	20.0	39	32.5	4	6.2	59	22.3
21 - 25	9	11.2	18	15.0	3	4.7	30	11.4
26 - 30	3	3.7	9	7.5	2	3.1	14	5.3
31 - 35	4	5.0	2	1.7	0	0.0	6	2.2
36+	1	1.2	2	1.7	0	0.0	3	1.1
Total	80	100.0	120	100.0	64	100.0	264	100.0

In the estate sector, a vast majority of participants had received MMS by 15 weeks of POA (85.9%). A comparatively lower percentage of urban and rural sector participants had received MMS by that POA. Only 58.8% (n=47) of urban sector participants, and 41.7% (n=50) of rural sector participants had received MMS by 15 weeks of POA.

Among the study sample of 264 who had received MMS during the current pregnancy, it was enquired whether they were currently using it. The details are in Table 3.

Table 4: Frequency distribution of participants who have received MMS during the current pregnancy, by their status of current usage

Residential Sector	Yes		No	
	N	%	N	%
Urban	62	77.5	18	22.5
Rural	100	83.3	20	16.7
Estate	58	90.6	6	9.4
Total	220	83.3	44	16.7

The findings of the above table show that 83.3% (n= 220) of those who had received MMS, were currently using it.

To identify the main reasons for not taking MMS, those who were not taking MMS (n=44) were enquired about the reasons for not taking MMS daily as advised, where multiple responses were allowed. The findings are depicted in Table 4.

Table 5: Reasons for not taking MMS, among the participants who don't use MMS currently (n=44)

Reason	Grand Total	
	N	% out of 44
Experienced side effects	16	36.4
Forgetfulness	5	11.4
Taking some other medication also	1	2.3
Tablets have an unpleasant taste/ smell	5	11.4
Got my tablets bottle misplaced	1	2.3
I am taking supplements from private sector (pharmacy/ private hospital)	18	40.9
Other	9	20.5

Fifty-five responses were received as the reasons for not taking MMS currently, where multiple responses were allowed. Taking supplements from the private sector was the commonest reason given (n=18), closely followed by experiencing side effects (n=16). Out of those who took supplements from the private sector, nine were from the urban sector. Eight from the urban sector, and six from the rural sector, experienced side effects resulting in non-use. Other reasons included forgetfulness, taking some other medications, tablets having an unpleasant taste or smell.

Those who were currently using MMS (n= 220), were enquired about their adherence with regard to missing any doses of MMS. It was revealed that a promising 70.0% of those who were currently taking MMS, took it daily without missing any doses. Among the 30.0% (n= 66) who forgot to take MMS daily, the majority missed only 1-2 doses per week. Close to one fifth of the sample (19.5%, n= 43) missed one or two doses a week (Table 5).

Table 6: Frequency distribution of adherence patterns of participants

Sector	Daily without missing any dose		Missing 1-2 Days per week		Missing 3-4 Days per week		Missing more than 4 days per week		Total	
	N	%	N	%	N	%	N	%	N	%
Urban	43	69.4	10	16.1	9	14.5	0	0.0	62	100.0
Rural	72	72.0	23	23.0	5	5.0	0	0.0	100	100.0
Estate	39	67.2	10	17.2	7	12.1	2	3.4	58	100.0
Total	154	70.0	43	19.5	21	9.5	2	0.9	220	100.0

Out of the 264 pregnant women who had received MMS, just above one third (34.1%, n=90) have experienced side effects (Table 6).

Table 7: Frequency of experiencing side effects of MMS in the participants (n=264)

Experienced side effects	Urban		Rural		Estate		Grand Total	% out of 264
	N	%	N	%	N	%		
Yes	23	28.8%	47	39.1	20	31.2	90	34.1
No	57	71.2%	73	60.8	44	68.7	174	65.9
Total	80	100%	120	100.0	64	100.0	264	100.0

The common side effects that they experienced were explored, where multiple responses were allowed.

Nausea or vomiting was highlighted as the most commonly experienced side effect of MMS, seen among close to two thirds of the affected (63.3%, n= 57). The frequency of experiencing different side effects, is given in Table 7.

Table 8: Frequency of side effects experienced by the pregnant women (n=90)

Side effects	Grand Total	
	N	% out of G0
Nausea or vomiting	57	63.3
Constipation	14	15.6
Diarrhea	1	1.1
Headache	7	7.8
Dizziness	8	8.9
Gastritis	27	30.0
Decreased appetite	6	6.7
Other	12	13.3

Apart from nausea or vomiting, the other commonly experienced side effects were gastritis (n= 27) and constipation (n= 14), followed by dizziness (n= 8) and headache (n=7). The 'Other' side effects reported included smelly urine, stomach burning, tremors, and drowsiness (n=12).

It was identified that the occurrence of side effects led to discontinuation or reducing the intake of MMS, among the majority of those who experienced side effects (86.7%, n= 78).

Table 9: Status of discontinuation or reduction of intake of MMS due to side effects (n= 90)

Stopped or reduced the intake due to side effects	Urban		Rural		Estate		Total
	N	% (out of urban)	N	% (out of rural)	N	% (out of estate)	
Yes	19	82.6	44	93.6	15	75.0	78
No	4	17.4	3	6.4	5	25.0	12
Total	23	100.0	47	100.0	20	100.0	90

The rural sector showed the highest proportion who stopped or reduced the intake of MMS due to side effects (93.6%, n=44), followed by the urban sector (82.6%, n=19)

The findings of the quantitative component of the study for assessing coverage and adherence, were complemented by the qualitative study findings of the observations carried out in ANCs and domiciliary visits, and findings from the FGDs and KIIs.

Some of the reasons mentioned above for not using MMS and the side effects experienced (Tables 6 and 7), which were revealed from these interviews with the participants, were re-established during the focus group discussions and domiciliary visit observations.

During the community level Focus Group Discussions, some recipients identified side effects such as gastritis, nausea, vomiting and metallic taste of the tablets as reasons for discontinuation.

"Gastritis, stomach pain, vomiting, and palpitations leading to discontinuation."

- FGD with pregnant women who consumed MMS

Side effects were highlighted as one of the main reasons for discontinuation of MMS by pregnant women who participated in FGDs. Reactions such as vomiting and fainting attributed to MMS have led to permanent quitting of the supplement.

"Very bad experience. I vomited every day. I fainted once. My husband was very scared. I told PHM and she asked me to stop taking MMS."

- FGD with pregnant women who consumed MMS

"I took only two tablets. After the second, I vomited and felt dizzy. Today I am going to stop taking MMS."

- FGD with pregnant women who consumed MMS

A few experienced diarrhea 'attributable to MMS', leading to discontinuation of MMS.

"Discontinued due to diarrhea."

- FGD with pregnant women who consumed MMS

These FGDs with pregnant women also revealed that not only the experience of side effects, but also the fear of side effects led to poor usage through non-initiation of MMS.

"I received MMS, but I did not take it. I was scared after hearing about the side effects of others."

- FGD with pregnant women who consumed MMS

However, some of the women declared that despite experiencing side effects, they managed to continue taking MMS.

"Even when we felt some side effects like nausea, we did not stop taking the medication. We continued with it as advised."

- FGD with pregnant women who consumed MMS

This continuation despite side effects was sometimes owing to the fact that they understood the importance of MMS.

"Even when we felt some side effects like nausea, we did not stop taking. We continued with it as advised."

- FGD with pregnant women who consumed MMS

Some of them took remedial action for side effects, such as through changing the timing of taking MMS, sometimes with the support of PHMs who gave them helpful advice.

"Initially, I experienced some mild nausea, but taking the tablet after meals helped reduce this."

- FGD with pregnant women who consumed MMS

"I had vomiting when I took this in the morning. After the PHM advised me, I changed to taking it at night. That made a big difference. I no longer vomited."

- FGD with pregnant women who consumed MMS

For some of them, side effects, which they attributed to MMS, were present initially, but they became less and subsided with time, resulting in continuation of the MMS regime.

"I had vomiting on the second and third day. But I continued. After one week, no more vomiting. Now I feel strong."

- FGD with pregnant women who consumed MMS

Some pregnant women declared that they were not experiencing many side effects, and continued consistent use.

"Most of our experience has been positive overall. We have been consistent and none of us stopped taking it."

- FGD with pregnant women who consumed MMS

"I had no side effects at all. It was easy. I just take one pill at night and sleep."

- FGD with pregnant women who consumed MMS

Some pregnant women also highlighted the metallic taste of MMS, which made them nauseous.

"The smell from the pack made me nauseous."

- **FGD with pregnant women who consumed MMS**

A few pregnant women highlighted forgetfulness as a reason for poor adherence.

"Yes, sometimes I forget to take the tablet at night. When that happens, I take it the next day. I don't skip it entirely."

- **FGD with pregnant women who consumed MMS**

Healthcare providers, mainly PHMs, were of the view that the most common reason for skipping MMS is forgetfulness. They attributed this forgetfulness to particular instances where the pregnant women fall asleep after dinner, and to busy daily routines.

During the 13 domiciliary visit observations, 12 women (92.3%) were currently taking MMS, and all of them were taking it daily. Four women (33.3%) had missed one or more pills during the previous week. Nausea and vomiting were given as the reason for missed doses by one and not taking due to fear of potential interactions with a herbal drink was given by another. Two pregnant mothers revealed forgetfulness as the reason for missing pills.

Discontinuing MMS due to switching to private sector supplements was revealed during the focus group discussions. This was mainly at the discretion of the Consultant Obstetrician and Gynaecologist.

"The VOG advised me to stop taking MMS. He prescribed other vitamins – (brand name)"

- **FGD with pregnant women who consumed MMS**

-

"Mothers often think government medicine is lower quality. In urban areas like Kesbewa and Kaduwela, many mothers go to private specialists (VOGs) who prescribe commercial brands like (brand name)"

- **FGD with PHM**

Key informant interviews (KII) with healthcare staff, including a Medical Officer of Maternal and Child Health (MO-MCH), PHMs, Divisional Pharmacists and healthcare administrators at the Regional Director of Health Services (RDHS) Offices also revealed information which supported the above.

"A significant challenge is that some Obstetricians and Gynaecologists have informed mothers that the iron content in MMS is relatively low, and mothers come to us asking about this."

- KII with an AMOH

"Some Obstetricians and Gynaecologists have recommended alternative micronutrient supplements instead of MMS, and as a result, some mothers have chosen these alternatives."

- KII with an AMOH

"The attitude of Obstetricians and Gynaecologists toward the national programme is crucial; however, a major barrier is the practice of private sector VOGs prescribing alternative brands to mothers who have already received government-supplied MMS."

- KII with a MO-MCH

"Most in the area about 50% prefer to take commercial products prescribed from private consulted doctors. As this is urban area mothers prefer those than government product since the myth of government products are low in quality."

- FGD with PHM

Low maternal compliance also impacts logistics; many mothers prefer vitamins prescribed by private consultants and may not use the government-provided MMS, leading to stagnant stock at the clinic level."

- KII with Divisional Pharmacist

"The major challenges include Obstetricians and Gynecologists in the private sector prescribing alternative nutritional brands, which hinders 100% utilization of the government-supplied MMS."

- KII with MO-MCH

"Some private Obstetricians and Gynaecologists have advised mothers against taking the government-supplied MMS, claiming it is unnecessary."

- KII with a Consultant Community Physician (CCP)

It was noted that pregnant women seek the advice of Obstetricians and Gynaecologists about the suitability of taking MMS.

"Some patients, especially who are followed up at private sector come to us, and they come and ask whether this is alright to take."

- **KII with an Obstetrician and Gynaecologist**

Sometimes, this switching to private sector supplements was attributed to lesser side effects.

"I stopped taking MMS. I take private vitamins from VOG. They are expensive, but no side effects for me and trust."

- **FGD with pregnant women who received MMS**

Perceptions that medicines issued in the government sector were of lower quality was another reason pointed out for switching to private sector supplements.

"Many women believe that government-issued medicine is of lower quality than supplements purchased at a private pharmacy."

- **KII with a Consultant Community Physician (CCP)**

Misinformation shared through social media, had led to fear of miscarriages and deformities due to MMS, which affected adherence.

"My husband saw Facebook posts that MMS causes birth defects."

- **FGD with pregnant women who consumed MMS**

Anyhow, recipients appreciated the single tablet replacing multiple pills. The fact that they received it free of charge was also appreciated, especially in rural areas.

"Our attitude is very positive. We believe it is important and beneficial. we don't need to take many tablets as MMS contains many vitamins."

- **FGD with pregnant women who consumed MMS**

The fact that mothers prefer one pill over multiple pills was further emphasized during KIIs with healthcare providers.

"Mothers generally prefer MMS over taking Iron and Folate separately. Even mothers who previously sought private-sector vitamins have shown interest."

- KII with a MOH

Blister packaging was also appreciated by some women, as it helped them to keep track of their daily doses.

"The blister packs also help me track whether I've taken my daily dose, as I can see which tablets are left."

- FGD with pregnant women who consumed MMS

The reminders from family members were a facilitating factor to improve adherence.

Domiciliary visits by the PHM also enabled effective monitoring of adherence, largely owing to their trust in the PHM.

"PHM said mild vomiting is normal. If vomiting continues more than one day, visit doctor. She also said not to take extra folic acid or calcium separately."

- FGD with pregnant women who consumed MMS

It was also explored how the women who received different packaging of MMS experienced side effects.

Table 10: Side effects experienced by the participants for different packaging of MMS

Packaging type	Have you experienced side effects?				Total	
	Yes		No		No.	%
	No.	%	No.	%		
Blister pack	89	35.0	168	65.0	257	100.0
Bottle	1	14.3	6	85.7	7	100.0

It was revealed that 35.0% (n=89) of the pregnant women who received blister packs claimed they experienced side effects. Out of the 7 women who received the bottled packaging, one (14.3%) experienced side effects.

Table 11: Packaging type of MMS received by the participants, by the sector of residence

Residential sector	Bottle		Blister pack		Total
	N	%	N	%	N
Urban	2	0.8	78	29.5	80
Rural	3	1.1	117	44.3	120
Estate	2	0.8	62	23.5	64
Total	7	2.7	257	67.3	264

Across all three sectors, 97.3% (n=257) have received MMS in blister packs. Only a minority of 2.7% (n=7) had received MMS in a bottle.

In par with the above findings, almost eighty percent of the participants who received MMS (82.2%, n=217), received their supply on a monthly basis. Only 2.7% (n=7) received the 6 months of supply at the initiation of it (Table 11).

Table 12: Frequency of receiving MMS, among participants who received MMS, by residence sector

Residential sector	Monthly		Given for 6 months		Other		Total	
	N	%	N	%	N	%	N	%
Urban	67	25.4	2	0.8	11	4.2	80	30.3
Rural	99	37.5	3	1.1	18	6.8	120	45.5
Estate	51	19.3	2	0.8	11	4.2	64	24.2
Total	217	82.2	7	2.7	40	15.2	264	100.0

The 40 participants who declared that they received their supply in other frequencies, included those who received it at different frequencies (e.g. once in two months, once in three months, for nine months, etc.), those who received at varying frequencies (e.g. initially for one month and then for three months), those who received a separate supplement after some time and those who did not receive for some time due to stockouts.

Out of the sample of pregnant women who received MMS, blister packs were preferred by the majority (n=224, 84.9%). This was common across all three sectors alike (Table 12).

Table 13: Package preference of pregnant women who received MMS

Sector	Blister pack		Bottle		Grand Total	
	N	%	N	%	N	%
Urban	68	85.0	12	15.0	80	100.0
Rural	113	94.2	7	5.83	120	100.0
Estate	43	67.2	21	32.9	64	100.0
Grand Total	224	84.8	40	15.1	264	100.0

Out of the three residential sectors, the rural sector showed the highest proportional preference for blister packs (113/120, 94.2%).

The main reason for preference of the MMS bottle for 6 months was the convenience of getting the entire requirement at the beginning (35 responses). However, there were also concerns about tablets getting soggy as a result of moisture, as well as difficulties in storing.

The main reasons favouring blister packs were, convenience in usage (155 responses), lesser chance of contamination (106 responses), ease of carrying when going out (99 responses), good protection from moisture (85 responses), more hygienic (83 responses) and the ease of keeping track of tablets (83 responses).

It was noted that blister packs were preferred by both pregnant women and PHMs in the FGDs conducted, as well.

Pregnant mothers declared that blister packs were better at maintaining quality of the tablets, compared to the bottles.

"The bottles were terrible. The tablets would stick together or break. After few weeks, the tablets would be one damp, messy lump. Blister packs are much better. Each tablet stays fresh and dry."

- **FGD with pregnant women who consumed MMS**

Public Health Midwives were also of the view that blister packs reduced wastage.

"If a mother stops halfway, we cannot give that opened bottle to another mother. Blister packs minimize wastage."

- **FGD with PHM**

They also mentioned that mothers prefer blister packs due to hygiene reasons, as well.

"Most prefer the blister pack because it's clean and each tablet is protected."

- **FGD with PHM**

Storage conditions maintained by the participants were enquired during the interviews, to see whether they adhered to proper storage conditions. The participants were allowed to select multiple responses out of the given options. Among the 264 participants, 174 (65.9%) stored MMS in the original pack. Almost half of the participants (48.1%, n=127)

stored the MMS tablets in a dry place, while 145 (54.9%) stored the tablets away from sunlight.

Table 14: Storage conditions maintained at home by the participants during storage of MMS

Storage of tablets at home	Urban		Rural		Estate		Grand Total and % out of 264	
	N	%	N	%	N	%	N	%
In the original pack	56	21.2	79	30.0	39	14.8	174	66.0
In another container	18	6.8	43	16.3	26	9.9	87	33.0
In a plastic/paper bag	20	7.6	19	7.2	3	1.1	42	16
In a dry place	28	10.6	67	25.4	32	12.1	127	48.1
Away from sun light	39	14.8	75	28.4	31	11.7	145	55.0
Other	1	0.4	3	1.1	0	0.0	4	1.5

When enquired about challenges during safe storage, only a minority of 1.1% (n=3) declared that they faced challenges during storage of MMS safely, and these included colour change in tablets, which was specified by one participant as blackish spots in yellow colour tablets, and safety concerns of a toddler being involved in handing over the tablets to the mother.

During the domiciliary visits (n= 13), recipients had tablets that appeared normal with no colour changes or signs of moisture damage. Storage conditions were favourable in all of them with MMS stored in original sealed packaging. Twelve out of them (92.3%) had stored MMS away from direct sunlight, while nine had stored out of reach of children and away from food and chemicals. Seven out of the 13 recipients had stored MMS in a clean dry place.

During the FGDs, pregnant women complained of colour changes in tablets and tablets becoming soggy when stored in bottles.

"Tablets becoming soggy and showing colour changes, particularly when supplied in bottles."

- FGD with pregnant women who consumed MMS

Table 15: Availability of MMS at the clinic

Residential sector	No		Yes		Total	
	N	%	No	%	N	%
Urban	3	3.8	77	96.2	80	100.0
Rural	17	14.2	103	85.8	120	100.0
Estate	3	4.7	61	95.3	64	100.0
Total	23	8.8	241	91.3	264	100.0

Less than ten percent of the 264 participants (8.8%) who received MMS declared inability at some point of time to get MMS from the health centre (n= 23). Mostly it was due to unavailability of stocks (n= 19, 82.6%). The other reason given was not attending the clinic. The rural sector showed a higher percentage claiming ever being unable to get MMS from the health centre (14.2%), compared to the urban (3.8%) and estate (4.7%) sectors.

During the Focus Group Discussions with the PHMs, there were mixed views regarding the stockouts. Some were in the view that there were no stockouts of MMS.

"There were no stockouts. We received our boxes (blister packs) monthly without interruption."

- FGD with PHM

Meanwhile, some of them disclosed that there were stockouts, implying poor coverage.

"In December, there was a stock out at the clinic, so we could not get the MMS."

- FGD with PHM

Stockouts were identified by the PHMs as a reason for losing trust of the pregnant women.

"A big problem is that large stocks arrive close to expiry, so we rush to distribute them. If mothers can't trust that the tablet will be there next month, they will never really believe in the program."

- FGD with PHM

Some commented on recent stockouts, despite good coverage previously.

"The supply was continuous until last week. However, we did not receive MMS last week."

- FGD with PHM

Pregnant women also identified inconsistent supply of MMS as a challenge.

"The MMS is not continuous. It comes, then stops, then comes again. We cannot rely on getting the supplements every time. Many days there is nothing. The supply is not steady. Some months we get, some months we don't."

- (FGD with pregnant women who consumed MMS)

Counselling and education related to MMS by healthcare providers is an important aspect in healthcare delivery, which can affect the usage and adherence to MMS. This was assessed during the interviews (Table 15).

Table 16: Status of receiving advice or information about MMS from healthcare providers

Residential sector	Yes		No		Total	
	N	%	N	%	N	%
Urban	74	92.5%	6	7.5%	80	100%
Rural	118	98.3%	2	1.7%	120	100%
Estate	59	92.2%	5	7.8%	64	100%
Grand Total	251	95.1%	13	4.9%	264	100%

The majority of participants who received MMS (95.1%) agreed that advice/ information about MMS was received from a healthcare provider such as a PHM, MOH, Medical Officer or a nursing officer. The findings were somewhat similar for all three sectors, with the rural sectors exhibiting the highest agreement (98.3%).

During FGDs, pregnant women agreed that counselling by PHMs and domiciliary visits by them helped in receiving instructions, support as well as monitoring the adherence.

"We were given clear instructions from the PHM. We were told to take the tablet at night and maintain a gap from meals."

- FGD with pregnant women who consumed MMS

"The PHM visits our homes to check on us. During these visits, she asks whether we are taking the tablets regularly and listens to any problems."

- FGD with pregnant women who consumed MMS

The most common types of information received were on how and when to take the MMS tablets (224 responses), purpose and benefits of MMS (206 responses), how to store MMS properly (152 responses), and importance of continued use during pregnancy (145 responses).

Majority of those who received advice felt it was sufficient (n=228, 89.8%).

Complementing the findings of the interviews with the pregnant women, ANC observations at 21 clinics revealed important findings on the service delivery related to counselling and education on MMS (Figure 3).

