

GUEST EDITORIAL

OPTIMAL BREASTFEEDING: SOLID FOUNDATION TO TRANSFORM THE NUTRITION LANDSCAPE OF AFRICA FOR NATIONAL DEVELOPMENT



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INTRODUCTION

Nutrition Landscape of Africa

Nutrition forms the foundation for good health and wellbeing of people and nations. The nutrition landscape of Africa shows that many African countries are not on course to meeting the global nutrition targets. Only 5 out of 54 African countries are on course to achieving the global targets of 40% reduction of under-five stunting [1]. Not a single country in the African region is on course towards meeting the target set for 50% reduction of anemia in women of reproductive age (WRA) [15-49 years], 30% reduction of low birth weight and halt in the rise of diabetes and obesity among men and women [1]. Reports show that Africa has the 2nd highest prevalence rates of under-five stunted and wasted children (2.9%) in the world as against 0.2% in Europe [1]. The prevalence of stunting in Africa is 29.1%, which is higher than the global average of 21.3% [1]. The region accounts for about 39.4% of the stunted, 24.9% of the underweight and 10.3% of the wasted under five children globally [1]. As at 2018, more than one third of all stunted under five children and about one quarter of all wasted and overweight under five children in the world live in Africa [2]. Africa is the only region in the world where the number of stunted children has risen between 2000 and 2018 (50.3 million stunted children in 2000 to 58.8 million in 2018[2]. Stunting affects greater percentage and number of under five children in the African continent.



Figure 1: Stunting in Africa

Source: <http://www.thissierraleone.com/over-300000-sierra-leone-children-malnourished-official/>

Stunting is the devastating result of poor nutrition in *utero* and early childhood. It has adverse irreversible effect on cognitive and physical development of the child and lowers the child's ability to contribute effectively to nation building. Stunted children may never attain their full possible height and their brains may never develop to their full cognitive potentials. They begin life at a marked disadvantaged position of irreversible effect of stunting on their cognitive and physical development. They face learning difficulties in school, earn less as adults and face barriers to participation in their communities and can never attain their full potentials. The devastating effects of stunting on the child can last a lifetime and even affect the next generation leading to intergenerational cycle of malnutrition.

In addition to stunting, there is an emerging face of malnutrition in the form of childhood overweight and obesity in Africa translating to double burden of malnutrition. Up to 9.5 million under five children in Africa are overweight as at 2018 [2]. Africa has witnessed a significant increase in the number of overweight under five children between 2000 and 2018 (6.6 million in 2000 to 9.5 million in 2018) [2]. Overweight increases the risk of diet-related non-communicable diseases like diabetes, cardiovascular diseases and hypertension later in life.

The African regions also face a burden of obesity and diet-related non-communicable diseases. An average of 8.6% of adult women (18years and above) and 8.3% of adult men live with diabetes, while 18.4% of women and 7.8% of men live with obesity [1]. Eight out of 20 nations in the world with fastest rising rates of adult obesity are in Africa [3].

With the worrisome nutrition picture of Africa, appropriate nutrition interventions need to be scaled up in African countries to tackle malnutrition. While malnutrition can manifest in many ways, the paths to prevention include adequate maternal nutrition before and during pregnancy and lactation, optimal breastfeeding in the first 2 years of life, nutritious diverse and safe foods in early childhood, healthy environment including access to basic health, water, hygiene and sanitation services as well as opportunities for safe physical activity [2]. If African countries can key into these pathways, the prevalence of malnutrition will significantly reduce in the continent. This Editorial looks at optimal breastfeeding in the first 2 years of life as a pathway to preventing malnutrition and transform the nutrition landscape of Africa for national development.

BREASTFEEDING

Breastfeeding is the natural way to feed the baby with mother's milk (breast milk), which is produced from the breast. Breast milk is nature's perfect food. Breastfeeding alone is a complete nutrition source for infants for the first six months of life because breast milk contains all the essential nutrients and bioactive components needed by the infant for the first six months of life. Good breastfeeding practices include:

- Early initiation of breastfeeding within one hour from birth.
- Exclusive breastfeeding for the first 6 months of a baby's life.

- Continued breastfeeding from 6 months with adequate complementary food from 24 months and beyond.

