

## **Malnutrition in Women And Children, It's Social Consequences, As Presented In Recent Studies, Since 2015.**

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### **Abstract**

Malnutrition in India has remained a major problem, despite being independent with sufficient of grains for more than 40 years. According to WHO reports, there are 1.8 billion people suffering from MN (Malnutrition) and MND (Micro -Nutrient Deficiencies) in the world, out of which half resides in India. Men, women, children, adolescents all. But children and women are hit the most and worst by MN and MND due to various factors, of which main are Malnutrition, Social and cultural, Economic, Literacy/illiteracy, Poor access to food and, Lack of Political will.

MN & MND leads to stunting, wasting, higher morbidity and mortality, affects physical, mental and psychological growth, reduces earning capacity. On the other side it may lead to obesity and related problems.

MN & MND affects and may alter body metabolism to cope the situation which itself may cause metabolic syndrome/ NCDs.

MN & MND in women affect next generation in multiple manner, and this effect may go on for a few generations too. Women grow economically poorer. If a woman has access to resources then the children will be well fed, they themselves can afford nutritious food, this will contribute to the national economy by increased production by women and lesser morbidity, saving on medical expenses which will be utilized for education of children. Even country's resources thus saved can be utilized for development.

Conclusion- MN & MND must be taken seriously, as it is related to most of the SDGs. Intensive researches, surveys, impact analysis of past and current programs, finding loop holes in policies and correcting them is the immediate requirement. MN & MND should be tackled at multi sectoral level not only at Health and WCD level. Safe drinking water, easy access to health care services, more effective PDS, agriculture, social justice must be ensured with strong political will.

**Key words-** Micronutrient Deficiency, Gender, Social Impact, Women

### **Introduction**

Malnutrition is defined as not having enough energy and/ or nutrients to live a physically active life that allows for optimal health. The World Health Organization considers that poor nutrition is the single most important threat to the world's health (WHO 2001).

Malnutrition in India has remained a major problem, despite being independent with sufficient of grains for more than 40 years. According to WHO reports, there are 1.8 billion people suffering from MN (Malnutrition) and MND (Micro -Nutrient Deficiencies) in the world, out of which half resides in India. Men, women, children, adolescents all. But children and women are hit the most and worst by MN and MND due to various factors like Malnutrition, Social and cultural, Economic, Literacy/illiteracy, Poor access to food, Lack of Political will

Malnutrition and especially micronutrient deficiencies affects a person with Poor health, Poor Physical and mental growth, low physical mental work capacities, therefore lower earnings, higher chances of falling ill, recovery takes longer, irregular menstruation, repeated abortions, poor access to healthcare services, hence more expenditure on medical care. Further decrease in income increases poverty further, a vicious cycle sets in. This can be seen well in Figure 1



When this is applied to a Nation, with almost 2/3<sup>rd</sup> population being MN, it has more severe implications not only at personal but economic & social implications at the National level too. When women suffer MN/MND this becomes a major cause of sliding of all health indicators like NMR (Neonatal Mortality Rate), IMR (Infant Mortality Rate), U5MR (Under 5 Mortality Rate), MMR (Maternal Mortality Ratio). Chances of a mal nourished woman producing a malnourished child are very high. In this review we will review studies, reports, and data as to how society is affected by malnutrition and what are the social implications of malnutrition in women. Currently MP tops the list with all indicators being at the highest.

Table 1- Current Status of Basic Health Indicators

		2016		2025 (Projected)	
<b>Birth rate</b>	<b>India</b>	<b>18</b>		<b>16</b>	
	<b>MP</b>	<b>20.7</b>		<b>18</b>	
<b>Death Rate</b>	<b>India</b>	<b>7.1</b>		<b>7.2</b>	
	<b>MP</b>	<b>7.5</b>		<b>7.2</b>	
<b>Life expectancy</b>		<b>M</b>	<b>F</b>	<b>M</b>	<b>F</b>
	<b>India</b>	<b>68.8</b>	<b>71.1</b>	<b>69.8</b>	<b>72.3</b>
	<b>MP</b>	<b>66.5</b>	<b>67.3</b>	<b>68</b>	<b>69.3</b>

Source : National Health Profile 2018

“Women’s Deprivation in Terms of Nutrition and Health Care Rebounds On Society In The Form Of Ill Health Of Their Of Springs, Male And Female Equally.” Siddiq Osmani And Amartya Sen.” (42)

Though it was said in 2003, it still stands true.

Women health has been a major concern since long. Since independence, many projects made to address the health issue of women of India and currently many programs are running in the

field. India has a huge population of young people, 22% up to 18 years of age (census 2011), of which 50% is malnourished due to poverty, lack of education, cultural and societal behaviors, non-availability of food, for the new generation added factors are fad to remain slim and availability and usage of junk food and abusive substances. To top it, we are facing increasing obesity, a form of malnutrition on opposite side. (21). (Kurrian)

As per WHO data, so far, we have been able to reduce MMR from 4.88% in 1994 to 1.7% by 2015. IMR has reduced from 167 in 1994 to 33 in 2017. But even then IMR is very high at 37 in India being highest in MP at 47 and lowest at 10 in Kerala, while MMR is 1.30 for India in 2016, for MP its 1.73. It still is a very high number as compared to other States. (SRS bulletin 2017, NITI Ayog GOI)(31,45)

Key facts presented by WHO-

1. Malnutrition, in all its forms, includes undernutrition (wasting, stunting, underweight), inadequate vitamins or minerals, overweight, obesity, and resulting diet-related noncommunicable diseases.
2. 1.9 billion adults are overweight or obese, while 462 million are underweight.
3. 52 million children under 5 years of age are wasted, 17 million are severely wasted and 155 million are stunted, while 41 million are overweight or obese.
4. Around 45% of deaths among children under 5 years of age are linked to undernutrition. These mostly occur in low- and middle-income countries. At the same time, in these same countries, rates of childhood overweight and obesity are rising.
5. The developmental, economic, social, and medical impacts of the global burden of malnutrition are serious and lasting, for individuals and their families, for communities and for countries.