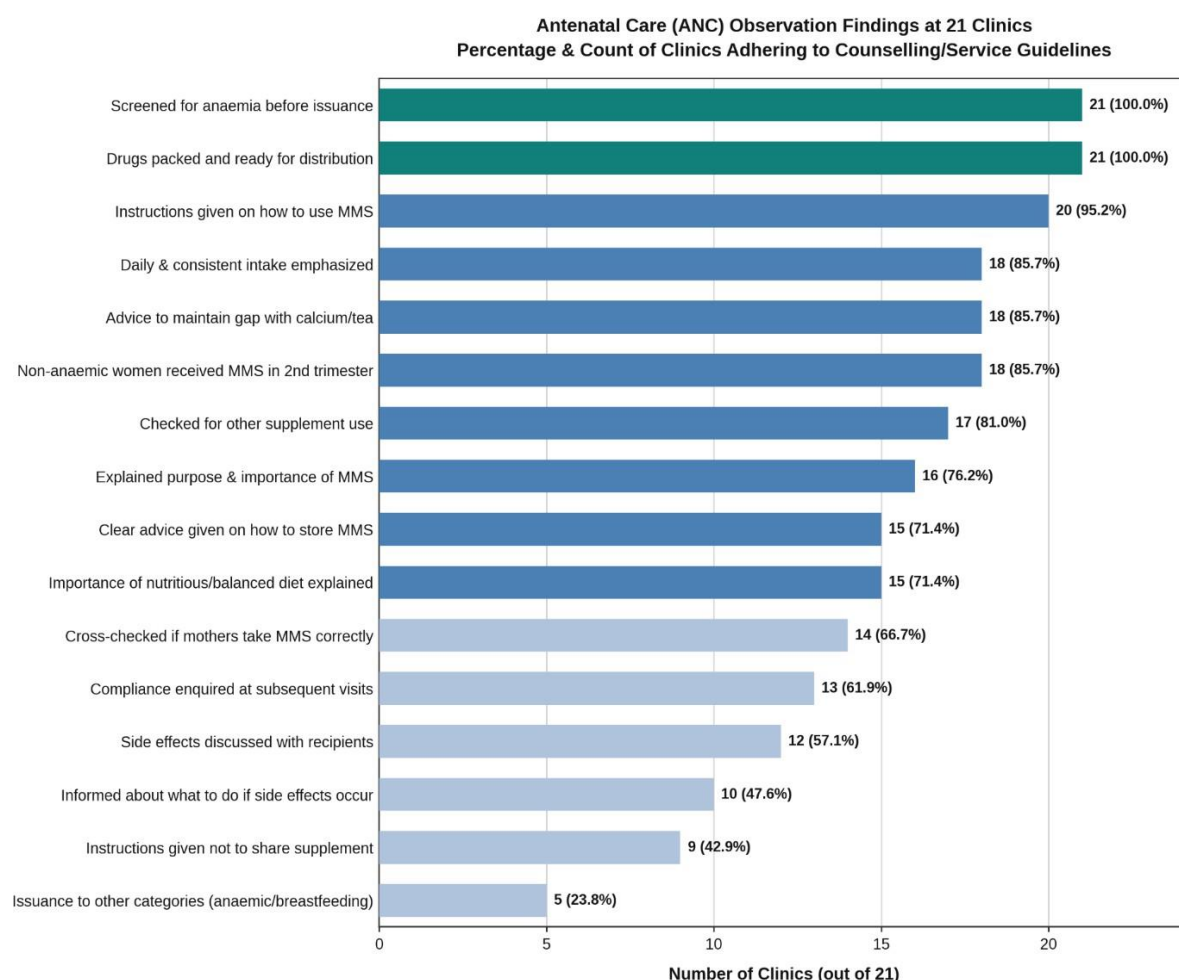


Figure 3: Observations at Antenatal Clinics

These ANC observations found out that all pregnant women were screened for anaemia before issuance of MMS. Non-anaemic pregnant women received MMS starting from second trimester at 18 out of the 21 Antenatal Clinics. Issuance of MMS to any other category was seen only in 5 clinics, where these categories included anaemic pregnant women and breastfeeding women (Figure 3).

At all observed clinics, drugs were packed and ready for distribution. Giving explanations on the purpose and the importance of MMS was observed at 16 clinics, while instructions on how to use MMS was given at all but one clinic. At 18 clinics, the daily and consistent intake of MMS was emphasized.

Clear advice on how to store MMS, such as storage in a dry, place, away from sunlight and children, tight capped, were given at 15 out of the 21 clinics.

Compliance with MMS was enquired at subsequent visits to 13 clinics. Mothers were cross checked at 14 clinics to see whether they take MMS correctly. At 9 clinics, instructions were given not to share the supplement with others. The importance of consuming a nutritious and balanced diet in addition to MMS was explained at 15 clinics, out of the 21 observed.

Twelve clinics discussed the side effects with the recipients, and at 10 clinics, MMS recipients were informed about what to do if side effects occur.

At 17 clinics, it was checked whether recipients were taking other supplements such as iron tablets, and they were asked not to take other supplements without medical advice. Advice was given at 18 clinics, to maintain a gap between MMS and calcium tablets, and to maintain a gap between MMS and diet/ tea (at least 1 hour).

It was observed that action was taken when a pregnant woman on MMS developed anaemia at two clinics, and this was not relevant for the other clinics on the days of the observations.

3.2 Efficiency and resilience of the supply chain for MMS distribution

To identify transport, storage, packaging and stock levels related to MMS, key informant interviews were conducted with staff involved in MMS logistics and distribution, and observations were made at Regional Medical Supplies Divisions (RMSD) and MOH offices. Focus Group Discussions conducted with the PHMs and KIIs (mentioned under objective 1) also extracted data related to the efficiency of the supply chain.

Officials at the Medical Supplies Division (MSD), Divisional Pharmacists and Storekeepers at the Family Health Bureau were approached during the key informant interviews. Altogether, four KII were conducted with them.

Observations were carried out at 21 MOH Offices belonging to 13 districts of the country, covering eight provinces, to identify whether there were stockouts present. These

districts included Anuradhapura, Badulla, Batticaloa, Colombo, Gampaha, Puttalam, Kalutara, Kurunegala, Rathnapura, Nuwara-Eliya, Jaffna, Kandy, and Galle.

Thirteen RMSDs were also observed, which were located in the aforementioned 13 districts.

3.2.1. Stockouts

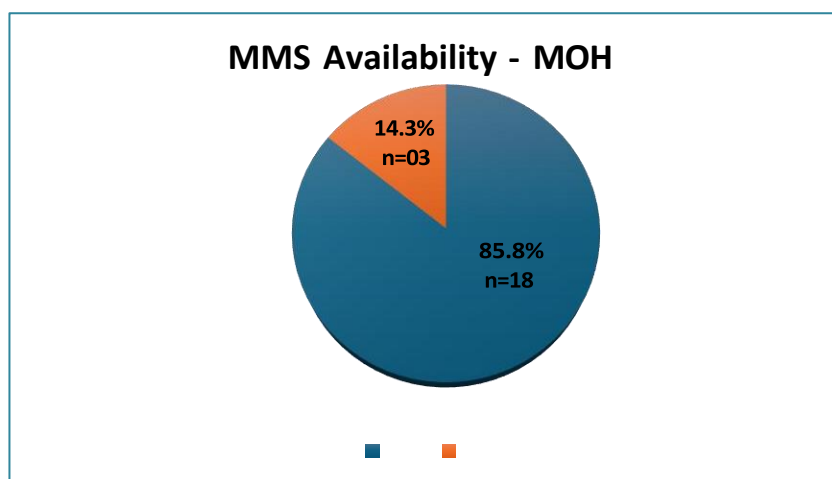


Figure 4: Availability of MMS in the observed MOH areas

Out of the 21 MOH areas that were observed for stockouts, MMS was available in 18 MOH areas.

As for the 13 RMSDs that were observed, MMS was not available in two of them (15.4%).

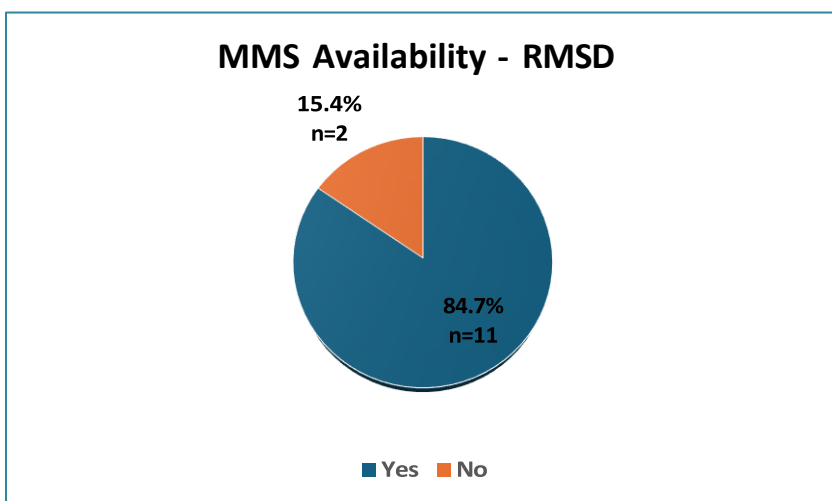


Figure 5: Availability of MMS in the observed RMSDs

The issue of frequent stockouts and supply delays emerged as a main theme during the KIIs and the FGDs carried out with relevant officials, where FGDs and KIIs explored supply chain resilience and continuity of MMS distribution. as well.

Consultants highlighted broader coordination and forecasting challenges.

"A major challenge observed is the unreliability of the supply, with stocks frequently running out by the seventh or ninth month of a mother's pregnancy, preventing the completion of the full 180-day course."

- **KII with a CCP**

Public Health Midwives raised the concern of inability to provide MMS due to stockouts.

"In December, there was a stock out at the clinic, so we could not get the MMS."

- **FGD with PHM**

Public Health Midwives raised the concern of having to revert back to previous supplements due to unavailability of MMS for relatively long periods of time.

"One month we have too many MMS but no calcium. The next month, we have no MMS for three weeks! We had to go back to the old iron tablets."

- **FGD with PHM**

They were also concerned about the loss of trust caused due to stockouts.

"Continuous provision of MMS has not been maintained. When MMS stocks are unavailable, we revert to issuing iron tablets."

- **FGD with PHM**

On the other hand, receiving sudden bulk deliveries without advance notice was also an issue identified by a Divisional Pharmacist.

"The RMSD frequently learns of a delivery only when the vehicle arrives at their gate."

- **KII with a Divisional Pharmacist**

"We usually order MMS 3 monthly. They don't bring it. When we need the drugs, we have to order it as well as go and get it."

- **KII with a Divisional Pharmacist**

This was attributed to poor coordination between the Medical Supplies Division (MSD) and the Family Health Bureau (FHB). This resulted in parallel supply systems causing potential waste of supplements.

"A major coordination gap exists because the FHB often delivers stock without advance notice... the standard Iron-Folate supplement is still being supplied based on old estimates alongside the MMS donations, creating a high risk of massive stock expiry by 2027."

- **KII with a Divisional Pharmacist**

Currently, the systems operate in silos, which prevents the agencies from seeing each other's performance or stock levels in real-time."

- **KII with official at, MSD**

"The supply chain typically moves from the FHB directly to the Regional Medical Supplies Division (RMSD) via invoice, often bypassing the usual MSD channels."

- **KII with a Divisional Pharmacist**

An official at the MSD identified that MMS was outside the standard MSD system.

"Many MMS products are considered borderline products that do not have an SR number. Because the MSD typically doesn't deal with borderline products, these items fall outside his primary oversight."

- **KII with official at MSD**

The supply chain typically moves from the FHB directly to the RMSD via invoice, often bypassing the usual MSD channels."

- **KII with a Divisional Pharmacist**

The limitation of transport facilities was also identified as an issue.

A Divisional Pharmacist mentioned that there was only one vehicle available for the entire division

"There is a severe shortage of transport; currently, only one functioning lorry is available to distribute vaccines, drugs, family planning supplies, and oxygen across the entire division."

-**KII with a Divisional Pharmacist**

"Main challenge we face is transport. We only have a small crew cab to do distribution. One hundred and thirty offices are involved. This crew cab is used for both getting as well as distributing."

- **KII with a Divisional Pharmacist**

"Stocks are generally distributed to MOH offices every 3 to 4 months to optimize the use of limited transport."

- **KII with a Divisional Pharmacist**

3.2.2. Storage conditions, documentation and distribution

The conditions of storage, documentation and distribution at the MOH offices and RMSDs were observed. The indicators used in assessing these conditions were, whether MMS was properly stored in a dry place away from sunlight, whether the stock ledger was up to date, whether there had been stockouts during the previous three months, and whether MMS have been distributed within the previous three months. It was observed that the stock ledger was up to date in all the MOH offices and RMSDs.

Proper storage conditions were maintained at all MOH offices and RMSDs where MMS was available. There have been no stockouts during the previous three months, in 18 MOH offices and 10 RMSDs, out of those observed. Nineteen out of 21 MOH offices have distributed MMS within the previous three months (Table 16).

Table 17: Information related to storage, documentation and distribution in the observed MOH areas and RMSDs

Indicator	MOH (n=21)			RMSD (n=13)		
	Yes	No	N/A	Yes	No	N/A
Proper storage (dry, away from sunlight)	80.9% (n=17)		19.0% (n=4)	84.6% (n=11)		15.4% (n=2)
Stock ledger up to date	100% (n=21)			100% (n=13)		
No reported Stock outs in last 3 months	85.7% (n=18)	14.3% (n=3)		76.9% (n=10)	23.08% (n=3)	
Distribution within last 3 months	90.5% (n=19)	9.5% (n=2)		92.3% (n=12)	7.7% (n=1)	

However, sub-optimal storage conditions in the form of inadequate storage infrastructure, were identified as an issue during the KIIs, by RMSD staff as well as at the National level.

A divisional Pharmacist revealed that there was no air conditioning at peripheral MOH stores.

"Peripheral MOH stores often lack air conditioning, with temperatures reaching up to 32°C. These high temperatures are particularly damaging to film-coated tablets like MMS."

- KII with a Divisional Pharmacist

National level key informants also agreed that there were no proper storage systems at lower levels of care.

"Standards are given for peripheries, but in practice, standards are not maintained. Temperature is about thirty degrees. I don't know all the details. That needs improvement. Humidity is the same."

- KII with a CCP

"Even centrally and in the periphery, there are storage issues. In the FHB, there is no proper logistic handling or monitoring system."

- KII with a CCP

"Storage has also been a problem on certain occasions."

- KII with a CCP

The comparative analysis of estimated, requested and issued amounts of MMS based on the data gathered on the estimated, requested and issued amounts of MMS at MOH offices in 2024 and 2025, highlighted severe operational discrepancies between supply-chain planning, demand forecasting, and actual distribution. There was unplanned stock dumping in some MOH areas and under-requesting despite high annual estimates. The system suffered from severe logistical bottlenecks where a few MOH areas received absolutely zero MMS stocks during 2024 and 2025. Un-forecasted "inventory dumping" was observed in almost all the provinces. Certain areas have received significantly high MMS stocks that they never requested for, while some MOH areas have received MMS despite not having documented annual estimates.

3.2.3. Impact of the frequent changes in MMS packaging

One other key theme which emerged during the KIIs was that the frequent change of packaging of MMS.

Frequent changes between bottles and blister packs were identified as a reason for poor stability of the programme by a CCP.

"Frequent changes between large bottles, small bottles, and blister packs have disrupted the programme's perceived stability."

- KII with a CCP

"Midwives felt inconvenienced and unable to counsel mothers consistently because they were not given clear guidance, especially when the programme transitioned from bottles to blister packs."

- KII with a CCP

"Another challenge faced up to now since starting MMS was interruption of supply in two instances. This was happened when they change the stocks from MMS bottle to blister pack and from blister pack to bottle."

- KII with a MOH

These changes in the packaging also led to confusion among the healthcare workers.

"The programme has seen frequent changes in packaging... This has caused confusion among midwives regarding the correct number of units to distribute."

- KII with a CCP

"The use of bottles resulted in significant wastage. This was primarily because a large quantity was issued at once, whereas the current 30-tablet packs allow for precise monthly distribution based on the mother's needs."

- KII with a PHNS

3.3 Knowledge, perceptions and experiences of pregnant women and healthcare providers regarding MMS

This section presents knowledge, experiences, and perceptions related to MMS among pregnant women and healthcare providers. Data were gathered using a quantitative survey among pregnant women and qualitative methods, including FGDs and KIIs with pregnant women and healthcare providers. Findings are presented under thematic areas including awareness and knowledge, perceived benefits, experiences with side effects, health system support, and preferences related to MMS.

3.3.1. Awareness and Knowledge on Multiple Micronutrient Supplementation

Knowledge and awareness regarding MMS were assessed through a survey conducted among 480 pregnant women across urban, rural, and estate sectors. In addition, FGDs with pregnant women and KIIs with healthcare providers explored awareness creation processes and communication practices related to MMS.

"My role involves coordinating the MMS program in the Kegalle district. We operate based on written guidelines from the Family Health Bureau (FHB) and instructions provided via Zoom technology. Using these guidelines, I develop and use PowerPoint presentations and digital posters to sensitize and train the field-level healthcare workers, including Medical Officers of Health (MOH), Public Health Midwives (PHM), Senior PHMs (SPHM), and MOH Nursing Sisters."

- KII with a MO-MCH

"Staff feel confident explaining that it is a multi-vitamin... They educate on benefits, contents, how to take and store during education sessions. They make a point to mention it contains Vitamin C, as mothers often ask why they are no longer receiving the separate white Vitamin C tablet."

- KII with a PHNS

Overall Awareness of MMS

Overall awareness regarding MMS among pregnant women was moderate. Only 57.9% (n=278) of participants had heard about MMS, while a considerable proportion remained unaware of the supplement.

Awareness varied notably by residential sector. Rural women demonstrated the highest level of awareness (n=125, 78.1%), followed by urban women (n=98, 61.3%). Awareness was lowest among estate sector women, where only 34.4% (n=55) had heard about MMS.

Healthcare workers also highlighted the limited awareness programmes conducted during the initial implementation phase of MMS for them.

“We did not receive any specific awareness about this MMS before they were introduced. We just heard it from the patients...”

- KII with an Obstetrician and Gynaecologist

Similarly, concerns were raised regarding the inadequacy of formal training mechanisms for healthcare staff.

“The vaccine programme has comprehensive training for every staff member. MMS had nothing beyond official letters and a Zoom session.”

- KII with a Divisional Pharmacist

At the RDHS level, one district had already identified implementation gaps and incorporated corrective measures into future planning.

“RDHS X has incorporated correction of MMS implementation gaps as a specific activity in the district’s 202c action plan.”

- KII with a CCP

Knowledge of Nutritional Composition of MMS

Knowledge regarding nutrients contained in MMS was assessed using a structured questionnaire among pregnant women who were aware of MMS.

Among 53.1% (n= 52) of urban, 52.8% (n=66) of rural and 60.0% (n=33) of estate pregnant women knew that MMS provides all the nutrients required during pregnancy.

Among the participants, iron was the most commonly identified nutrient as included in MMS (68.3%), followed by Vitamin C (60.8%) and folic acid (50.0%). Awareness regarding other micronutrients such as zinc (16.5%), iodine (12.9%), calcium (12.9%), selenium (6.8%) and copper (6.5%) was substantially lower.

Women from the estate sector demonstrated comparatively higher awareness regarding vitamins A, C, D, E, and Vitamin B complex, whereas rural women showed greater awareness regarding folic acid and iron content.

Knowledge on MMS Storage and Correct Use

Knowledge regarding appropriate storage and use of MMS was evaluated using structured survey questions among current users which were complemented by the home visits.

Most participants demonstrated satisfactory knowledge regarding certain aspects of MMS use. A high proportion of participants across all sectors (urban-81.6%, Rural-88%, Estate-85.5%) correctly understood that nutritious meals remain important even while taking MMS.

However, several important gaps were identified regarding dosage management and concurrent supplementation practices. Knowledge regarding missed doses was particularly inconsistent across sectors. However, the estate sector (65.5%) women demonstrated comparatively better responses regarding actions to be taken after missing a dose (urban-40.8% Rural-54.6%).

Continuing to take iron, folate and vitamin C supplements along with MMS, was identified as a wrong practice by a majority (Urban-64.3%, Rural-64.0%, Estate-74.5%).

With respect to the storage of MMS, many women correctly identified the need to protect MMS bottles from light and moisture (Urban-70.4%, Rural-88.8%, Estate-89.1%).

Sources of Information on MMS

Survey participants who were aware of MMS were further questioned regarding their primary source of information.

Across all residential sectors, healthcare workers were identified as the dominant source of MMS-related information. More than 96% of pregnant women reported receiving information from PHMs, MOHs, nurses, or other healthcare providers. Less than 4% identified alternative sources such as friends, mass media, or social media.

Women explained that PHM counseling helped them manage side effects effectively.

“We were given clear instructions from the PHM. We were told to take the tablet at night and maintain a gap from meals.”

- FGD with Pregnant women who consumed MMS

“The PHM’s guidance helped us manage side effects and continue without fear.”

- FGD with Pregnant women who received MMS

Perceived Benefits of MMS

Perceived benefits of MMS were assessed quantitatively among pregnant women using structured questionnaires. Qualitative insights were explored through FGDs and KIIs.

The majority of pregnant women perceived MMS as beneficial effects to improve maternal nutrition (76.6%) and improving foetal health (78.8%). However, only 56.5% believed MMS prevents maternal anaemia.

Perceptions differed across sectors. Rural sector participants consistently demonstrated higher recognition of maternal and nutritional benefits compared to urban and estate sectors. Estate sector women most frequently (74.5%) identified that reduction of low birth weight as a key benefit of MMS compared to urban (25.5%) women.

The most frequently reported perceived benefit among urban women was support for foetal health (79.6%, n=78), followed by improvement of maternal nutrition (73.5%, n=72). More than half (58.2%, n=57) believed MMS helps prevent maternal anaemia. However, urban women were less likely to perceive MMS as beneficial in reducing low birth weight (25.5%, n=25) compared to women from rural and estate sectors.

The majority of rural women believed MMS improves maternal nutrition (83.2%, n=104) and supports foetal health (82.4%, n=103). Rural women also had the highest perception regarding prevention of maternal anaemia (64.8%, n=81). Among the rural women 44.8%, (n=56) perceived MMS as beneficial in reducing low birth weight.

