Micronutrients: Global progress, technical updates, challenges for micronutrient programming

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Outline

✓ Role of micronutrients in achieving the MDGs
✓ UNICEF’s strategic approach to nutrition programming
  • Global progress of UNICEF-supported micronutrient programmes
  • Technical update on micronutrient programming incl. new areas of programming
  • Programme challenges (supply focused)
Another reason to invest in micronutrient programmes!

Copenhagen Consensus (2008)

- Panel of economic experts, comprising eight of the world’s most distinguished economists (5 Nobel laureates)
- Best ways of advancing global welfare assuming $75 billion at disposal over a four year period

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UNICEF’s strategic approach to MN programming: a life cycle perspective

Why?
• Low birth weight is major public health problem
• Damage occurs before 24 months of age
• Effects of fetal deprivation & early malnutrition are irreversible (*Barker hypothesis*). Affects learning throughout life (*Lozoff*). Adult productivity. Onset of chronic disease in later life.

What?
• Enter pregnancy with better micronutrient status
• Improve micronutrient status during pregnancy and lactation
• Promote breastfeeding and timely/quality complementary feeding
• Improve micronutrient status of children 6-24 months (6-59 mo in emergencies)
• Equity (pro-poor, hard to reach) and gender perspective
How?

Preventative
• Delayed cord clamping
• Food-based approaches
  – Breast-feeding
  – Staple food fortification (*iodized salt*, flour, sugar, oils, condiments), fortified complementary foods, home fortification
  – Dietary diversification
  – Recognize other promising approaches (bio-fortification)
• Supplementation
  – VAS, Iron-folic acid,
• Infectious disease control (e.g. de-worming, malaria)

Therapeutic
• Fortified foods
• Supplementation (VA, Fe, other MNs – Vit C, Vit D)
Global progress: iodized salt coverage


UNICEF
34 countries have now achieved universal salt iodization (USI)

UNICEF provision of potassium iodate has decreased significantly since 1992.
Increasingly industry is absorbing the cost of potassium iodate or governments are subsidizing it. Building private sector and national commitment and capacity to support this transition.
Lessons learned from this experience being applied to other food fortification programmes (e.g. Flour fortification)

**Total kilograms of potassium iodate purchased using UNICEF Resources**
- **All countries (4 year intervals)**
  - **1992-1995**: 625,975 kg
  - **1996-1999**: 459,857 kg
  - **2000-2003**: 553,959 kg
  - **2004-2007**: 159,428 kg
Improved political and regulatory environment

• Position IDD as part of larger national development agenda
• 55 out of 117 countries have enacted legislation that appears to be effective
• UNICEF analyses show that countries with legislation have a greater % consumption of iodized salt compared to those without legislation
• Important for salt producers/private sector – creates a ‘level-playing field’

UNICEF
Stronger partnerships

• More countries are taking concrete steps to introduce universal salt iodization through partnerships with the private sector.

• Salt producers recognize their critical role in providing adequate iodine to the households that buy their product.

• At least 72 developing countries have adopted national public-private partnerships that provide practical mechanisms to raise and sustain commitments to IDD elimination.
Four-fold increase in two-dose vitamin A supplementation coverage
Greatest progress in LDCs

% children receiving two doses of vitamin A

- *East Asia & Pacific: 82
- Sub-Saharan Africa: 73
- South Asia: 71
- *World: 72
- *Developing: 72
- Least Developed: 77
Approx. one-third of affected countries fully protecting children with two VA doses.

Vitamin A Supplementation (priority countries)

% of under-five children who received two doses of vitamin A supplementation

Emphasize efforts to reach rural poor

Figure 1. Children never reached by vitamin A supplementation

Children in poor, rural areas are more likely to be missed

- Boys: 27%
- Girls: 27%
- Rural: 29%
- Urban: 25%
- 1st quintile (poorest 20%): 27%
- 2nd quintile: 25%
- 3rd quintile: 22%
- 4th quintile: 20%
- 5th quintile (richest 20%): 20%

Source: Based on data from MICS for 22 developing countries, 2005 – 2006.
Delivery of vitamin A ensured by diverse delivery strategies

- Fixed site: 19%
- Fixed site + outreach: 10%
- Micronutrient event: 7%
- Polio immunization days: 30%
- Measles supplementary activities: 2%
- Child Health Days: 32%
Countries with Current Child Health Policies adapted to Include Zinc for Diarrhea Management (2009)
Zinc for Diarrhea Available.
Global Progress To Date

Public Sector  Private Sector  Both
Micronutrient topics reviewed: HIV negative & emergencies