(54)(WHO malnutrition 2018)

Most of the causes of MMR and IMR are directly or indirectly linked with the malnutrition and multiple micronutrient deficiencies in women. So far Iron, Iodine, Vit A, Folic Acid and Vitamin B12 have been identified as major micronutrient deficiencies of concern. But there are many more micronutrients which play a major role in the metabolism and are very essential for cell replication. Deficiency of many these nutrient, like Zn, folic acid, Vitamin D, Vitamin E, Magnesium, Manganese, Chromium, Selenium etc. have been well proven, in various studies, to cause alteration of nucleic acid, osteoporosis, Sarcopenia and are causative of NCDs which includes mainly Hyper tension, NIDDM, arthritis, cancer, low immunity and acute and chronic infections. These problems are major causes of insufficiency of public health interventions, because a huge number of people are suffering and have suffered from some or other form of malnutrition leading to one or more of these problems individually. Which in turn cause loss of workdays and increased medical expenditure, lower productivity and therefore lower earnings and major cause of insufficiency in medical services. (48)(WHO MAIn2018) (As shown in Figure 2)

Malnutrition, especially micronutrient deficiencies, restricts survival, growth and development of children born to MND mothers. It contributes to high morbidity and mortality in vulnerable population, resulting in substantial diminution in productive capacity in

adulthood and consequent reduction in the Nation's economic growth and well-being. (29)(NHP, 2017)

Low personal income automatically means lower availability of food and resources to women. The purpose of taking this review is to look at the problem from a further deeper level i.e. from simple malnutrition we need to move on to the extent of deficiencies of multiple and specific micro -nutrients and other major causes responsible for MN/MND their possible effects on women-

- During pregnancy further depletion of micronutrients,
- In the form of NCDs and frequency of infections in adolescents and adulthood.
- On the progeny
- On the society
- The public health and
- On the National Economy.

There are multiple Govt. projects going on to provide nutrition since before birth till end of adolescence (especially for girls) to improve on the problem of malnutrition. Have they overcome or improved status of MND? If multiple nutritional deficiencies are present, what is their levels of existence? Are they associated with general anemia, osteoporosis, NCDs, IMR, MMR, etc.? What has been the impact of various programs so far? Impact studies are required at larger scale for establishment and proving effectiveness of any of the long-term programs. We need to move on to nutrition security from food security, as food security has been proven to be insufficient in controlling malnutrition.

Most of the young females will become mothers in coming two to ten years, once or multiple times. Most of these women are suffering from some or other form of malnutrition (as defined) If they are deficient in multiple nutrients, then they will pass this on to the coming generation and them -selves will become further deficient and as a result will face the consequences, as described. Children born to them will be more prone towards being LBW, preterm, infections and higher IMR and if survive will be prone to MND and NCDs. Possibility of their children suffering from malnutrition and its consequences will be higher. MND will affect children's Physical & Mental health and development and working capacities which will be a big hurdle in their economic empowerment. Many MNDs are shown to lead to criminal attitudes as well.

If these young women have overcome majority of deficiencies of malnutrition, at this age, then they themselves and future generation will be safe from consequences of malnutrition. Therefore, even child health programs shall focus on women of child- bearing age.

Figure two shows causes of malnutrition at different levels and their effects on the society. Cause of this extent of malnutrition lies at multiple levels-

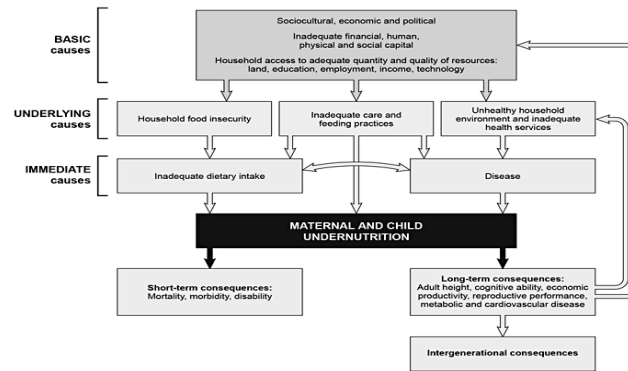


Figure 2

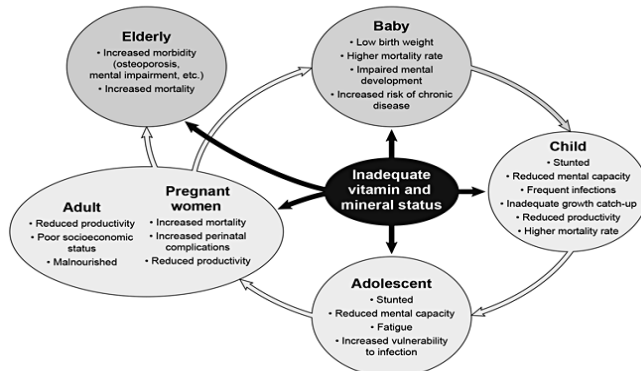


Figure 3

Figure 2-(Updated UNICEF Conceptual Framework for the Determinants of Undernutrition (adapted from UNICEF)2004

Figure 3- The conceptual framework for the cycle of micronutrient inadequacies across the life span (adapted from ACC/SCN) (1) (Epidemiology of MND in 2015)

The top factor which has been mentioned as basic cause in figure three is socioeconomic, economic and Political will these three are the basic causes of malnutrition. So far most of the women and child oriented programs are focused on immediate/superficial causes, rather than on major causes responsible for the status of MN & MND today.