The most prominent perceived benefit among estate women was reduction of low birth weight, reported by 74.5% (n=41), which was substantially higher than both urban and rural sectors. Estate women also positively perceived fetal health benefits (69.1%, n=38) and improvement of maternal nutrition (67.3%, n=37). However, estate women reported the lowest perception regarding prevention of maternal anaemia (34.5%, n=19).

Qualitative findings suggested that the benefits for mother and baby gain from MMS, contributed to these positive perceptions.

"Our attitude is very positive. We believe it is important and beneficial... we don't need to take many tablets as MMS contains many vitamins."

- FGD with Pregnant women who consumed MMS

Experiences of Side Effects

Experiences related to side effects were assessed among MMS recipients through surveys and qualitative FGDs with pregnant women and healthcare workers (see section 3.1.3).

Among MMS recipients (n=264), 34.1% (n=90) reported experiencing side effects. Nausea and vomiting were the most commonly reported symptoms (n=57, 63.3%),

followed by gastritis (n=27, 30.0%), constipation (n=14, 15.56%), dizziness (n=8, 8.9%), and headaches (n=7, 7.8%).

Importantly, side effects had a direct impact on adherence behaviours. Among women who experienced side effects, 86.7% (n=78) either stopped taking MMS or reduced the frequency of use.

Healthcare workers highlighted that non-adherence was often hidden and only identified through follow-up monitoring.

“Mothers stopped taking MMS quietly without informing the health workers due to side effects – only discovered during home visits when tablet counts were performed.”

- FGD with PHM

During the domiciliary visits (n=13), 76.9% have reported that they have come across side effects.

The KII findings have reported that the complaints they received on side effects were fewer compared to IFA.

“Reduced vomiting complaints compared to IFA”

- KII with a SPHM

One Consultant Obstetrician and Gynaecologist was of the view that due to lower elemental iron content in MMS compared to IFA, the gastrointestinal side effects are expected to be lesser.

“...The amount of iron determines the side effects (gastrointestinal tract related side effects like nausea and vomiting). Since MMS contains 30 mg of elemental iron compared to IFA, the side effects are expected to be lower.”

- KII with an Obstetrician and Gynaecologist

Preference for Packaging Type

Current MMS users were asked about their preferred packaging format and reasons for their preferences (see also section 3.1.3).

Blister packs were generally preferred by pregnant women (97.3%). Reported reasons included convenience of use, ease of carrying during travel, better hygiene, easier tracking of tablet consumption, reduced contamination risk, and improved protection

from moisture. Pregnant women further compared blister packs favorably against bottle packaging.

“The blister packs also help me track whether I've taken my daily dose, as I can see which tablets are left in the pack. The glass bottle is bulky and sometimes difficult to handle.”

- FGD with Pregnant women who consumed MMS

Women explained that blister packs made it easier to track daily tablet intake.

“The blister packs also help me track whether I've taken my daily dose, as I can see which tablets are left.”

- FGD with Pregnant women who consumed MMS

Healthcare providers preferred blister packs as they are cleaner, safer, and more resistant to humidity.

“The blister pack packaging is seen as a safe and easy way to issue the medicine without contamination.”

- FGD with PHM

PHMs also explained that blister packs improved monitoring and reduced wastage.

“If a mother stops halfway, we cannot give that opened bottle to another mother. Blister packs minimize wastage.”

- FGD with PHM

Perceptions of health care workers and pregnant women on MMS

Data from FGDs with pregnant women and PHMs, and KIIs with health care workers were synthesized to understand perception of pregnant mothers and health care workers.

Positive perceptions

“Providing free of charge” as “separate tablets”, “feeling healthier and improved weight gain”

- **FGD with Pregnant women who consumed MMS**

*“Easier in storing the product” “easier distribution”
“easier for mothers to remember taking the tablets”
“easy tracking with blister packs” “reduce vomiting complaints compared to IFA”*

- **FGD with PHM**

3.4 Supportive Factors and Barriers Related to MMS Implementation

This section explored the supportive factors and barriers related to the users that influence the uptake, adherence, perceptions, and factors related to implementation, health system, market of MMS among pregnant women in Sri Lanka

Data were collected through FGDs with pregnant women and PHMs, and KIs with healthcare providers (Obstetricians and Gynaecologists, PHM) and programme-level stakeholders (healthcare administrators, Consultant Community Physicians), as well as clinic and programme observations.

The findings revealed that MMS implementation is shaped by a complex interaction of individual, interpersonal, community, provider, programme, and health-system factors.

Several major thematic areas emerged across the qualitative data, including convenience and acceptability of the supplement, trust in healthcare workers, counseling and adherence support, side effects, packaging and storage issues, misinformation, private-sector influence, supply chain challenges, and training gaps among healthcare providers.

3.4.1. Supportive Factors Influencing MMS Uptake and Adherence

This section describes the factors that facilitated the acceptance, uptake, adherence, and implementation of MMS among pregnant women

Positive Perception of the Single-Tablet Regimen

The simplified single-tablet regimen emerged as one of the strongest facilitating factors influencing MMS acceptance and adherence. Pregnant women consistently described MMS as easier and more convenient than taking multiple tablets separately.

Women appreciated that MMS combined several nutrients into a single tablet, reducing pill burden and simplifying daily routines.

“We believe it (MMS) is important and beneficial... we don't need to take many tablets as MMS contains many vitamins.”

- FGD with Pregnant women who consumed MMS

Many women perceived the single-tablet formulation as providing complete nutrition for both mother and baby.

“The main thing is that it's only one pill. ‘This one tablet gives baby full nutrition. ’That's something every mother wants to hear.”

- FGD with Pregnant women who consumed MMS

Healthcare providers similarly observed strong maternal preference for MMS over separate iron and folic acid supplementation.

“Mothers generally prefer MMS over taking Iron and Folate separately. Even mothers who previously sought private-sector vitamins have shown interest.”

- KII with a MOH

Positive Adherence Experiences and Perceived Benefits

Focus Group Discussions among pregnant women explored adherence experiences and perceptions regarding the effectiveness and tolerability of MMS.

Several women reported positive experiences with MMS and described regular daily intake without major difficulties.

“Most of our experience has been positive overall. We have been consistent and none of us stopped taking it.”

- FGD with Pregnant women who consumed MMS

Some women explained that despite mild side effects, they continued supplementation because they believed MMS was important for maternal and fetal health.

“Even when we felt some side effects like nausea, we did not stop taking the medication. We continued with it as advised.”

- FGD with Pregnant women who consumed MMS

Some mothers experienced no side effects at all and described MMS as easy to use.

“I had no side effects at all. It was easy. I just take one pill at night and sleep.”

FGD with Pregnant women who consumed MMS

-

Family Support and Social Reinforcement

Focus Group Discussions among pregnant women explored interpersonal influences affecting MMS use. Family support was particularly important for women who experienced forgetfulness or side effects. Emotional reassurance and reminders from household members appeared to improve consistency of intake.

Several women described the positive role played by husbands and mothers-in-law in encouraging supplementation and reminding them to take tablets regularly.

Existing Domiciliary Care Facilitated Adherence Monitoring

Focus Group Discussions with PHMs and pregnant women explored the role of the public health infrastructure in supporting adherence monitoring.

The established domiciliary care was identified as an important implementation strength. PHMs described home visits as opportunities to monitor adherence, identify side effects, reinforce counseling messages, and address concerns.

“The PHM visits our homes to check on us. During these visits, she asks whether we are taking the tablets regularly and listens to any problems.”

- FGD with Pregnant women who consumed MMS

Public Health Midwives further explained that home visits allowed them to identify women who had discontinued supplementation silently.

“Mothers stopped taking MMS quietly without informing the health workers due to side effects – only discovered during home visits when tablet counts were performed.”

- FGD with PHM

Strong PHM Counseling and Maternal Trust on PHMs

Focus Group Discussions with pregnant women and PHMs and KIs with healthcare administrators explored the role of frontline healthcare workers in supporting MMS adherence.

Public Health Midwives emerged as central facilitators in the implementation of MMS. Pregnant women consistently described PHMs as trusted sources of guidance, reassurance, and problem-solving related to supplementation.

Women explained that PHM counseling helped them manage side effects and improve adherence.

“We were given clear instructions from the PHM. We were told to take the tablet at night and maintain a gap from meals.”

- FGD with Pregnant women who consumed MMS

“I had vomiting when I took this in the morning. After the PHM advised me, I changed to taking it at night. That made a big difference. I no longer vomited.”

- FGD with Pregnant women who consumed MMS

Healthcare providers highlighted that PHMs are particularly trusted in rural and estate communities, enhancing the credibility and acceptance of MMS-related messages.

Positive Experiences with Side-Effect Management

Focus Group Discussions among pregnant women explored coping mechanisms and experiences related to side-effect management.

Although side effects were commonly reported, several women explained that symptoms became manageable after modifying the timing of intake or following PHM advice.

“Initially, I experienced some mild nausea, but taking the tablet after meals helped reduce this.”

- FGD with Pregnant women who consumed MMS

Some women emphasized that understanding the health benefits of MMS motivated them to continue despite mild discomfort.

“Even if some of us had side effects, we continued taking MMS because we know it is important for our health and the baby.”

- FGD with Pregnant women who consumed MMS

Preference for Blister Pack Packaging

Focus Group Discussions and KIIs explored perceptions regarding packaging formats and their influence on adherence and implementation.

Blister pack packaging emerged as a major facilitator among both pregnant women and healthcare providers.

Women explained that blister packs made it easier to track daily tablet intake.

"I prefer Blister pack. It is easy to carry and I can see if I missed a day."

- FGD with Pregnant women who consumed MMS

Healthcare providers perceived blister packs as cleaner, safer, and more resistant to humidity.

"Blister packs have better packaging and are easier to store. In bottles, tablets tend to become soggy and show colour changes."

- FGD with PHM

"The bottles were terrible, especially here near the coast! The tablets would stick together or break. The last few tablets would be one damp, messy lump. Blister packs are much better. Each tablet stays fresh and dry"

- FGD with PHM

Public Health Midwives also explained that blister packs improved monitoring and reduced wastage.

"Blister packs are easier to distribute during monthly clinic visits and help ensure regular follow-up with pregnant women. It also allows better monitoring of tablet usage and adherence."

- FGD with PHM

Pregnant women further compared blister packs favourably against bottle packaging.

"Most prefer blister pack because it's clean and each tablet is protected. Glass bottle can break and children can open it." "We prefer the blister pack because it is easy to use. The tablets are not exposed to air or moisture while we use them, and it is easy to carry in a handbag."

- **FGD with Pregnant women who consumed MMS**

Free Availability Through the Government Health System

Focus Group Discussions and KIs explored access-related facilitators influencing uptake and continuation.

Pregnant women consistently identified free availability of MMS through government maternal health services as a major supportive factor.

"MMS received free of charge, and we don't need to take many tablets."

- **FGD with pregnant women**

"It is seen as convenient because we don't have to get a new supply every month. ."

- **FGD with Pregnant women who consumed MMS**

"Many of us low-income families. We have no money to buy private medications and vitamins. So, it is useful we can get free of charge all required vitamins in one tablet."

- **FGD with Pregnant women who consumed MMS**

Many participants explained that purchasing private multivitamin supplements regularly would be financially difficult for their households. The ability to access MMS through clinics and PHMs therefore, improved accessibility and uptake.

Donor and Programme-Level Support

Key Informant Interviews with programme administrators explored programme-level enabling factors.

Healthcare administrators and programme managers acknowledged that donor support, particularly from UNICEF, facilitated the initial rollout and procurement of MMS.

“We received donations from the beginning. That was a big positive factor. We did not have any economic issues.”

- KII with a CCP

3.4.2. Barriers for MMS Uptake and Implementation

Side Effects as the Major Barrier to Adherence

Focus Group Discussions among pregnant women and PHMs explored experiences related to side effects and discontinuation.

Side effects emerged as the most significant barrier affecting adherence. Women commonly described nausea, vomiting, gastritis, abdominal pain, metallic taste, dizziness, fainting, diarrhoea, and palpitations.

“Side effects. That's the number one reason they stop.”

- FGD with PHM

“Gastritis, stomach pain, vomiting, and palpitations leading to discontinuation.”

- FGD with Pregnant women who consumed MMS

Some women described severe experiences leading to discontinuation.

“Very bad experience. I vomited every day. I fainted once. My husband was very scared. I told PHM and she asked me to stop taking MMS.”

- FGD with Pregnant women who consumed MMS

Other women explained that smell and metallic taste contributed to nausea and poor acceptability.

“The smell from the pack made me nauseous.”

- FGD with Pregnant women who consumed MMS

Fear, Misinformation, and Social Media Influence

Focus Group Discussions among pregnant women and PHMs explored the role of misinformation and community perceptions.

Fear generated through social media emerged as an important barrier to uptake and adherence.

“My husband saw Facebook posts that MMS causes birth defects.”

- FGD with Pregnant women who consumed MMS

“Negative information on social media makes afraid.”

- FGD with Pregnant women who consumed MMS

Some women avoided initiating MMS due to fear arising from hearing about side effects experienced by others.

“I received MMS, but I did not take it. I was scared after hearing about the side effects of others.”

- FGD with Pregnant women who consumed MMS

PHMs explained that negative attitudes spread rapidly among mothers.

“If one mother complains at the clinic, negative attitudes spread quickly to others.”

- FGD with PHM

Language Barriers

Tamil-speaking Muslim women highlighted difficulties understanding instructions when labels or counseling materials were provided only in Sinhala.

Market Availability and Commercial Supplement Environment

Twelve commercial brands of antenatal multivitamins were available in pharmacies, though substantial variability existed regarding micronutrient composition, iron content, and price.

Out of the multivitamin brands available in the market, there were two brands that were commonly available (69.2% availability each). Prices varied considerably, with the most expensive product costing Rs.158.00 per tablet while the cheapest one costing Rs. 23.00 per tablet.

The number of micronutrients contained in supplements ranged from four to twenty, while the elemental iron content also varied substantially across brands, from 5mg to 60mg.

The most expensive brand contained twelve micronutrients, but it did not contain any iron. The cheapest brand contained nine micronutrients, including 45mg of elemental iron. The most commonly available brands contained nine micronutrients in each, with 45mg of elemental iron in one and 50mg of elemental iron in the other.

Preference for Private-Sector Supplements

Focus Group Discussions and KIIs explored maternal perceptions regarding government versus private-sector supplements.

"In some areas, 25% to 50% of mothers use private vitamins instead of the clinic supply."

- KII with PHNS

In the market survey conducted among 13 pharmacists representing 13 districts it was further interviewed regarding reasons for preference.

The most commonly reported reason for preferring commercial brands was advice from Obstetricians and Gynaecologists (84.6%). Other reasons included perceived quality and trust in commercial products (61.5%), fewer side effects or better tolerability (30.8%), stock-outs of government MMS (23.1%), and better packaging or ease of use (15.4%).

Qualitative interviews conducted among health administrators further revealed the maternal perception of private sector micronutrients as having better quality and more effective than government-issued MMS.

"Many women believe that government-issued medicine is of lower quality than supplements purchased at a private pharmacy."

- KII with RDHS

Healthcare providers similarly observed that many mothers trusted private specialists more than government clinic staff.

"The private doctors. The feeling that 'paid is better than free.'"

- FGD with PHM

"I stopped taking MMS. I take private vitamins from VOG. They are expensive but no side effects for me and trust."

- FGD with Pregnant women who consumed MMS

"The VOG advised me to stop taking MMS.

He prescribed other vitamins:...."

- FGD with Pregnant women who consumed MMS

Private-sector Obstetricians and Gynaecologists were perceived as influential in shaping supplementation practices.

"The major challenges include Obstetricians and Gynecologists in the private sector prescribing alternative nutritional brands, which hinders 100% utilization of the government-supplied MMS."

- KII with a MOMCH

Obstetricians and Gynaecologists advising against government MMS.

"Some private Obstetricians and Gynaecologists have advised mothers against taking the government-supplied MMS, claiming it is unnecessary."

- KII with a CCP

Stock-Outs and Supply Chain Interruptions

Focus Group Discussions and KIIs explored supply chain resilience and continuity of MMS distribution. Stock-outs and inconsistent supply were major barriers affecting continuity and trust.

"We ordered based on our estimation, but we didn't get enough tablets."

- FGD with PHM

"Getting the tablets on time is the biggest problem."

- FGD with PHM

"Due to this shortage, mothers become confused when IFA is reintroduced after MMS."

- FGD with PHM

Healthcare consultants highlighted broader coordination and forecasting challenges.

“A major challenge observed is the unreliability of the supply, with stocks frequently running out by the seventh or ninth month of a mother's pregnancy.”

- KII with a CCP

Inadequate Training and Provider Knowledge Gaps

Key Informant Interviews and PHM FGDs explored provider preparedness and implementation challenges.

Healthcare workers repeatedly emphasized the absence of formal training prior to MMS rollout.

“There was no formal separate training program for the staff before the introduction; instead, awareness was created through official circulars.”

- KII with a MOH

“No. We haven't got any awareness programmes at all... We only know things from whatever we read.”

- KII with a Divisional Pharmacist

Even the consultant Obstetricians and Gynaecologists were not aware of MMS.

“We just heard it from the patients that they have been given a new tablet.”

- KII with a Consultant Obstetrician and Gynaecologist

Healthcare providers further reported that the uniformity of instructions was not there, impacting the standard of care

“Instructions have not reached all staff uniformly, leading to different practices in different areas.”

- KII with a CCP

Public Health Midwives also expressed uncertainty regarding benefits, composition, beneficiary groups, and anaemia management.

"Honestly, we haven't received proper training or detailed circulars. We don't know the exact benefits like how it helps the baby's brain development. So, we just tell mothers it's a 'multivitamin.'"

- FGD with PHM

"We are also confused: if a mother needs high-dose folic acid (5mg), is the MMS enough?"

- FGD with PHM

There was a confidence gap among health care workers, and they were not confident in their knowledge of the iron content.

"Many health workers are uncertain about the composition of the supplements. For instance, they are often unsure if the tablet contains 30mg or 60mg of elemental iron."

- KII with a CCP

Despite the formal guidance issued for anaemia management, they have not reached and the healthcare workers were not confident in managing anaemia.

"We didn't receive instructions... we manage based on experience."

- FGD with PHM

Inconsistent Anaemia Management Practices

Key informants further described inconsistencies in anaemia management protocols across facilities and clinicians. Some Obstetricians and Gynaecologists prescribed additional iron supplements together with MMS, while others discontinued MMS entirely when anaemia was detected.

Limited Reach to Private Clinic Attendees

Public health Midwives explained that mothers attending only private-sector antenatal services often miss government-provided health education sessions regarding MMS.

Packaging Instability and Storage Problems at Home and Clinic Level

Focus Group discussions and KIIs explored packaging and storage-related challenges.

Bottle packaging was repeatedly identified as problematic due to humidity and poor storage conditions.

“Tablets becoming soggy and showing colour changes, particularly when supplied in bottles.”

- FGD with Pregnant women who consumed MMS

“If bottle lids are not closed tightly or are exposed to sunlight, the tablets tend to clump or stick together.”

- KII with a CCP

There was confusion among health workers due to packaging changes

“The programme has seen frequent changes in packaging... This has caused confusion among midwives regarding the correct number of units to distribute.”

- KII with a CCP

Women also reported inadequate storage guidance.

“We were not given any specific instructions regarding how to store MMS at home.”

- FGD with Pregnant women who consumed MMS

3.5 Nutrient Adequacy Assessment

This section evaluates the contribution of MMS in optimizing nutrient adequacy among non-anaemic pregnant women in Sri Lanka. The primary objectives were to quantify the baseline dietary intake profiles of essential micronutrients within this population and to determine the capacity of MMS to fill any existing nutritional gaps.

The current assessment, therefore, explored dietary intake patterns and the role of MMS in supporting maternal and foetal nutrition.

3.5.1. Dietary Intake and Nutritional Context of Pregnant Women

The mean dietary intakes of selected micronutrients among pregnant women were compared with the Recommended Dietary Allowances (RDAs) established by the Medical Research Institute (MRI, 2022) and the World Health Organization (WHO, 2004). In addition, the nutrient contribution provided by a single MMS tablet was evaluated. A summary of these comparisons is presented in Table 18.

Table 18: Comparison of Mean Daily Nutrient Intakes of pregnant mothers with Estimated Average Requirements (EARs) and Recommended Dietary Allowances (RDAs) (n=400)

Nutrient	Mean $\pm$ SD	Estimated Average Requirement (EAR) ^a		Recommended Dietary Allowance (RDA) ^a		Recommended Dietary Allowance (RDA) ^b	Upper Limit (UL) ^a	Adequate Intake (AI) ^a	Amount per MMS tablet
		2 nd trimester	3 rd trimester	2 nd trimester	3 rd trimester				
Energy, kcal	1720.7 $\pm$ 508.7	2150	2390	2150	2390	NA	NA	NA	NA
Macronutrients									NA
Carbohydrates, g/d	275.6 $\pm$ 64.2	NA	NA	NA	NA			NA	NA
Protein, g/d	53.0 $\pm$ 17.2	45	61	55	70			NA	NA
Fat, g/d	52.8 $\pm$ 16.6	NA	NA	NA	NA			NA	NA
% E from CHO	56.8 $\pm$ 7.8	NA	NA	NA	NA			45-60	NA
% E from Protein	12.5 $\pm$ 2.5	NA	NA	NA	NA			NA	NA
% E from Fat	27.8 $\pm$ 6.6	NA	NA	NA	NA			20-35	NA
Micronutrients									
Iron (mg/d)	10.8 $\pm$ 5.5	21	21	27	27	27	NA		30
Zinc (mg/d)	5.2 $\pm$ 2.2	10.2	10.2	10.2	10.2	10	25		15
Calcium (mg/d)	460.7 $\pm$ 231.2	750	750	950	950	1200	2500		NA
Thiamin (mg/d)	1.7 $\pm$ 6.2	0.9	1.0	0.9	1.0	1.4	NA		1.4
Riboflavin (mg/d)	2.7 $\pm$ 8.8	1.5	1.5	1.9	1.9	1.4	NA		1.4
Niacin (mg NE/d)	8.5 $\pm$ 4.5	11.8	13.1	14.2	15.8	18	NA		18
Vitamin B6 (mg/d)	3.4 $\pm$ 7.7	1.5	1.5	1.8	1.8	1.9	25		1.9
Folate (μ g DFE /d)	236.2 $\pm$ 244.6	600	600	600	600	600	1000		667
Vitamin B12 (μ g/d)	1.6 $\pm$ 1.4	NA	NA	NA	NA	2.6	NA		2.6
Vitamin C (mg/d)	57.7 $\pm$ 62.1	90	90	105	105	55	NA		70
Vitamin A (μ g RE/d)	556.7 $\pm$ 557.0	540	540	700	700	800	3000*		800

^a Dietary reference values were adopted from the Dietary Reference Intakes for Sri Lankans issued by the Medical Research Institute (MRI), Sri Lanka, in 2022.

