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Importance of Micronutrient Supplementation Programme in Childhood to Reduce Child Mortality: The Haryana Experience

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The World Health Organization (WHO) estimates that more than 2 billion population of the world is deficient of micronutrients primarily micronutrients are iron, Vitamin A, iodine and zinc and of these, one-third are children below 5 years. Majority of these malnourished children lives in developing countries like India.[1] In India, in terms of the loss of productivity, illness, increased healthcare costs, and death is 1% of Gross Domestic Product (GDP) (loss of Rs. 280 million approximately) per annum due to micronutrient deficiency (MND).[2] The MNDs diseases cause unacceptable high morbidity and mortality in children, especially below the age of 5 years. In India, more than 6000 children below 5 years die per day, and more than half of these deaths are because of micronutrients deficiencies diseases majorly due to deficiency of Vitamin A, iron, iodine, and folic acid. Some of the studies quoted that about 57% of preschool children suffered from subclinical Vitamin A deficiency (VAD).[3] Micronutrients such as Vitamin A, iron, and iodine deficiency in children are considered as the second major risk factor in the global burden of disease.[4] In India, VAD precipitate approximately 0.33 million child deaths every year and due to folic acid deficiency, around 0.2 million children are born every year with neural tube birth defects.[2]

The nutrients that are required in small quantities (microgram) for maintenance of healthy life are called micronutrients. The micronutrients such as iron, Vitamin A, zinc and iodine which are of significant public health importance.[5] MNDs usually occurs when children do not have access food such as fruit, vegetables which are rich in micronutrients, especially green leafy vegetables, animal products, and fortified foods. In India, the micronutrients-rich food does not access because they are too expensive to buy or are locally unavailable or inadequate complementary feeding practices. MND has global health impact because its manifestations become less visible and usually begins to show when the condition is severe and has already led to serious health burdens, that is why the name is hidden hunger.[6] Globally, India contributes to over one-fifth child death, and more than half of child deaths are because of diarrhea and acute respiratory infection (ARI), here comes the role of micronutrients, which play a highly significant contribution in prevention and control of this morbidity.

IRON

Iron is the most important micronutrient that is required for transportation of oxygen in all tissues of the body, especially the brain. Anemia is simple to detect and has been used as the gold standard of iron deficiency severe enough to affect tissue function. Globally, more than 30% of the world's population is affected with the iron deficiency anemia, and it is considered as one of the major MND diseases.[7] The most commonly children are affected with anemia because of the high iron needs for increasing muscle mass and blood volume. Indian children mostly eat staple foods and very little meat that contains low iron or children are infested with worm that causes blood loss mainly by hookworm disease that makes them iron deficiency anemia.[8] The iron deficiency anemia adversely affects the health status of children primarily on behavior and cognitive performance, retarded physical growth, decreases immunity that leads to morbidity and mortality.[9] As per National Family Health Survey (NFHS-3) (2005–2006 in India), the prevalence of anemia in rural children (6–59 months) is 72% while 63% among urban children. This survey also reported that in 24 states, more than half of young children are anemic, including 11 states where over two-third children are anemic. As per NFHS-3 data, the prevalence of any anemia in children: 6–11 months is 81.3%, 12–23 months is 88.5%, 24–35 months is 76.7%, 36–47 months is 65.0%, and 48–59 months is 54.3%.[10]

Vitamin A is another essential micronutrient that helps in maintaining healthy vision, growth, and development of a child. Vitamin A also maintains the integrity of epithelial cells as well as strengthens the immune system of body and reproduction. There are several factors such as low dietary intake containing Vitamin A, malabsorption diseases, and increased excretion during common illnesses which are responsible for VAD. In many parts of the developing countries, VAD is responsible for visual impairment and is considered as a major risk factor for acquired blindness in children worldwide. VAD never directly causes the mortality in children, but diarrhea and ARIs including measles are responsible for mortality in children.[11] Globally, nearly one-fifth of all children suffer from VAD (defined as low serum retinol concentrations) are from South East Asia. Vitamin A supplementation reduces the mortality by 23 % in children (6 months to 5 years) when Vitamin A was given in Vitamin A-deficient areas.[12] NFHS-3 reported that only 18.2% children (6–59 months) received Vitamin A supplements in the last 6 months.[10] Worm infestation leads to both anemia and VAD. Worm infestations such as hookworm and flukes common in children cause chronic blood loss that develops anemia in children. Approximately 40–160 hookworms in the body cause the iron deficiency anemia in children depending on the status of iron status in the body.