It has been repeatedly in various studies that in India-

- >38% population is anemic.
- 50% women population in childbearing age are anemic
- Vitamin A deficiency is to the extent of > 55%
- Recent studies indicate deficiency of Vitamin D in more than 50% population.
- Deficiency of Zinc, Iodine and Calcium are well proven.
- 65-70% pediatric population (0-18yrs) is anemic.
- > 50% pediatric population is mal nourished in some or other form
- 38 % under five children are stunted
- Obesity in children and adults is on rise. (28, 49, 54) (WHO & UNICEF ,2018, NFHS 4)

If there is only iron deficiency, predominantly, then providing IFA as public health intervention (for almost five decades) should have resolved the problem of anemia, anemia



related problems and consequences, by now. Which does not seem to have worked very well, so far. Low cost cereals from PDS (Public Distribution System) has, supposedly, removed factor of non-availability of basic food. Adolescent programs like “Kishori Shakti” “IFA (Iron Folic Acid) with counselling” etc. should have brought anemia under control way back.

After so many years of IFA program we still have >50 % women population (Child-bearing age) suffering with anemia (literate and illiterate both). But if there co-exists multiple deficiencies then we will need further such studies at a larger level. Which will help us to diagnose the problem at a larger and deeper level and to make policy changes accordingly. Presence of MND is indicative of tendency towards alteration in metabolism and proneness to NCDs (Non- Communicable Diseases).

To achieve the Sustainable Development Goals (SDGs), improving the status, health, and welfare of women will be critical. Women comprise the majority of the world’s poor. In poor households, women play a critical role in ameliorating the effects of poverty, especially for infants and young children. Clearly, the reduction of micronutrient deficiencies, given that they have an impact on infant and child mortality; maternal morbidity and mortality; and development, growth, and economic and social well-being, needs to be aggressively tackled, not least to reflect the legal human right of women and children to adequate nutrition, including micronutrients. (43,51) (Patrick Webb, 2015). (SGD 2015),

MND also hampers efforts of women empowerment in long term.

Physically it makes them prone to diseases and disorders, malnourished mothers produce children exposed to micronutrient deficiencies in utero. MND in utero hampers physical and mental growth of the child, it may have psychological impact as well. Children born to MN mothers are more prone to diseases and premature death. Chances of children, borne to MN mothers, growing to be stunted is more. MND in utero may also cause alteration in genetics of the unborn. Children born to MN mothers are more prone to NCDs at an early age. (1)

Pregnancy and lactation further deprive mothers of nutrients and declines their overall health, making them prone to pregnancy related mortality. This physical and mental insult, in long term reduces capacities and capabilities of malnourished women. This also is an added factor to develop NCDs earlier than normal age. Poor health means poor income, repeated illness which increases medical expenditure. (38) (Richmond wale)

All this together may prove to be a major obstacle in women empowerment. We need to tackle all the levels at the same time as suggested in SDG 2015.

We will review each point as to how malnutrition and MND affects women and in turn affect society, and national health and economy. Initially it will seem to be a pure scientific review, which it is, but it is necessary to understand them before getting on to the social and national level implications.

### **1.1 Malnutrition, MND and Hidden Hunger- Definitions**

2018 Global hunger index India stands at 103rd amongst 119 countries included. (9)(Global Hunger Index 2018)

Hidden hunger is a lack of vitamins and minerals i.e. lack micronutrients. (52)(WHO definition)

2 billion people in the world suffer from vitamin and mineral deficiencies, half of them reside in India. (9)(GHI 2018)

Women and children in families with low-income often do not get enough food, vitamin A, Iodine and Iron, and other essential nutrients. this limits their physical and mental growth, development, health and working capacity. (54)(WHO 2018)

Malnutrition, simply put, is bad nutrition. Bad nutrition because you are eating either too much food, or too little food. Too little food because you are not meeting your dietary requirements and so the body's growth and development is affected—undernourishment—or it can be exposing the body to too much dietary energy and nutrients and so there are other consequences i.e. Obesity and related diseases, that too is considered malnutrition.

Malnutrition is caused by too little food, too much food or just the wrong food.

Hundreds of millions of people around the world are starving while half a billion are obese They are side-by-side in the same countries, and in the same communities. (55) (WHO FAO 2014)

Chronic hunger is the result of inadequate food intake over a long period. Which leads to stunting of height and wasting of muscles which in future may probably lead to obesity and NCDs.

The term malnutrition addresses 3 broad groups of conditions:

1. undernutrition, which includes wasting (low weight-for-height), stunting (low height-for-age) and underweight (low weight-for-age);
2. micronutrient-related malnutrition, which includes micronutrient deficiencies (a lack of important vitamins and minerals) or micronutrient excess; and
3. overweight, obesity and diet-related noncommunicable diseases (such as heart disease, stroke, diabetes and some cancers). (54) (WHO Malnu 2018)

Chronic hunger—when people do not consistently eat enough food to meet their requirements, so they don't get enough dietary energy—is the situation for more than 800 million people in the world today.

One in every nine people goes hungry, every day.

Too many people around the world still die from lack of food. Under-nutrition contributes to almost half of all child deaths. Stunting, an indicator of chronic undernutrition, seriously affects growth and development, and its effects are irreversible.

Ending child under-nutrition would prevent 45% of all child deaths. (55) (WHO FAO 2014)

The 'double burden' is when hunger and obesity affect people within the same population. More than 800 million people go hungry, yet half a billion people are obese.

While undernutrition still kills almost 1.5 million women and children every year, growing rates of overweight and obesity worldwide are driving a rise in diseases like cancer, heart disease, stroke and diabetes. (55) (WHO FAO 2014)

Micronutrient deficiency remains not of much interest in studies and policies as it does not cause major morbidity or mortality. But this is high time to pay attention to the hidden hunger/ MND along with malnutrition for major nutrients, as MND is the cause of untimely mortality in children and underlying cause of almost all infectious diseases and NCD's in direct or indirect way especially in women.

