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Introduction of Multiple Micronutrient Supplements in Pakistan through the National Health System: A Pilot Study

This pilot study demonstrates the feasibility of distributing multiple micronutrient supplements (MMS) through Pakistan's existing health system. Training 762 healthcare providers across seven districts, the program distributed 107,185 MMS bottles to pregnant women, exceeding government estimates by 53% with high continuation rates (>98%) in five districts.

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Abstract

Multiple micronutrient supplements (MMS) are more effective than iron-folic acid (IFA), reducing the risk of preterm and small-for-gestational-age (SGA) births by 29%. In Pakistan, where 39% of women of reproductive age are anemic and one-third of infants are born SGA, contributing to 26% of neonatal deaths, MMS offers a critical intervention. Following the World Health Organization's 2021 inclusion of MMS in the Essential Medicines List, the Junaid Family Foundation (JFF) partnered with Pakistan's Ministry of National Health Services from 2019–2023 to pilot the introduction of the United Nations International Multiple Micronutrient Antenatal Preparation (UNIMMAP) MMS within the public health system. The initiative secured Planning Commission (PC-1) approval from Pakistan's Ministry of Planning, Development & Special Initiatives, for national implementation through the existing IFA network. Across seven districts, JFF organized cascade trainings for 762 community health workers, more commonly known as Lady Health Workers (LHWs) in Pakistan, and distributed 129,600 MMS bottles through the LHWs and public health facilities. Of the 108,727 verified bottles, 98.6% were successfully delivered, with an additional 20,873 bottles distributed but pending verification. Continuation rates exceeded 98% in all districts. Key challenges included limited awareness, cultural barriers requiring family consent, and weak reporting systems. Overall, the pilot proved the feasibility of integrating MMS into Pakistan's public health delivery model, paving the way for scale-up and further evaluation of effectiveness and cost.

Learning Outcomes

1. Identify the maternal health outcome challenges globally and in Pakistan and analyze the evidence-based solutions for addressing micronutrient deficiencies during pregnancy.
2. Describe the importance of multiple micronutrient supplementation (MMS) to maternal health outcomes and explain how the pilot study delivered MMS to pregnant women through existing health system infrastructure.
3. Evaluate the successes and limitations of the delivery approach this pilot study utilized, including implementation challenges and system-level factors affecting program effectiveness.

Which Sustainable Development Goals (SDGs) Does the Case Support?

- **Goal 3:** *Good Health and Well-being* – This work supports SDG 3 by showing how the existing health system enabled the delivery of multiple micronutrient supplements in Pakistan to address adverse birth outcomes. The successful distribution to pregnant women directly contributes to SDG targets, reducing maternal mortality and ending preventable deaths of newborns.

Background and Context

Maternal micronutrient deficiencies during pregnancy are the leading cause of adverse birth outcomes globally. These deficiencies have deleterious consequences for birth outcomes, including low birth weight (LBW), preterm birth, stillbirth, and being born small for gestational age (SGA), affecting women of reproductive age worldwide (Gomes *et al*., 2022; Gomes *et al*., 2023). Multiple micronutrient deficiencies are prevalent among pregnant women in low-and middle-income countries (LMICs), with 31.6% of pregnant women being anemic overall, with particularly high prevalence in Africa (48.3%) and South-East Asia (44.8%) (Bourassa *et al*., 2019).

The consequences of these deficiencies are severe but preventable. LBW is the leading cause of neonatal mortality globally, with an estimated 19.8 million LBW live births in 2020, and more than 90% of LBW occurring in LMICs, with the highest burden in South Asia (48%) (Wang *et al*., 2025). SGA infants have an increased risk of adverse birth outcomes and a higher risk of chronic disease later in life, with an estimated 32 million SGA infants born in LMICs, with the highest burden in South Asia (Moran *et al*., 2024). In Pakistan, the prevalence of children born SGA is high, with one in three born SGA, accounting for 26% of all neonatal mortality (Moran *et al*., 2024). Additionally, per the World Health Organization (WHO), the prevalence of anemia in Pakistani women of reproductive age (15–49 years) is 39.1% and a meta-analysis showed that most pregnant Pakistani women were deficient in iron at the time of conception (World Health Organization, 2023; Mahar *et al*., 2024). According to the 2018 National Nutrition Survey (NNS), 22.4% of Pakistani women of reproductive age were vitamin A deficient, and 79.7% were vitamin D deficient (Busch-Hallen *et al*., 2023).