- Vitamin A
  - Maternal VA or Beta-Carotene supplementation
  - Post-partum VA supplementation
  - Early neonatal and Infant VA supplementation
- Zinc
  - Preventative zinc supplementation
- Iron
  - Adolescent iron-folic acid supplementation
  - Pediatric iron supplementation (infectious disease context)
- Multiple micronutrients
  - Ante-natal multiple micronutrient supplementation
  - Pediatric multiple micronutrient supplementation
Current ante-natal MN policies & programmes

- Population wide provision of fortified staple foods, e.g. flour and salt

- Iron-folic acid supplementation: daily Fe 60mg + Folic Acid 400 mcg

- Vitamin A supplementation: maternal VA supplementation for ‘treatment’ NOT ‘prevention’

- Women of reproductive age with night blindness or Bitot’s spots:
  - Daily oral dose: 5,000-10,000 IU for at least 4 weeks
  - Or, weekly oral dose: 25,000 IU
  - 1 country (Nepal) treating XN women in pregnancy (23,000 IU weekly)

- Women of reproductive age with severe clinical VAD (whether or not pregnant): Balance risk of teratogenic effects against serious consequences of VAD (for herself & fetus)
  - Treatment schedule: 200,000 IU for two consecutive days followed by 3rd dose after 2 weeks
Ante-natal VA supplementation

- 1 large RCT (Nepal), weekly VAS. 44% ↓ maternal mortality; Anemia ↓, Ante/post natal morbidity ↓, Diarrhea ↓, Labor ↓ (in mother)

- Offers the potential of a completely different tool to add to Safe Motherhood
  - Safe, inexpensive
  - Can potentially be delivered at community level
  - Promises short-term impact

- Results from trials in Bangladesh and Ghana do support earlier findings. Not sufficient evidence to update policy.
But… women of child-bearing age suffer from multiple MN deficiencies

- MN deficiencies exist pre-pregnancy
- Increased micronutrient needs in pregnancy and during lactation. Needs cannot be met through diet.
- MMNs commonly prescribed to pregnant women in industrialized countries

Hypothesis:
- Improving ante-natal and pp MN status will improve pregnancy outcomes (perhaps similar to food supp trials?)
- Ante-natal and post-partum maternal micronutrient status
- MN breast-milk content
- Neonatal and infant survival status (reduce LBW)
- Improved growth and development
Multiple MMN deficiencies occur in anemic 14-18 yr old adolescent girls in Dhaka, Bangladesh.

Ahmed et al, 2005
Multiple MMN deficiencies occur in women in 1st trimester, Sarlahi Nepal

**Graph:**
- Vitamin A: 7%
- Vitamin D: 14%
- Vitamin E: 25%
- Riboflavin: 32%
- Vitamin B6: 40%
- Vitamin B12: 28%
- Folate: 11%
- Zinc: 61%
- Iron: 40%
- Anemia: 33%

*Source: UNICEF, Jiang et al, 2005*
Micronutrient deficiencies are prevalent in 3rd trimester
Haryana, India

UNICEF
Pathak et al; Indian J Pediatr 2004
MMN intake in infants 6-8 mo. in Bangladesh is less than recommended

UNICEF
Kimmons et al, 2005
MN supplementation in CBA + adolescents

• Current policy:
  • **Food fortification** – I, Fe, Folic acid
  • **Prevention** – Fe 60 mg + Fa 400 mcg weekly option for adolescents
  • **Treatment** – Fe 120 mg + Fa 400 mcg daily, 3 mos
  • *Infectious disease control (hookworms and malaria)*

• Significant research & programme experience in Asia:
  • Bangladesh (MMNs) India (scaling up among secondary school girls), Indonesia (Aceh), Philippines & Viet Nam (social marketing – IDA 49%-19% in 12 mos.)
  • Africa (Gambia, Mozambique…)

• Two studies on use of MMNs in adolescents. Small impact on anemia. No change in policy as yet.
UNICEF has supported MMN trials in pregnancy

- Supported efficacy/effectiveness research on impact of Multiple micronutrient supplements in pre-pregnancy and pregnancy
- 9 studies - Bangladesh, B-Faso, China, G-Bissau, Indonesia-L & I, Mexico, Nepal-J&S, Niger, Pakistan & Zimbabwe
- UNIMMAP developed by UNICEF, WHO & UNU (1999)
- Based on pregnancy RDAs
## Composition of UNIMMAP

### Vitamins:
- Vitamin A: 800 RE
- Vitamin B₁: 1.4 mg
- Vitamin B₂: 1.4 mg
- Niacin: 18 mg
- Vitamin B₆: 1.9 mg
- Vitamin B₁₂: 2.6 mcg
- Folic Acid: 400 mcg
- Vitamin C: 70 mg
- Vitamin D: 200 IU
- Vitamin E: 10 mg