Micronutrient deficiency is a major health problem in the country, with anemia affecting almost 50 to 60 per cent of the population while status of vitamin A deficiency and ID (Iodine Deficiency) have improved over the years. (Further impact studies are required). With recent initiatives of the government and strengthening of existing health and agriculture systems, micronutrient status of the population is expected to improve in the coming years. Other micronutrients levels need to be studied. (50) (UN NCD & Diets)

84 percent of children in Kenya and 64 percent in India have a Vitamin A deficiency whereas in a western country like Poland, deficiencies in children are at less than 10 percent. These figures illustrate how countries that have a lower GDP per capita and thus higher rates of poverty often experience a higher rate/severity of cases of MND. (2) (Borgen project)

### **1.2 Micronutrient deficiencies and their metabolic effects-**

Maternal malnutrition increases the risk of poor pregnancy outcomes including multiple miscarriages, obstructed labor, premature or low-birth-weight babies, still births and postpartum hemorrhage. Severe anemia during pregnancy is linked to increased mortality at labor. (34) (Marry Robinson)

Adequate iron is important for best reproductive outcomes, including gestational cognitive development. Iodine and Calcium have been recognized for their roles in development of the fetus/neonate. Many effects of deficiencies of Zinc, Copper, Magnesium, and Selenium have been reported. Folate sufficiency periconceptionally improves chances of neural tube defects. Other vitamins likely to be important include vitamins B12, D, E and A with the water-soluble vitamins. Epigenetic influences and likely influence of MNDs on fetal origins of adult chronic diseases are currently being connected in various studies. MN may have other more subtle, unrecognized effects. (14) (Hill I Darnton 2015)

Iron, Iodine, Folate, vitamin A, and Zinc deficiencies are the most widespread MNDs, and all these MNDs are common contributors to poor growth, intellectual impairments, perinatal complications, and increased risk of morbidity and mortality. Iron deficiency is the most common MND worldwide and leads to microcytic anemia, decreased capacity for work, as well as impaired immune and endocrine function. Iodine deficiency disorder is also widespread and results in goiter, mental retardation, or reduced cognitive function. Single MNDs rarely occur alone; often, multiple MNDs coexist. The long-term consequences of MNDs are not only seen at the individual level but also have deleterious impacts on the economic development and human capital at the country level. Most deleterious effect is that it goes on in generations. (1)(Baily RL)

Malnutrition is an imbalance in micro and macronutrients either a deficit or surplus of them, which impedes the body's capability of growing and staying healthy. Malnutrition occurs in stages. The imbalance in nutrients first shows in blood and tissue, followed by metabolic processes finally, tell-tale signs and symptoms appear. The effects of malnutrition include changes in body mass, poor wound healing, severe weight loss (cachexia), and organ failure. (38)(Richmond Vale, 2016)

Children, especially girl child, and born to MN mother, who are malnourished from an early age are severely disadvantaged in their ability to learn. These children later in life go on to earn 20 per cent less than other adults who are well-nourished in their childhood.



malnourishment perpetuates the cycle of poverty, as poverty-stricken and malnourished mothers have stunted children. children born to the poorest of families in developing countries are 2.8 times more likely to be malnourished. (19) (Jitendra)

**1.2.1. Vitamin A-** Vitamin A deficiency is the leading cause of blindness worldwide and also impairs immune function and cell differentiation. deficiency of vitamin-A can lead to conditions like xerophthalmia, anemia, increased susceptibility to infections, growth retardation and risk of death. 800000 women & children's death is related to vitamin A deficiency, across world. It has always remained a public health problem. (37) (rice amy 2014)

**1.2.2. Vitamin B12-**Deficiency causes megaloblastic anemia, myelin sheath deterioration and neuronal degeneration. Vitamin B12 is required for proper red blood cell formation, neurological function, and DNA synthesis, deficiency can cause fatigue, weakness, constipation, loss of appetite, and weight loss, soreness of the mouth or tongue, difficulty maintaining balance, depression, confusion, dementia, poor memory, and neuronal degeneration. (30) (2017 NIH B 12 Fact sheet)

**1.2.3. Calcium-** This is the most abundant mineral in body. Calcium as a nutrient is most commonly associated with the formation and metabolism of bone. Calcium is required for general metabolic reactions, management of muscle contractions, both striated and nonstriated, for electrolytes balances, extracellular fluid pH and brain functioning. In the state of deficiency for a long time Ca is withdrawn from bones and may lead to osteoporosis and cause bone brittle ness. Severe calcium deficiency may cause severe cramps and alteration in cardiac functions. (27) (NCBI bookshelf 2011)

**1.2.4. Chromium-** Chromium deficiency is associated with elevated levels of fasting blood glucose, circulating insulin, cholesterol and triglycerides, and decreased proportion of lean body mass. (18) ((Bai Jianling (2015 Chromium exposure)

**1.2.4. Vitamin D-** Vitamin D is responsible for Ca metabolism in the body. Recent studies are indicating its major role in immunity. The active form of vitamin D (1,25(OH)2D3, calcitriol) regulates calcium-phosphate homeostasis through the interaction with vitamin D receptor (VDR). It also has a huge impact on the proper functioning of musculoskeletal, immune, nervous, and cardiovascular systems. A low level of vitamin D is strongly correlated with a decreased calcium level, which in turn leads to inadequate mineralization of bones with subsequent development of rickets in children or osteoporosis in adults. (57)( Zmijewski Michal A., Vitamin D and Human)2019

Vitamin D deficiency has been associated with increased risk of common cancers, autoimmune diseases, hypertension, and infectious diseases. (15)(Holick Michael F (2018, vit D )

**1.2.5. Folic acid-** Folate is essential for DNA synthesis and repair, especially when cells and tissues are growing rapidly, such as during infancy, adolescence, and pregnancy, crucial for proper brain functioning and plays an important role in mental and emotional health. Deficiency results in microcytic anemia. Deficiency is related to depression, low immunity, Autism, Rheumatoid arthritis. Folic acid has a vital role in cell growth and development through many reactions and processes that occur in the body. When the body becomes deficient in folic acid, all cycles will become ineffective and lead to many problems, in addition to other problems such as megaloblastic anemia, cancer, and neural tube defects. Vit. B complex are

needed for healthy skin, hair, eyes, and liver. Also, they are important for the nervous system function. They are necessary part of cycle of energy production and immunity. (23) (Lubna Mehmood 2014)