Multiple micronutrient supplementation (MMS) is a cost-effective solution to address this challenge, with increasing evidence proving its effectiveness in reducing the risk of preterm-SGA-LBW by 27%, reducing the risk of giving birth to a preterm-SGA neonate by 29%, and 9% risk of term-SGA in comparison to iron and folic acid (IFA) (Gomes *et al*., 2022; Wang *et al*., 2025). Following evidence demonstrating the benefits of MMS for maternal pregnancy outcomes, the Government of Pakistan added MMS to its Essential Medicines List in October 2023 and aimed to reach 50% of pregnant women who would consume MMS by 2027 (Busch-Hallen *et al*., 2023; Ministry of National Health Services, 2023). Despite this commitment, implementation challenges limit translation into health system practice in resource-constrained settings (Dewey and Zlotkin, 2025; Wang *et al*., 2025). Pakistan presents a unique case with established health infrastructure through community midwives (CMW), Lady Health Workers (LHW), health facility staff, private health facility care providers, and a government commitment to MMS integration in antenatal care (ANC) guidelines approved by the Ministry of National Health Services, Regulation and Coordination (MoNHSR&C).

This pilot study shares lessons learned from the pilot project and specifically underscores the ability to work with the existing governmental health care system in Pakistan.

Description of Approach

The pilot study was conducted to assess an MMS distribution program in Pakistan that utilized the local public health workforce within the existing health system infrastructure for program delivery. To initiate this study, JFF collaborated with the Government of Pakistan to create an enabling environment by advocating for the importance of MMS and ensuring that MMS provision in ANC visits was integrated into policy documents. The study was then implemented from March 2022 to February 2023 in seven districts, selected by the MoNHSR&C based on the prevalence of IFA use in the 2018 NNS and consideration of district storage capacity to ensure no stockouts and minimize waste due to overstocking. Muzaffarabad and Mirpur districts (of the Azad Kashmir dependent territory), Attock district (of Punjab province), Gilgit and Nagar districts (of the Gilgit-Baltistan administrative territory), Mirpur Khas and Tando Allah Yar districts (of Sindh province) were selected for this pilot study. Also, the MoNHSR&C projected approximately 70,000

pregnant women in the selected districts as the target population, based on a 3.5% pregnancy rate in the population, according to the 2018 Pakistan NNS data.

Pakistan's health system operates through three levels of healthcare service delivery: the private health facilities level (including hospital networks), the health facilities level (including basic health units, rural health centers, public hospitals, and district hospitals), and the community level (including LHWs and CMWs). For ANC services, an extensive primary healthcare network with over 100,000 LHWs plays a critical role in reaching pregnant women across diverse geographic and socio-economic contexts (Zhu *et al*., 2014).

To effectively distribute 129,600 bottles of MMS (containing 180 tablets each for 6-month use) in the targeted districts, JFF worked with the Government of Pakistan to provide training to LHWs, CMWs, and hospital staff, and to deliver MMS to pregnant women during their ANC visits. Kirk Humanitarian donated the MMS bottles. JFF donated the funds and coordinated the shipment, transportation, and development and implementation of training for MMS product distribution.

From March to June 2022, JFF coordinated with the central government to provide cascade training first at district health facilities for health facility staff and hospital staff, followed by training of LHWs and CMWs at the community level. Between 44 and 73 participants attended each district training session. Participants were equipped with technical knowledge about micronutrient deficiencies and their negative impacts, the benefits of MMS, counseling skills for pregnant women, distribution protocols, progress record-keeping, and monitoring and reporting procedures. They were trained to provide MMS bottles and an informational leaflet containing basic MMS information to pregnant women as early as possible during their ANC visits.

The MMS bottles containing UNIMMAP formulation were certified halal and obtained approval from the Drug Regulatory Authority of Pakistan. The batch of MMS bottles was manufactured in New York, USA (Contract Pharmacal Corp, NY), and shipped in a single container to Karachi, Pakistan. Trucks transported boxes of MMS from the central warehouse in Karachi to district headquarters warehouses across two provinces and two territories, before distributing them at the district health facility level and to LHWs and CMWs. To ensure timely distribution before the expiration date of this batch of MMS in September 2023, all deliveries to individual pregnant women needed to be completed by March 2023.

This pilot study was conducted as a program implemented by JFF and the government of Pakistan. Program data, which is part of routine health service delivery within Pakistan's existing health system, was used to assess targets. The aggregate public sector data used for this analysis had no identifying information, and therefore did not need an institutional review board (IRB) approval.