Mothers should initiate breastfeeding within one hour from birth to facilitate breast milk production. Sucking of the breast by the baby sends signal to the mother's brain, to stimulate production of the hormones, prolactin and oxytocin that help in milk production and ejection. Prolactin stimulates milk biosynthesis within the alveolar cells of the breast while oxytocin stimulates contraction of the myoepithelial cells that surround the alveoli, causing the milk to be ejected into the ducts leading to the nipple. There should be immediate skin to skin contact between mother and the baby shortly after birth by placing the baby on the mother's chest or stomach to help initiate early breastfeeding. The baby should be positioned properly for effective sucking and breastfeeding. The mother should hold the baby close to her belly, with the baby facing the breast, and the baby's ear, shoulder and hip in a straight line (belly to belly). The baby's mouth should open wide just before latching to the nipple so that the nipple and as much of the areola as possible are in the mouth. The baby can then suck properly to get breast milk and satisfaction. Breastfeeding should be on demand by the baby and not on strict schedule. The baby should be fed on one breast until it is empty before offering the second breast. This will help the baby get all the nutrients in breast milk. Initial sucking takes the baby to fore milk, which is less concentrated in nutrients with much water to quench thirst. Continuous sucking takes the baby to hind milk, which is more concentrated. The baby should suck the colostrum, which is the first yellowish milk, produced by the breast. This is because it contains all the nutrients and antibodies needed for healthy growth. The colostrum serves as the baby's first immunization.

EXCLUSIVE BREASTFEEDING

World Health Organization (WHO) recommended that breastfeeding alone (Exclusive Breastfeeding) should be the source of infant nutrition to meet all the nutritional needs of the infant for the first six months of life. Exclusive breastfeeding is the act of feeding an infant with only breast milk and nothing else INCLUDING WATER except drops or syrups consisting of vitamins, mineral supplements or medicines when medically prescribed [4]. Babies should be exclusively breastfed for the first six months of life because breast milk provides all the energy, nutrients and immunological factors that an infant needs for the first six months of life. The practice of giving water and other liquids such as teas, sugar water, juices and herbs to breastfed infants within the first six months is widespread throughout the African countries. In most African countries, breastfeeding is culturally practiced by mothers; however, the idea of exclusive breastfeeding is contrary to the cultural norm. This explains why the exclusive breastfeeding rate in Africa is still low (37% as at 2017) [5]. Mothers hold tenaciously to giving water as soon as baby is delivered because they believe that water is essential for life and should be given to baby to quench thirst, relieve pains and make baby comfortable. Mothers should be strongly discouraged from the practice of giving water and other fluids with breast milk within the first six months of a baby's life because:

1. the water content of breast milk is high enough (88.1%) [6] to meet the water requirement of the baby. The milk, which comes first during sucking, the fore milk, contains more water than the one which comes later (the hind milk) so the initial breastfeeding quenches thirst. The water in breast milk exceeds the infant's water requirements in normal conditions and is adequate for exclusively breastfed infants in hot, dry climates. Studies indicate that infants exclusively breastfed for the first six months of life do not require additional fluids even in countries with extremely hot temperature [6].
2. displacing breast milk with water and other fluids can adversely affect the infant's nutritional status, survival, growth and development. This is because the fluids (water and other liquids) fill the infant's small stomach capacity with no room for the baby to take the nutrient-rich breast milk that will support optimum growth.
3. water and other fluids are sources of contamination, illness and repeated hospital visits for the baby. Infants are at great risk of exposure to diarrhoea-causing organisms through water and feeding implements as many communities in Africa do not have access to safe drinking water.

Serious campaigns should be mounted in communities to discourage mothers from giving water and other fluids to babies before six months of life. Such campaign should carry slogans like **“water is not healthy for babies less than six months”**. Health workers should be educated to be convinced that breast milk meets the water requirements of an exclusively breastfed baby for the first six months of life so that they can pass the correct information.

BREAST MILK

Breast milk is mother's natural milk prepared by nature as the perfect food for human infants for the first six months of life. The milk is produced in small clusters of cells called alveoli from where it travels down through the milk ducts to the nipples for breast feeding the baby. Only a woman can produce breast milk. It cannot be replicated in any laboratory and there is no man-made equivalent of the milk. Breast milk provides all the nutritional needs of the infant for the first six months of life. It continues to provide up to half or more during the second half of the first year, and up to one third during the second year of life.