**1.2.7. Magnesium-** Magnesium is the fourth most abundant cation in the body. It has several functions in the human body including its role as a cofactor for more than 300 enzymatic reactions. Several studies have shown that hypomagnesemia is a common electrolyte derangement in clinical setting especially in patients admitted to intensive care unit where it has been found to be associated with increase mortality and hospital stay. reduced levels of magnesium are associated with a wide range of chronic diseases such as diabetes, osteoporosis, bronchial asthma, preeclampsia, migraine, and cardiovascular diseases. (46)(2018, sandawana, Alawi Abdullah M. Al Magnesium and Human Health))

**1.2.8. Manganese -** Manganese (Mn) is an essential element that is involved in the synthesis and activation of many enzymes and in the regulation of the metabolism of glucose and lipids in humans. responsible for scavenging reactive oxygen species (ROS) in mitochondrial oxidative stress. Both Mn deficiency and intoxication are associated with adverse metabolic and neuropsychiatric effects. Studies have found that ROS generation, oxidative stress, and inflammation are critical for the pathogenesis of diseases like metabolic diseases, including type 2 diabetes mellitus (T2MD), obesity, insulin resistance, atherosclerosis, hyper lipidemia, non -alcoholic fatty liver disease (NAFLD), and hepatic steatosis. (22) (2018, Li Longman □e Essential Element Manganese)

**1.2.9. Selenium** – Selenium is associated with anemia, oxidative stress, cardiac ailments. (12) Han Jing

**1.2.10. Zinc-** Zn is an essential trace element, necessary as cofactor for at least 300 enzymes. Adequate zinc is necessary for optimal immune function, endocrine system, brain disorders, and deficiency is associated with an increased incidence of diarrhea and acute respiratory infections, major causes of death in those <5 years of age, depression in adults. Almost 20% of the population worldwide is at risk of developing zinc deficiency with a high number also in industrialized countries. The immune system and brain development and function seem to be highly sensitive to zinc deficiency. (41) ( Ann Katrin Sauer (2016)).

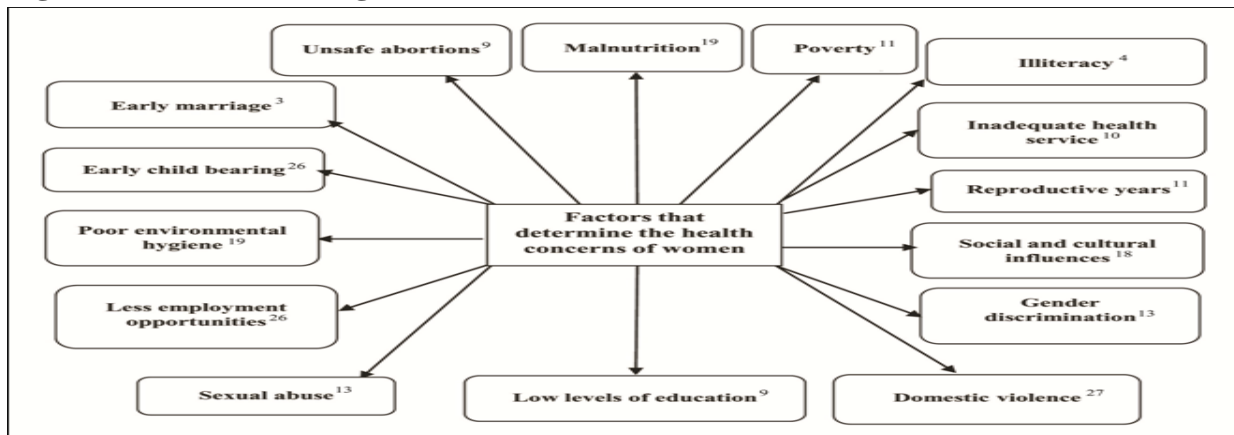
### **1.3 Malnutrition in women and social implications-**

#### **1.3.1 International scenario**

Nutrition justice will only be achieved when women are empowered and when policies and programs are gender responsive. Even though women farmers are responsible for between 60 and 80 per cent of food production in developing countries, their rights and socioeconomic status are rarely equal to those of men, and this disempowerment undermines their ability to attain food and nutritional security. When women are empowered, not only do they become more productive, as studies have shown, but as the main source of food for their children, they give future generations a better start in life. (34) (Mary Robinson)

Malnutrition is responsible for 2.3 million children's deaths annually, and 130 million malnourished children who managed to reach school failed to learn even basics and are left without core skills and abilities they need to make their lives more productive. At least half of these children are girls who will grow to be MND mothers. (19)(Jitendra)

**Figure 4- Factors affecting maternal nutrition**



(36) (Raju Komasly)

Maternal mortality remains stubbornly high in India as compared to many developing nations India contributed approximately 20 percent of all maternal deaths worldwide between 1992 and 2006; due to lower socioeconomic status and cultural constraints as well as limiting access to health care. Maternal mortality is 57 fold higher in Indian women than in the United States. India's maternal mortality ratio is lower than the ratios for Bangladesh and Nepal, while it is higher than those in Pakistan and Sri Lanka. (36) (Raju Komasly,1 Shanmugam Manoharan, 2017,)

Research focusing on women of childbearing age living in socioeconomically deprived circumstances has documented the intergenerational transmission of both stunting and obesity. Women pass on their malnutrition, micronutrient deficiencies, stunting and obesity to their progeny and to the next generation. (35) (Rafael Perez-Escamilla, 2018,)

### 1.3.2 Indian perspective

It is estimated that more than two billion people suffer from 'hidden hunger' (MND) globally, with nearly half living in India. Despite being highlighted as one the most cost-effective investments for human development, progress on addressing MND has been slowing. The severe social, health, and economic costs of MND in India should make it a top priority for domestic governance and international donors alike. Results of the study suggest widespread (>80% total Indian population) risk of deficiencies in calcium, vitamin A, B, folate, in addition to lysine limitation, with more localized deficiencies (<25% population) in iron, zinc, and vitamin B. It is projected that, through economic growth and shifts in dietary preferences, meat and dairy demand in India will continue to increase through to 2050. (13) (Hannah Ritchie, 2018,)

Some of the major causes for malnutrition in India is Economic inequality. Due to the low social status of some population groups, their diet often lacks in both quality, quantity, and variety of foods. Women who suffer malnutrition are less likely to have healthy babies. In India, women are fed last and mothers generally lack proper knowledge of feeding children. Consequently, newborn and infants are unable to get adequate amount of nutrition from their mothers.

