

Vitamin A and the Millennium Development Goals



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Introduction

- Vitamin A is an essential fat soluble vitamin, obtainable from two major food sources;
 - animal products, such as milk, eggs, liver, fish and poultry, and
 - plants in a precursor form as beta-carotene in green leafy vegetables, pawpaw, mangoes, pears and any yellow-brown fruit.

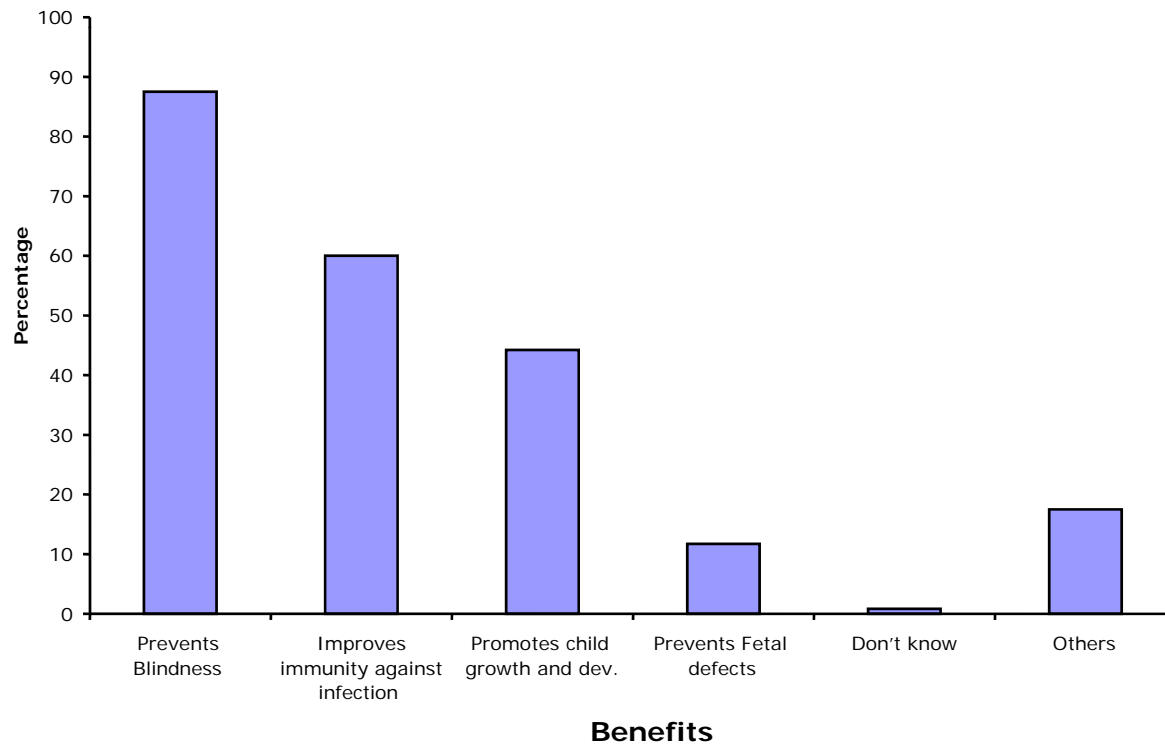


Introduction (Contd.)

- Some benefits of vitamin A within a physiologic level include:
 - cellular differentiation,
 - Maintenance of epithelial structures integrity and
 - immunologic functions.
 - gene transcriptions

VA coverage survey 2006

- Public knowledge about benefits of vitamin A





Chemistry and functions of vitamin A

- Occurs as a preformed natural retenoid and precursor carotinoid with biological activity of retinol.
- During digestion, retinyl esters, carotenoids and lipids from foods are emulsified by pancreatic enzymes released by the actions of bile salts
- Vitamin A is absorbed through facilitated diffusion at the brush border of intestinal mucosa (enterocytes) in the form of retinol



Chemistry (contd.)