<https://www.mri.gov.lk/wp-content/uploads/2024/02/Dietary-Reference-Intakes-for-Sri-Lanka.pdf>

^b Reference values were based on Human Vitamin and Mineral Requirements (WHO/FAO, 2004).

<https://iris.who.int/server/api/core/bitstreams/d2d18d86-d4ef-471e-a4a0-964044f31c3f/content>

EAR: Estimated Average Requirement; the daily nutrient intake level estimated to meet the requirements of 50% of healthy individuals in a specific age, sex, and life-stage group.

RDA: Recommended Dietary Allowance; the daily nutrient intake level sufficient to meet the requirements of nearly all (97–98%) healthy individuals in a specific age, sex, and life-stage group.

UL: The highest average daily nutrient intake at which long-term exposure is not expected to produce any harmful overdosage effects on almost all individuals in the general population.

AI: The recommended average daily intake based on observed or experimentally determined approximations or estimates of nutrient intake by a group (groups) of apparently healthy people that are assumed to be adequate. It is used when there is no sufficient data to calculate EAR or RDA.

CHO, Carbohydrates. NE, niacin equivalents; DFE, dietary folate equivalents; RE, retinol equivalents.

NA- Not available

*The adult UL for vitamin A was adopted due to the absence of a pregnancy-specific UL

The mean daily energy intake of pregnant women (1720.7 ± 508.7 kcal/day) was considerably lower than the Estimated Average Requirement (EAR) and Recommended Dietary Allowance (RDA) for both the second and third trimesters, indicating inadequate dietary energy consumption during pregnancy. Mean protein intake (53.0 ± 17.2 g/day) was below the RDA for pregnancy and marginally below the EAR for the third trimester. Carbohydrates contributed 59.8% of total energy intake, and fat contributed 27.8%, both of which were within the recommended acceptable macronutrient distribution ranges. However, despite an acceptable macronutrient distribution, the overall quantity of food consumed appeared insufficient to meet the increased nutritional requirements of pregnancy.

The mean intakes of several key micronutrients were substantially below the recommended levels. Iron intake (10.8 ± 5.5 mg/day) was less than half of the RDA and considerably below the EAR. Zinc intake (5.2 ± 2.2 mg/day) was approximately half of the recommended intake. Calcium intake (460.7 ± 231.2 mg/day) was markedly lower than both the EAR and RDA. Folate intake (239.2 ± 244.6 µg DFE/day) was less than half of the recommended level, while niacin intake (8.5 ± 4.5 mg NE/day) was also below the EAR and RDA. Vitamin C intake (57.7 ± 62.1 mg/day) was lower than the recommended intake levels for pregnancy. Vitamin B12 intake (1.6 ± 1.4 µg/day) was also below the recommended adequate intake.

In contrast, mean intakes of thiamin, riboflavin, vitamin B6, and vitamin A met or exceeded the corresponding EARs for pregnancy. However, vitamin A intake remained below the MRI RDA of 700 µg RE/day, despite exceeding the EAR.

3.5.2. Contribution of MMS to close the nutrition gap

The comparison of dietary micronutrient intakes with the MRI (2022) and WHO (2004) reference values demonstrated substantial inadequacies for several nutrients. Based on the comparisons, iron intake reached only approximately 40% of the recommended intake, while only about half of the requirement was fulfilled by the zinc intake. Folate intake represented one of the largest nutrient gaps observed, with less than 40% of the recommended level fulfilled. Nutrition gaps were identified for Niacin, Vitamin C and Vitamin B12, as well. Mean intakes of thiamin, riboflavin, vitamin B6, and vitamin A didn't exhibit this nutrition gap.

The graphical comparison below (Figure 6) between dietary intake, reference requirements, and MMS nutrient content demonstrates that the MMS formulation either met or exceeded the WHO-recommended dietary allowances for all included micronutrients. The contribution of MMS was particularly notable for iron, zinc, niacin, folate, vitamin B12, vitamin C, and vitamin A, where dietary intakes alone were insufficient to meet recommended levels. For example, the MMS provided 30 mg of iron compared with a mean dietary intake of only 10.8 mg/day, and 667 µg DFE of folate

compared with a mean dietary intake of 239.2 µg DFE/day. Similarly, the MMS supplied the full WHO-recommended amounts of vitamin B12 (2.6 µg), vitamin C (70 mg), and vitamin A (800 µg RE).

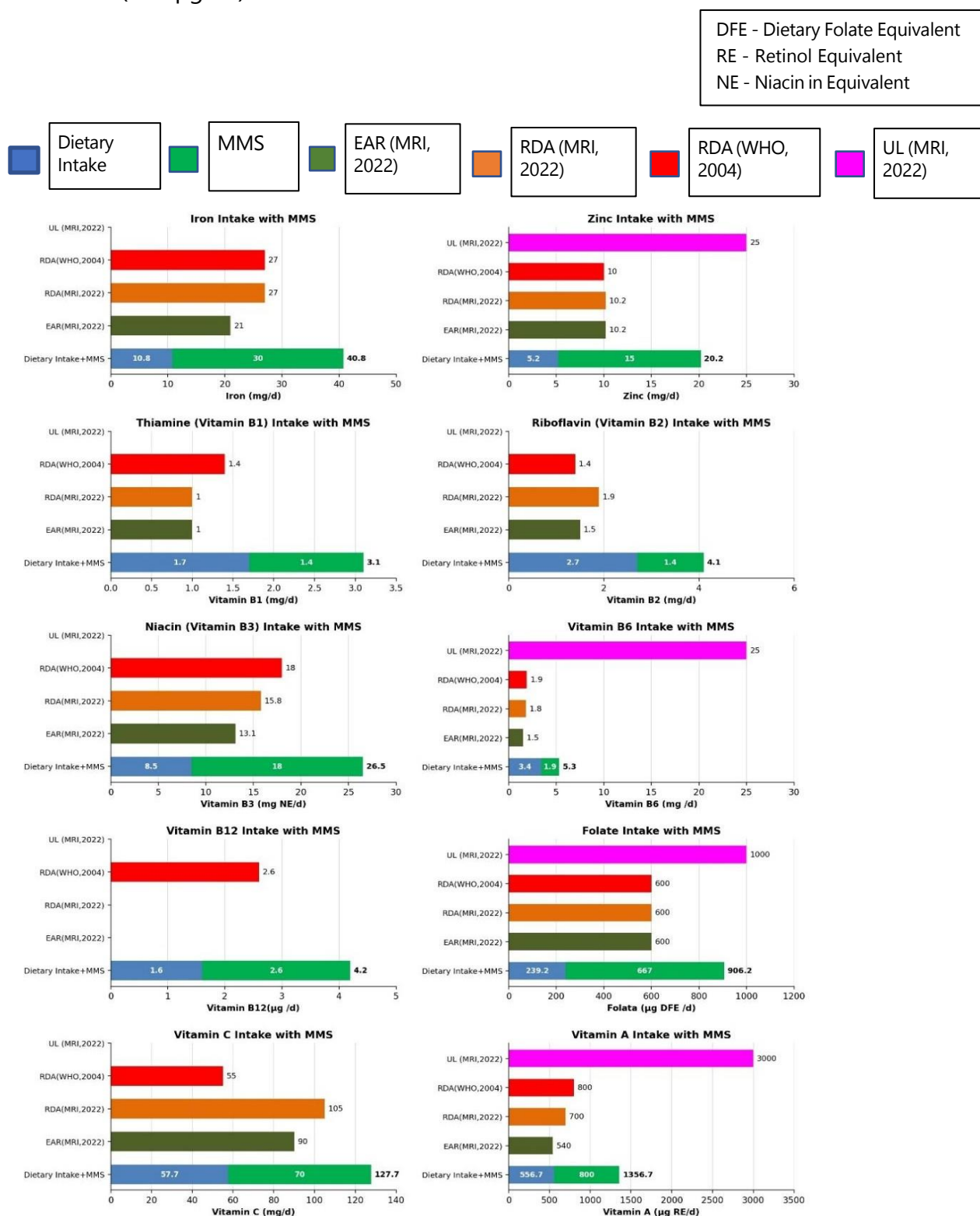


Figure 6: Dietary intake of selected micronutrients, recommended intake levels, and nutrient contribution from one MMS tablet in pregnant women

Figure 7 further illustrates that dietary calcium (not a component of MMS) intake (460.7 ± 231.2 mg/day) was markedly below the EAR (750 mg/day), the MRI RDA (950 mg/day), and the WHO RDA (1200 mg/day).

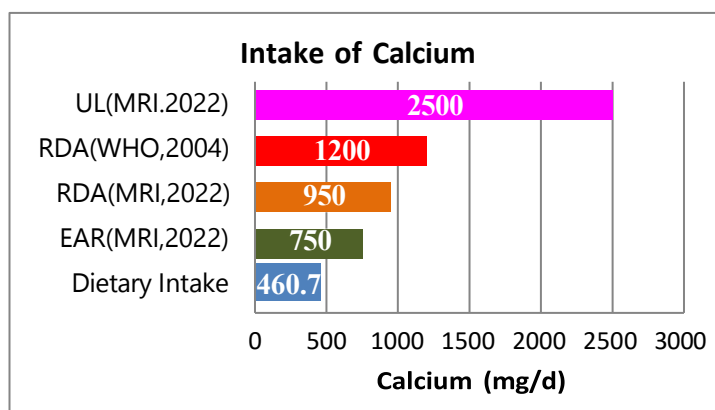


Figure 7: Dietary Intake of Calcium vs EAR(MRI,2022), RDA(MRI,2022), and RDA(WHO,2004)

On average, participants consumed only about 49% of the MRI RDA and 38% of the WHO-recommended intake for calcium, highlighting a substantial risk of inadequate calcium intake during pregnancy.

Overall, the figures clearly demonstrate substantial dietary nutrient gaps among pregnant women, particularly for iron, zinc, calcium, niacin, folate, vitamin B12, and vitamin C. The nutrient composition of MMS has the potential to substantially reduce these inadequacies and improve the likelihood of achieving recommended micronutrient intakes during pregnancy. The observed micronutrient inadequacies may be partly explained by pregnancy-related symptoms, including nausea, vomiting, food aversions, and reduced appetite, which can limit dietary intake and make it difficult for pregnant women to meet their increased nutritional requirements through food alone.

Comparison of dietary intake and the nutrient contribution from one MMS tablet with the established Upper Intake Levels (ULs) indicated that none of the assessed micronutrients exceeded their respective ULs. Although the MMS substantially increased the intake of key micronutrients, the combined contribution from dietary intake and supplementation remained within safe limits for iron, zinc, folate, vitamin A, and vitamin B6. These findings suggest that the MMS formulation provides nutritionally meaningful amounts of micronutrients while maintaining intakes below levels associated with potential adverse effects

¹UL: The highest average daily nutrient intake at which long-term exposure is not expected to produce any harmful overdosage effects on almost all individuals in the general population.

RDA: Recommended Dietary Allowance; the daily nutrient intake level sufficient to meet the requirements of nearly all (97–98%) healthy individuals in a specific age, sex, and life-stage group.

EAR: Estimated Average Requirement; the daily nutrient intake level estimated to meet the requirements of 50% of healthy individuals in a specific age, sex, and life-stage group.

*The adult UL for vitamin A was adopted due to the absence of a pregnancy-specific UL.

CHAPTER 04

DISCUSSION



Sri Lanka has a long-standing maternal nutrition programme that has successfully implemented iron and folic acid (IFA) supplementation through its well-established antenatal care system laid out through MOH system. For decades, IFA tablets were routinely provided to pregnant women to prevent and treat iron deficiency anaemia, which remains one of the most common nutritional deficiencies during pregnancy. However, evidence increasingly showed that pregnant women often suffer from multiple micronutrient deficiencies beyond iron and folate, limiting the ability of IFA alone to meet increased nutritional demands during pregnancy.

Based on recommendations from the World Health Organization (WHO) and growing evidence demonstrating the benefits of MMS in improving maternal and birth outcomes, Sri Lanka introduced MMS for non-anaemic pregnant women. MMS provides 15 essential vitamins and minerals, including iron and folic acid, through a single daily tablet. The programme was integrated into the existing maternal healthcare infrastructure, utilizing PHMs and antenatal clinics for distribution, counselling, and monitoring, thereby facilitating a relatively smooth transition from IFA to MMS. While the implementation has been generally well accepted, challenges such as side effects, supply interruptions, provider training needs, and misinformation highlight the importance of strengthening programme systems to ensure successful nationwide scale-up and sustainability of MMS supplementation in Sri Lanka.

This study represents a comprehensive implementation evaluation of MMS among non-anaemic pregnant women in their second and third trimesters in Sri Lanka. Using a mixed-methods approach, the study examined coverage and adherence, supply-chain performance, awareness, knowledge and experiences, perceptions and perspectives among pregnant women and healthcare providers, supportive factors that have facilitated the rollout of MMS and barriers hindering optimal uptake and affecting implementation, and the contribution of MMS towards nutrient adequacy among the target population. By integrating both quantitative and qualitative methods, this study generated a rich, multi-faceted dataset where each approach complemented the other.

4.1 Coverage and adherence of MMS

The study examined the coverage of MMS among non-anaemic pregnant women in their second and third trimesters, where the weighted national level estimate for MMS coverage was 68.6% (95% CI: 63.2%–74.0%), exhibiting low coverage statistics to previous coverages for supplementation to pregnant women. The National Nutrition and Micronutrient Survey carried out in 2022 (Jayatissa, Perera and de Alwis, 2023) showed a much higher coverage of IFA supplementation among pregnant women (92.3%), and an

earlier study conducted in 2004, revealed the national coverage of the iron supplementation among pregnant women to be similar to that, at 92.9% (Jayatissa C Mahamithawa, 2004). The comparatively low coverage statistics in the current study could be attributed to different timings of the studies, the difference of the supplements, and supply chain management issues.

Sectoral inequalities in the coverage were also highlighted, where the rural sector exhibited the highest coverage, while the estate sector demonstrated the lowest coverage out of the three sectors, with only one third of the sample receiving MMS. The reasons for these sectoral disparities can be identified as multifactorial. It is noteworthy that, in a context where the estate sector is known to have poorer nutrition indicators compared to the other sectors, this comparatively lower coverage would impose further disparities and widen the nutrition gaps for the estate sector. When considering the adherence of MMS, though the coverage was comparatively less, most of the MMS recipients from the estate sector had received the supplement within 12-15 weeks of POA. Contrastingly, the rural sector, which exhibited the highest coverage out of the three sectors, showed the lowest proportion of those who received MMS at 12-15 weeks of POA, with a significant proportion receiving MMS only between 16-20 weeks. Interestingly, a few of the recipients from the urban and rural sectors have received their supplements for the first time at POAs as late as 36 weeks. The main barriers identified for timely initiation of MMS were issues in the supply chain management and unawareness of staff resulting in supplying IFA instead of MMS despite its availability, partly due to efforts to avoid wastage of IFA stocks approaching their expiry dates. In the current study, the median POA at which non-anaemic pregnant women started receiving MMS was 14 weeks (IQR: 12–19 weeks), compared to the 2022 National Nutrition and Micronutrient Survey, where the mean (SD) POA of receiving supplements was 11.4 (3.0) weeks (Jayatissa, Perera and de Alwis, 2023). However, this could be due to the difference in the supplements assessed in that study. Current usage of MMS among the recipients showed promising statistics overall, with more than 80% of the recipients claiming to be using the supplement across all sectors, and the estate sector showing the highest usage. The possible facilitators contributing to this could be the formulation being a single tablet to be taken daily, availability of multiple micronutrients in MMS and being distributed free of charge. The single-tablet MMS formulation was highly valued by both pregnant women and healthcare providers for its convenience and ease of use compared with multiple supplements. This simplified regimen likely enhanced adherence and contributed substantially to the high acceptability and positive uptake of MMS observed in the study. Similar findings have been reported from Indonesia, Mali, Bangladesh, and other low- and middle-income countries where women consistently preferred MMS because of its simplicity and perceived comprehensiveness (Garcia-Casal et al., 2018; UNICEF, 2021; Aguayo et al., 2007). Studies have shown that ease of consumption is a critical component of supplement acceptability and contributes significantly to adherence (Abebe et al., 2025). The free provision of MMS through government antenatal

services was also highly valued, especially among rural and estate populations. Evidence from global MMS programmes consistently demonstrates that financial barriers reduce coverage and adherence, whereas cost-free access substantially improves programme uptake (Kissell et al., 2025). The findings therefore reinforce the importance of maintaining MMS as a publicly funded intervention within Sri Lanka's maternal healthcare system.

In the Sri Lankan study conducted as early as in 2004 (Jayatissa and Mahamithawa, 2004), usage of iron tablets by pregnant women showed a similar percentage (87.8%). However, the calculation of this value has taken daily usage and complete adherence into account, compared to assessing use of MMS in the current study, depicting differences in the operationalization of the variable. Hence, the findings need to be compared with caution. Only a minority (6.9%) declared that they had not used iron tablets at all in the above study.

In a study which assessed acceptability of and adherence to MMS in Pakistan and Nigeria in 2023 and 2024, revealed very high ever-usage in both countries (99.9% and 97.4%, respectively) (Busch-Hallen et al., 2026). However, around one fourth in Pakistan and one third in Nigeria had stopped MMS at some point during pregnancy, despite these very high ever usage statistics, and around one fourth of that have not restarted, indicating non-use. These findings limit the opportunity of directly comparing them with the usage statistics of the current study, since despite the very high ever-use, sustained use seems to be lacking.

Despite the encouraging usage statistics in the current study, doses were missed by some of the women who used it. While seventy per cent claimed to have taken MMS without missing any doses, close to ten per cent missed 3-4 doses per week, highlighting the need for identifying reasons for poor adherence. This was more prominent in the urban and estate sectors, compared to the rural sector. Comparatively, the rate of compliance for IFA supplementation during pregnancy was 80.1%, in a Sri Lankan hospital-based study conducted in Kurunegala Provincial General Hospital, Sri Lanka in 2018/ 2019 (Pathirathna et al., 2020). In the global scenario, in Nigeria and in Pakistan (Busch-Hallen et al., 2026), daily adherence assessed based on the percentage of expected tablets consumed, was around seventy-five per cent. Compared to this, Sri Lankan adherence data can be considered higher. To further establish this fact, it was revealed that only around half in the study done in Nigeria and in Pakistan reported consuming more than 90% of the tablets (Busch-Hallen et al., 2026).

In the current study, exploration of the reasons for not using MMS brought important issues to light, where using supplements from the private sector and experiencing side effects were highlighted as the most commonly quoted reasons for non-use. Forgetfulness and the unpleasant taste and smell of the tablets also emerged as less-common reasons. Forgetfulness was the major reason for non-compliance (57.9%) in a

Sri Lankan hospital-based study assessing IFA compliance (Pathirathna et al., 2020), while side effects (13.6%) were the second commonest reason. In Pakistan and in Nigeria (Busch-Hallen et al., 2026), forgetfulness appeared to be the commonest reason for non-intake, while perceived side effects emerged as the second commonest, whereas only a negligible minority declared that they stopped taking MMS as per their healthcare providers' advice.

4.1.1 Side effects of MMS

In the current study, around one third of the recipients (34.1%) claimed to have experienced side effects. Gastrointestinal side effects were the most common adverse effects of MMS, consistent with findings from other low- and middle-income countries (UNICEF, 2021; Alfaqeeh et al., 2025). Nausea or vomiting was highlighted as the most common side effect experienced by nearly two thirds of the affected. Similar to the current study, nausea and vomiting were the most commonly reported side effects experienced in multiple studies assessing iron supplementation in Sri Lanka (Pathirathna et al., 2020; Jayatissa C Mahamithawa, 2004). Gastrointestinal disturbances including vomiting, constipation and lack of appetite were associated with IFA making them a reason for non-compliance among pregnant women (Pathirathna et al., 2020). Studies compared the two supplements IFA and MMS reported that there were more side effects reported in the IFA than in the MMS group (Abebe et al., 2025; Horino et al., 2024). Reviews that compared the acceptability of IFA and MMS reported that side effects were more common with IFA than MMS, and is likely due to higher iron content (60 mg in IFA vs. 30 mg in MMS). Some studies suggested that negative side effects may be from pregnancy itself rather than the supplements (Kissell et al., 2025). However, the persistence of these concerns highlights the need for proactive counselling regarding expected side effects and their management

It is a concerning fact that the side effects led to discontinuation or reducing the intake of MMS in the majority of the affected in the current study, highlighting the importance of providing adequate guidance and support by the healthcare workers to mitigate side effects. A previous Sri Lankan study on iron supplementation revealed that the reason for non-usage around one fourth of those who did not use iron supplements was experiencing side effects (Jayatissa C Mahamithawa, 2004). Previous studies in other countries have also found out the existence of side effects such as nausea and vomiting to be associated with lesser adherence to MMS (Battung, Groen C van der Beek, 2025).

Qualitative findings in the current study revealed that while some of the women discontinued MMS due to the side effects experienced. These symptoms were generally mild and manageable in others, and they managed to continue. Vomiting and dizziness especially led to discontinuation in some, as identified in the qualitative interviews, but at the same time, some others managed to continue MMS despite these side effects, with remedial action taken to minimize them. Role of the healthcare providers was a

facilitating factor in this context, where PHMs provided helpful advice and counselling on appropriate timing of intake changing the timing of taking MMS, leading to reduction of side effects and helping many women continue supplementation successfully. Similar observations have been reported in Bangladesh and Indonesia, where counselling quality was a stronger predictor of adherence than the occurrence of side effects themselves (UNICEF, 2021; Alfaqeeh et al., 2025). This signifies the importance of providing adequate information and advice to the MMS recipients. Educating pregnant women about the transient nature of these side effects, strategies to alleviate them and the benefits of continuing MMS, is likely to improve adherence and reduce premature discontinuation.

In addition, fear generated by hearing about adverse experiences from peers prevented some women from initiating MMS despite receiving supplies. Similar concerns have been documented internationally, where perceived rather than actual side effects frequently influence supplementation behaviour (Kissell et al., 2025). These findings illustrate the importance of proactive communication strategies that normalize common side effects and provide practical management guidance.