### **1.3.3. Status in Madhya Pradesh**

Madhya Pradesh, already under the national glare for poor health and nutrition indices among children, about 54 per cent of kids in Madhya Pradesh in age group of one to four years are anemic, compared to the 41 per cent national average. Similarly, 32 per cent of adolescents (10-19 years) in the state are moderately or severely thin, compared to the national average of 24 per cent. Worryingly, the survey found that 13 per cent of children in Madhya Pradesh are pre-diabetic, against the national average of 10 per cent. Women with BMI < 18.5% is 28.4%, Anemia U5 70%, 15-49 yrs women 52%, 7% women diabetic, Hypertensive 8%. (28) (NFHS 4)

### **1.4 General social impact of Malnutrition-**

The health indicators of crucial importance are IMR, NMR, MMR, U5MR, Child stunting and wasting. All of them are directly or indirectly related to maternal MN and especially MNDs, since main food is wheat or rice or similar food, which is lacking in pulses, beans, vegetables, fruits and animal protein.

India's work on malnutrition has brought rate of stunting from 48% in 2006 to 38% in 2015. But the rate differs within various states and various districts within the States, where some states like Delhi, Arunachal Pradesh and Mizoram this rate has become very low while in states like Madhya Pradesh, Uttar Pradesh, Rajasthan and Bihar it remains very high but differences within districts are quite big. The rate of stunting and wasting has not kept the pace with the rate of decline of IMR and NMR, they still remains high. (29) (National Health profile report PHFI)

This statement, regarding stunting, means that children are going hungry for an exceedingly long time. If food is available to the mother, she tends to feed children first. This is a usual practice in India across socio cultural differences. Another meaning is women are not getting access to the food.

National Health Report says children's malnutrition is not very much related to income as 25% of stunted children were from high income quintile. If India is a growing economy, it has to tackle its malnutrition conditions as a developmental head shall be kept on top priority. (29) (NHR)

#### **1.4.1. Relationship of MND and NCD**

Non-communicable diseases (NCDs) are now the leading cause of mortality worldwide; they are responsible for 70% of global deaths, equivalent to 40 million people. The health and economic repercussions of this trend are enormous. Millions of people will experience premature mortality or compromised quality of life, countries and regions will experience reduced productivity and arrested economic growth. Increased prevalence of obesity, increased consumption of poor quality diets, and pervasive undernutrition are contributing to this epidemic. Today, every country in the world bears a combined burden of malnutrition and NCDs. No country is immune.

Stunting, which is a direct cause of short height and sub-optimal cognitive and physical function is now also recognized as a risk factor for becoming overweight and developing NCDs later in life. The countries with high childhood malnutrition are showing more of obesity and NCDs. (50) (United Nations System Standing Commi. on Nutri, 2018,)



Major part of Population explosion occurred during 1950-1980. 70% of these children were malnourished, who are in 40+ years of age group now. This is the population prone to NCDs. Preventive Public Health measures are required, at a large scale, as the unprecedented number of NCDs and associated complications is looming ahead.

This is indicative of dire public health consequences as NCDs leads to non-productive, illness ridden life, burdening existing health systems by sheer number and with adverse impact on personal and National economics.

#### **1.4.2. Relationship of MND in Adolescents, women (child -bearing age group), and MND in children born to them.**

In 2012, there were 1.2 billion adolescents in the world. Vicious circle of MN starts with being born as a girl child. Adolescence is a time of rapid physical growth, second only to the first year after birth. During adolescence, children gain up to 50% of their adult weight and skeletal mass and more than 20% of their adult height. Poor nutrition during adolescence will not only affect adult body size, resulting in shortness or thinness, but may also affect the nutritional status of any children born to mothers who were malnourished during adolescence. This is particularly important for the estimated 10 million girls under the age of 18 who get married each year and the 16 million adolescent girls who give birth each year. (35) (Rafael Perez-Escamilla, 2018,)

Micronutrients are essential to sustain life and for optimal physiological function. Widespread global MNDs exist, with pregnant women and their children under 5 years at the highest risk. Iron, iodine, folate, vitamin A, and zinc deficiencies are the most widespread MNDs, and all these MNDs are common contributors to poor growth, intellectual impairments, perinatal complications, and increased risk of morbidity and mortality. (1) (Bailey RL, 2015,) Multiple micronutrient deficiencies (MMND) often coexist among women of reproductive age in low and middle income countries. They are exacerbated in pregnancy due to the increased demands of the developing fetus, leading to potentially adverse effects on the mother and baby. (5)

Evidence shows that nutrient imbalance before implantation of embryo may result in somatic hypo evolution at birth, and endocrine and metabolic dysfunctions in postnatal life. In addition, the maternal malnutrition could exert a suppressive effect on the maternal and fetal immune response. It could also affect both the proliferation of myogenic precursors reducing the number of muscle fibers and the future reproductive maturation with possible consequent impaired fertility and quality of gametes. The nutritional needs of the fetus depend on the intake of nutrients of the mother, their metabolism, and their distribution through maternal circulation and on the placental transport mechanism. Malnourished mothers may be limited in their ability to adequately support the fetus. (3)

A study found that all 5 composite scores, including full-scale intelligence quotient (FSIQ), verbal comprehension index (VCI), WMI, perceptual reasoning index (PRI), and processing speed index (PSI) were significant lower in stunted and underweight children. The differences in the means of WISC-IV test scores were greatest between stunted and non-stunted children. (4) (Chao Li, Ni Zhu, 2016,)