### Minerals:
- Iron: 30 mg
- Zinc: 15 mg
- Copper: 2 mg
- Selenium: 65 ug
- Iodine: 150 ug
- Other micronutrients?
- Calcium?
- Vitamin K?
Outcomes of a systematic review of MMNs

Outcomes:

- Small but significant effect on mean birth weight: 22 gms;
- Risk of LBW reduced: RR = 0.91 (0.84-0.99) compared with Fe FA;
- MMN are as effective as Fe FA in improving iron status (using less iron-30 mg Fe compared to 60 mg) but cannot eliminate anemia
- Women entering pregnancy with better nutritional status faired better
- Reduction in vitamins B & D deficiencies; vitamin A and E status improved;
- 1 study assessed (Indonesia) infant death (through 90 days) was statistically significant: 0.81 (0.70-0.95); some concerns about small, NS increases in peri-natal mortality
- Multi-country follow up of children shows improved growth and motor skills
- Next steps: WHO review of findings; optimal composition of MMN (e.g. inclusion of Ca, vit K, other?)
Current policy and evidence for post-partum VAS

- Current WHO Vitamin A Supplementation guidelines (1997) recommend post-partum dosing (200,000 IU) within 6-8 weeks post-partum
- Infant VA status, anthropometry, morbidity, and mortality ↔ No impact
- Breast-milk retinol ↑ 3-8 months post-partum with 200,000 IU
- Conclusions:
  - Opportunity to replenish maternal VA stores
  - No evidence to revise current WHO recommendation
MN policies for neonates & infants

• **Vitamin A:**
  • 50,000 IU for non breast-fed infants or infants of mothers with non-receipt of pp VA dose
    • Currently not implemented

• **Fe: Prevention**
  • If >40% IDA, then Fe12.5 mg + FA50mcg (6-24 mos)
  • If <40% IDA, then Fe12.5 mg + FA50mcg (6-12 mos)
  • Children 2-5 yrs – Fe 20-30 mgs daily
  • If LBW – start at 2 mos. Currently not implemented

• **Fe: Treatment**
  • Daily Fe 30 mgs + 100-400 mcg FA (2 yrs), 3 mos
  • Daily Fe 60 mgs + 400 mcg FA (2-12 yrs), 3 mos
Neonatal & Infant VA supplementation

• Neo-natal VA supplementation (soon after birth):
  • 50,000 IU safe and efficacious; impact on low birth weight babies; Current evidence limited to Asia. No policy change

• Infant supplementation (25,000/50,000 IU with DPT < 6mos)
  • Evidence of safety but not efficacious in terms of mortality effect nor VA status

Conclusion:
• WHO guidelines in process of being updated but no policy change on newborn and infant VA (< 6mo)
• Focus on reaching infants at 6 mos
Pediatric Fe supplementation

• Two large trials dominate recent discussion:
  • **PEMBA** (malarious setting)
    • FeFA arm discontinued due to adverse events noted among iron-replete children
    • PEMBA-2 trial which included iron deplete children showed positive impact
  • Policy implications:
    – In low-medium malaria settings:
    – WHO ID & IDA policy unchanged. Fe supplementation safe.
Policy implications

• In high endemicity (Pemba-like) malaria settings (high perennial transmission of PF malaria):
  • Fe supplementation without malaria interventions associated with increased morb & mortality particularly among iron-replete subgroups. Adverse events highest in 1-6 mos group.
• Therefore,
  • Treat malaria, severe anemia & malnutrition (use IMCI guidelines)
  • Eliminate FA from supplement where SP used (although SP being phased out)
  • Support comprehensive approach to control anemia - malaria, de-worming, infectious disease management, delayed cord clamping, EBF, and expanded health worker training to increase use of IMCI.
  • No Fe supp < 6 mos, unless LBW
  • Promote consumption of nutrient dense/fortified complementary foods
  • Where FCF not available, support home fortification (powders, crushable tablets & spreads). May be safer than medicinal Fe supplements. Studies using low-dose Fe Sprinkles ongoing
Pediatric Zn supplementation

Therapeutic:
- Current WHO policy (2004) to provide Zn supplements (20 mg) as adjunct to diarrhea treatment. Is being scaled up.

Preventative (weekly and daily):
- A number of trials using different dosages, duration, looked at mortality, morbidity and impact on zinc status.
- Evidence suggests an impact among >12 mo children on mortality, esp. SGA infants; consistent impact on diarrhea and ALRI. Inconsistent impact on zinc status.
- Growth: Significant effects on weight & height, effects greater in underweight or stunted children (25 studies 0.72 cm – similar to food supplementation trials)
- Currently no change in preventative zinc policy. However, trials ongoing with modified zinc as part of Sprinkles formulation to determine impact on growth, diarrhea, and ALRI (Cambodia and Peru).
Why MMN preparations for young children?