COMPOSITION OF BREAST MILK

Breast milk contains water, fat, proteins, carbohydrates, minerals, vitamins, some hormones, enzymes, stem cells, growth factors essential fatty acids and immunological factors that play vital roles for adequate development and growth.

Water

Breast milk is made up of about 88.1% water [6]. Breast milk alone provides all the water required by an infant for the first six months of life to quench thirst and flush out excess solutes. High concentration of water is contained in the fore milk.

Proteins

The proteins content of breast milk is 0.9% [6]. The principal proteins in breast milk are alpha-lactoalbumin, lactoferrin (apo-lactoferrin), immunoglobulin A (IgA), lysozymes and serum albumin). Many of the breast milk proteins cannot be replicated. The proteins contribute to its unique qualities of supporting growth and providing antimicrobial properties for the infant. Breast milk proteins provide adequate quantity and quality of amino acids for the growing infant. Breast milk protein is divided into whey and casein fractions. Whey protein is soluble and easily digestible. It consists of anti-infective proteins, which help to protect the infant against infection. Casein protein forms thick indigestible curds in baby's stomach because of its molecular structure. Breast milk contains more of whey protein than casein and this makes the protein almost completely digestible. The whey to casein ratio of breast milk fluctuates between 80:20, 70:30, 60:40 and 50:50.

The proteins present in breast milk make nutrients in the milk to be utilized exceptionally well. Some of the proteins bind essential nutrients to help keep them in solution and facilitate their uptake by the intestine mucosa. Alpha-lactoalbumin binds divalent cations (Ca & Zn) and may facilitate the absorption of essential minerals. Folate-Binding Protein (FBP) binds folate to facilitate folate uptake and bioavailability by forming FBP complexes. Breast milk folate when bound to protein is highly absorbed intact through permeable infant intestine. Lactoferrin binds iron to facilitate its absorption from breast milk. Lactoferrin is structurally similar to transferrin. Haptocorrin binds vitamin B₁₂ and other corrinoids to facilitate their absorption. Some of the proteins in breast milk are nucleotides, which are more commonly produced during the night to help the baby sleep well.

A multitude of proteins in breast milk have inhibitory activities against pathogenic bacteria and other microorganisms. They include immunoglobulin, lactoferrin, lysozyme and lactoperoxidase. Some act independently, others act synergistically to produce multilayered defense system to boost immunity of breastfed infants. This is why exclusively breastfed infants hardly suffer from diarrhoea and make frequent visits to hospitals. The major type of immunoglobulin in breast milk is secretory immunoglobulin A (IgA). This is the primary antibody in breast milk. It coats the baby's lungs and intestines, sealing them to prevent germs from entering the body and bloodstream. This is a very strong immune support for the baby. Immunoglobulins are natural immune substances passed from the mother through breastmilk to help protect against common cold, ear infections, vomiting, diarrhoea and other potentially dangerous infections. Lactoferrin protects the baby's intestine from infection. Alpha-lactalbumin protects babies against cancer. In an acidic environment as the stomach, alpha-lactalbumin unfolds into a different form and binds oleic acid to form a complex called HAMLET that kills tumor cells to protect baby against cancer.

Some milk proteins have prebiotic activity. They stimulate the growth of beneficial bacteria, lactobacillus bifidus (probiotics) in the gut to limit the growth of several pathogens by decreasing intestinal pH (bifidus factor). Breastfed infants have fewer

potentially pathogenic bacteria (E – coli, bacteroides, campylobacteria and streptococci) but more lactobacilli and bifidobacteria (beneficial bacteria).

Fat

Breast milk contains 3.8% fat [6]. Milk fat provides a dense source of energy for infants to meet the high energy demands of growing cells and tissues. Breast milk has high levels of polyunsaturated fatty acids (PUFA). The PUFA are important for formation of healthy blood vessels and protects breastfed infants against high blood pressure and increased body weight. The PUFA are necessary for development of brain, nervous system and vision. Breast milk contains the two most important PUFA necessary for brain development and healthy growth. They are:

- Docosahexanoic acid (DHA) obtained from alpha linoleic acid (Omega – 3 –fats).
- Arachidonic acid (ARA) obtained from linoleic acid (Omega - 6 –fats).

The omega – 3 – fats play an important role in brain, nerve and eye development. It is extremely difficult to meet the infant’s requirements for brain growth without adequate DHA. