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Book

The role of maternal nutrition in reducing childhood stunting

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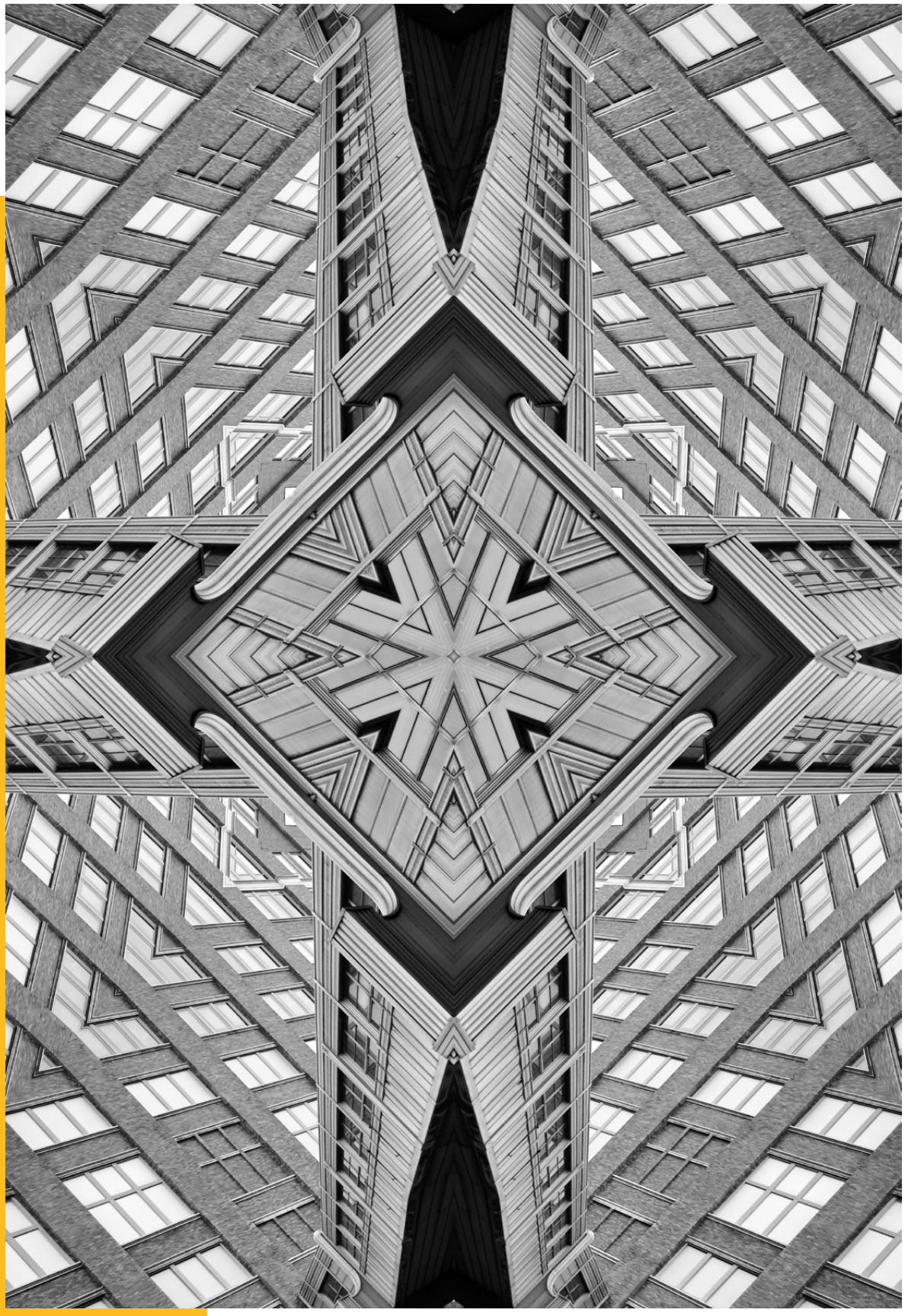

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The Role of Maternal Nutrition in Reducing Childhood Stunting

Sheila C Vir and Shoba Suri

Abstract

Maternal nutrition impacts not only the woman's health during pregnancy but also that of her newborn; the child's health in their first 1,000 days of life, in turn, will influence outcomes during childhood. Indeed, maternal undernutrition is estimated to account for 20 percent of childhood stunting in India. It is therefore important to ensure that women enter pregnancy in good health, as measured for example in adequate height and weight, and micronutrient deficiency parameters such as those that determine susceptibility to anaemia. This paper argues for strengthening the implementation of both, direct nutrition services and nutrition-sensitive measures that will improve maternal health. A comprehensive national maternal nutrition policy that incorporates interventions through various platforms should accelerate India's efforts in improving maternal nutrition and reducing childhood stunting.

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Introduction

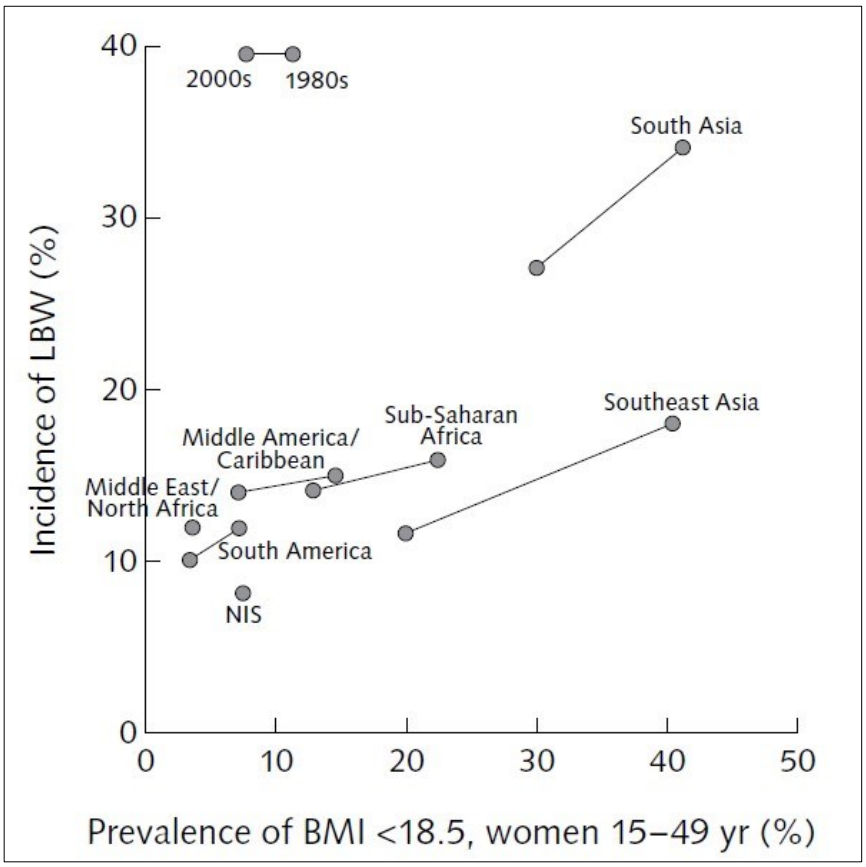
Maternal malnutrition is a serious public health concern in many parts of the world, including India. A woman's health and nutrition before, during, and after pregnancy influences her child's early growth and development.[1] Maternal undernutrition contributes to maternal mortality, foetal growth restriction, and neonatal death; it sets up a life cycle of undernutrition for the child.[2] In India, maternal undernutrition is estimated to account for one-fifth of all incidence of childhood stunting.[3] In turn, child undernutrition contributes to a massive 68 percent of under-5 child deaths. During this period, poor nutrition adversely impacts the brain's sensory, language, and cognitive functions. This carries long-term consequences, including diminished learning capacity and poor school performance in childhood, and in adulthood, reduced earnings and increased risks of chronic diseases such as diabetes, hypertension, and obesity.[4]

A regression analysis of the determinants of childhood stunting in three countries in Asia, including India, has found five important contributory risk factors: maternal height, lack of maternal education, poor healthcare, low standard of living, and lack of access to clean toilet.[5] These observations are supported by the reported finding in the last decade of an association between maternal anthropometry (height, weight or thinness) and the infant's birth weight.[6] Maternal stunting (defined as having a height less than 145 cm) increases the risk of both term and preterm 'small for gestational age' (SGA) babies. A pooled analysis of 7,630 mother-child pairs from birth cohorts of five countries[a] reveals that maternal height is associated with birth weight, and with linear growth of children over the growing period.[7] An analysis of national demographic survey findings from India reveals a significant decrease in the relative risk of stunting in children for every 5 cm increase in maternal height from 160 cm.[8]

Evidence also indicates a strong association in improvement in the woman's Body Mass Index or BMI with reduced incidence of low birth weight (LBW) babies (See Figure 1).

a The countries are Brazil, Guatemala, India, the Philippines, and South Africa.

Figure 1
Improvement in Women's Body Mass Index (BMI) Reduces LBW (1980s-2000s)



Source: Mason et al 2012[9]

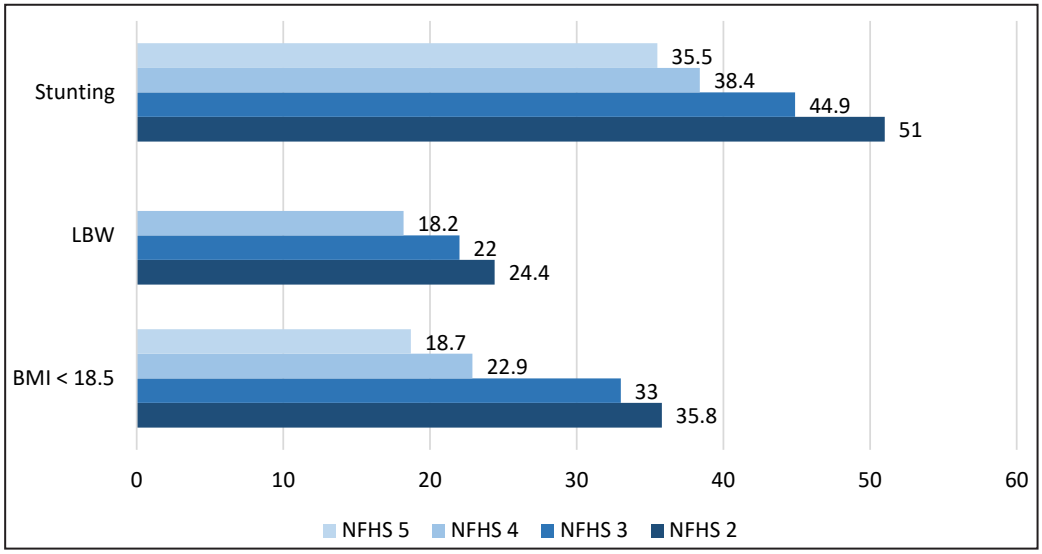
LBW is associated with 2.5- to 3.5-fold higher odds of wasting, stunting, and underweight in children.[10,11] Stunting that occurs in the first 24 months of life is largely irreversible, contributing to an intergenerational cycle of poor growth and development: Girls who are stunted in childhood remain stunted as adults, and then have a higher chance of giving birth to stunted offspring.[12,13]

A trend analysis of data from the 1998-99 National Family Health Survey-2 (NFHS 2) to the 2019-21 NFHS-5, shows an association between a reduction in the percentage of underweight women (i.e., defined as having BMI less than 18.5) and lower percentages of LBW and childhood stunting (See Figure 2).[14]

Women who are overweight or obese (i.e., with BMI greater than 25) are found to be at increased risk of preterm births.[15] The child then grows up becoming more susceptible to a host of physical, cognitive, and social-development challenges.[16]

Figure 2

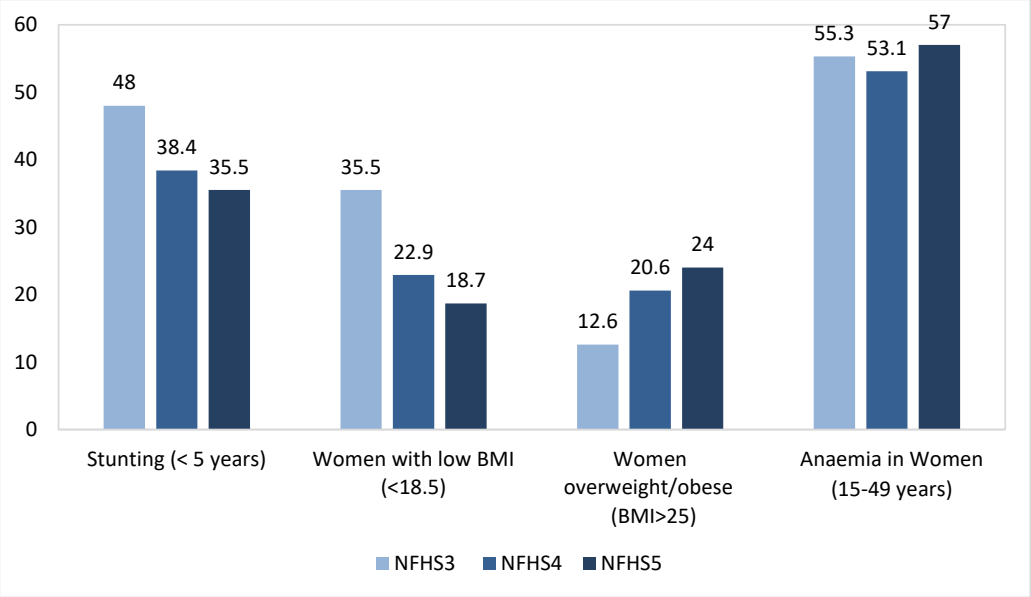
Trends in the percentage of women with low BMI (<18.5), LBW, and Childhood stunting, 1998–2021: NFHS 2 (1998–99), NFHS3 (2005–6), NFHS 4 (2015–16), and NFHS 4 (2019–21)



As seen in Figure 2, child undernutrition—measured as childhood stunting—has declined rather slowly, from 51 percent in 1998–99 to 35.5 percent in 2019–21.[17] This is possibly due to inadequate progress in implementing appropriate measures for improving maternal nutrition.

Malnutrition—in this paper, defined as comprising undernutrition, overweight, and anaemia[b]—adversely impacts pregnancy outcomes. In India, the national health surveys of the last two decades have found undernutrition in adult women to have declined from 35.5 percent in 2008–09 to 18.7 percent in 2019–21 (see Figure 3). Over the same period, overweight/obesity doubled, and the prevalence rate of anaemia hovered between 55.3 and 57 percent.

Figure 3
Trends in childhood stunting and Women's nutritional status



b A universally accepted standard definition of 'malnutrition' refers to deficiencies, excesses or imbalances in a person's intake of energy and/or nutrients. It covers two broad groups of conditions: One is 'undernutrition'—which includes stunting (low height for age), wasting (low weight for height), underweight (low weight for age), and micronutrient deficiencies or insufficiencies (a lack of important vitamins and minerals); and the other is overweight, obesity and diet-related non-communicable diseases (such as heart disease, stroke, diabetes, and cancer).

There is wide variation in both undernutrition and overweight/obesity in women across India's states and UTs (see Figure 4). In all except two states, there has been a decrease in the percentage of undernourished women, and an increase in overweight/obesity. Except for five states, all other states show an increase in the proportion of overweight/obese among adult women. In eight states, over one-third of adult women are found to be overweight/obese. Women who are overweight prior to the onset of pregnancy face additional risk factors during pregnancy, such as gestational diabetes, hypertension, preeclampsia, and non-natural delivery, as well as poor pregnancy and breastfeeding outcomes.[18]

The increase in overweight rates in women in India can be attributed to various factors such as changing food habits and decreased energy expenditure because of sedentary habits. Low-cost, attractively packaged unhealthy processed foods have also become more easily available—having high content of fat and sugar, these food items result in excess energy intake against the energy required for daily chores or mobility.

> "In the last two decades, undernutrition in adult women in India has declined from 35.5% in 2008–09 to 18.7% in 2019–21; overweight/obesity doubled in the same period."

Figure 4: Prevalence rate of undernutrition and overweight/obesity in women 15–49 years, in various states/UTs of India (2019–21)

Besides the twin problems of undernutrition and overweight, micronutrient deficiencies are prevalent in women of reproductive age. Little data is available on the extent of micronutrient deficiencies in women or in pregnant women; most reliable is the data on anaemia and dietary intake from the decadal National Nutrition Monitoring Bureau (NNMB) Survey (see Table 1). NNMB surveys indicate that many women have poor diets, and they are deficient in key micronutrients (e.g., iron, folate, vitamin B12), irrespective of whether they have normal, low, or high BMI.

According to NFHS 5, anaemia, primarily due to iron and folic acid deficiencies, affects 57 percent of all adult women in India. Iron deficiency anaemia in pre-pregnancy or early pregnancy puts the mother at increased risk of significant decrements in foetal growth, as well as preterm birth or LBW delivery.[19,20] The prevalence of anaemia in adolescent girls (15–19 years) is also a cause for alarm: it increased from 54.1 percent in 2015–16 to 59.1 percent in 2019–21.

Table 1

Consumption of Recommended Dietary Allowance (RDA) of various nutrients

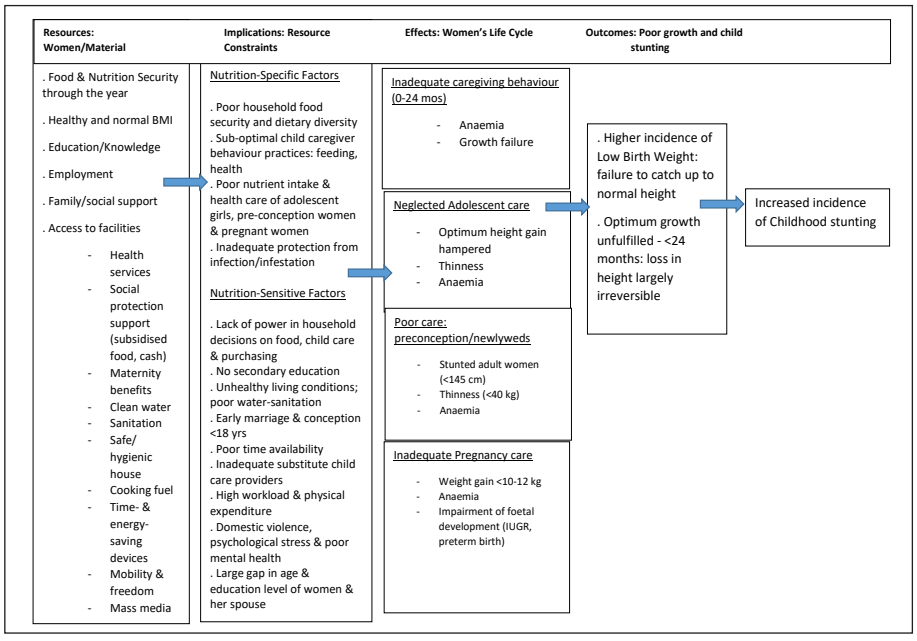
	Percentage consuming < 50 percent RDA of nutrients			
Nutrients	**Households**	**Young children (1-3 yrs)**	**Adolescent girls (13-15 yrs)**	**Pregnant women**
Protein	11.2	11.7	16.8	35.7
Total Fat	13.1	56.0	53.2	19.6
Energy	7.6	28.1	22.6	13.7
Calcium	44.2	74.1	74.7	76.1
Iron	25.5	48.9	67.3	78.0
Vitamin A	80.6	81.5	83.6	83.2
Thiamine	9.8	21.9	20.1	16.1
Riboflavin	49.6	52.5	68.3	52.5
Niacin	9.7	40.7	15	13.4
Vitamin C	34.9	76.9	44.9	50.6
Dietary folate	38.5	40.3	51.5	72.0

Source: NNMB Survey report, 2012[21]

Health experts agree that malnutrition in women has roots in many factors, at the individual, household, community, and societal levels.[22] Figure 7 illustrates the implications of women's resource constraints on child undernutrition. The resource constraints include both, nutrition-specific drivers of mother's nutrition and physical well-being, as well as nutrition-sensitive factors such as women's empowerment that impact decision-making power and control over household resources, education and knowledge, employment, and time availability.[23]

Figure 5

Women's resources, nutrition-specific and nutrition-sensitive factors, and childhood stunting



Source: Sheila C. Vir, 2016[24]

A review study indicates that the three domains of women's empowerment—i.e., control of resources and autonomy, workload and time, and social support environment—influence child anthropometry. However, the strength and direction of association differs according to various factors such as child's age and household income.[25]

Poor Diet and Inadequate Healthcare

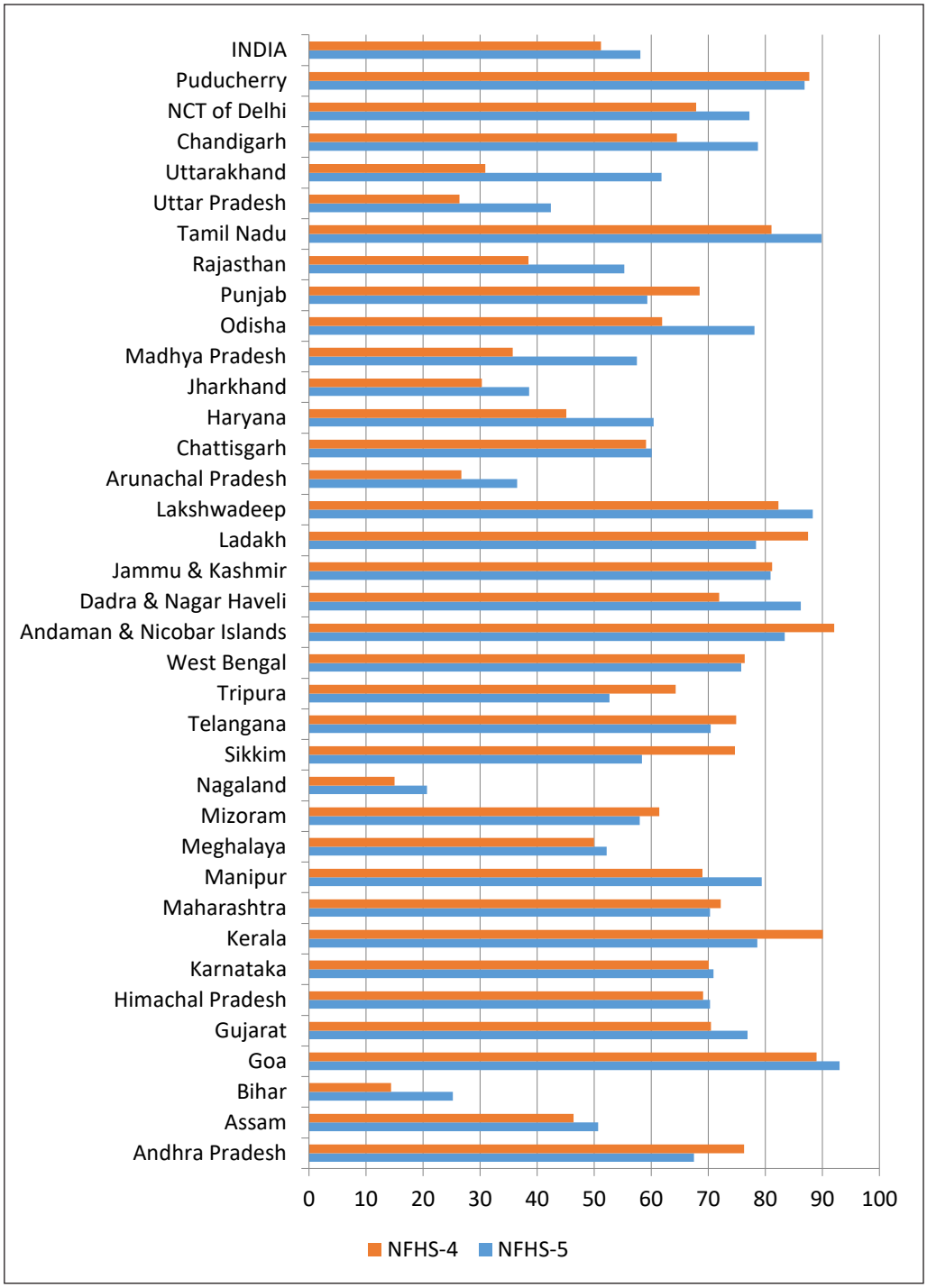
As shown in Figure 5, the immediate and direct causative factors of poor maternal nutrition are poor dietary intake during pregnancy, and inadequate health services. Women must maintain a healthy weight prior to the onset of pregnancy, as both excess and low weight gain during pregnancy could lead to adverse pregnancy outcomes.[26] To meet the observed nutrient intake gap and the rapid increase in nutrient requirements during pregnancy, the ICDS sector provides pregnant women supplementary nutrition (SN),[c] and the health sector administers micronutrient supplements (IFA and calcium), all as part of national policy. In most states, SN is supplied as dry food mixture in the form of Take Home Ration (THR); in others, SN is given as a hot cooked meal instead of THR. According to latest data for 2013-14, only four of every 10 pregnant mothers (40.7 percent) availed the SN service of ICDS, while an even lower 27.8 percent of all ICDS-enrolled pregnant women received SN for the minimum prescribed 21 days in a month.[27] Meanwhile, the proportion of pregnant women who daily consume IFA tablets for 180 days was reported to be as low as 26 percent.[28]

Besides poor SN intake and consumption of IFA supplements, many pregnant women's daily food intake lacks diversity. Analysts attribute this to lack of purchasing power; moreover, whatever meagre resources they do have, are not used to buy appropriately nutritious food because of lack of awareness. The imperative for behaviour change in food habits is indeed widely recognised, and it was for this reason that nutrition education was made a component of ICDS. However, national surveys show that women generally do not receive quality nutrition counselling services: for example, less than 18 percent of mothers of under-five children are aware that nutrition counselling is part of ICDS services.[29]

The other immediate factor that impacts maternal nutrition is timely access to health services. Appropriate antenatal care (ANC) services help reduce adverse health outcomes during pregnancy and childbirth.[30] According to NFHS-5, there has been a steady increase in the coverage of ANC services at the national level—from 51.2 percent in 2015–16 to 58 percent in 2019–21 (see Figure 6). Most states and UTs show an increase in the percentage of women availing the minimum recommended four ANC services, with Goa having the highest coverage at 93 percent; the states of Bihar, Manipur, Haryana, Madhya Pradesh, Odisha, Uttar Pradesh, and Uttarakhand are recording substantial improvement.[31]

c SN provides one-third of daily requirements of energy, protein, and micronutrients.

Figure 6: Percentage of women attending 4 Antenatal Care (ANC) services: NFHS 4 (2015–16) and NFHS 5 (2019–21)



Data from the NFHS 5 (2019-21) reveals a substantial improvement in many of the nutrition-sensitive factors illustrated in Figure 5, including proxy indicators of women empowerment (See Table 2 and Figure 7). The latter includes indicators such as completing 10 years of education, marriage in adolescence (below 18 years), domestic violence, and ownership of mobile phones and bank accounts.

Table 2.

Coverage of nutrition-sensitive interventions in women 15-49 years: Comparison of percentage points (NFHS 4 and NFHS 5)

States/UTs	HH using clean fuel for cooking			Women having a bank or savings account			Women having own mobile phone			Women facing spousal violence		
	NFHS 5	NFHS 4	% (+/-)*	NFHS 5	NFHS 4	% (+/-)*	NFHS 5	NFHS 4	% (+/-)*	NFHS 5	NFHS 4	% (+/-)*
Andhra Pradesh	83.6	62	+21.6	81.8	66.3	+15.5	48.9	36.2	+12.7	30.0	43.4	-13.4
Arunachal Pradesh	53.2	45	+8.2	78.2	56.6	+21.6	76.4	59.8	+16.6	24.8	31	-6.2
Assam	42.1	25.1	+17	78.5	45.4	+33.1	57.2	46	+11.2	32.0	24.5	+7.5
Bihar	37.8	17.8	+20	76.7	26.4	+50.3	51.4	40.9	+10.5	40.0	43.7	-3.7
Chattisgarh	33	22.8	+10.2	80.3	51.3	+29	40.7	31	+9.7	20.2	36.8	-16.6
Goa	96.5	84.1	+12.4	88.3	82.8	+5.5	91	80.9	+10.1	8.3	12.9	-4.6
Gujarat	66.9	52.6	+14.3	70	48.6	+21.4	48.8	47.9	+0.9	13.0	20.2	-7.2
Haryana	59.5	52.2	+7.3	73.6	45.6	+28	50.4	50.5	-0.1	18.2	32	-13.8
Himachal Pradesh	51.7	36.7	+15	83.1	68.8	+14.3	79.5	73.5	+6	8.3	5.9	+2.4
Jharkhand	31.9	18.9	+13	79.6	45.1	+34.5	49	35.2	+13.8	31.5	34	-2.5
Karnataka	79.7	54.7	+25	88.7	59.4	+29.3	61.8	47.1	+14.7	44.4	20.6	+23.8
Kerala	72.1	57.4	+14.7	78.5	70.6	+7.9	86.6	81.2	+5.4	9.9	14.3	-4.4
Madhya Pradesh	40.1	29.6	+10.5	40.1	29.6	+10.5	38.5	28.7	+9.8	28.1	33	-4.9
Maharashtra	79.7	59.9	+19.8	72.8	45.3	+27.5	54.8	45.6	+9.2	25.2	21.3	+3.9
Manipur	70.4	42.1	+28.3	74	34.8	+39.2	72.2	63.1	+9.1	39.6	53.2	-13.6