• High MMN deficiency prevalence among young children. Born to mothers with micronutrient deficiencies
• Sub-optimal micronutrient breast milk content
• Poor diet: low MN content/intake from complementary foods. Multiple MND occur together
• Early childhood assoc. with high MN needs : rapid growth & morbidity
• Could the lack of success of single nutrient supplements be because of multiple micronutrient deficiencies?
WHO/WFP/UNICEF MMN and emergency recommendations

• Recognizes that MN needs for young children to be adequately met

• First critical condition is that general food aid rations are adequate and well balanced in contents, distributed regularly and in sufficient quantities

• Need to consider additional needs for young children
  • Provide MMN preparation containing 1 RNI/daily or 2 RNI/weekly of 10-15 vitamins and minerals to all young children when MNDs are likely to exist pre-emergency (depending on availability of fortified food aid)
  • Preferably in a form that is ingested together with food (in-home fortification)
  • Continue VAC distribution and Zn as adjunct for diarrhea treatment
  • Many countries introducing multiple micronutrient powders as part of emergency response but also as part of routine programming
Multi Micronutrient Powder (MNP) for children 6 – 24 months

• Most advanced in terms of research; proven impact on anemia among children (~45% reduction)
• Good acceptability of use in field settings
• Affordable and easy to use
• Number of commercial suppliers available
• MNPs are a new approach which has potential to improve complementary feeding practices
• Effective even when used intermittently and flexibly
• Distribution schedule should be based on individual country context
MNP composition and use

• Target groups:
  • Emergencies: 6-59 months
  • Extend use to routine: 6-24 months - period of rapid growth and development and highest requirements

• Interest to expand to other groups: school age children, adolescents, pregnant and lactating women. Now recommendation limited to young children.

• Use of current formulation of MNPs not recommended in malarious settings; research ongoing on modified formulations

• Based on existing evidence, MNPs alone are unlikely to reduce stunting and wasting

• Choice of preparation: 2 formulations available via SD (5 MNP and 15 MNP). There are cost implications!
Positioning of MNPs

• Relevant - MDGs, food and economic crisis, national human capital development

• Being scaled up in Asia (+30 projects) and Latin America (+5 projects)

• Successful if
  • Part of infant and young child feeding, not stand-alone
  • Part of lifecycle approach for anemia prevention
  • Delivered together with ongoing MN efforts (VAS, Iodized salt)
  • Delivered, accepted by the caregiver and used by child
  • Reaching intended target group
  • Results used to motivate families, programme managers, and decision makers
  • Scaled up and sustainable
Constraints
Supply challenges

• Time-lag between policy development and product availability, and programme implementation:
  – Need to work closely with suppliers (information sharing on programme needs and latest developments, e.g. Pediatric Fe consultation which led to Sprinkles development)
  – Develop supplier base

• Use of tried-tested products (evidence-based, peer reviewed)

• Clarity on technical specifications (food v. pharma)

• Stability testing (even of expired products)

• Quality assurance esp. as countries move towards local procurement. Central v. local procurement

• Understand national regulatory requirements, IPs

• Weak supply chain (Accenture/UNICEF VA) and product availability (Fe 30mg for pediatric treatment?)
• Safety (choking, labeling)
  – particularly as efforts to bring supplies closer to communities (assure product availability)
  – chewable tabs, multi-dosing dispensers

• Acceptability: taste, appearance, organoleptic properties/interactions, packaging (oxidation, clumping), cultural considerations (gelatin)

• Standardized products (one size fits all?)
  – Scientific developments require more customized products (HIV+)
  – Same product for adults v. children, pregnant v non-pregnant: double the dose?
  – Standardized v. customized packaging, cost considerations, timely availability

• Not commercially available

• Plethora of MN products! Countries need guidance
Local Names

- Monimix – Bangladesh
- Pushtika – Bangladesh (WFP)
- M’sau Vitamin – Cambodia
- Ying Yang Bao – China
- Anuka – India (MI)
- Vita Shakti – India (MI)
- Vitalita – Indonesia
- Taburia – Indonesia
- Gulazik – Kyrgyzstan
- Bichel Tejeel – Mongolia
- Vita – Mix – It – Nepal
- Baby Active – Pakistan
- Jeewaka – Sri Lanka
RISING EFFICIENCY IN MANAGING SUPPLIES

- Forecasting:
  - Erratic funding
  - Issues with population estimations
  - Emergencies

- Stock outs
Thank you