IODINE

Iodine is an essential micronutrient daily required 100–150 μg for normal growth and development of a child. For the synthesis of thyroid hormones in the body, iodine is required, and thyroid hormone plays a significant role in cell multiplication. Iodine deficiency in pregnancy can lead to abortions, low birth weight baby, cretinism, stillbirths, congenital abnormalities, psychomotor disorders, and increased the chance of neonatal mortality. Iodine deficiency leads to hypothyroidism, goiter, impaired mental function or mental retardation, and diminished intelligence during childhood.[13] A survey was conducted in 325 districts on iodine deficiency disorders (IDDs); of these, 263 districts were found to be endemic of IDD. More than 71 million people are affected with IDD reason being insufficient intake of iodine.[14] In India, more than 13 million newborn are born with IDD and 6.6 million/year children are born with mental retardation while intellectual capacity is decreased by 15% due to iodine deficiency.[2] According to NFHS-3, in Haryana, only 55% of household were using adequately iodized salt.[10]

Micronutrient supplementation programme is a strategy to deliver the key micronutrients services to the children below the age of 5 years through routine immunization session, every year of the month of April and October–November. In Haryana, during this period, a variety of important services are delivered with focus on the administration of Vitamin A. Doses of this essential nutrient will be given to children aged 12–59 months who have not received Vitamin A in the past 1 month. Other services will include iron and folate distribution to children, deworming, and salt testing for iodine content.[15] In terms of cost, the micronutrient supplementations are very cost effectiveness and the estimated additional cost is Rs. 5.40 per capita per year to control micronutrients deficiencies diseases and Rs. 28.50 per high-risk beneficiary.[3]

Package of services under micronutrient supplementation programme[15]

Vitamin A supplementation

The dose of vitamin supplementation will be given to all children between 12 and 59 months, who have not received the dose in the last 1 month.

The recommended doses in National immunization schedule are as follows:

- The 1st dose contains 1 lac IU is given with routine measles dose, i.e., 9 months completed age
- Next, 8 doses (each dose 200,000 IU) are given after every 6 months.

In the biannual rounds, 2nd to 9th dose of Vitamin A will be included. All children 12–59 months age will be given one full spoon (200,000 IU) of Vitamin A syrup, if not administered 1-month before the round. This is done twice in a year, at interval of 6 months, i.e. April and October–November. This activity will be carried out by Auxiliary Nurse Midwife (ANM) or any other trained health worker with the support of Anganwadi worker and Accredited Social Health Activist.

Deworming

During the biannual rounds, albendazole tablets will be administered to children of more than 1 year age and who have signs or symptoms of worm infestations.

The recommended dose of albendazole:

- Children aged 12–23 months: Single-tablet albendazole contains 200 mg. Tablet should be broken and crushed in the spoon, then mix with safe water/breast milk, and administer to child
- Children aged 24–59 months upward: Single-tablet albendazole contains 400 mg.

Iron folic acid syrup

The recommended dose for 6–60 months: Dose is 1 ml of IFA syrup contains 20 mg elements iron and 100 mcg folic acid and given biweekly given regularly between children having age 6–60 months. The age 6–60 months is decided by the Haryana government for this programme. Some study also recommends intermittent regimens to overcome anemia.[16]

Salt testing for iodine contents

Recommended iodine in cooking salts should be more than 15 ppm. ANM will inform in advance to bring a salt sample from their home while visiting biannual campaign; the activity will be performed once a year. One salt testing kit covers approximately fifty households, and 1–2 salt testing kits per sub-center are sufficient.

CONCLUSIONS

Haryana is the only state which is working to combat against MNDs in India and the first state to launch a micronutrient supplementation programme with a view to overcoming malnutrition in children. However, the implementation of the programme in other states of India is still waiting. The Government of Haryana has responsibility to scale up and promote this program effectively and set an example for other states. The programme becomes successful only when there is an effective implementation of inter-sectoral coordination between other complementary programmes such as Integrated Child Development Scheme and convergence among health and women and child development. This can be made possible with an effective micro-planning, surveillance, capacity building, logistics planning and management and supervision and monitoring at village level (sub-center, Primary Health Center and Community Health Center level), district level, and state level. Without taking these steps, it is very difficult to achieve the goals of eliminating MND diseases from children in the state of Haryana as well as from the other states in the country.

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