- Absorption of carotenoids decreases in the situation of low dietary fat intake,
- Thus exophthalmia is common in cultures where most vitamin A is consumed as carotenoids,
- Penetration of vitamin A across the cell membrane into the nucleus is aided by both intra-cellular retinol binding protein (CRBP) and retinoic acid binding protein (CRABP) and
- These carrier proteins render the fat soluble retinoid more water-miscible and prevent their interactions with cell membranes.



VAD: Classification

- VAD occurs when the serum retinol level of an individual or group falls below 0.70 micromole/L
- Moderate VAD is between 0.70 to 0.35 micromole/L
- Severe form is any level below 0.35 micromol/L



VAD: Causative factors

- Insufficient intake due to poor content of the diet of individual or group compared to the physiological need,
 - Poor food choices
 - Increased physiological demand during Pregnancy and rapid growth in infancy and childhood or
- marked losses due to illnesses or absorptive disorders.



VAD: Cellular level effects

- Growth cessation with weight loss
- Alteration in differentiation/morphology of epithelial and mesenchymal tissues
- Epithelial tissues changes include;
- loss of goblet cells,
- Columnar epithelial cells become replaced by squamous cells
- absence of mucous production and
- keratinization of epithelial cells, i.e. squamous cells become dry, thickened, scaly and rough



VAD: Visual effects

- visual impairment resulting from loss of normal functions and morphology of cornea, conjunctivae as well as retina
- Decreased levels of Retinoic acid and retinaldehyde affect retina maintenance as well as formation of visual pigment, rhodopsin.



VAD: Liver Dysfunction Effects

VAD is observed to be associated with:

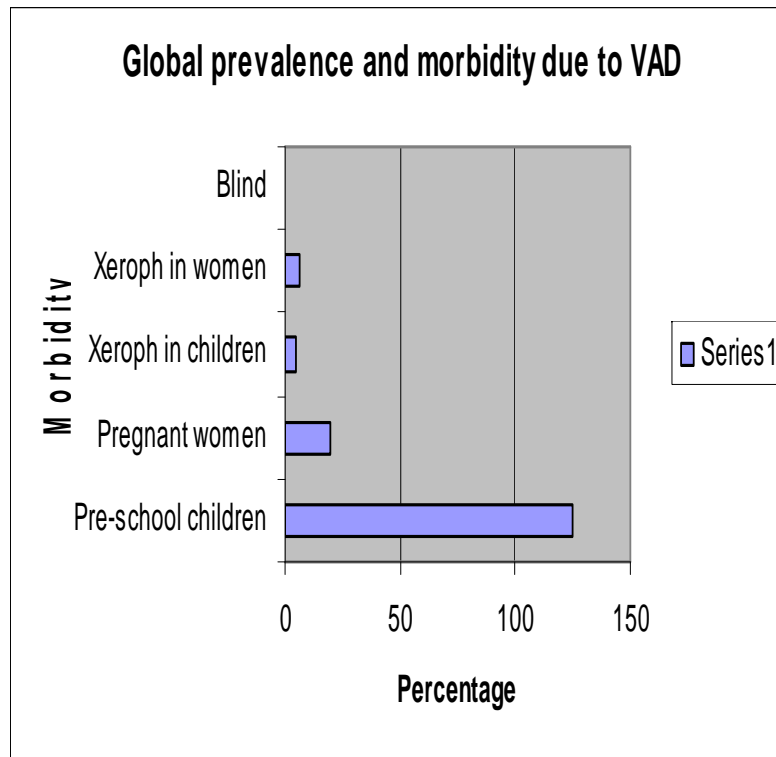
- decline in plasma retinol concentration,
- disturbances in hepatic retinol metabolism,
- reduction in retinol-binding-protein (RBP),
- accumulation of hepatic retinyl esters,
- decrease in lecithin;
- depletion of retinol acyl transferase (RAT)
- liver becomes vulnerable to infections and
- gross dysfunction of glycogen formation and storage.