Results

The micronutrient content of MMS bottles was aligned with UNIMMAP standards (Table 1); the selected districts are shown in Fig. 1, and the delivery logistics in Pakistan are presented in Fig. 2. After manufacturing, packaging, and shipping from the United States, the MMS bottles arrived at Karachi Port and were stored at the Government of Pakistan's warehouse in Karachi. Subsequently, MMS bottles were transported to the government's warehouse in Islamabad. Then, those bottles were shipped to the district headquarters

Table 1. Multiple-micronutrient supplementation (MMS) bottles content, aligning with the United Nations International Multiple Micronutrient Antenatal Preparation (UNIMMAP) details.

Micronutrients	Contents
Vitamin A, mcg	800
Cholecalciferol (Vitamin D), mcg	5
Vitamin E, mg	10
Ascorbic Acid (Vitamin C), mg	70
Thiamine (Vitamin B1), mg	1.4
Riboflavin (Vitamin B2), mg	1.4
Niacin (Vitamin B3), mg	18
Pyridoxine (Vitamin B6), mg	1.9
Cobalamin (Vitamin B12), mcg	2.6
Folic acid, mg	0.4
Iron, mg	30
Zinc, mg	15
Copper, mg	2
Selenium, mcg	65
Iodine, mcg	150

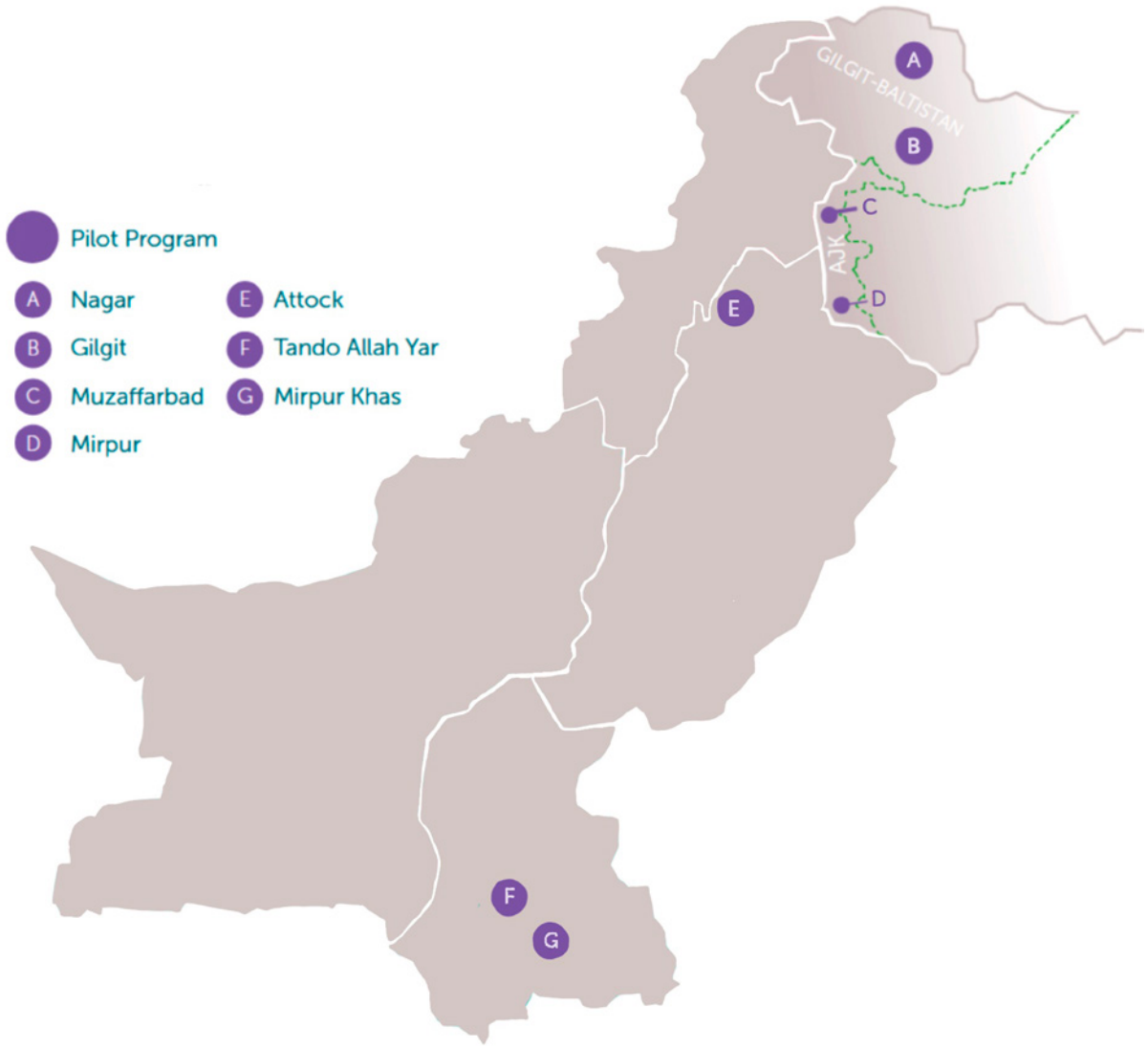

Fig. 1. The pilot study sites in Pakistan.

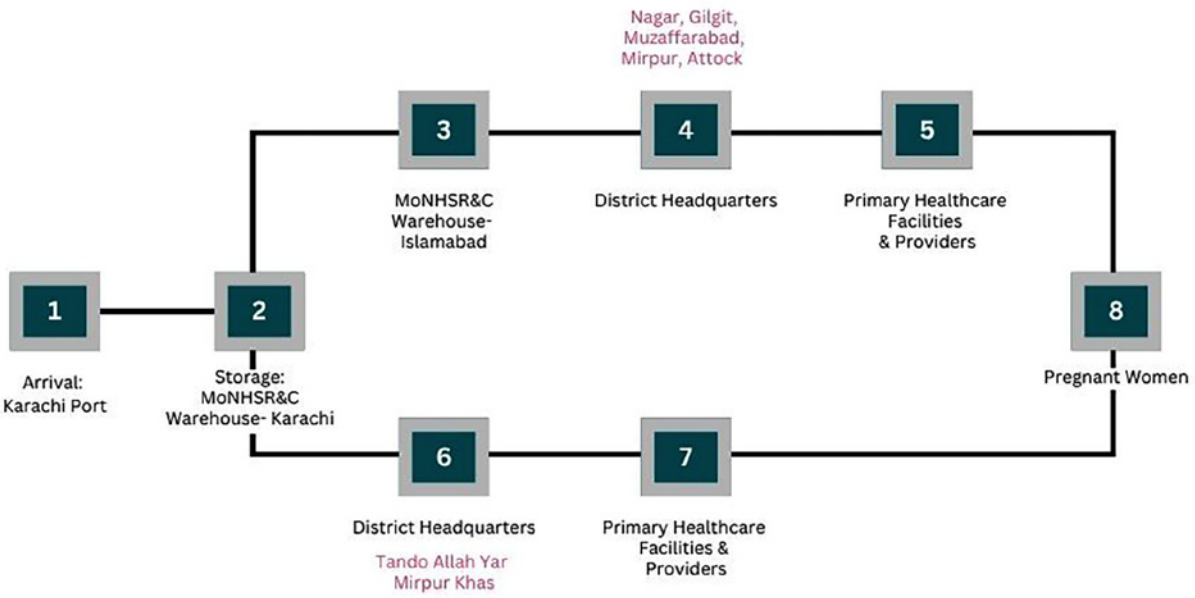

Fig. 2. Distribution pathway of MMS bottles from delivery to end beneficiaries.

offices of Nagar, Gilgit, Muzaffarabad, Mirpur, and Attock districts. The bottles were then distributed to primary healthcare facilities, district health facilities, and healthcare providers, followed by distribution to individual pregnant women. For the distribution in the districts of Tando Allah Yar and Mirpur Khas, MMS bottles were shipped directly to their respective district headquarters offices, then to primary healthcare facilities and providers, and finally to pregnant women.

High distribution rates of MMS bottles (86–100%) were achieved across all districts (Table 2). In total, 129,600 bottles were programmed for delivery. A total of 108,727 bottles were delivered to district health facilities, of which 107,185 (99%) were verified as distributed to pregnant women in the targeted areas. The remaining 1542 bottles stayed at facilities or with community health workers, primarily due to refusals during ANC visits. In Muzaffarabad, however, 14% of bottles were not distributed as planned. A total of 20,873 bottles were distributed by the Ministry of Health within the same provinces and districts, at their discretion; while the Ministry confirmed delivery, this portion is considered unverified distribution since supporting data were not provided.

Table 2. MMS bottles received and distributed to district health facilities.