Poor quality diets are among the top 6 risk factors contributing to the global burden of disease. Specifically, the NCD burden is associated with diets low in fruits and vegetables, high in sodium, low in nuts and seeds, low in whole grains, and low in seafood-derived omega-3 fatty acids. (47) (tammy briace)

**1.4.3 Relationship of MND and Women in agriculture and working sector** (recognized and unrecognized both)

Recognition of Indian women's roles in both agriculture and domestic work is key to improving household nutrition outcomes. In most of rural India, women work as agricultural and family farm laborers, in addition to performing nearly all the childcare and household duties. Longer working hours for women or increased work intensity can have detrimental effects on their own health and, in turn, their ability to care for their children. This leads to poor child- and household-level nutrition outcomes. (33) (Press Trust of India London (2019)

Women's work in agriculture potentially has a negative impact on household nutrition, through a combination of reduced time for care work, seasonal energy deficits, lack of nutrition knowledge and non-availability of variety of food.

Figure- 5 Explains the effects of malnutrition

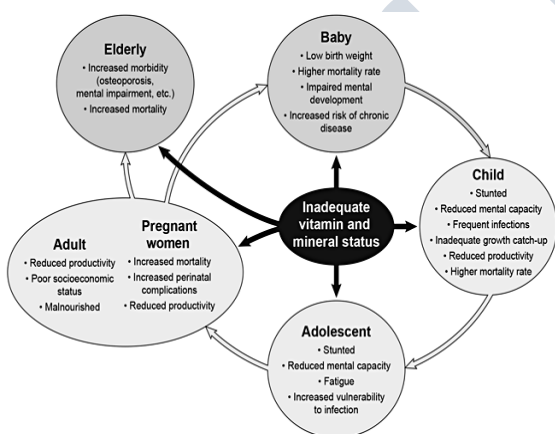
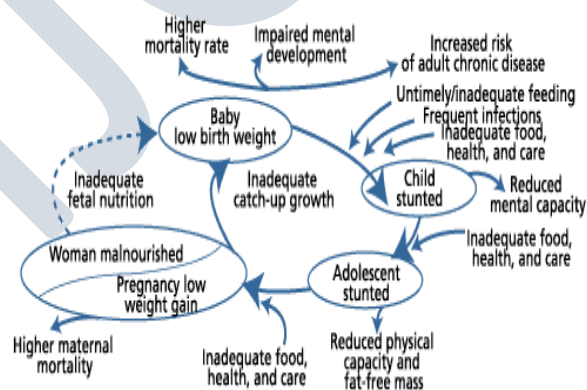


Figure 6- depicts how adolescent malnutrition creates a vicious cycle for generations to come.



(The conceptual framework for the cycle of micronutrient inadequacies across the life span (adapted from ACC/SCN) (1)

Figure 6- depicts how adolescent malnutrition creates a vicious cycle for generations to come. Source: Adapted from the ACC/SCN-appointed Commission on the Nutrition Challenges of the 21st Century.

This is true for urban working women too, in organized or unorganized area both, since a woman is supposed to take care of house hold she is burdened with double duty. Class, caste, and ethnicity play important roles in shaping access to resources, especially land. These factors define authority of women in a house.

Initiative of Global Food Security for promoting specific crops has caused availability of starchy food, distorting markets while promoting obesity and NCDs at the cost of non - availability and cost of healthy foods being unaffordable. (35) ( Rafial perez Global Burden BMJ )

#### 1.4.4 Relationship of MNDs and Women empowerment

The health sector is essential to a stable, functioning economy. Health systems have a positive impact on the economic performance of other sectors in the national economy, through the jobs they generate and from the purchase of goods and services. (47)(Tammy Boyce and Chris Brown, 2019, Eco)

On the other hand, health sector is affected by being over burdened with diseases of infection and NCD.

Women's status and improvements in women's education are associated with positive impacts on nutritional status. The study estimates that improvements in women's status account for 11.61% of global reductions in the proportion of children who are underweight, and improvements in women's education secondary enrolments account for 43.01% of global reductions in the proportion of children who are underweight. Taken together, the two indicators accounted for over half of the reductions in child underweight. This remains true even after twenty years, in spite of all the projects and programs. (44) (Smith I. 2000,)

The fact that women empowerment at every level will bring about massive and positive change in the situation of Malnutrition, has been established long ago, but yet somehow this has not been executed and implemented well, so far.

When women's incomes rise, they tend to invest more in the food, education, and health of their family, causing a ripple effect that can benefit entire communities— Higher female earnings and bargaining power translate into greater investment in children's education, health, and nutrition, which leads to economic growth in the long term. (6)(DFID 2018)

Gender inequality can be a cause as well as an effect of hunger and malnutrition. Not surprisingly, higher levels of gender discrimination are associated with higher levels of both acute and chronic undernutrition. (26) ( Mucha & UNDP (2011-12))

Gender and nutrition are not stand-alone issues with some experts considering women to be the nexus of the agriculture, health, and nutrition sectors. (16) (IFPRI (2011))

Women play a decisive role in the food security, health, and nutrition of their families and this should be considered in the design and targeting of all food security and nutrition actions. While the determinants of good nutrition and health are complex, there are several areas where changes to policy, legislation and planning can play a critical role in empowering women to act as key agents of change for improved nutrition.