VAD: Immuno-systems effects

- Promotes the occurrence of infections
- Poor response of (Type 2 and T-cell dependent) antigens to infections
- Decrease in T-cell mediated cytotoxicity and delayed-type-hypersensitivity

Global VAD Prevalence and some of its consequences



- globally 25% of pre-school aged children (125 million) and 18% of pregnant women (20 million) are vitamin A deficient;
- About 4.4 million children and 6.2 million women suffer from xerophthalmia.
- WHO estimates that 250,000 to 500,000 children become blind every year due to VAD
- Half of those that become blind die within 12 months
- Twenty-six percent of vitamin A deficient children are said to be in Africa



VAD: Mortality Rates

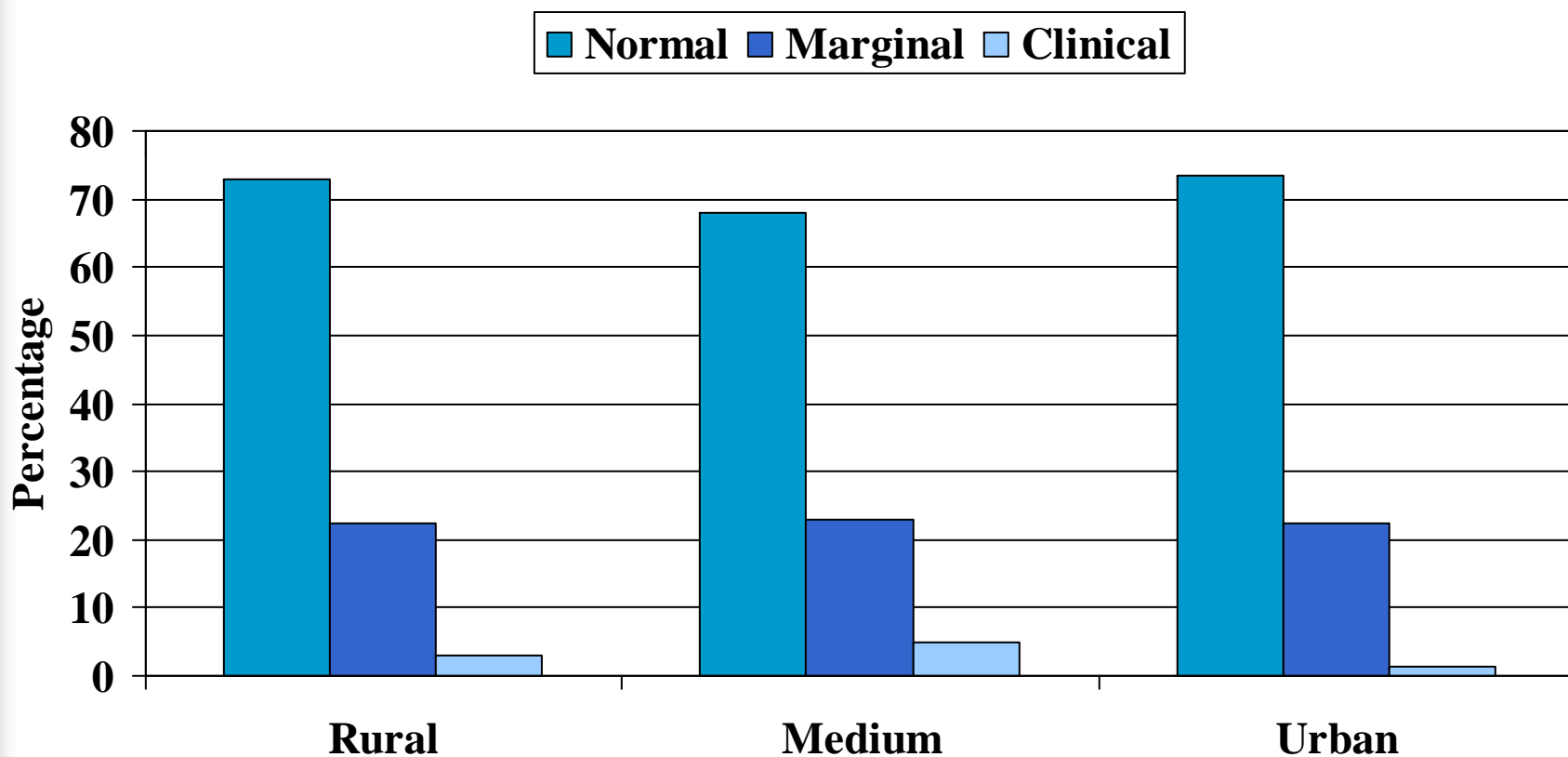
- About 2.5 million deaths annually,
- Likely cause of 23% childhood deaths,
- Over 50% suffer from severe complications of measles.
- VAD is a major contributor of 20 -24% of child mortality from diseases like diarrhea, measles and malaria.