Province/Territories	Districts	Number of bottles received	Number of bottles distributed	Delivery rate (%)
Sindh	Mirpur Khas	20,610	20,610	100
	Tando Allahyar	15,300	15,300	100
Gilgit-Baltistan	Gilgit	7650	7650	100
	Nagar	1710	1710	100
Azad Kashmir	Mirpur	10,960	10,960	100
	Muzaffarabad	11,070	9528	86
Punjab	Attock	41,427	41,427	100
Total		108,727	107,185	

A total of 762 professionals, including district healthcare providers, community midwives, and lady health workers, were trained to provide counseling and MMS bottles to pregnant women during ANC visits (Table 3). Training participation varied by district, with Attock district having the highest number of trained professionals (n = 256) and Nagar district having the lowest (n = 44).

Table 3. Trained professionals for MMS delivery by districts.

Province/Territories	Districts	Trained personnel
Sindh	Mirpur Khas	160
	Tando Allahyar	75
Gilgit-Baltistan	Gilgit	75
	Nagar	44
Azad Kashmir	Mirpur	73
	Muzaffarabad	79
Punjab	Attock	256

A total of 107,185 pregnant women across seven districts received MMS bottles (Table 4). Among women who initiated MMS use, high continuation rates (98–100%) were observed in seven districts among those who received MMS bottles during their first four ANC visits and chose to continue using MMS beyond the fourth ANC visit. A total of 366 women refused to switch to MMS bottles during their first four ANC visits. Among women who discontinued MMS use, reported reasons included not getting permission from family members, lack of awareness about the benefits of MMS, and concerns about side effects (such as vomiting and pain).

Discussion

This pilot study presents a practical approach to distributing MMS in Pakistan, utilizing the existing health system to enhance health outcomes among pregnant women in the country. The factors that made the pilot study a success and the strengths and limitations mentioned below are useful contexts for countries with similar health system infrastructure looking to conduct a similar pilot study.

Table 4. Total number of pregnant women who received and refused MMS bottles (during 1st–4th antenatal care visits), and the number and percentage of women who continued receiving MMS after 4th visits.

Province/ Territories	Districts	Total number of pregnant women who received MMS during 1st–4th ANC visits	Total number of pregnant women refused MMS during 1st–4th ANC visits	Total number of pregnant women continued to receive MMS after 4th ANC visit
		n	n	n (%)
Sindh	Mirpur Khas	20,610	19	20,610 (100)
	Tando Allahyar	15,300	0	15,300 (100)
Gilgit-Baltistan	Gilgit	7650	312	7650 (100)
	Nagar	1710	35	1710 (100)
Azad Kashmir	Mirpur	10,960	0	10,694 (98)
	Muzaffarabad	9528	0	9528 (100)
Punjab	Attock	41,427	0	41,427 (100)
Total		107,185	366	

Cascade training initially trained healthcare providers at the district level and subsequently at the community level, resulting in 762 district and community-level healthcare providers being trained in seven districts. High distribution rates of MMS bottles were achieved across all districts, with 107,185 verified pregnant women receiving MMS bottles, exceeding the government's estimated 70,000. High continuation rates (>98%) among MMS users were reported in all districts, where the women were more willing to continue using MMS beyond the fourth ANC visit.

Several key elements in the preparation phase contributed to the success of this pilot study, including creating an enabling environment through policy advocacy, ensuring MMS bottles met the regulatory requirements, and developing a well-planned coordination and logistics plan for MMS bottle stock, distribution, and management. First, JFF began engaging with the Government of Pakistan in 2021. In 2022, MMS was integrated into the policy (PC-1), and in 2023, it was listed in the Pakistani Essential Medicines List. Second, with Kirk Humanitarian's donation, JFF focused on MMS production, managing the logistics of obtaining approval for MMS bottles from the Pakistan Drug Regulatory Authority and securing halal certification. Third, a comprehensive coordination plan and timely execution, involving multiple stakeholders, were critical to facilitating MMS distribution at the national, provincial, and district levels. This ensured sufficient MMS bottle stock and allowed adequate time for distribution and consumption before the expiration date, addressing critical bottlenecks during the preparation phase.

The distribution efficiency met expectations for this batch of MMS bottle distribution at the national, provincial, and district levels. By actively engaging with the central government of Pakistan, this pilot study demonstrated that the coordination and delivery approach was effective in these seven districts, with no stock shortage reported, indicating the feasibility of MMS delivery.