4.1.2 Counseling and education on MMS

Vast majority of MMS recipients from all three residential sectors alike, agreed that they had received advice and information on MMS from healthcare providers. Recipients confirmed that PHMs specifically gave them advice on how to optimally take MMS and how to minimize side effects. Their trust in the PHM and the frequent monitoring done by her contributed to the continuation of the supplement in pregnant women. In the 2004 Sri Lankan study, only 28.7% of women were given advice on side effects of iron supplementation (Jayatissa C Mahamithawa, 2004), and compared to this, receiving information from the healthcare providers shows a favourable trend in the current study. Consistent with this finding, a Sri Lankan hospital-based study reported that 97.1% and 96.3% of women received information on supplement benefits through ANC awareness programmes and antenatal classes, respectively (Pathirathna et al., 2020). Nevertheless, consistent health education was found to be lacking in that study, where only 17.8% of the participants had received instructions on correct supplement use each time they received them from the clinic. This provision of accurate information to the recipients would be crucial in a context where misinformation shared on social media sometimes created undue fear in women to use MMS. Observations of the ANCs also revealed satisfactory conditions of service provision during MMS supplementation to pregnant mothers, in terms of adequate screening of women before starting MMS, and almost all clinics giving instructions on how to use MMS, and many of the clinics explaining its purpose, importance and advocated consistent use. Previous studies have also identified knowledge on supplementation and ANC counselling to be influencing MMS adherence (Labonte et al., 2024). Provision of instructions on enhancers and inhibitors on iron absorption and the side effects of iron tablets was seen in only around 35% in

clinics while distributing the tablets, in an earlier study conducted in 2004 (Jayatissa C Mahamithawa, 2004). One of the most important findings of this study is the central role played by PHMs. Women consistently described PHMs as trusted sources of information, reassurance and practical support. International implementation experiences suggest that regular contact with frontline health workers is among the strongest predictors of supplement adherence (Garcia-Casal et al., 2018).

Sri Lanka's long-established domiciliary maternal care system encompassed in the Maternal and Child Health Programme (Ministry of Health, 2012) appears to provide a unique advantage for MMS implementation. In the current study, PHMs were able to identify adherence problems, manage side effects, reinforce key messages and monitor supplement use during home visits. Such a community-based follow-up mechanism is rarely available in many low- and middle-income countries and may partly explain the favourable adherence observed (Pathirathna et al., 2020).

Language barriers were particularly evident in the current study among Tamil-speaking populations receiving instructions primarily in Sinhala. Such communication barriers may reduce comprehension and adherence and highlight the need for multilingual educational materials.

Healthcare providers reported limited orientation and formal training during MMS implementation, with information mainly disseminated through circulars and social media platforms. Inadequate capacity building may have affected confidence of the provider and consistency of counselling. Similar implementation challenges have been documented in other low- and middle-income countries, where insufficient training contributed to variable programme uptake and effectiveness (Tuncalp et al., 2020).

Some women switched to commercial supplements based on the recommendations from private sector Obstetricians and Gynaecologists or perceptions that government medicines were of lower quality. This finding highlights a potentially important disconnect between public and private sectors. Similar findings have been reported in countries with mixed public-private healthcare systems. Inconsistent messages from healthcare providers can reduce the trust in national programmes and contribute to fragmented care pathways. This highlights the need for stronger engagement of private-sector providers in MMS policy implementation and communication. Multiple Micronutrient Supplements provided in Sri Lanka are considered to be of high quality, which are distributed through the Medical Supplies Division of the Ministry of Health in partnership with global organizations like UNICEF. It is known that these supplements meet stringent international regulatory and manufacturing standards. The most commonly used MMS formulation is the UNIMMAP, and it contains 15 essential nutrients, including iron, folic acid, vitamin A, B-complex vitamins, vitamin D, iodine, and zinc (UNICEF, 2020). This formulation is recommended during pregnancy, aligning with WHO recommendations, and this is the formulation distributed in Sri Lanka. Yet, some of the

pregnant women perceive that the government supplied supplements are of lower quality compared to what they purchase from the private sector, which is one of the main concerns that needs to be addressed strategically. The presence of this misconception was confirmed by the healthcare providers as well as the pregnant women. The market survey conducted revealed that the main reasons why women preferred commercial brands over government-distributed MMS were advice received from the Obstetrician and Gynaecologist, and the perceived quality and trust in the brand. Limited understanding of MMS composition which was noted in the current study (also refer section below on awareness and knowledge) may have contributed to this misconception, since the market survey conducted during this study identified that some of the multivitamin supplements available in the private sector did not contain all the micronutrients available in MMS, and a few didn't contain iron at all, and only a few contained the recommended daily elemental iron content. Yet, the pregnant women perceived government sector supplements to be of low quality compared to privately purchased supplements, and spent out-of-pocket to purchase supplements containing less micronutrients at high prices, sometimes as high as over one hundred and fifty Sri Lankan Rupees per tablet. This reduced client appreciation of the broader nutritional benefits of MMS due to poor knowledge can be considered a main barrier for continued adherence. It was quite concerning to note that some Obstetricians and Gynaecologists instructed the pregnant women to shift to other private sector supplements from MMS, claiming them to be unnecessary or low in iron. One reason for this miscommunication could be their lack of awareness regarding the nutrient composition of MMS. Using tablets prescribed by the Obstetrician and Gynaecologist was also identified as the reason in close to half of the pregnant women (48.3%, n=367) not receiving iron supplements in the 2004 Sri Lankan study (Jayatissa and Mahamithawa, 2004), signifying the effect of the private sector supplements on the utilization of government sector supplements throughout the years.

Some women seek guidance of the Obstetricians and Gynaecologists at the private sector, and in such instances, it is crucial that correct instructions are provided to them regarding MMS. When pregnant women believe that government sector supplements are of poor quality, they discontinue MMS and shift to purchasing supplements from the private sector, which can lead to multiple unfavourable effects, including unnecessary expenses for them to purchase supplements, stagnation of MMS stocks at government sector clinics due to not being distributed as per the estimates, and poor utilization/intake of MMS leading to wastages. For a resource-limited country like Sri Lanka, this is a major concern, which requires immediate awareness creation among the healthcare providers as well as the pregnant women. Some women also switched to private sector supplements claiming them to be having less side effects. This fact, revealed at interviews, needs to be further explored.

Forgetfulness was seen as a major reason for skipping MMS by the PHMs, in line with the findings from studies in other countries (Busch-Hallen et al., 2026). Some pregnant women also supported this view, but this would have mainly led to missing doses rather than entire discontinuation or non-use. Healthcare providers, especially at the grass-root level, such as the Public Health Midwife, can play a major role to reduce this issue in affecting the adherence, with frequent monitoring and communicating the importance of adherence to the pregnant women, during antenatal encounters at the clinic as well as at their homes. Most of the pregnant women in the current study already acknowledged that the counselling and education related to MMS supplementation was given to them by different categories of healthcare providers. A fact especially emphasized during interviews was the support from PHMs, where their instructions, support and monitoring were found to have helped in improving adherence. This favourable trend needs to be further strengthened, by empowering the PHMs further through capacity building and timely updates. Support from husbands and mothers-in-law emerged as another important facilitator. Family reminders improved adherence, especially among women who experienced forgetfulness or uncertainty about supplementation. Similar observations have been reported in multi-country studies examining IFA and MMS implementation, where household support positively influenced both uptake and continued use of supplements (Garcia-Casal et al., 2018).

4.1.3 Packaging types received and preferences

In all three residential sectors, the vast majority of the pregnant women had received the blister pack, as the packaging type of MMS. Attempts in triangulating this data on the type of packaging they received, or even whether they received IFA or MMS, by referring the Pregnancy record (H512), were futile, since the records didn't specify whether the woman received IFA or MMS, or the packaging type of MMS. This is due to the fact that there is only provision in the H512 to mention the amount of iron and folate received. Even though it is possible to identify the provision of supplements from the Pregnancy Record (H512), at present, there is no mechanism to distinguish between the provision of MMS and iron folate by that documentation.

When considering the package preference, many of the pregnant women showed preference for the blister pack over the bottle, despite having to collect them regularly, as opposed to receiving a bottle of tablets sufficient for the entire pregnancy. The main reasons for this were being able to track their daily dose, convenience in usage, better storage, lesser chance of contamination and being more hygienic. Though convenience of receiving the entire requirement at one was a positive point for the bottled packaging, there were concerns about the quality of tablets, getting soggy with use. Similar to pregnant women, PHMs also preferred blister packs as the wastage was less, if a mother discontinued use.

There were some differences observed with regard to experiencing side effects with the two packaging forms, with a higher proportion of those using blister packs claiming to experience side effects. However, considering the comparatively smaller number using the bottled tablets, this finding needs to be interpreted with caution.

During interviews, the frequent change of the MMS packaging was identified as a reason affecting the stability of the programme. The grass-root level PHMs haven't received clear guidance when the packaging change occurred, resulting in them being unable to counsel the mothers consistently, and creating confusion among the healthcare providers. This being a concern for the effective implementation of the programme, needs to be looked into, and necessary remedial action needs to be taken.

4.1.4 Storage of received MMS

Out of the pregnant women who received MMS, only around half claimed to have had stored the tablets in a dry place and away from sunlight, showcasing the need for further awareness and health education, despite mentioning that storage instructions were one aspect that they had received information from healthcare providers. Only about two thirds have stored the tablets in the original pack, again exhibiting some gaps in the awareness regarding storage of MMS. Some women also declared challenges during storage, including deteriorated appearance of tablet, which could be due to sub-optimal storage conditions.

4.2 Efficiencies and bottlenecks in the supply chain management of MMS

Close to ten percent of the MMS recipients in the current study revealed that they experienced inability to get the tablets from the health centre at some point. This was most of the time due to unavailability of stocks, which was re-confirmed during interviews, posing concerns about the uninterrupted supply of MMS. Stockouts were pointed out by the PHMs as a challenge for the sustainability of the programme, as well, where they identified it as a reason for losing trust of the clients. Supply of MMS was identified to influence the adherence to the supplement in previous studies, too (Labonte et al., 2024). In the 2004 Sri Lankan study assessing iron supplementation (Jayatissa and Mahamithawa, 2004), it was noted that only around 60% received iron tablets at every visit of the clinic, and considering that particular clinic visit, 6.8% (n=52) did not receive iron due to it not being available in the clinic. Delays in supply chain and distribution from the centre to the periphery were identified as a constraint and an operational challenge faced by the programme implementers in the Multiple Micronutrient (MMN) supplementation programme for supplementation for infants and young children (Senerath et al., 2014). This gives the impression that stockouts have been a concern in supplementation programmes, not limited to MMS. However, the fact that these studies were conducted more than 10 years back needs to be considered when interpreting the findings.

During observation of MOH offices and RMSDs, stockouts were observed in three of the 21 MOH Offices observed, and in three of the 13 RMSDs. Despite the considerably high proportion of MOH Offices (18/21) and RMSDs (11/13) with the availability of MMS, the coverage statistics were considerably low (69.6% weighted coverage), for which the reasons need to be explored on where the bottleneck lies.

The healthcare providers interviewed had concerns regarding these stockouts, causing many repercussions, including having to revert back to iron tablets. Lack of coordination in the health system was pointed out as an issue, where there were periods with no supplies, as well as instances where bulk deliveries were received without notice. Receiving both MMS, as well as iron folate based on old estimates, was also a concern raised, which was a cause for undue wastage of supplies. This also contributes to the lower coverage of MMS, due to MMS not being issued to women as IFA is provided instead due to short expiry dates. Improving coordination between the different regulatory bodies in the system is deemed essential to rectify these issues. The instructions issued by the FHB in 2024 on calculating the necessary amounts of MMS supplements for non-anemic pregnant mothers can be a facilitating factor for easy forecasting (Family Health Bureau, 2024a). Apart from these issues, transport issues also posed barriers for efficient distribution of MMS supplies, which need to be explored and rectified at the regional level.

The comparative analysis of estimated, requested and issued amounts of MMS at MOH offices pointed out the operational discrepancies between supply-chain planning, demand forecasting, and actual distribution, leading to under-requesting despite high annual estimates, non-receipt of stocks and unplanned stock dumping, highlighting an important area requiring attention.

In a context where optimal storage conditions largely affect the quality of the supplements, the storage conditions at MOH offices and RMSDs were explored. Encouraging findings were observed, with all institutions observed and having MMS at the time of observation having stored the supplements in a dry place away from sunlight, and having their Stock Ledgers up to date. Despite these positive findings, during the interviews, gaps were revealed in terms of lack of air-conditioning and proper storage conditions in MOH stores. In order to maintain the quality of MMS stocks and in turn, secure the trust of the clients about the quality of the product, it is crucial that these conditions are improved.

Observations of the ANCs also revealed satisfactory conditions of service provision, in terms of adequate screening of women before starting MMS, and almost all clinics giving instructions on how to use MMS, and many of the clinics explaining its purpose, importance and advocated consistent use. However, side effects and necessary countermeasures were discussed with recipients at only around half of the observed clinics. This area requires urgent improvement, considering that the occurrence of side

effects directly led to discontinuation or reduced intake of MMS in many of the affected women.

During ANC observations, it was noted that there was no uniform procedure to document the provision of MMS to pregnant women, due to the unavailability of uniform guidelines, except instructions to duly note it in the H512 A and H512 B documents (Family Health Bureau, 2024b). Different practices were followed by the staff at different clinics, including documenting the supply of MMS in CR books. This is one area that needs prompt attention at the central level.

4.3 Evaluating the awareness and knowledge, on MMS implementation

The study found that awareness regarding MMS among pregnant women was moderate, with substantial variation across residential sectors. Rural women demonstrated higher awareness than urban and estate populations, reflecting the stronger reach of community-based maternal health services in rural settings. Nevertheless, only slightly more than half of pregnant women had heard about MMS, indicating that awareness generation has not yet reached the desired level.

Knowledge regarding the nutrient composition of MMS was generally limited. While iron, vitamin C and folic acid were commonly recognized, awareness of other essential micronutrients such as zinc, iodine, selenium and copper was poor. This finding is consistent with studies conducted in Bangladesh, Indonesia and Ethiopia, where women often perceive MMS primarily as an “iron tablet” rather than a comprehensive micronutrient intervention (UNICEF, 2021; Alfaqeeh et al., 2025). Limited understanding of MMS composition may reduce appreciation of its broader nutritional benefits and weaken motivation for continued adherence. Despite knowledge gaps, perceptions regarding MMS were overwhelmingly positive. Women commonly viewed MMS as beneficial for maternal nutrition, foetal growth, prevention of anaemia and overall pregnancy wellbeing. A qualitative study in Cambodia identified knowledge on supplementation, attitudes, perceptions and beliefs about MMS, ANC counselling and supply of MMS as factors influencing adherence (Labonte et al., 2024).

Knowledge regarding the correct use and storage of MMS was generally satisfactory. Most women understood that MMS should complement rather than replace a nutritious diet, demonstrating an appreciation that supplementation cannot compensate for poor dietary practices. Similarly, a large proportion correctly identified the need to protect MMS from moisture and direct sunlight, indicating that key storage messages had been effectively communicated. These findings are encouraging, as improper storage can compromise the stability of several vitamins, particularly under tropical climatic conditions such as those experienced in Sri Lanka.

However, important knowledge gaps remained regarding dosage management and concurrent supplementation. Understanding of appropriate action following a missed dose varied considerably across sectors, while a notable proportion of women incorrectly believed that iron, folic acid, and vitamin C supplements should continue alongside MMS. These misconceptions may lead to unnecessary duplication of supplementation, increased pill burden and potentially reduced adherence. These findings highlight the need for standardized counselling messages and practical educational materials that clearly explain appropriate supplement use.

Overall, the findings demonstrate that MMS has achieved substantial acceptance among pregnant women and frontline healthcare workers, largely owing to its perceived nutritional benefits, convenience, free availability through the government health system, and strong support from Public Health Midwives (PHMs). However, important implementation challenges remain, including inadequate awareness creation, inconsistent provider training, side effects affecting adherence, stock interruptions, misinformation, and gaps in supply-chain management. These findings suggest that Sri Lanka possesses a strong platform for scaling up MMS but requires strengthening of programme systems to maximize effectiveness and sustainability.

4.4 Contextualizing the contribution of MMS to close the nutrition gap

One of the most important findings of the study was the substantial gap between dietary micronutrient intake and Estimated Average Requirement (EAR) / Recommended Dietary Allowance among pregnant women.

Median dietary intake was below recommended levels for iron, zinc, folate, niacin, vitamin B12 and vitamin C. The observed deficits were particularly marked for iron and folate, two nutrients critically important during pregnancy. In contrast, mean intakes of thiamin, riboflavin, vitamin B6, and vitamin A met or exceeded the corresponding EARs for pregnancy. However, vitamin A intake remained below the RDA despite exceeding the EAR.

MMS effectively bridged many of these nutritional gaps by providing nutrient quantities that met or exceeded recommended daily allowances. For example, dietary iron intake was only 9.5 mg/day compared with a requirement of 27 mg/day, while MMS provided 30 mg/day. Similarly, dietary folate intake was substantially below recommended levels, whereas MMS supplied 667 µg DFE, exceeding the recommended requirement.

Overall, substantial dietary nutrient gaps among pregnant women, particularly for iron, zinc, calcium, niacin, folate, vitamin B12, and vitamin C, were identified. The nutrient composition of MMS was found to have the potential to substantially reduce these inadequacies and improve the likelihood of achieving recommended micronutrient intakes during pregnancy. The observed micronutrient inadequacies may be partly explained by pregnancy-related symptoms, including nausea, vomiting, food aversions,

and reduced appetite, which can limit dietary intake and make it difficult for pregnant women to meet their increased nutritional requirements through food alone.

Comparison of dietary intake and the nutrient contribution from one MMS tablet with the established Upper Intake Levels (ULs) indicated that none of the assessed micronutrients exceeded their respective ULs. Although the MMS substantially increased the intake of key micronutrients, the combined contribution from dietary intake and supplementation remained within safe limits for iron, zinc, folate, vitamin A, and vitamin B6. These findings suggest that the MMS formulation provides nutritionally meaningful amounts of micronutrients while maintaining intakes below levels associated with potential adverse effects.

These findings provide strong biological justification for continuation of the programme. They also support global evidence demonstrating that MMS addresses multiple micronutrient deficiencies simultaneously and offers advantages over iron-folic acid supplementation alone.

The findings are particularly relevant for Sri Lanka because many women experience pregnancy-related nausea, food aversions and economic constraints that limit dietary adequacy. Under such circumstances, MMS serves as an important nutritional safety net.

4.5 Limitations of the Study

When interpreting the findings of this report, the following aspects must be considered:

- The temperature of the storage conditions within the drug stores was not measured.
- Disruptions to supply chain management caused by the cyclone Ditwah, may have contributed to the lower coverage and supply chain interruptions in certain places.
- Actual adherence rates may fall below self-reported levels, as data collection within a healthcare setting often encourages participants to report higher compliance
- The provision of advice during supplement issuance may have been influenced by the Hawthorne effect, as healthcare workers were aware that their processes were being monitored by the data collectors.

CHAPTER 05

CONCLUSIONS



Key takeaways on coverage s adherence

- The implementation of the Multiple Micronutrient Supplementation programme among non-anaemic pregnant women in Sri Lanka demonstrates strong feasibility, embedding into the well-established maternal health programme in the country comprising of a remarkable domiciliary care component.
- However, its islandwide coverage remains suboptimal at a weighted average of 68.6%, with considerable sectoral disparities. The estate sector recorded the lowest overall coverage, representing a critical implementation bottleneck. Worthwhile to note is that women in this sector who received MMS demonstrated the highest usage, indicating that service delivery and coverage mechanisms, rather than acceptance of clients, pose as the primary barriers in the estate sector.
- Current usage of MMS among the recipients was high (83.3%), with 70% of them demonstrating complete adherence. However, non-adherence and missing of doses remained a problem especially in the urban and estate sectors, which was largely driven by experiencing of side effects and shifting to private-sector supplements.

Concluding insights on enablers and drivers for implementation of MMS

- The success of the Multiple Micronutrient Supplementation programme is grounded in strong structural enablers within the country's public health framework, where PHMs served as the primary grassroot level health workforce for programme acceptability. Domiciliary visits, personalized counselling and monitoring of adherence acted as main drivers for uptake and adherence among the recipients.
- Preferences of the recipients as well as the healthcare providers heavily favoured blister packs over bottled packaging. Blister packs were preferred for their ability in daily tracking of dose, minimizing contamination risk, reducing tablet wastage in cases of discontinuation, and offering better hygiene and storage convenience, thereby enhancing adherence.
- The current formulation of MMS given in Sri Lanka effectively bridged the maternal nutritional gaps for micronutrients including iron, zinc, niacin, folate and vitamin B12, with the combined contribution from dietary intake and supplementation remaining within safe limits.

Concluding insights on challenges for strategic implementation of MMS

- Approximately one-third of recipients experienced side effects, mainly nausea, vomiting, and dizziness, which directly led to missed doses or total discontinuation. Inconsistent counselling on mitigation of side-effects by healthcare providers exacerbated this issue, owing to inadequate training limiting their ability to effectively communicate how to manage side effects.
- Perceived superiority of private-sector supplements and misbeliefs regarding the quality of supplements from the government sector made pregnant women switch away from MMS. Adding to this, instructions from some medical specialists directing women away from MMS, which highlighted a critical gap in professional awareness and stakeholder engagement in this national initiative.
- Inconsistent supply distribution, stockouts at the MOH and RMSD levels, lack of institutional coordination, and transport constraints threatened the public trust in the programme, in a context where resilience in the supply chain can play a major role in its sustainability. Inadequate physical infrastructure for optimal control of temperature, and improper storage conditions identified, could have had an effect on the quality of the product.
- Inadequacy of formal and standardized training for healthcare providers involved in the programme has compromised uniform and quality counselling. Frequent changes in product packaging without concurrent provider guidance had created confusion among the healthcare providers and adversely affected their confidence in counselling, therein affecting the stability of the programme.