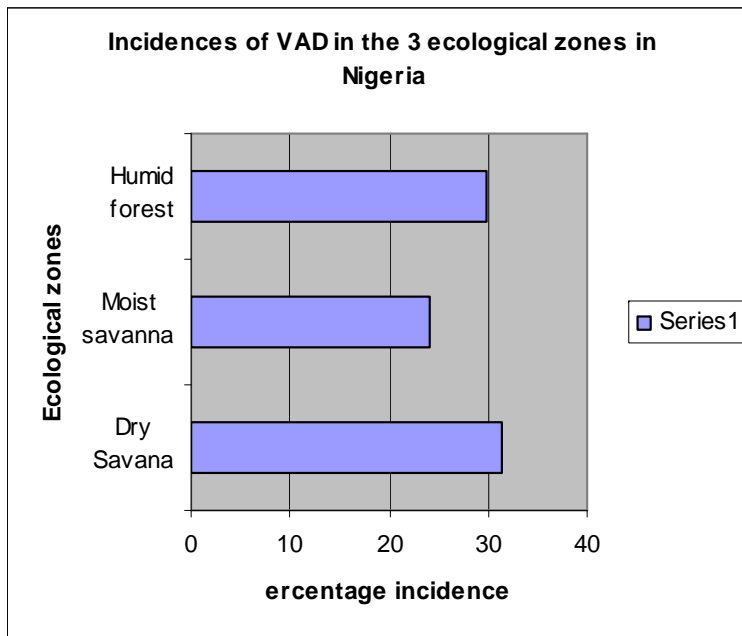
VAD in Nigeria

- Nigeria is one of the top six countries in the world that account for the largest concentration of vitamin A deficient and xerophthalmic children
- 29.5% of Nigerian children less than 5 years are vitamin A deficient
- The problem is nationwide and of public health concern

Vitamin A Status of all surveyed children under 5 by sector

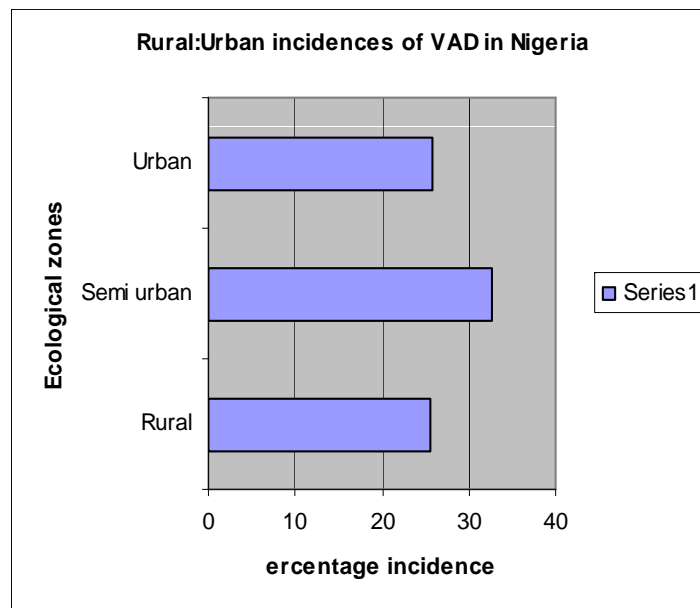


VAD in the 3 ecological zones of Nigeria



- 31.3% in the dry savanna;
- 24.0% in the moist savanna; and
- 29.9% in the humid forest (9).