These include:

- protecting girl children from early marriage and pregnancy
- safeguarding and increasing women's access to, and control over, incomes and other resources
- exploring innovative approaches to reducing women's time constraints
- enhancing women's understanding of good nutrition
- increasing women's involvement in decision making at all levels

#### 1.5. Economics of Malnutrition

Malnutrition, in all its forms, imposes unacceptably high costs, direct and indirect, on individuals, families and nations. Poor nutrition carries a significant economic burden for individuals and entire economies. This is a major impediment to achieving the 2030

Sustainable Development Goals. The estimated impact on the global economy could be as high as US\$3.5 trillion per year, or US\$500 per individual. These enormous costs result from economic growth foregone and lost investments in human capital associated with preventable child deaths, as well as premature adult mortality linked to diet-related noncommunicable diseases. (11)(cost of malnutrition) Malnutrition decreases the gross domestic product (GDP) in low- and middle-income countries, The study estimates that the economic cost of micro-nutrient malnutrition costs India between 0.8 per cent and 2.5 per cent of its GDP, which is equivalent to \$15–46 billion. The various pathways of malnutrition, cognitive and physical impacts on children, as well as additional medical costs due to ill health. These cumulative effects can reduce GDP by 2 per cent to 11 per cent. In India, the problem of malnourishment is helping to perpetuate the caste system, if nutritional inequalities were tackled in such a way that low-caste children gained the same average nutritional status as their upper caste counterpart, this would close existing caste cognitive differentials by 25 per cent. (19) (Jitendra)\$1 spent on nutritional interventions in India could generate \$34.1 to \$38.6 in public economic returns, three times more than the global average. As one of the fastest growing economies in the world, India requires a strong and healthy workforce to sustain its growth levels. According to NFHS 2 figures, 46% of children under-3 in India were stunted. Today, 18 years later, those individuals form an integral part of the country's workforce and have perhaps been constrained in giving their best to the economy. While the importance of preventing stunting far exceeds the economic aspect, it is important to be aware of all the benefits and returns that investing in nutrition can bring for the country. (20) (Kurrian) Total economic cost of MN is estimated to range from 2-3% of Gross Domestic Product to as much as 16 % in most affected countries, the effects are long term and causes trapping of generations in to poverty.

MN & MND keeps women from reaching their full potential. Malnourished children underperform in school, limiting their future job opportunities. MN & MND adults are less able to work, contribute to local economies, and provide care for their families. MN & MND mothers are more likely to have underweight children, who will in turn have a higher risk of physical and cognitive impairment. This perpetuates a cycle of poverty and economic stagnation. (7) (FAO cost of malnutrition 2014)

### **Conclusion-**

Prevention of MNDs is critical and traditionally has been accomplished through supplementation, fortification, and food-based approaches including diversification. It is widely accepted that intervention in the first 1,000 days is critical to break the cycle of malnutrition; however, a coordinated, sustainable commitment to scaling up nutrition at the global level is still needed. Understanding the epidemiology of MNDs is critical to understand what intervention strategies will work best under different conditions. (1)(Baily RL) The problem of women MN & MND will solve major part of pediatric malnutrition. This requires action from multiple sectors and multiple levels simultaneously. There is a need of high impact pragmatic strategy to tackle undernutrition decision makers need to understand the extent of problem and its determinants, identify areas of intervention and work on it simultaneously. (29)(NH Profile 2015) NHR



Gender inequality can be a cause as well as an effect of hunger and malnutrition. Higher levels of gender discrimination are associated with higher levels of both acute and chronic undernutrition. Gender and nutrition are not stand-alone issues with some experts considering women to be the nexus of the agriculture, health and nutrition sectors. Studies have shown that when women's incomes rise they tend to invest more in the nutrition, education, and health of their family, causing a ripple effect that can benefit entire communities. Higher female earnings and bargaining power translate into greater investment in children's education, health and nutrition, which leads to economic growth in the long term. (26)( Mucha DFID and UNDP 2011)

### **Recommendations-**

It is necessary to develop dietary strategies to optimize nutrition, not only during pregnancy but already when it is programmed, to improve the outcomes of pregnancy, promote growth, healthy child development, reduce the risk of chronic diseases, and slow down the metabolic decline associated with aging. (3) (Castrogiovanni 2017)

Intergenerational transmission of risk for malnutrition is heightened in the presence of social, economic, and gender inequities. The challenges associated with facilitating optimal pre-conception nutrition are rooted in many societal processes and sectors. These need to be tackled by equity focused policies and systems through changes in community capacity building, advocacy, and political will. (35) (Rafael Perez-Escamilla)

Implementation of science research based on complex systems frameworks is needed for understanding how to scale up cost effective, multisectoral interventions that can simultaneously tackle stunting, overweight, and micronutrient deficiencies. International initiatives for food security are now considering balancing programs focused on protein energy malnutrition and micronutrient deficiency with obesity prevention initiatives. (35)(Raffiel BMJ Global Burden ) Direct nutrition interventions, such as promoting breastfeeding, and indirect nutrition interventions, such as social protection, investments in agriculture, and ensuring access to safe water and sanitation, can address malnutrition's underlying causes. (19) (Jitendra)

The Global panel recommends that:

1. Governments should calculate the direct and indirect cost of malnutrition in all its forms for their own country.
2. Standardized metrics must be developed to support more effective communication of findings to policymakers.
3. Viable options for policy and program interventions across the food system must be identified and costed.
4. Establish a national Common Results Framework to shape the monitoring and reporting on progress.
5. Generate rigorous data to support ongoing assessment of cost-effective actions across the food system and food environment.
6. Urgently address knowledge gaps and data deficiencies on the costs and benefits of national investments in infrastructure enhancement; processing and food transformation; wholesale and



retail incentives for delivery of affordable and desirable nutritious and healthy foods; and drivers of dietary choices and policy options for supporting better informed choice. (11)

To address this major challenge, India needs to adopt a multisectoral approach on nutrition and effectively engage its multiple stakeholders in the planning, coordination, implementation, and review stages. This would primarily require an understanding of how different sectors contribute to improvements in nutrition outcomes. There is a need for greater joint planning so that the government can identify ways of making different schemes, particularly core schemes, more nutrition sensitive. A truly multisectoral approach therefore would actively involve all government ministries and departments, civil society organizations and not be limited to nutrition specific but nutrition sensitive interventions. (20) (OOMMEN C. KURIAN)

“There is no copy and paste solution that India can use; I see it as a good thing”. If India is to achieve the WHA and SDG targets on malnutrition and stunting, it needs to take immediate action and build its own unique model for nutrition. By Mr. Yuri Afanasiev, UNDP Resident Representative in India.

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