States/UTs	HH using clean fuel for cooking			Women having a bank or savings account			Women having own mobile phone			Women facing spousal violence		
	NFHS 5	NFHS 4	% (+/-)*	NFHS 5	NFHS 4	% (+/-)*	NFHS 5	NFHS 4	% (+/-)*	NFHS 5	NFHS 4	% (+/-)*
Meghalaya	33.1	21.8	+11.3	70.4	54.4	+16	67.5	64.3	+3.2	16.0	28.8	-12.8
Mizoram	83.8	66.1	+17.7	80.7	57.1	+23.6	82.3	77	+5.3	10.9	17.1	-6.2
Nagaland	43	32.8	+10.2	63.7	38.8	+24.9	82.5	70.4	+12.1	6.4	13.1	-6.7
Odisha	34.7	19.2	+15.5	34.7	19.2	+15.5	50.1	39.2	+10.9	30.6	35.2	-4.6
Punjab	76.7	65.9	+10.8	76.7	65.9	+10.8	61.2	57.2	+4	11.6	20.5	-8.9
Rajasthan	41.4	31.8	+9.6	41.4	31.8	+9.6	50.2	41.4	+8.8	24.3	25.2	-0.9
Sikkim	78.4	59.1	+19.3	76.4	63.5	+12.9	88.6	79.8	+8.8	12.1	2.6	+9.5
Tamil Nadu	82.9	73	+9.9	82.9	73	+9.9	74.6	62	+12.6	38.1	40.7	-2.6
Telangana	91.8	67.3	+24.5	84.4	59.5	+24.9	60	47.4	+12.6	36.9	42.9	-6.0
Tripura	45.3	31.9	+13.4	76.9	59.2	+17.7	53.1	43.9	+9.2	20.7	28.1	-7.4
Uttar Pradesh	49.5	32.7	+16.8	49.5	32.7	+16.8	46.5	37.1	+9.4	34.8	36.7	--1.9
Uttarakhand	59.2	51	+8.2	59.2	51	+8.2	60.9	55.4	+5.5	15.1	12.7	+2.4
West Bengal	40.2	27.8	+12.4	76.5	43.5	+33	50.1	41.8	+8.3	27.0	33.1	-6.1
Andaman & Nicobar Islands	79.8	63.5	+16.3	89.2	81.8	+7.4	80.8	66.9	+13.9	17.2	18.4	-1.2
Chandigarh	95.8	93.9	+1.9	95.8	93.9	+1.9	70	74.2	-4.2	9.7	22.5	-12.8
Dadra & Nagar Haveli and Daman & Diu	79.9	63.1	+16.8	83.6	46.5	+37.1	60.5	46	+14.5	16.8	30	-13.2
Jammu & Kashmir	69.2	57.5	+11.7	84.9	60	+24.9	75.2	53.9	+21.3	9.6	9.4	+0.2
Lakshadweep	59.4	31.8	+27.6	88.4	75.9	+12.5	81.2	71.2	+10	1.3	8.9	-7.6
Ladakh	76.3	67.6	+8.7	69.9	74.4	-4.5	84	64.9	+19.1	18.1	8.5	+9.6
NCT of Delhi	98.9	97.9	+1	98.9	97.9	+1	73.8	66.6	+7.2	22.6	26.8	-4.2
Puducherry	92.3	84.8	+7.5	92.3	84.8	+7.5	82.9	67.3	+15.6	30.5	34.6	-4.1

* it represents the percentage point change

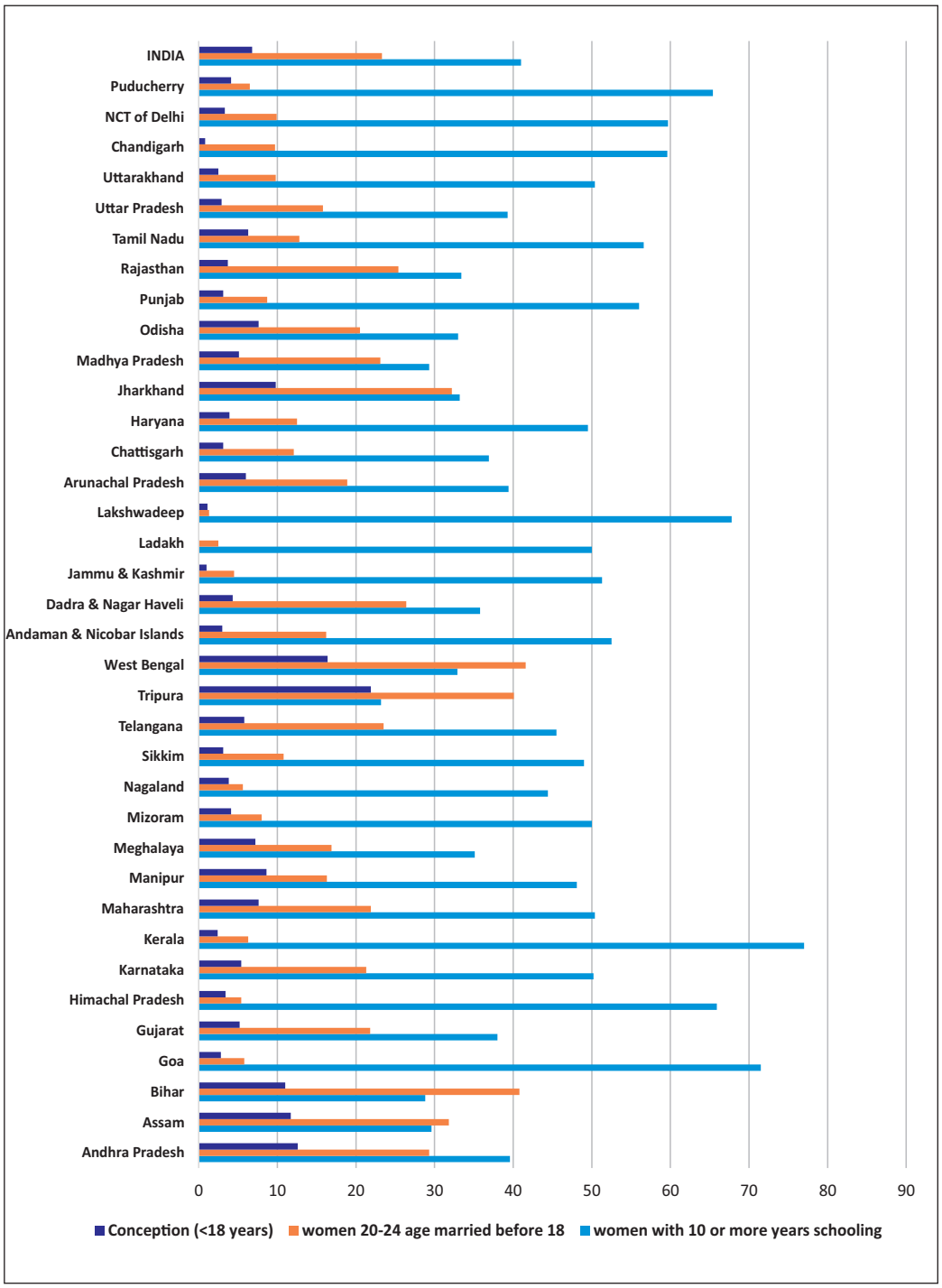
Mother's Education

Latest data on the percentage of women completing 10 years of education is reported to be at 41 percent, up from 35.7 percent five years earlier in 2015-16, and 22.3 percent in 2005-06. Such attainment of education is found to have a positive impact on the nutrition status of these women's children.[32] It is an experience that is not unique to India. Studies across different countries in South and Central Asia show similar patterns of reduction in childhood stunting, wasting, and underweight through the empowerment of their mothers by improving their independence and giving them a voice in decision-making.[33] Greater agency, in turn, allows the woman to mobilise family support for food and care; it also addresses harmful cultural beliefs and practices about pregnancy (e.g., restrictive or excessive food intake) and gendered practices such as women being the last in the family to partake of a meal.