Rural :Urban incidences of VAD in Nigeria



- rural (25.6%),
- semi-urban (32.6%)
- and urban centers (25.9%),



VAD and MDGs in Nigeria

- **Goal 1: *Eradication of extreme poverty and hunger***
- VAD contributes to stunting, innate immune systems and visual impairments especially in children less than 5 years as mentioned above.
- Studies have shown “that about 6% of the productivity of adult manual labor is lost due to stunting and children who are stunted do on average 10% worse in school than their peers” (10).



VAD and MGDs in Nigeria (contd.)

- Reducing childhood growth retardation due mainly to VAD will result in more productive adults, intellectually and physically.
- Physically strong and intellectually productive adults will no doubt contribute appreciably to the attainment of MDG1
- VAD leads to household spending on health care, and depletion of household financial resource thereby impeding on the attainment of MDG1



VAD and MDGs

- **Goal 2: *Achieve Universal Primary Education***
- VAD affects school enrolment due to delayed milestones
- VAD promotes poor school attendance/ increased rate of absenteeism.
- Lean primary education resources are directed toward medical care



VAD and MDGs

- **Goal 3: *Promote gender equality and empower women***
- ***means maximum attention to peculiar physiological needs and rights of women;***
- ***menstruation, pregnancy, and lactation place , a lot of demands for micronutrients store especially vitamin A and iron on women of childbearing age***
- **Therefore, improving maternal store of vitamin A leads to improved maternal health and productivity, including reduction in disability like night blindness**



VAD and MDGs

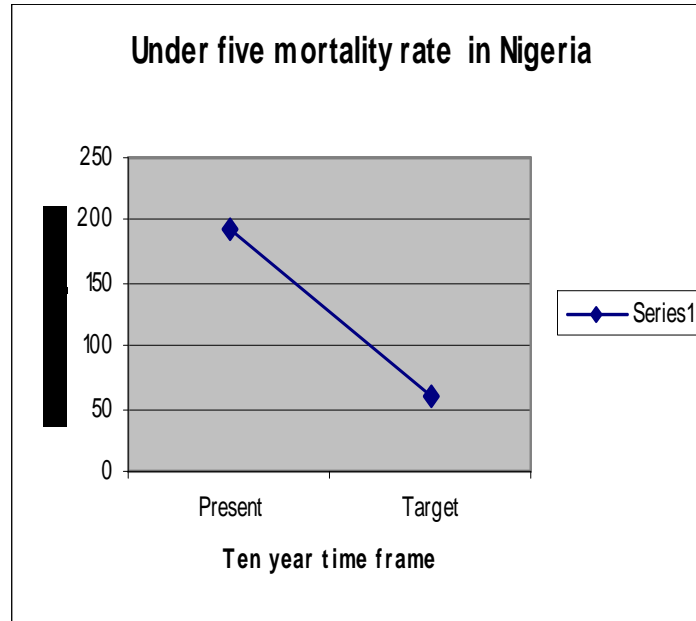
- **Goal 4: *Reduce Child mortality***
- ***Meta-analyses demonstrate that VAD is responsible for:***
 - ***50% measles related deaths,***
 - ***25% diarrhea related deaths and***
 - ***33% all cause mortality of under-five children.***
- ***“Children 6-59 months old living in vitamin A deficient areas who received vitamin A supplement were on average 20-30% less likely to die from any cause than children not receiving supplements”***
(8)



VAD and MDGs

- Controlling VAD in Nigeria can result to:
- Reduction of current under five mortality rate of 197/1000 to about 59.1/1000 live births.
- Saving about 489,821 deaths of under five children annually
- Reduction in complications from measles, malaria and other infectious diseases.
- Improved recovery and disease outcomes especially severe adverse effects of measles, malaria and diarrhea.