Overall synthesis of concluding remarks

- Introduction of MMS into Sri Lanka's national maternal care programme is operationally feasible, and highly acceptable to both recipients and healthcare providers. The programme has the capacity to successfully function on strong public trust and robust field-level healthcare networks.
- Despite the observed high acceptability of MMS, some critical risks challenge programme implementation and sustainability.
- Optimized implementation and sustainability of the programme leading to long-term success will heavily depend on targeted interventions in sectors with low coverage, regularized capacity building for healthcare providers, continuous professional collaboration with specialists including those in the private sector, structural stabilization of the supply chain, and standardized blister-pack packaging accommodating client and provider preference.

CHAPTER 06

RECOMMENDATIONS



Recommendations

6.1 Recommendations for policy and governance

- At present, MMS is provided only to non-anaemic pregnant women from the start of the second trimester throughout the pregnancy and afterwards. Those who are found to be anaemic are not given MMS in the current context, owing to difficulties in administering the therapeutic dosage of iron required for them, when combined with MMS. Instead they are given higher doses of elemental iron and folic acid. This deprives the anaemic women from receiving a supplement containing 15 micronutrients, which is identified to close the nutrition gap from dietary intake alone, for many of the micronutrients. It can be assumed that those who are anaemic may be the group that could also be having other micronutrient deficiencies, and depriving them of the other micronutrients could create further nutritional gaps for them. Hence, it is recommended to consider supplying MMS to all pregnant women anaemic and non-anaemic alike, and provide the additional iron requirement through a suitable mechanism.
- In order for streamlining the implementation of the MMS supplementation programme across the country and providing directives, all new advances in the programme, instructions and guidance for healthcare workers and implementation requirements need to be communicated with the healthcare workers through Ministerial level and institutional level circulars and guidelines, and adherence to those need to be ensured.
- Establish clear national guidelines for MMS use, including standardized protocols for anaemia management, administration of the therapeutic dose of iron with MMS, side-effect management, and transition from IFA to MMS.
- Strengthen coordination between the Family Health Bureau, Medical Supplies Division, Regional Health Authorities, and other stakeholders involved in procurement and implementation.
- Establish mechanisms to engage healthcare providers to ensure consistent messaging regarding MMS both at national and regional level.
- For the obstetric practice at the private sector, the micronutrient prescription should adhere to the current national guidelines.

6.2 Recommendations for financial commitment

- Even though the UNICEF and other international partners have so far provided financial support to the government of Sri Lanka (GOSL) for sustaining the MMS programme in the country, it is recommended that the GOSL plans domestic financing for procurement once donor support is ended, in order to maintain the sustainability of the MMS supplementation programme.

6.3 Recommendations for capacity building and awareness creation

- In order to build capacity among district level healthcare managers on MMS, it is recommended to conduct Training of Trainers programmes for MOMCHs and update them on the latest advances. They can be instructed to arrange awareness programmes for the ground level healthcare staff to share the knowledge, as well as to improve their counseling skills for facilitating MMS usage among pregnant women.
- As it was observed that there was lack of awareness and a communication gap for sharing information with the Obstetricians and Gynaecologists about the importance and benefits of MMS, it is recommended to share the latest advances of the programme with the Obstetricians and Gynaecologists by collaborating with their professional college and capacity building workshops organized by them, as per the feasibility.
- Misconceptions regarding MMS were also evident among pregnant women, where they believed that government sector supplements were of low quality, had more side effects, and can cause adverse effects. Awareness creation and behaviour change communication at the community level is of utmost importance in this regard, and trained healthcare workers at the grassroot level and MOH offices, can share accurate and updated information with the pregnant women during antenatal clinics, antenatal classes and home visits.
- Awareness can be created through disseminating evidence-based information on MMS, including its benefits among the general public, using mass media channels during health talk sessions and through digital platforms and social media.
- Development and wide dissemination of culturally appropriate and multilingual IEC material in Sinhala, Tamil, and English related to MMS usage by the central level is recommended, to alleviate misconceptions, improve knowledge and foster favourable attitudes on MMS among the general public and healthcare providers alike.

- Develop and implement comprehensive training programmes for PHMs, Medical Officers of Health, Obstetricians and Gynaecologists, pharmacists, and clinic staff before further programme expansion.
- Incorporate MMS-related content into in-service training curricula for PHM
 - Nutritional benefits of MMS
 - Differences between MMS and IFA
 - Management of side effects
 - Counselling techniques
 - Addressing misconceptions and misinformation
- Strengthen counselling services within antenatal clinics and include family centered counselling at pre-conceptual and antenatal sessions to improve understanding of MMS benefits and correct usage.

6.4 Recommendations for nutritional interventions

- Continue emphasizing that MMS complements, but does not replace, a balanced and diverse diet.
- Strengthen nutrition education within antenatal care services to improve dietary diversity and food choices during pregnancy.
- Integrate MMS counselling with broader maternal nutrition interventions, including dietary assessment and individualized nutrition advice.
- To intensify interventions among areas with low coverage and groups with low uptake during programme implementation.

6.5 Recommendations for improving adherence to MMS

- Strengthen PHM-led home visits for adherence monitoring and side-effect management.
- Promote practical strategies such as taking MMS after meals or at night to minimize gastrointestinal side effects.
- Encourage the use of family reminders and social support mechanisms to improve compliance.
- Develop simple adherence-monitoring tools that can be used by both healthcare workers and pregnant women.

6.6 Recommendations for supply chain and logistics

- Steps need to be implemented to strengthen the supply chain management of MMS to prevent stockouts and wastage, through improved coordination between different organizations responsible for estimating and distributing MMS, is highly recommended.
- Measures need to be taken to establish central storage facilities for MCH related commodities with optimal storage conditions.
- Measures need to be taken to improve storage conditions in district and MOH office level, which are currently known to have sub-optimal storage conditions, including lack of air-conditioning required for maintaining optimal temperature conditions. Facility surveys need to be carried out to identify storage facilities lacking optimal storage conditions.
- In a context where frequent changing of packaging type, between bottle and the blister pack, is known to disrupt the credibility of the programme, this needs to be taken into consideration during procurement processes, as practically feasible.
- Considering the preference of the HCW and pregnant mothers for blister packs over bottles, implement blister pack preparation after careful consideration of the other factors
- Since transport constraints were identified to cause hiccups in the distribution at the regional level, it is recommended to make arrangements for priority allocation of distribution vehicles for distributing supplements.

6.7 Recommendations for monitoring and evaluation

- Monitoring and evaluation of the MMS programme is crucial for the successful implementation of the programme, preferably with the introduction of key performance indicators with targets set to be achieved at the institutional and regional level.
- Integrate MMS indicators into routine maternal health information systems.
- Monitor key indicators at national and regional level under following aspects
 - Coverage
 - Adherence
 - Stock availability
 - Side-effect reporting
 - Counselling quality
- Establish supportive supervision mechanisms to monitor implementation quality and provide feedback to healthcare workers.

- Conduct periodic implementation reviews and operational research to guide programme improvements
- To obtain better information about the provision of MMS to pregnant women, it is recommended to provide space in the H512 to specify the type of iron supplement given (whether it is MMS or iron folate), during the next amendment of the pregnancy record.

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Annexure 01: Antenatal Clinic list for the Coverage

Province	RDHS Division	MOH Division	Antenatal clinics
Western	Colombo	Kaduwela	Athurugiriya B
			Hokandara A
			Kaduwela
		Kesbewa	Jamburaliya
			Kesbewa
	Colombo MC	2A	St. Pauls
		2B	Maligawatta
	Gampaha	Negombo	Kudapaduwa
			Periyamulla
		Gampaha	Gampaha 1
			Imbulgoda
		Mahara	Kadawatha
			Sooriyapaluwa
		Biyagama	Biyagama RH
			Gonawala II
			Makola
	Kalutara	Panadura	Malamulla East
			Walana 1
		NIHS	Kalutara South
			Kohalana
Eastern	Batticaloa	Batticaloa	Central Clinic MOH
			Kallady Velloor
		Kattankudy	Baduriya
Southern	Galle	Akmeemana	Kadurugashena
			Moragalawatta
		Hikkaduwa	Hikkaduwa
Northern	Jaffna	Jaffna	Ariyalai Clinic Centre
		Nallur	Vannarpannai
		Kopay	Kaddappurai
			Irupalai
		Uduvil	Thavady
Central	Kandy	Udunuwara	Central Clinic MOH
		Kundasale	Balagolla
	Nuwara Eliya	Nuwara Eliya	Kandapola
			NuwaraEliya Estate

		Ambagamuwa	Ambagamuwa
			Shannon
			Watawala DH
Northcentral	Anuradhapura	Kekirawa	Central Clinic MOH
			Madatugama CD
		Thalawa	Eppawala RH
			Medagama
Uva	Badulla	Passara	Ambathenna
			Kanverella DH
			Passara DH
			Central Clinic MOH
		Hali-Ela	Maliththa
			Neluwa
	Ratnapura	Embilipitiya North	Ranchamadala
			Madajanapahaya
		Ratnapura	Kosgoda CHC
Northwestern	Kurunegala	Pannala	Thalawitiya CHC
			Bopitiya RH
			Meddepola
		Rideegama	Pannala
			Dodangaslanda CD
	Puttalam	Kalpitiya	Koswatta
			Daluwa
		Wennappuwa	Norochcholei
			Central Clinic MOH
			Kirimetiyawaththa

Annexure 02: Antenatal Clinic list for the Adherence

RDHS Division	MOH Division	Antenatal clinics
Colombo	Kaduwela	Athurugiriya B
		Kaduwela
	Kesbewa	Jamburaliya
		Kesbewa
Colombo MC	2A	St. Pauls
	2B	Maligawatta
Gampaha	Negombo	Kudapaduwa
		Periyamulla
	Gampaha	Gampaha 1
		Imbulgoda
	Mahara	Kadawatha
		Sooriyapaluwa
	Biyagama	Biyagama RH
		Gonawala II
		Makola
Kalutara	Panadura	Malamulla East
		Walana 1
	NIHS	Kalutara South
		Kohalana
Batticaloa	Batticaloa	Kallady Veloor
		Central Clinic MOH
	Kattankudy	Baduriya
Galle	Akmeemana	Kadurugashena
		Moragalawatta
	Hikkaduwa	Hikkaduwa
Jaffna	Jaffna	Ariyalai Clinic Centre
	Nallur	Chunnakam
	Kopay	Kaddappurai
	Uduwil	Vannarpannai
Kandy	Udunuwara	Central Clinic MOH
	Kundasale	Balagolla

Nuwaraeliya	Nuwara Eliya	Kandapola
		Nuwara Eliya Estate
	Ambagamuwa	Ambagamuwa
Anuradhapura	Kekirawa	Madatugama CD
	Thalawa	Eppawala RH
		Medagama
Badulla	Passara	Ambathenna
		Kanverella DH
		Passara DH
	Hali-Ela	Maliththa
		Neluwa
Ratnapura	Embilipitiya North	Ranchamadala
		Madajanapahaya
	Ratnapura	Kosgoda CHC
		Thalawitiya CHC
Kurunegala	Pannala	Bopitiya RH
		Meddepola
		Pannala
	Rideegama	Dodangaslanda CD
		Koswatta
Puttalam	Kalpitiya	Daluwa
		Norochcholei
	Wennappuwa	Central Clinic MOH
		Kirimetiyanawaththa

Annexure 03: A detailed justification and list of the selection of districts, MOH areas, and ANCs

Province	RDHS Division	MOH Division	Antenatal clinics
Western	Colombo	Kaduwela	Athurugiriya A
			Athurugiriya B
			Central Clinic MOH
			Dedigamuwa
			Hewagama
			Hokandara A
			Hokandara B
			Kaduwela
			Malabe
			Nawagamuwa A
			Nawagamuwa B
			Thunandehena
		Kesbewa	Central Clinic MOH
			Batekettara
			Dampe
			Deltara
			Hedigama
			Jamburaliya
			Kahapola
			Kesbewa
			SOS
	Colombo MC	2A	New Bazaar
			St. Pauls
			Bandaranayaka Mawatha
		2B	Forbes Road
			Maligawatta
			Mohideen Musjid
	Gampaha	Negombo	Central Clinic MOH
			Dalupotha
			Galkanda
			Kadolkale
			Kamachchode
			Kochchikade
			Kudapaduwa
			Kurana
			Munnakkaraya
			Palagathure
			Pathimawaththa
			Periyamulla
			Pitipana
			Poruthota

			Thalahena
		Gampaha	Baduwathugoda
	Bulugahagoda		
	Central Clinic MOH		
	Gampaha 1		
	Gampaha 2		
	Ganemulla		
	Ganemulla South 1		
	Henarathgoda		
	Ihalayagoda		
	Imbulgoda		
	Kalagedihena		
	Kossinne east		
	Kossinne west		
	Makevita		
	Weliweriya 1		
	Weliweriya 2		
	Yakkala 1		
	Yakkala 2		
	Mahara		Atikehelgalle
			Central Clinic MOH
		Dalupitiya	
		Eldeniya	
		Gongithota	
		Kadawatha	
		Kendaliyaddhapaluwa	
		Kinigama	
		Kirikitta	
		Malwathuhipitiya	
		Neligama	
		Pinnemeda	
		Ranmutugala	
		Sooriyapaluwa	
		Udupila	
		Uruwela	
		Weboda North	
		Wilimbula	
	Biyagama	Biyagama BOI	
		Biyagama RH	
		Biyagama Siyabalapewatta	
		Central Clinic	
		Gonawala I	
		Gonawala II	
		Heiyanthuduwa - 1	
		Heiyanthuduwa - 2	

			Kanduboda
			Madarawa
			Makola
			Mawaramandiya I
			Mawaramandiya II
			Pahala Biyanwila
			Pattivila
			Walgama
	Kaluthara	Panadura	Adam Forest
			Ambalanduwa
			Central Clinic MOH
			Eluwila
			Gorakana
			Hirana 1
			Hirana 2
			Horethuduwa
			Keselwaththa CD
			Malamulla East
			Malamulla West
			Nalluruwa
			Pallimulla
			Rividewgama
			Thotawatta
			Walana 1
			Walana 2
			Wekada
	NIHS	Kalutara	Alwis watta
			Bollessgama
			Bombuwala
			Central Clinic NIHS
			Dediyawala
			Ethanamadala
			Gamagoda
			Kalamulla
			Kalapuwa
			Kalutara North
			Kalutara South
			Katukurunda
			Kohalana
			Mahaheenatiyagala
			Nagoda
			NIHS
Eastern	Batticaloa	Batticaloa (Manmunai North)	Batticaloa TH
			Central Clinic MOH
			GHC Kokkuvil

			GHC Koolavady
			GHC Maddikkaly
			GHC Manjamthoduvai
			GHC Navalady
			Iiruthyapuram
			Kallady Velloor
			Koddaimunai CD
			Palameenmadu PU
			Puliyanthivu
			Sinnaurani
			Thirupperunthurai
		Kattankudy	Anver
			Baduriya
			Central Clinic MOH
			Hairath
			Iqbal
			Millath
			Shuhatha
Southern	Galle	Akmeemana	Amalgama (Hiyare)
			Atahawula
			Central Clinic MOH
			Ettiligoda
			Kadurugashena
			Kalahe
			Kuruduwa
			Lunuwila Watta
			Maliban
			Mataramba
			Moragalawatta
			Pilana
			Pinnaduwa
		Hikkaduwa	Akkarawissa-Closed
			Akurala
			Dewagoda
			Dodanduwa
			Galagoda
			Galduwa
			Hikkaduwa
			Kalupe
			Kalupe-Closed
			Madampagama
			Narigama
			Thelwatta
Northern	Jaffna	Jaffna	Ariyalai Clinic Centre
			Central Clinic MOH

			Gurunagar DH
			Jubilee Maternity Home
			Kantharmadam Clinic Centre
			Nallur Clinic Centre
			Navalar Road Clinic Centre
			Passaiyoor Maternity Home
			Pommaiveli Maternity Home
			Suvammiyar Road Clinic Centre
		Nallur	Clinic - Central Clinic MOH
			Kokuvil PCMU
			Kondavil DH
			PHC Ariyalai
			RDS Kokuvil
			Thirunelvely PCMU
			Vannarpannai Clinic Centre
		Kopay	Kaddaipirai PHC
			DH Kopay
			Irupalai
			Urumpirai PCMU
			Nervely PHC
			DH Atchuvily
			Urelu PHC
			Putur PCMU
			Siruppiddy CH
			Central Clinic MOH
		Uduvil	Thavady North
			Thavady South
			Inuvil North
			Unuvil South
			Uduvil North East
			Uduvil South
			Uduvil West
			Chunnakam North
			Chunnakam South
			Kantharodai
			Punnalaikadduvan
			Kuppilan
			Punnalaikadduvan North
			Earlalai South
			Earlalai Center
			Earlalai North
Central	Kandy	Udunuwara	Central 1
			Central Clinic MOH

			Elamaldeniya CD
			Gelioya DH
			Mampitiya DH
			Pamunuwa DH
			Uda Aludeniya
			Wahankoha Rahumania
		Kundasale	Ambakote
			Balagolla
			Central Clinic MOH
			Clinic MOH1
			Clinic MOH2
			Janasavigama 1
			Kumbukkandura
			Rajawella CD
	Nuwara Eliya	Nuwara Eliya	Central Clinic MOH
			Desford
			Glasso Estate
			Headherset
			Kandapola
			Kotlodge Estate
			Mahagasthota
			Mihindupura
			Nanuoya
			NuwaraEliya Estate
			Olifant
			Park Estate
			Pattipola - Closed
			Peedru
			Radhella Estate - Closed
			Seetha eliya
			Shanthipura
			Summerset Estate
		Ambagamuwa	Ambagamuwa
			Badupola
			Carolina
			Central Clinic MOH
			Dickoya
			Dunbar CD
			Ginigethena DH
			Hangarapitiya
			Kalaweldeniya
			Laxapana DH
			Malliappuwa
			Norton CD
			Pitawala

			Polyclinic Dickoya South
			Shannon
			Strathdon
			Vellaioya
			Watawala DH
North Central	Anuradhapura	Kekirawa	Bendiwewa
			Central Clinic MOH
			Dambewatana
			Ganewalpolu
			Kekirawa DH
			Kumbukwewa
			Madatugama CD
			Maradankadawela RH
			Murungahitikanda
			OluKarada
			Ramadegala
			Shastravelliya
			Unagollewa
		Thalawa	Central Clinic MOH
			Eppawala RH
			Galmaduwa
			Ihala Halmillewa
			Ihalawewa
			Katiyawa RH
			Katiyawa Yaya 1
			Lahirupura
			Mawathawewa
			Medagama
			Meegassagama
			MOH Clinic
			Pahalathalawa
			Rathmalgahawewa
			Thalawa DH
Uva	Badulla	Passara	Ambathenna
			Bibilegama PMCU
			Central Clinic MOH
			Dammeria Estate - Closed
			Eltab Estate
			Gonakale Estate - Closed
			Kahataruppa DH
			Kannahela
			Kanverella DH
			Madugasthalawa
			Maedawelagama
			Mahadowa

			Maligathanna - Closed
			Maussagolla
			Meedumpitiya PMCU
			Meedumpitiya Poly clinic
			Meeriyabedda
			Passara
			Passara DH
			Puhulwattha
			Sapuroda
			Tholabowatta - Closed
			Udagama
			Ury DH
			Wawekelle
			Central Clinic MOH
			Dehivinna
			Etampitiya DH
			Gaawela
			Haliela CD
			Haliela MOH
			Imbulgoda
			Kandana - Closed
			Ketawela
			Kirinda
			Kurukudaya
			Maliththa
			Medagama
			Morethota
			Mugunumatha
			Neluwa
			Rilpola
			Springvelly DH
			Unagolla DH
			Uva highland DH
			Wepassawela
			Pallebedda Hospital
			Thithhawelpotha
			Sankhapala
			Miriswelpatha
			Anduluwa
			Kolambageara
			Udawalawa Hospital
			Thimbolkatiya
			Yaya 2
			Ranchamadala
			Halmillara
			Mada Janapadhaya

			Gangeyaya
			Ketagalara
			Central Clinic MOH Udawalawa
			B Erathna DH
		Kuruwita	C Theppanawa DH
			Central Clinic MOH
			Devipahala CHC
			Galukagama CHC
			Kadangoda CHC
			Keeragala PMCU
			Kithulpe CHC
			Kosgoda CHC
			Kuruwita CD
			Parakaduwa CHC
			Pathagama CHC
			Pohorabawa RCC
			Pussella GHC
			Thalawitiya CHC
			Waladura CHC
			Watapitiya GHC
North Western	Kurunegala	Pannala	Bammanna
			Bopitiya RH
			Central Clinic MOH
			Elibichchiya
			Ellabadagama
			Gonulla
			Hamangalla
			Hengawa
			Horawadunna CD
			Kandanegedara RH
			Katugampola
			Maholawa
			Malgamuwa
			Meddepola
			Mohoththawa
			Mummana
			Narangoda CD
			Nedalagamuwa
			Pannala
			Pannere
			Raddalana
			Sandalankawa
			Sandalankawa RH
			Udugama
			Welpalla

			Wetakeyawa
			Yakwila
		Rideegama	Buluwala CD
			Central Clinic MOH
			Delwita RH
			Dodangaslanda CD
			Egodamulla
			Ginihiraya
			Gonigoda RH
			Kalamulla
			Kandededara
			Koswatta
			Meegasthenna
			Ogodapola
			Panagamuwa
			Pussella
			Rambadagalla
			Rideegama DH
			Udahorombuwa
			Thalgaspitiya
	Puttalam	Kalpitiya	Acre 90 CD
			Alankuda CD - closed
			Anawasala - Closed
			Andankanniya
			Daluwa
			Eththala
			Kalpitiya DH
			Kandakuliya
			Karamba CD
			Kurinchipitiya
			Mampuri RH
			Mandalakuda
			Mudalapaliya
			Musalpitiya
			Norochcholei
			Palliwasalthurei
			Paniyadiya
			Referral Clinic
			Sethapola
			Thalawila CD
			Thihaliya
			Ulukkapallama
			Wanimundal - Closed
		Wennappuwa	Angampitiya
			Central Clinic MOH

			Galawaththa
			Kirimetiyanawaththa
			Kolinjadiya
			Lunuwila DH
			Mirissankotuwa
			Nainamadama CD
			Sahanagama
			Sindathriya
			Ulhitiyawa
			Wennappuwa CD

For a national-level study on the implementation of MMS programme among non-anaemic pregnant women in Sri Lanka, a well-structured sampling technique is crucial to ensure representativeness and minimize bias. This study will be conducted in the areas of the Medical Officer of Health (MOH) where pregnant women without anaemia are commonly reported under various sectors (urban, rural and estates). In addition to the highest number of cases of pregnant women without anaemia in the study area, religion and ethnicity are also to be taken into account.