Women completing 10 years of education also has a positive impact on the age of marriage and conception (see Figure 7). In this regard, India has seen gains in the past decades in reducing the incidence of early marriage, especially amongst those under-18. This is expected to contribute in improving the state of child nutrition in the country; after all, early marriage and childbearing are among the most crucial causes of maternal undernutrition and have adverse consequences on health, education, and employment.[34]

> "A mother's education is found to have a positive impact on the nutrition status of their children; it is an experience that is not unique to India."

Figure 7: Status of women in India: Percentage with secondary education, low age of marriage, and conception < 18 years



Early Marriage

A 2016 analysis of social and biological factors of undernutrition in India found that children born to adolescent mothers have a 10-percent higher chance of being stunted.[35] Other countries share the same experience. Data gathered in 2015 from five low- and middle-income countries (LMICs) including India, showed a strong association between younger maternal age and lower birth weight, preterm birth, and stunting by 2 years of age.[36] Early pregnancy and conception prevents a woman from gaining optimum height. This then traps the woman in a likely cycle: Short stature (below 145 cm) is closely associated with poor pregnancy outcomes, such as SGA (small for gestational age) and preterm births, and stunting in children.[37]

Domestic Violence

Another important nutrition-sensitive determinant of maternal health is domestic violence. According to NFHS 5 data, 29.3 percent of adult women have experienced domestic violence at the time of the survey—this is lower than the 31.1 percent recorded by NFHS 4, and the 37.2 percent found by NFHS 3 (see Table 2). In India, such observed reduction in the incidence of domestic violence is partly correlated with completing higher levels of education.[38] This is remarkable progress. As indicated in Figure 5, domestic violence has immediate impacts on all aspects of women's health—physical, sexual and reproductive, and mental. Domestic violence increases the risk of maternal mortality and pregnancy-related consequences such as stillbirths.[39]

> "Data from five LMICs, including India, showed a strong association between younger maternal age, and low birth weight and stunting by 2 years of age."

Indeed, studies in different countries—i.e., Nicaragua, Bangladesh, India, and the United States—similarly report high incidence of low-birth-weight babies and deaths amongst pregnant women who experience domestic violence.[40] A 2020 study that focused on India also found an increased probability of stunting, underweight and wasting in children of mothers who experience violence from their intimate partner.[41]

Water, Sanitation, and Hygiene

The interrelated concerns of water, sanitation, and hygiene (WASH) are among the fundamental nutrition-sensitive factors that can influence maternal nutrition and, in turn, the likelihood of childhood stunting**.** Poor WASH practices can cause gastrointestinal conditions such as tropical enteropathy, which have adverse effects on growth. They also increase the occurrence of water-borne illnesses such as hookworm, and the risks of anaemia and low birth-weight. Findings of the NFHS 5 (2019-21) indicate a marked improvement in the country's WASH situation: all states and UTs reported increased coverage of sanitation facilities, except in Sikkim, which had achieved 89.7-percent coverage in 2015-16 but declined to 87.3 percent in 2019-21. Water facilities were also recorded to have increased in all except four states and UTs (Sikkim, Punjab, Chandigarh and Delhi).[42] While these improvements in nutrition-sensitive measures are notable, they have not been accompanied by parallel progress in the provision of more direct nutrition services for pregnant women. Programme interventions during pregnancy for promoting appropriate weight gain, consumption of diversified diet, and consumption of micronutrient supplements remain weak.

These gaps need to be bridged, given adequate evidence that paying attention to high coverage of evidence-based, nutrition-specific maternal nutrition interventions through integration with antenatal care services can have a significant impact on pregnancy outcomes. A 2019 study that gathered data from 81 LMICs reported that when evidence-based nutrition intervention packages were made available to mothers seeking antenatal healthcare, maternal and neonatal deaths declined by nearly one-third (28 percent), and stillbirths, by 25 percent.[43]

Some of India's states have shown remarkable achievements in various nutrition-sensitive interventions. Odisha's Mamata Scheme, for example, has led to a reduction in the percentage of stunting in children following programme interventions that focused on pregnant women improving attendance to ANC services, ensuring higher consumption of IFA tablets, and addressing the problem of household food insecurity.[44] In Maharashtra, meanwhile, childhood stunting has dropped from 39 percent in 2006 to 24 percent in 2012, owing

to, among others, renewed focus on maternal, neonatal, and adolescent girls' health. The state has also worked on creating an enabling environment for the reduction of childhood stunting.[45] This involves improving outcomes in mother's literacy, delaying first pregnancy, number of antenatal visits, and promoting institutional delivery. There are also initiatives related to providing women with opportunities for income-generation, along with appropriate infant and young child feeding practices and improved sanitation.[46,47]

These are only a few of the examples from specific states which prove that maternal nutrition is crucial to achieving rapid and significant progress in reducing childhood stunting. Attention needs to be directed at scaling up these evidence-based nutrition interventions for pregnant women. These include nutrition counselling, as well as monitoring for appropriate weight gain, improving supply and compliance of micronutrient supplements that are delivered as a part of ANC services, and consumption of supplementary nutrition from the ICDS system. These interventions need to be continued and supplemented by efforts to address the underlying socioeconomic causes that adversely influence nutrition in women and children.[48,49]

> "Some states have shown remarkable achievements in nutrition-sensitive interventions. Odisha's Mamata Scheme, for example, has led to a reduction in the percentage of stunting in children."

Recommendations

Policymakers are giving more attention to the imperative of improving maternal nutrition, and the goals of improving women's health before, during, and after pregnancy are today part of two of the country's primary national programmes—the ICDS, and the National Health Mission. However, it must be ensured that the opportunity platforms offered by these two schemes are used to the optimum, and explicit guidelines on maternal nutrition care are issued by the government. This paper makes the following recommendations.