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VAD and MDGs

- In Nepal under five mortality fell from 158/1000 to 91/1000 live births over a 10 year period (1987-1991 and 1997 to 2001); a decline of 42% (8).
- Similarly Bangladesh had a decline of 38%
- Tanzania, another sub-Saharan African country has experienced the same feat.
- High V A coverage (>80%) of the under five is one of the veritable tools for achieving the MDG4



VAD and MDGs

- *Goal 5: Improve Maternal Health*
- *global prevalence of VAD among women is about 18%,*
- *about 20 million pregnant women suffer from VAD and 6.2 million suffer from xerophthalmia (8).*
- *A study in Nepal revealed that “pregnant women receiving a weekly supplement of 10,000 I.U. of vitamin A were 40% less likely to die than those receiving placebo”. VAD is said to contribute to about 13% maternal deaths*



VAD and MDGs

- It has been observed that there is either unchanged or worsening trend in sub-clinical vitamin A in sub-Saharan Africa compared to other regions of the world.
- Maternal health can be greatly improved upon to achieve the MDG5, through improved and sustained vitamin A programming



Interventions for VAD

- Requires;
- a three pronged approach namely supplementation, fortification and food diversification (bio-fortification) of staple crops.
- A long term coordinated leadership with effective partnership across key sectors

Vitamin A supplementation strategy



- In Bangladesh, Nepal and Tanzania, strong partnership accounted for the attainment and sustenance of high coverage; with the resultant decline of under-five mortality rates of 38%, 42% and 30% respectively over a ten year interventions



Interventions for VAD (contd.)

- VA Supplementation:
- Key components for successful vitamin A supplementation include among others:
 - Extended outreach services through fixed health facilities, especially in hard to reach remote rural areas.
 - Effective monitoring and supervision activities,
 - Adequate logistics arrangements, communications, community mobilization and sensitization.

Interventions for VAD (contd.)



- Training and supervision of health workers with the aim of providing sound technical skills.
- Adequate and timely supply of supplement to the target population, through well planned twice yearly out reach services.
- Broad based partnership with free or subsidized vitamin A capsules supply.
- Strong advocacy and efficient data generation and usage.
- Optimal breast feeding and appropriate complementary feeding

Interventions for VAD: Human resource development



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Interventions for VAD (contd.)

- *Fortification*; can be targeted at:
- Common staple foods like flour, vegetable oil, palm oil, sugar and powdered milk/ beverages.
- Infants and young children foods.
- Production of vitamins and mineral mixes in sprinkles or powdered.
- Pastes containing vitamin A in combination with protein and fats



Interventions for VAD (contd.)

- Proposed key issues for satisfactory vitamin A fortification in Nigeria include:
- Strong advocacy for adequate resources supported with appropriate policies.
- Active and continuous participation of the private sectors especially the foods industries.
- Building human resource with the capacity to advance food fortification agenda.
- It can be summed up that food fortification is “one of the most cost-effective interventions and one that could achieve scale rapidly if foods commonly consumed by a large proportion of the population were fortified”.

Future Thrust for VA coverage



- The future thrust should aim at the development of different interventions to the diverse needs of the people in accordance to the demographic and disease patterns.
- Programs especially supplementation should aim at reaching at least 80% of the target population.
- Combination of strategies should be reinforced with optimal breast feeding practice.
- Ongoing effective progress monitoring especially at few years interval (2-3 years) is very crucial.
- Agreed target coverage and process indicators including data collection, analysis and usage will help the program tremendously.
- Promoting the consumption of vitamin A rich foods in also very important.



Conclusion

- In conclusion, VAD is very much of a public health importance in Nigeria (NFCNS 2001 -2003) with high under-five mortality rate of 197/ 1000 live births.
- Continuous high prevalence of VAD in the country, will impede the attainment of MDGs4 &5
- This can be successfully accomplished through strategies mix, partnership building, community awareness and ownership, governments commitments backed with appropriate policies with the unflinching supports of the private sectors especially in the foods industries and international agencies including donors.



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Thank You
For Your
Attention