Here, the information on pregnant women for the year 2024 obtained from the eRHMS of Family Health Bureau of the Ministry of Health for the RDHS level will be used to prepare the sample framework (Family Health Bureau, 2024). In addition, the population ratio at the sectoral (urban, rural and estate) level of each district maintained by the Department of Census and Statistics will be multiplied by the number of pregnant women without anaemia in each RDHS (RDHS offices are approximately aligned with administrative districts) to calculate the number of pregnant women without anaemia in the various sectors (urban, rural and estate) of each RDHS (Annex 19) (Department of Census and Statistics, 2024).

Also, to better achieve the objectives of the study, the number of pregnant women without anaemia is needed at the MOH level. For this purpose, the female population data available in the Department of Census and Statistics by sector (urban, rural and estate) of each district, further adjusted according to the Divisional Secretariat (DS) areas of each district, has been used to calculate the number of pregnant women without anaemia by Medical Officer of Health area (MOH offices are also closely aligned with divisional secretariats) by multiplying it by the total number of pregnant women without anaemia in each RDHS.

Calculating the exact sample size is an important part of a research design. It is essential to understand that different study designs require different methods of calculating sample size, and that one formula cannot be used for all designs (Charan and Biswas, 2013). According to the population data system maintained by the Department of Census and Statistics, the population proportions in the urban, rural, and estate sectors of each district in Sri Lanka are approximately 18%, 77.5% and 4.5% respectively. Furthermore, since it is expected to obtain a sample of about 480 in this study, if a proportional allocation is made based on sectors, the sample represented by the estate sector will be about 21. Therefore, to better reflect the objectives of the study, it is expected to obtain an equal sample size from all 3 sectors instead of proportional sampling. Accordingly, a sample of 160 from each sector is to be obtained using multi-stage random sampling techniques. Accordingly, the sampling errors for urban, rural, and estate sectors take different values as follows.

The total sampling frame of the urban, rural, and estate sectors where the target group (nonanaemic pregnant women) is going to be selected is 34181, 146553, and 8412, respectively. Accordingly, since 160 sample sizes are selected for each of the urban, rural and estate sectors, it is approximately done within a margin of error of plus or minus 6.20 percentage points and a confidence level of 95%. (This has been calculated based on the Cochran's formula) (Charan and Biswas, 2013). This means, in this case, there is a 95% chance that the real value is within $\pm 6.2\%$ of the measured/surveyed value. To obtain the optimum margin of error for given precision and confidence level, the estimated prevalence (p) considered as 80% for the sample calculation. The approximate sample size needed in each stratum was then estimated using the following formula:

$$n = N \cdot X / (X + N - 1);$$

Where, $X = Z_{\alpha/2} * p * (1-p) / MOE^2$, and $Z_{\alpha/2}$ is the critical value of the Normal Distribution at $\alpha/2$ (e.g., for a confidence level of 95%, α is 0.05 and the critical value is 1.96), MOE is the margin of error, p is the sample proportion, and N is the population size.

Here, since the total sample size to be selected according to urban, rural, and estate sectors is **480** (160 from each sector), it is not practical to use the entire RDHS belonging to each sector as strata for the study. Therefore, the total number of non-anaemic pregnant women in the RDHS of each sector (urban, rural and estate) are arranged from highest to lowest, and the RDHS that contribute to representing the total of those values is more than 50% (statistically, a sector needs to be represented at least 50% for a better representation) is expected to be used as the sampling strata for each sector.

Accordingly, the design ensures representation from three sectors (urban, rural and estate), 8 provinces, 13 districts, 14 health areas (RDHS and MC) and 32 MOH areas throughout the country to reach the study locations. Here, as mentioned earlier, RDHS have been selected to represent more than 50% of the total population in different strata which are urban, rural, and estate sectors as the first stage. In the second stage, two MOH areas with the highest number of non-anaemic pregnant women in each selected RDHS will be chosen to reflect sectoral diversity. Within each identified stratum, antenatal clinics will be randomly selected, followed by the random selection of eligible non-anaemic pregnant women attending these clinics, verified through antenatal records (e.g., H512A forms). Here, the sample will be divided to ensure proportional representation from each RDHS and MOH subject to the overall sampling plan given above.

The total number of Antenatal Clinics available within each selected MOH area will be taken into account when determining the number of clinics to be included in the study. Accordingly, one clinic will be selected randomly from MOHs with up to 10 antenatal clinics; two clinics from MOHs with 11–20 clinics and three clinics from MOHs with >20 clinics.. For each selected clinic, an additional buffer Antenatal Clinic will also be randomly selected. If any practical challenges arise in obtaining the required sample from a selected clinic, the buffer clinic will be used.

One of the study objectives is to assess adherence to MMS, for which a minimum sample of 480 non-anaemic pregnant women is required. However, at field level, some non-anaemic pregnant women may not have received MMS. For example, if 60 non-anaemic pregnant women have not received MMS, researchers will need to include an additional 60 non-anaemic pregnant women who have received MMS to ensure the minimum required sample is achieved. In practice, this means that the adherence sample will always total 480, although the overall number of participants may exceed 480 to accommodate these adjustments.

Annexure 04: Additional MOH Areas used for Adherence

Province	RDHS Division	MOH	ANCs
Central	Nuwara Eliya	Bogawanthalawa	Venture
		Maskeliya	Maussakele
			Osborne

Annexure 05: List of participants for FGD with non-anaemic pregnant women in 2nd s 3rd trimesters

District	No of FGDs	No Of Participants
Badulla	1	8
Galle	1	7
Jaffna	1	9
Kalutara	1	6
Kandy	1	8
Kesbewa	1	10
Kuruwita	1	8
Puttalam	1	10
Total	08	66

Annexure 06: List of Participants for FGDs with Public Health Midwives (PHMs)

District	No of FGDs	No of Participants
Jaffna	1	10
Kandy	1	6
Batticaloa	1	7
Galle	1	7
Kesbewa	1	7
Nuwara Eliya	1	8
Puttalam	1	7
Udawalawa	1	6
Kalutara	1	8
Total	06	66

Annexure 07: List of Key Informants

Stakeholder Category	Designation	No of Officers
Frontline healthcare Workers	Medical Officer of Health (MOH)	2
	Additional Medical Officer (AMOH)	2
	Public Health Nursing Sister (PHNS)	2
	Supervisory Public Health Midwife (SPHM)	1
Staff Involved MMS logistics and Distribution	Assistant Director MSD	1
	Divisional Pharmacist	2
	FHB Storekeepers	1
Technical Team- National/ District level	CCP	2
	MOMCH	2
	CCP- Maternal Care Programme	1
Health care specialists	Obstetricians and Gynaecologists	3
Health Administrators and/ Policy Makers	Director Maternal and Child Health	1
Total		20

Annexure 08: Interviewer Administered Questionnaire for non-anaemic pregnant women

Date	
Interviewer	
Location	(Set by Google Map)
Residential sector	(Select from Urban, Rural, Estate)
Province	
District	
MOH	
ANC	
PHM area	

Items to be checked in H512-A form by the interviewer

Date of LRMP	
Gravidity	G - P -
Have you received MMS?	Yes No (Move to Section 01)
Date of the first received MMS	
POA of the first received MMS	
Amount issued (Bottle/Blister Packs)	
Haemoglobin level (g/dL)	First Trimester -
	Second Trimester -
	Third Trimester -

1. Socio-demographic information

1.1. Age (years):

- ☐ Below 20
- ☐ 21 – 25
- ☐ 26 – 30
- ☐ 31 – 35
- ☐ 36 – 40
- ☐ 41 – 45
- ☐ Above 45

1.2. Ethnicity:

- ☐ Sinhala
- ☐ Tamil
- ☐ Muslim
- ☐ Burgher
- ☐ Other (specify).....

1.3. POA for today (cross check with H512) in weeks

.....

1.4. Trimester of current pregnancy:

- ☐ Second trimester
- ☐ Third trimester

1.5. Highest level of education completed:

- ☐ No proper school education
- ☐ Incomplete primary education
- ☐ Passed up to grade 5
- ☐ Passed up to grade 8
- ☐ Passed GCE Ordinary level
- ☐ Passed GCE Advanced level
- ☐ Completed higher education (Diploma / University)
- ☐ Post graduate
- ☐ Do not want to answer

1.6. Current employment status of the participant:

- ☐ Housewife / Not engaged in income-generating work
- ☐ Temporarily unemployed / Job-seeking
- ☐ Government employee
- ☐ Private sector employee (fixed monthly income)
- ☐ Self-employed (including small-scale business)
- ☐ Daily wage earner
- ☐ Estate worker (For estate sector)
- ☐ Agricultural / Livestock / Fishing worker
- ☐ Student (school / university / vocational training)
- ☐ Other (please specify):

1.7. Household monthly income:

- ☐ Below Rs. 25,000
- ☐ Rs. 25,000 – 49,999
- ☐ Rs. 50,000 – 74,999
- ☐ Rs. 75,000 – 99,999
- ☐ Rs. 100,000-149,999
- ☐ Rs. 150,000- 199,999
- ☐ Above Rs. 200,000
- ☐ Other
- ☐ Don't know
- ☐ Do not want to answer

2. Knowledge and attitudes on MMS

2.1. Have you heard about Multiple Micronutrient Supplementation (MMS) for pregnant women? (Show a picture of a MMS bottle/blister pack since they might not be familiar with name MMS)

- ☐ Yes
- ☐ No (Go to the section 8)

2.2. From where did you first hear about MMS?

- ☐ From Public Health Midwife
- ☐ From a medical officer / medical officer of health

- ☐ From a nurse
- ☐ From a friend / relative
- ☐ From articles or mass media
- ☐ Other (Please specify): _____

2.3. What extent do you agree with the following statement?

“Taking multiple micronutrient supplements (MMS) is important for your health and your baby’s health.”

- ☐ Strongly agree
- ☐ Agree
- ☐ Neutral
- ☐ Disagree
- ☐ Strongly disagree

2.4. What benefits do you believe multiple micronutrient supplements (MMS) provides? (You may select more than one response)

- ☐ Prevent maternal anaemia
- ☐ Improves maternal nutrition
- ☐ Supports fetal health
- ☐ Reduces low birth weight births
- ☐ No benefit at all
- ☐ Other (Please specify): _____

2.5. Do you know what nutrients are included in multiple micronutrient supplements

(MMS) provides? (You may select more than one response)

- ☐ Iron
- ☐ Zinc
- ☐ Copper
- ☐ Iodine
- ☐ Selenium
- ☐ Vitamin A
- ☐ Vitamin C
- ☐ Vitamin D

Vitamin E

Folic acid

Calcium

☐ Most vitamins included in Vitamin B complex (B1, B2, B3, B6, B12)

☐ Not aware

☐ Other (Please specify): _____

2.6. Which of the following statements about Multiple Micronutrient Supplementation (MMS) are true or false?

Statement	True	False	Not sure
MMS provides all the nutrients required during pregnancy			
When taking MMS, nutritious meal is not that important			
Should continue to take iron, folate and vitamin C supplements along with MMS			
It is important to keep the MMS bottle away from light and moisture			
MMS tablets should be taken with calcium carbonate tablets or food without any gap			
If you forget to take MMS, you should take it as soon as you remember on the same day			
If a dose is missed, skip it and continue with the next scheduled dose on next day			

3. Usage and Adherence

3.1. Have you received MMS during your current pregnancy?

☐ Yes

☐ No (Go to section directly)

☐ Not sure (Go to section 8 directly)

3.2. Are you currently taking MMS?

☐ Yes

☐ No (Go to section 8)

☐ Not at present but used before (Go to question 3.4)

3.3. How many days per week do you forget to take the MMS tablet?

☐ Daily without missing any doses (Skip question 3.5)

☐ Missing 1- 2 days per week

☐ Missing 3 -4 days per week

☐ Missing more than 4 days per week

3.4. What are the reasons for not taking MMS? (You may select more than one response)

☐ Experienced side effects

☐ Forgetfulness

☐ Did not receive

☐ Did not think it is that important

☐ Taking some other medications also

☐ Tablets have an unpleasant taste / smell

☐ Tablets got soggy

☐ Difficulty in swallowing

☐ Got my tablets bottle misplaced

☐ Family advised against it / Cultural or religious issues

☐ I think this is not useful

☐ I am taking supplements from private sector(pharmacy/private hospital)

☐ Other (please specify): _____

3.5. Have you experienced any side effects after taking MMS?

☐ Yes

☐ No (Go to section 4)

3.6. If yes, what were the side effects? ((You may select more than one))

☐ Nausea or vomiting

☐ Constipation

☐ Diarrhoea

☐ Headache

☐ Dizziness

- ☐ Stomach pain
- ☐ Change in urine/stool color
- ☐ Decreased appetite
- ☐ Other (please specify): _____

3.7. Did the side effects cause you to stop or reduce the frequency of taking MMS?

- ☐ Yes
- ☐ No

4. Packaging and storage

4.1. In what form did you receive MMS tablets from the clinic?

- ☐ Bottle (Skip the section 5)
- ☐ Blister pack
- ☐ Other (Please specify) _____

4.2. How often do you receive your MMS supply?

- ☐ Monthly
- ☐ Given for 6 months
- ☐ Other (please specify): _____

4.3. MMS comes in blister packages of one month duration and in bottles of six months duration. which packaging do you most prefer?

- ☐ Bottle
- ☐ Blister pack
- ☐ Not sure

4.4. What do you think about the MMS given in bottle containing six months supply? (You may select more than one)

- ☐ Convenience of getting the entire requirement at the beginning
- ☐ Difficult to store
- ☐ Feels less hygienic
- ☐ Not easy to carry outside
- ☐ Tablets change colour/smell over time
- ☐ Moisture can get in and tablets get soggy
- ☐ No problems experienced

☐ Other (please specify): _____

4.5. What do you think about MMS given as blister packs containing one months supply?

(You may select more than one)

- ☐ Convenient to use
- ☐ Easy to carry when going out
- ☐ Feels cleaner/hygienic
- ☐ Easier to keep track of tablets
- ☐ Less chance of contamination
- ☐ Good protection from moisture
- ☐ Hassle of taking the supplies monthly
- ☐ Difficult to open
- ☐ No difference noticed
- ☐ Other (please specify): _____

4.6 How do you usually store your MMS tablets at home?(Multiple Answers)

- ☐ In the original pack
- ☐ In another container
- ☐ In a plastic/paper bag
- ☐ In a dry place
- ☐ Away from sun light
- ☐ Other: _____

4.7 Have you faced any challenges storing them safely?

- ☐ Yes (Go to question 4.8)
- ☐ No

4.8 If yes, please describe:

5. Availability

5.1. Have you ever been unable to get MMS from the health center?

- ☐ Yes
- ☐ No (Go to section 6)

5.2. What was the reason?

- ☐ Stock unavailable
- ☐ Did not attend clinic
- ☐ Other(Please specify) : _____

6. Counseling and Information Received

6.1. Have you received advise / information about MMS by a healthcare provider (PHM, MOH/MO, nurse)?

- ☐ Yes
- ☐ No (Go to section 7)

6.2. What kind of information were you given? (Select all that apply)

- ☐ Purpose and benefits of MMS
- ☐ How and when to take the tablets
- ☐ How to store MMS properly
- ☐ Possible side effects and how to manage them
- ☐ Importance of continued use during pregnancy
- ☐ Dietary advice alongside MMS
- ☐ Other (Please specify): _____

6.3. Did you feel that the information provided was sufficient?

- ☐ Yes
- ☐ No

7. Suggestions and Final Comments

7.1. What suggestions do you have to improve access to and adherence with MMS in your area?

.....

7.2. Do you have any suggestions on how the MMS tablets should be packaged or stored to make it easier or safer for you to use them?

.....

7.3. Mention any additional comments or experiences you would like to share regarding MMS use:

.....

Annexure 0G: Interviewer guide and template for 24-Hour Dietary Recall

1. Introduction

The 24-hour dietary recall (24HR) is a structured, interviewer-administered method to capture **all foods and beverages consumed by a participant during the previous 24 hours**, from midnight to midnight.

2. Objectives

- To collect accurate, detailed information on dietary intake.
- To assess portion sizes using culturally appropriate tools.
- To ensure standardization across interviews for high-quality data.

3. Ethical Considerations

- Obtain **informed consent** before the interview.
- Respect participant privacy and cultural norms.

4. Preparation Before the Interview

a) Materials Checklist

- 24HR dietary recall template
- **Dr. Ranil Jayawardena's Food Atlas for Sri Lankan Adults**

b) Interviewer Readiness

- Be familiar with the **five-pass method** (explained below).
- Review local food terminology and common dishes.
- Practice using the Food Atlas and utensil-based portion estimation.

5. The Five-Pass Method (For interviewer use)

Pass 1	Quick List	Ask the respondent to list everything they ate or drank the previous day. Use neutral prompts and do not interrupt.
Pass 2	Forgotten Foods Probe	Use a checklist to ask about commonly forgotten items such as: • Snacks (e.g., biscuits, fruits) • Beverages (e.g., tea, coffee, soft drinks, water) • Condiments (e.g., coconut sambol, oil, sugar) • Supplements or medicines (e.g., iron, MMS)
Pass 3	Time and Occasion	For each item, ask: • What time was it consumed? • What was the eating occasion? • Where was it consumed?
Pass 4	Detail Cycle	Gather detailed information for each food/beverage: • Type: Brand, variety • Cooking method: Fried, boiled, curried • Ingredients: Especially in mixed dishes • Amount consumed: Use Dr. Ranil's Food Atlas and standard household utensils to aid estimation.
Pass 5:	Final Probe	Ask if there's anything else the participant ate or drank that was not yet mentioned. Double-check for water, tea, sweets, supplements.

6. Portion Size Estimation

Serial images: Different portion sizes of common Sri Lankan foods.

Range photos: Full spectrum of portion sizes.

Guide photos: Brand/type or packaging variations.

7. How to Use:

- Show the food images and ask: "Which photo looks closest to the amount you ate?"
- Cross-verify with physical utensils if needed.

- Record the selected portion in grams (based on atlas conversion table).

8. Special Notes for Pregnant Women (Should be filled by the interviewer)

1. Is this an usual day for you? (whether food intake changed from usual e.g., due to illness or fasting)
 - ☐ Yes
 - ☐ No
2. Are you on any supplements (eg vitamins, minerals, fish oil etc)
 - ☐ Yes (Go to 8.3)
 - ☐ No
3. If yes, please specify
4. Have you developed any cravings, aversions, or food restrictions due to pregnancy.
 - ☐ Yes (Go to 8.5)
 - ☐ No
5. If yes, please specify

Template for the 24-hour dietary recall

Date:

Day.....

Reference No:

Name:.....

Time and place	Type of meal	Food item	Description (cooking method, brand, cooking oil etc..)	Quantity (in household measurements)	Remarks
	Morning tea				
	Breakfast				

	Mid-morning snack				
	Lunch				
	Evening snack				
	Dinner				
	Late-night snack				

Annexure 10: Market survey guide - Pharmacy visits

Date:

Time:

GPS Location:

Observer's name:

1. List of available Micronutrient Supplements for pregnant women in that pharmacy

Record the following,

- Brand name
- Packaging type (bottle, blister pack, etc.)
- Contents (key vitamins/minerals included)
- Price per unit/pack

2. Ask About Sales Performance - Are there any brands women specifically ask for?

3. Ask reasons pregnant women prefer commercial brands over government-distributed MMS

Eg:

- Perceived quality/trust in brand
- Packaging or ease of use
- Less side effects or tolerability
- Availability (stock-outs at health centers)
- Perceived effectiveness
- Advice from Obstetrician and Gynaecologist
- Online sources

Annexure 11: Focus Group Discussion (FGD) Guide for Non-anaemic pregnant women

District.....

MOH

Date:.....

Interviewer's name :

Duration: Approximately 1 hour **Introduction :**

Good morning/afternoon, I am.....(name C designation).

We are here today to discuss on nutrition supplements given to pregnant women. The research is conducted by Dr. Chandima Siritunga, Director of Maternal and Child Health, Family Health Bureau (FHB) and Prof. K.L.M.D. Seneviwickrama, Professor in Community Medicine, University of Sri Jayewardenepura who serve as co-principal investigators and the interviewer represents the IPID. My colleague here(name C designation) will be taking notes and recording the interview.

Ground rules

- Your views are valuable and important and will contribute to improvement of MMS program.
- There are no right or wrong answers. Every person's experience and opinion are important. We want to hear a wide range of opinions.
- Participation in this discussion is free and there is no obligation to respond, you can stop at any point.
- Only one person should talk at a time. We would like to hear from every participant.
- We don't identify anyone by name in our report. What is said in this room stays here. No personal data will be shared with others and the information provided will be analysed anonymously and used confidentially.

This interview will be recorded without your personal identification details to ensure quality of data. Do you have any objections to this interview being recorded? To start with, please tell us about yourself (Age, parity)

1. Your knowledge and experience with MMS Intake

1.1. What do you know about nutritional supplementation?

1.2. What do you know about the MMS in pregnancy?

Probes: timing, dosage, frequency, duration, benefits, purpose

1.3. What information or advices about MMS you received from the health staff?

Probes: Storage, side effects, timing, dosage, frequency, duration, benefits , purpose

1.4. Describe your experience on taking MMS *Probes: side effects, difficulties*

1.5. If you experienced any side effects (e.g., nausea, vomiting) how did you deal with them?

2. Perceptions and Preferences on MMS Packaging

- 2.1. MMS is available in different packaging forms such as **glass bottles** containing 6 months' supply and **blister packs containing one month supply**. Which one did you receive from the clinic? How often?
- 2.2. If you had a choice, which packaging **would you prefer to receive in future — blister pack or glass bottle?** Why?
- 2.3. From your experience or what you've heard from others, which packaging do most pregnant women prefer, blister packs or glass bottles? Why?
Probes: Easier to use? Safer for storage?
- 2.4. How do you usually store MMS tablets at home?
Probes: In original pack? In another container? Are there any challenges with storing them safely?
- 2.5. What do you know about how MMS should be stored?