1. *Improve integration of ANC services.* For instance, neither the regular weighing of mothers during pregnancy nor the promotion of appropriate gestational weight gain is systematically integrated in the ANC health services nor in the ICDS programme. To begin with, there is no clarity about who is responsible for monitoring the weight of pregnant mothers; nor are there specific guidelines about the recommended weight parameters during pregnancy. Based on the 2016 WHO antenatal care guidelines, a shift needs to be made from counselling on average weight gain of 10-12 kg to following an updated protocol that specifies weight gain counselling based on the recommended BMI classification.[50]

   In Uttar Pradesh, a study of the implementation of the ANC programme in two districts in 2021 found grave gaps in the use of the platform for improving nutrition care for pregnant women.[51] There is an urgent need to build on the 2016 WHO recommendations, which included counselling for improving dietary diversity, monitoring appropriate weight gain, and improving coverage of IFA supplementation and supplementary nutrition for the undernourished population.[52] Nutrition care should therefore be pushed into the mainstream with the ANC services,[53] along with efforts to increase the coverage of four ANC visits from the current 60 percent to 100 percent. Ensuring effective implementation of the *Pradhan Mantri Surakshit Matritva Abhiyan* (PMSMA) initiative—launched in 2016 as a fixed-day ANC services approach—would help improve the coverage and quality of ANC services. There is also a need to focus attention on improving compliance of IFA supplements that are supplied as part of the Anaemia Mukt Bharat Programme.

   Key lessons and challenges emerging from an implementation study on maternal nutrition in two districts of UP provide crucial insights for optimising the opportunities of ANC delivery platforms. This will ensure appropriate coverage of beneficiaries with maternal nutrition interventions comprising measures for desirable gestational weight gain, promoting use of diversified diet, and creating demand and compliance for micronutrient supplements.[54,55]

2. *Counselling*. There is a need to seize the opportunity offered during contacts for family planning services for preventing pregnancies that are too early, too close, and too often. This will help improve birth outcomes and, in turn, reduce the incidence of childhood stunting. It is important to mainstream nutrition counselling, IFA and calcium supplements and prophylactic deworming, with ANC services.

3. *Improve diets*. To improve maternal nutrition care, the opportunity of PMMVY *(Pradhan Mantri Matritva Vandana Yojana)*— a centrally sponsored conditional cash scheme for pregnant women[56]—should be tapped to offer counselling services to pregnant women especially on their daily diet. Effort also needs to be directed to reach and counsel the spouses of pregnant women to ensure they provide support in making the right choices in food items, given limited resources.[57,58] Dietary advice needs to be put in context, and combined with inputs for improving production, availability, and access to homestead food production of diversified food. Systematic studies are needed to understand the barriers facing women in making appropriate choices in their daily diets, as well as decisions on allocating food at the household level.

4. *Maximise the ICDS programme*. Pregnant and nursing women are entitled, for the first six months of lactation, to supplementary nutrition (SN) that provides one-third of their daily nutrient requirements. Yet, SN provision by ICDS is often underutilised. Appropriate breastfeeding practices should be communicated properly.[59] ICDS food supplement policy is to provide one-third of daily nutrient requirements. With increase in percentage of women who are overweight, such a policy of ICDS on universal provision of supplementary nutrition needs to be revisited with reference to targeting only those women who are identified as undernourished, or with BMI below 18.5. Moreover, as stated above, supplementary nutrition distribution contacts with beneficiaries also need to be viewed as an excellent opportunity for nutrition education.[60]

5. *Counselling for young girls*. It is important that platforms of various services, beyond ANC and ICDS services, are used to the optimum. Nutrition counselling, along with information on issues such as personal and menstrual hygiene, also need to be integrated in the middle- and secondary-education curricula so that young women can enter pregnancy well-informed. The recently released guidelines of Saksham Anganwadi and POSHAN Abhiyaan or the National Nutrition Mission (NNM) 2.0 positions

nutrition care for adolescent girls high in the agenda for meeting the targets of reducing childhood undernutrition.[61] Besides diet and nutrition education, the Scheme for Adolescent Girls aims to mobilise communities to encourage and support girls to complete secondary education and empower them to take decisions on self- and family care.

6. *Tap the National Rural Livelihoods Mission (NRLM).* By 2022-23, NRLM plans to cover 7 crore rural poor households, across 600 districts, 6000 blocks, 2.5 lakh Gram Panchayats, and 6 lakh villages in the country through self-managed Self-Help Groups (SHGs) and federated institutions that support women members for livelihoods activities.[62] Women organised in SHGs can reach those in the most marginalised communities to create nutrition awareness and improve diversity in their diets.[63] In addition to these essential direct nutrition interventions, informed SHG women members are also in a position to play a key role in improving school education of girls, delaying age of marriage, reducing domestic violence, and creating demand for WASH facilities.[64] Linkages with NRLM offer opportunities for improving access to food items from activities such as vegetable gardening, poultry keeping, and fishery.

> "Systematic studies are needed to understand the barriers facing women in making appropriate choices in their daily diets, and in allocating food at the household level."

Conclusion

Malnutrition in women is a result of a multitude of factors, including poor diets, limited knowledge, poor access and use of health and hygiene services, and a weak enabling environment due to harmful social and cultural practices. These gaps need to be filled, as malnutrition before and during pregnancy is an important contributory factor to low birth-weight, which in turn has long-term, adverse consequences on a child's growth.

Both direct and indirect determinants of undernutrition or overweight, and micronutrient deficiencies in pregnant women need to be addressed through a life-cycle approach. Particular attention needs to be paid to the first 1,000 days of life, as well as in the accelerated growth period of adolescence, through to the pre-conception period. Optimum use of contact opportunities with mothers during health and ICDS services, and reaching out to the unreached women through NRLM contacts, deserve special attention.

It is also critical to reach pregnant women who are outside the government health system and who opt for private health facilities. They should be informed of their entitlements in government feeding schemes, counselling on nutrition care including diet diversity, and for consumption of weekly iron-folic acid tablets for improved health and productivity.

The formulation of an evidence-based national maternal nutrition policy that addresses both immediate and underlying determinants of undernutrition is imperative. This policy should clearly outline the roles and accountability assigned for scaling up maternal nutrition interventions to the two primary sectors—health and ICDS, and other critical existing platforms (water-sanitation, education, maternity protection benefits, and social protection).[65] Implementing a comprehensive maternal nutrition policy would help the country achieve the Sustainable Development Goal (SDG) of eliminating all forms of malnutrition.

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Endnotes

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