The cascade training approach equipped district and community-level healthcare providers with knowledge and local language education leaflets to support the distribution of MMS bottles during the first four ANC visits. These healthcare providers offered counseling and educational support (an educational leaflet) to pregnant women. However, in many cases, there was a lack of active supervision or ongoing support provided to LHWs, CMWs, or lady doctors to help them to address challenges more effectively when they encountered implementation questions or difficulties. For example, limited support was offered to help health workers to address concerns about side-effects among pregnant women. Additionally, inconsistent reporting quality resulted in critical data being missed. Hand-written data, which was then transferred to a digital reporting sheet, left room for user error.

The program's reach among pregnant women was higher than expected. The pilot study verified reaching more than 107,185 pregnant women in the targeted areas, exceeding the initially estimated 70,000 women, with an additional 20,837 women unverified as receiving MMS. With 108,727 out of 129,600 MMS bottles reported verified as received, and 107,185 MMS bottles distributed to pregnant women during their first four ANC visits, the coordination and delivery approach demonstrated a functional mechanism for supporting the intervention reach.

The uptake of MMS bottles among pregnant women in targeted areas was high, ranging from 86 to 100% of the targeted population. Moreover, all seven districts reported a high continuation rate (98–100%) among pregnant women receiving MMS bottles. However, without a pre-tested survey collecting women's outputs (knowledge, behavior, and attitudes) pre- and post-intervention to assess the acceptability of MMS

among pregnant women quantitatively, and without using focus group discussions or in-depth interviews to examine the views of women and their communities qualitatively, critical information regarding refusal or discontinuation might not be effectively addressed if this pilot approach is scaled up. Additionally, some districts reported that reasons for pregnant women's MMS bottle discontinuation included not obtaining permission from family members, being unaware of the benefits of MMS, and fear of side effects such as vomiting and pain. Acceptability, adherence, and cultural considerations require further exploration for improved implementation.

This pilot study has both strengths and limitations. Regarding limitations, first, there was a lack of reporting detail and consistency due to limited accountability mechanisms, which hindered data quality and the capacity to inform future interventions for scaling up. Second, limited support was provided to the frontline health workers to assist them in addressing concerns. Third, there is limited information on the acceptability and appropriateness of the intervention, which may hinder its sustainability and scalability.

This pilot study has several strengths. First, to our knowledge, this is one of the earliest pilot studies to report the use of the existing health system from program inception to the delivery of MMS bottles, aiming to improve health outcomes for pregnant women. Second, with a comprehensive coordination plan and multi-level collaboration and execution, MMS bottle transportation was timely, and the delivery method was functional, ensuring sufficient stock in all targeted areas. Third, the number of pregnant women reached extended beyond the expected number in targeted areas. Fourth, the uptake of MMS bottles among pregnant women in the targeted areas during their first four ANC visits was high.

Conclusion

Overall, this pilot study demonstrates that utilizing the existing health system to distribute MMS bottles to pregnant women can be an effective method, contributing to increased MMS uptake and potentially reducing the risk of adverse pregnancy outcomes. This pilot study may be transferable to implement in countries with similar health system infrastructure as Pakistan. The study reported high reach of pregnant women in the targeted areas and high uptake of MMS bottles by women during their first four ANC visits in Pakistan. Future studies on the acceptability (including knowledge, attitude, and behavior) of pregnant women, as well as the cost-effectiveness of switching from IFA to MMS, will help to ensure sustainability and scalability.

Exercises/Group Discussion Questions

- What can be learnt from this pilot study about how one might try to reach pregnant women who could benefit from being provided with multiple micronutrient supplements globally?
- How can a monitoring and evaluation framework be designed to address challenges in the reporting of multiple micronutrient supplements distribution in Pakistan's health system context, as identified in the pilot study? [The pilot study noted "inadequate progress reporting systems" and "inconsistent reporting quality" as limitations.]
- What are the critical requirements and evidence gaps that must be addressed if considering a nationwide implementation of a multiple micronutrient supplement program, as Pakistan aims to reach 50% of pregnant women with MMS by 2027, requiring expansion from 107,185 to approximately 3.5 million women annually?

Conflict of interest

The authors have no conflict of interest.

Author's contribution

AA, AH, and JN conceptualized the commentary. Y-FC rewrote the paper as AA wrote the first draft. AA, JN, and JR reviewed and revised the drafts. AA, JN, JR, AH, and AG reviewed the final commentary.

Acknowledgments

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Further Reading

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