3. Beliefs and Attitudes Toward Supplements

- 3.1. What is your attitude toward MMS in pregnancy?
- 3.2. What do people in your family or community say about taking supplements during pregnancy? Did anyone in your family encourage or discourage you from taking MMS? Why?
Probes: myths or misconceptions

4. Barriers and supporting factors to Taking MMS

- 4.1. What barriers / challenges, if any, have you faced in taking MMS regularly?
(Probes: forgetfulness, side effects, fear, family pressure, unavailability of MMS)
- 4.2. What are the supporting factors to continue taking MMS?
a. *(Probes: strong counselling, family support, perceived benefits, accessibility)*

Annexure 12: Focus Group Discussion (FGD) Guide for Public Health Midwives

Participants: **Public Health Midwives**

District.....

MOH area

Date:.....

Interviewer's name:

Duration: Approximately 1 hour **Introduction :**

Good morning/afternoon, I am _____ (name C designation).

We are here today to discuss on nutrition supplements given to pregnant women. The research is conducted by Dr. Chandima Siritunga, Director of Maternal and Child Health, Family Health Bureau (FHB) and Prof. K.L.M.D. Seneviwickrama, Professor in Community Medicine, University of Sri Jayewardenepura who serve as co-principal investigators and the interviewer represents the IPID. We are here today to discuss on MMS intake practices, including experiences with adherence, side effects, and outcomes; socio-cultural perceptions influencing acceptance, barriers and supportive factors. My colleague here..... (name C designation) will be taking notes and recording the interview.

Ground rules

- Your views are valuable and important and will contribute to improvement of MMS program.
- There are no right or wrong answers. Every person's experience and opinion are important. We want to hear a wide range of opinions.
- Participation in this discussion is free and there is no obligation to respond, you can stop at any point.
- Only one person should talk at a time. We would like to hear from every participant.
- We will be tape recording the group. We don't identify anyone by name in our report. What is said in this room stays here. No personal data will be shared with others and the information provided will be analysed anonymously and used confidentially.

This interview will be recorded without your personal identification details to ensure quality of data. Do you have any objections to this interview being recorded?

To start with, please tell us about yourself (age, total period of service, duration of service at current position)

Your Role and Experience with MMS

1.1 What do you know about nutritional supplementation?

1.2 What do you know about the MMS in pregnancy?

Probes: timing, dosage, frequency, duration, benefits, purpose

1.3 What is your role in Multiple Micronutrient Supplementation (MMS) programme pregnant women? Who are the categories you issue MMS?

1.4 How do you introduce and explain MMS to pregnant women? What are the instructions you're providing for them regarding MMS?

1.5 If a pregnant woman on MMS develops anaemia, how would you manage it ?

1.6 What is your opinion regarding replacement of iron and folic acid (IFA) supplementation with Multiple Micronutrient Supplementation (MMS) for pregnant women?

Prompt: effectiveness, acceptability, and positive changes/outcomes

1.7 What has been your experience with adherence to MMS among pregnant women? Including information on discontinuation of it in favor of commercial brands.

1.8 Have pregnant women reported any side effects or made any complaints of MMS?

Prompt: storage issues, spoilage etc

1.9 When a pregnant woman reports side effects from taking MMS, what actions do you take, and what kind of advice or guidance do you provide to help her manage the side effects and continue the supplements if appropriate?

Beliefs and Attitudes Toward Supplements

2.1 Have you heard any myths / misconceptions/misinformation toward supplementation that might affect MMS acceptance?

Prompt: religious or cultural etc/ less effective than IFA

2.2 How do you address those myths/ misconceptions/ misinformation or cultural resistance?

Perceptions and Preferences on MMS Packaging

3.1 MMS is available in different packaging forms such as **bottles** containing 6 months supplements and **blister packs**, containing monthly supplements. Explain which packaging form of MMS most suitable as you think, giving reasons for your preference.

Probes: Any difficulties? Storage? Distribution? Contamination? Color changes with time?

Moisture issues/spoilage/wastage?

3.2 From your experience or what you've heard from others, which packaging do most pregnant women prefer, blister packs or glass bottles? Why?

Probes: Easier to use? Looks more professional? Safer for storage? Spoilage/wastage

Barriers and supporting factors to Taking MMS

4.1 What are the most significant barriers /challenges you have observed among clients in relation to MMS intake?

Probes: common reasons why women stop or skip taking MMS- forgetfulness, side effects, fear, family pressure, commercial preparations are more attractive, doctors' prescriptions.

4.2 Do any particular groups face more difficulties?

Probes: estate sector women, young mothers, poor socioeconomic status 4.3

What practices has worked well in encouraging women to take MMS regularly?

4.4 What steps do you take when a pregnant woman discontinues or fails to regularly take MMS?
What follow-up strategies or interventions do you use to re-engage her and encourage adherence to the supplementation schedule?

4.5 Describe your experience in relation to MMS supply and storage

Probes: unavailability or stockouts and frequency

4.6 How do you ensure continuous supply and proper record-keeping?

Closing

5.1. Describe the strengths and weaknesses of the MMS program implementation

5.2. What improvements would you recommend strengthening the MMS program

Probes: storage, packaging, distribution, data systems, community engagement, guidelines, training

5.3 Is there anything additional you would like to share about your experiences or observations related to the use of MMS among pregnant women ?

Other (please specify)
24-hour dietary recall will be conducted from here onwards. Please follow the 24-hour dietary recall guide provided

Annexure 13: Key Informant Interview (KII) Guide

1. Frontline healthcare workers (MOH/AMOH, PHNS, SPHM)
2. Technical team overseeing maternal and child health programs in national, provincial C regional settings (Programme Manager FHB / CCP/ MOMCH)
3. Staff involved in MMS logistics and distribution (Assistant director of MSD, MSD officer in-charge of MMS logistics and distribution, RMSD officer in-charge of MMS logistics and distribution, RDHS divisional pharmacists, Wharf officer of SPC, FHB Storekeepers)
4. Health Administrators/ Policy makers - National Level and regional level (Director MCH/ RDHS)
5. Health care specialists – Obstetricians and Gynaecologists

Organization:

Position:

Name of the interviewer:.....

Date:.....

Duration: Approximately 1 hour

Introduction :

Good morning/afternoon, I am_____ (name Camp; designation). We are conducting this interview to gather info on selected aspects of maternal care supplements. The research is conducted by Dr. Chandima Siritunga, Director of Maternal and Child Health, Family Health Bureau (FHB) and Prof. K.L.M.D. Seneviwickrama, Professor in Community Medicine, University of Sri Jayewardenepura who serve as principal investigators and the interviewer represents the IPID. My colleague here (name C designation) will be taking notes and recording the interview.

The interviews revealed key challenges in MMS implementation, including stock management issues, gaps in RHMIS integration, inadequate training for health workers, and weak systems for monitoring delivery, adherence, and client satisfaction.

Ground rules

- Your views are valuable and important and will contribute to improvement for nonanaemic pregnant women
- Participation in this discussion is free and there is no obligation to respond, you can stop at any point.
- We would like to record this interview, do you have any concerns or objections to it being recorded?

1. Background and Role (Ask from all except for RMSD/MSD/Wharf officials)

- 1.1. Could you briefly describe your role in MMS for pregnant women ? How are you involved in the planning, coordination, or monitoring of the MMS programme ?

- 1.2. Importance, relevance of MMS
- 1.3. Who are the categories issued with MMS?
- 1.4. What are the changes you have observed since introduction of MMS?
- 1.5. What are the challenges, difficulties encountered?
- 1.6. Based on your experience, what is the effectiveness, acceptability, and overall nutritional impact of MMS compared to iron and folic acid (IFA) supplementation of pregnant women?
- 1.7. Based on your experience, which supplementation, MMS or iron and folic acid (IFA) is preferred by pregnant women? Reason?

2. Skill development and training (Ask from All)

- 2.1. Have you organized / received specific awareness programs on MMS?
- 2.2. Do your staff / you feel confident in providing necessary information when issuing MMS? (Except for RMSD/MSD officials) Prompt: importance of MMS, storage instructions, frequency and dosage
- 2.3. Do your staff /you feel confident in handling MMS stocks?
Prompt: storage (humidity, direct sunlight)
- 2.4. What gaps or limitations do you see in implementation of the MMS programme

3. Program Monitoring and Supervision (Ask from all except Obstetricians and Gynaecologists)

- 3.1. What monitoring or supervision mechanisms are used to track the progress of the MMS programme?

Prompt: use of standard tools such as checklists, supervision tools, or scorecards

- 3.2. How is client adherence monitored at the clinic or field level?
- 3.3. How is client feedback on MMS (e.g., satisfaction, complaints, suggestions) collected and acted upon?

4. Supply Chain Management (For RMSD/MSD/Wharf only)

- 4.1. How is MMS stock distributed from the central level to peripheral health facilities in your area?
- 4.2. What systems or tools are in place to manage inventory, forecasting, and buffer stocks in MMS?
- 4.3. Have you experienced any stockouts or supply delays in MMS? If yes, how were these addressed?

4.4. What are the major challenges in ensuring a consistent and uninterrupted supply of MMS?

5. Integration into RHMIS (RMSD/MSD/Wharf officers only)

5.1. How is MMS-related data currently recorded and reported within the Reproductive Health Management Information System (RHMIS)?

5.2. Are there any specific indicators tracked to monitor MMS coverage, distribution or adherence?

5.3. How would you assess the reliability and timeliness of data coming from field level facilities?

6. Barriers, supporting factors and recommendations (Ask from All)

6.1. In your view, what are the main factors supporting successful implementation of MMS?

6.2. What are the most significant challenges you have observed in relation to MMS for non-anaemic pregnant women?

6.3. Have any innovative strategies or best practices been used in your area to improve MMS coverage or adherence?

6.4. What improvements would you recommend strengthening the MMS for nonanaemic pregnant women? (e.g., supply chain, data systems, community engagement)

7. For Obstetricians and Gynaecologists only

7.1. In your clinical experience, what is your overall perception of the use of MMS in non-anaemic pregnant women?

7.2. Have you observed any differences in the health and wellbeing of mothers and babies between those who take MMS and those who take IFA supplementation?

7.3. What is your opinion on the clinical effectiveness of MMS in meeting the nutritional needs of non-anaemic pregnant women?

7.4. Have any of your patients reported adverse effects or difficulties with MMS? If yes, could you elaborate?

7.5. Have you encountered pregnant women who choose not to use the government issued MMS and prefer private sector nutrition supplements instead? What factors do you think influence this choice?

7.6. How do you counsel pregnant women regarding the use of MMS ? Do you provide specific guidance based on individual nutritional status?

Annexure 14: Observation Checklist for Antenatal clinics

Date:

Time:

Venue:

MOH:

Observer's name:

Places: Antenatal clinics

A. Service delivery and MMS-related counselling s education

	Observation Area	Yes	No	N/A	Remarks
1.	Pregnant women are screened for anaemia before MMS issuance				
2.	Non-anaemic pregnant women receive MMS starting from second trimester				
3.	Whether any other category is also issued with MMS				
4.	Drugs are packed and ready for distribution among pregnant women				
5.	Explained the purpose of MMS and why it is important for non-anaemic pregnant women				
6.	Explained pregnant women how to use MMS				
7.	Emphasized daily and consistent intake of MMS				
8.	Given clear advice on how to store MMS (e.g., in a dry, place, away from sunlight and children, tight capped)				
9.	Ask for compliance to MMS in subsequent visits				
10.	Cross check from the mother whether she takes them correctly				
11.	Advised not to share the supplement with others				
12.	Importance of consuming a nutritious and balanced diet in addition to MMS explained				
13.	Potential side effects of MMS (e.g., nausea, constipation, dark stools) discussed with the client for first time recipients/ asking for side effects at subsequent visits				

14.	Informed about what to do if side effects occur				
15.	Check whether she is taking other supplements (e.g. iron tablets) and ask not to take other supplements without medical advice				
16.	Advice provided to maintain a gap between MMS and calcium tablets				
17.	Advice provided to maintain a gap between MMS and diet/ tea (at least 1 hour)				
18.	Action taken, if a pregnant woman on MMS develops anaemia.				

B. Beneficiary Verification s Documentation

Observation Area	Yes	No	N/A	Remarks
Beneficiary records maintained				
Any evidence of fraud/corruption observed				If yes, describe:

Annexure 15: Observation checklist for RMSD / MOH

Date:

Time:

Venue:

GPS Location:

Observer's name:

Places: Regional Medical Supplies Divisions, MOH stores

MMS Supply Chain and Stock

Observation Area	Yes	No	N/A	Remarks
MMS available in stock (check physical inventory)				
Proper storage of MMS (dry, place, away from sunlight)				
Stock ledger up to date				
No reported stock-out in last 3 months				
Distributions within last 3 months.				

Annexure 16: Domiciliary visit checklist for MMS monitoring

Date:

Time:

Venue:

GPS Location:

Observer's name:

Places: Domiciliary visits with public health midwife

1. Compliance Monitoring

- 1.1. Ask participant if she is currently taking the MMS.
- 1.2. Have you come across cases where pregnant women received MMS but are not currently taking it? If so, could you share possible reasons; for example, whether another preparation was recommended or issued by the Obstetrician and Gynaecologist?
- 1.3. Ask how often she takes the tablets (daily/irregular/other):
- 1.4. Ask how many tablets were missing in the past week:
- 1.5. Ask reasons for any missed doses (tick all that apply):
 - ☐ Forgot
 - ☐ Nausea/vomiting
 - ☐ Ran out of tablets
 - ☐ Side effects
 - ☐ Other: _____

2. Side Effects Assessment

- 2.1. Ask whether the participant experienced any side effects from taking MMS.
- 2.2. If yes, specify (select all that apply):
 - ☐ Nausea
 - ☐ Vomiting
 - ☐ Constipation
 - ☐ Diarrhea
 - ☐ Headache
 - ☐ Metallic taste
 - ☐ Other: _____
- 2.3. Action taken for side effects:
 - ☐ None
 - ☐ Consulted PHM/Midwife
 - ☐ Stopped tablets
 - ☐ Other: _____

3. Storage Observation

- 3.1. Request to see the bottle / blister pack of MMS. (Be careful if it is a bottle)
- 3.2. Observe tablets remaining (Color changes/ moisture tablets, etc) (Observer should be careful if it is a bottle)

3.3. Observe where MMS tablets are stored:

3.4. Is the storage location:

- ☐ Dry
- ☐ Away from direct sunlight
- ☐ Out of reach of children
- ☐ In original packaging

3.5. Remarks on storage condition: _____

4. General Notes / Additional Comment

Annexure 17: Information Sheet

We would like to invite you to participate in a research study on *Multiple Micronutrient Supplementation (MMS) for Non-Anaemic Pregnant Women*. The research is conducted by the Director Maternal & Child Health, Family Health Bureau with the support of UNICEF Sri Lanka. The Institute for Participatory Interaction in Development (IPID) was selected to carry out the project in consultation of Prof. K.L.M.D. Seneviwickrama, Professor in Community Medicine, University of Sri Jayewardenepura, R.D.S. Ranasinghe, Senior Lecturer, Department of Community Medicine, University of Sri Jayewardenepura, Prof. A. Balasuriya, Professor of Public Health, Faculty of Medicine General Sir John Kotelawala Defense University of Sri Lanka.

1. Purpose of the Study

The study aims to understand the experiences, perceptions, and behavioural drivers related to the implementation of MMS among non-anaemic pregnant women in Sri Lanka. This will help identify barriers and enablers related to the use and acceptability of MMS, and support improvements in programme implementation and maternal nutrition outcomes.

2. Voluntary Participation

Your participation in this study is completely voluntary. You are free to choose not to participate or to withdraw at any time without giving a reason. Your decision will not affect your access to health services or any other benefits you are entitled to.

3. Duration, Procedures, of the study and participant's responsibilities

The research will be conducted between **1st of August to 31st of August 2025**. You are invited to participate in this study as a respondent by contributing to Community survey, Key Informant Interviews / Focus Group Discussions. A researcher/interviewer from our team will facilitate the interview/discussion that is relevant to Multiple Micronutrient Supplementation (MMS) for non-anaemic pregnant women in Sri Lanka. It takes around 30 minutes to 45 minutes.

4. Potential Benefits

You will get an opportunity to learn about MMS and your insights will help to improve the quality and delivery of maternal nutrition in Sri Lanka. The study findings will be used to strengthen community awareness and service delivery regarding MMS.

5. Risks, Hazards and Discomforts

There are no potential risks or hazards that are foreseen for this study. Certain questions or statements can potentially bring out feelings of discomfort as they are specific to health and care and which can be confidential for the participant.

6. Reimbursements

You will not be paid any sum of money or any other material benefit for participating in this study. However, we strongly appreciate your participation and contribution to this study.

7. Confidentiality

Confidentiality of all information and records are guaranteed and no information by which you can be identified will be released or published. These data will never be used in such a way that you could be identified in any way in any public presentation or publication without your express permission.

8. Termination of study participation

You may withdraw your consent to participate in this study at any time, with no penalty or effect on medical care or loss of benefits. Please notify the investigator as soon as you decide to withdraw your consent.

9. Clarifications

If you have questions about the procedure of the study or require additional information, please feel free to ask any of the persons listed below.

Prof K. L. M. D. Seneviwickrama, Professor in Community Medicine, University of Sri Jayewardenepura (Co-investigator)

Mobile Number: + 94777888596

Email: maheeka@sjp.ac.lk

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Co- Investigator

Contact person - Jenny De Silva, Malisha Fonseka, Institute for Participatory Interaction in Development (IPID)

Mobile Number: + 94763285894 /+94711457189

Email: jenny.ipid@gmail.com/malishafonseka.ipid@gmail.com

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Project Coordinators/IPID

If you have any concerns, or complaints related to this research project, you may contact the Ethics Review Committee, Faculty of Medicine, General Sir John Kotelawala Defence University, Kandawala Road, Ratmalana.

Contact No:

+94-11-2635268

+94-11-2638656

+94-11-2638657

+94-11-2632028

E mail: ethicsreviewcommittee.fom@kdu.ac.lk

Annexure 18: Consent Form

Part A – To be completed by the participant

Please read the following and mark your responses.

1. Have you read or had the information sheet explained to you?
☐ YES ☐ NO
2. Have you had the opportunity to ask questions and discuss the study?
☐ YES ☐ NO
3. Have all your questions been answered clearly?
☐ YES ☐ NO
4. Do you understand what the study is about and what your role will be?
☐ YES ☐ NO
5. Who explained the study to you?
.....
6. Do you understand that you are free to withdraw at any time without having to provide a reason and without it affecting any healthcare or services you receive?
☐ YES ☐ NO
7. Do you agree that the information you provide may be used for research, with your identity kept strictly confidential?
☐ YES ☐ NO
8. Do you permit research staff to access your responses for analysis (with confidentiality maintained)?
☐ YES ☐ NO
9. Have you had enough time to decide whether to participate?
☐ YES ☐ NO
10. Do you consent to participate in this study?
☐ YES ☐ NO

Participant's Name (BLOCK CAPITALS):

Signature of Participant:

Date:

Part B – To be completed by the investigator/interviewer

I confirm that I have explained the purpose and procedures of the study to the above participant, and that she has agreed to participate voluntarily.

Name of Investigator (BLOCK CAPITALS):

Signature of Investigator:

Date:

Annexure 1G: Details of total pregnant women with non-anaemia-2024 in each sector

Health Area	Number of pregnant mothers registered	Pregnant women with anaemia	Pregnant women with non-anaemia	Urban ratio	Rural ratio	Estate ratio	Pregnant women with non-anaemia-Urban	Pregnant women with non-anaemia-Rural	Pregnant women with non-anaemia-Estate
Sri Lanka	237236	48090	189146	0.1807	0.7748	0.0445	34181	146553	8412
Colombo MC	4974	1359	3615	0.7757	0.2209	0.0034	2804	799	12
Colombo RDHS	15661	3014	12647	0.7757	0.2209	0.0034	9810	2794	43
Gampaha RDHS	22507	4380	18127	0.1563	0.8432	0.0005	2833	15285	9
Kalutara NIHS	3638	787	2851	0.0893	0.8799	0.0308	254	2509	88
Kalutara RDHS	9164	1700	7464	0.0893	0.8799	0.0308	666	6568	230
Kandy RDHS	15652	2747	12905	0.1240	0.8138	0.0622	1600	10501	803
Matale RDHS	5934	1314	4620	0.1244	0.8362	0.0394	575	3863	182
Nuwara Eliya RDHS	8573	1037	7536	0.0564	0.4088	0.5348	425	3081	4030
Galle RDHS	10500	2083	8417	0.1255	0.8569	0.0177	1056	7212	149
Matara RDHS	8410	1825	6585	0.1186	0.8537	0.0277	781	5622	182
Hambantota RDHS	7622	1868	5754	0.0529	0.9471	0.0000	304	5450	0
Jaffna RDHS	8162	2307	5855	0.2014	0.7986	0.0000	1179	4676	0
Mannar RDHS	2167	534	1633	0.2452	0.7548	0.0000	400	1233	0
Vavuniya RDHS	2539	407	2132	0.2023	0.7977	0.0000	431	1701	0
Mullaitivu RDHS	1717	351	1366	0.0000	1.0000	0.0000	0	1366	0
Kilinochchi RDHS	1954	394	1560	0.0000	1.0000	0.0000	0	1560	0
Batticaloa RDHS	9388	1786	7602	0.2872	0.7128	0.0000	2183	5419	0
Ampara RDHS	3147	856	2291	0.2361	0.7639	0.0000	541	1750	0
Kalmunai RDHS	8363	1660	6703	0.2361	0.7639	0.0000	1583	5120	0
Trincomalee RDHS	7430	1314	6116	0.2243	0.7757	0.0000	1372	4744	0
Kurunegala RDHS	17079	3930	13149	0.0187	0.9766	0.0047	247	12841	61
Puttalam RDHS	9881	2066	7815	0.0878	0.9101	0.0021	686	7112	16
Anuradhapura RDHS	10356	2224	8132	0.0588	0.9412	0.0000	478	7654	0
Polonnaruwa RDHS	5197	1027	4170	0.0000	1.0000	0.0000	0	4170	0
Badulla RDHS	10486	1517	8969	0.0856	0.7257	0.1887	768	6508	1693
Moneragala RDHS	6549	1323	5226	0.0000	0.9815	0.0185	0	5129	97
Rathnapura RDHS	11762	2634	9128	0.0914	0.8169	0.0916	834	7457	837
Kegalle RDHS	8424	1646	6778	0.0190	0.9129	0.0680	129	6188	461

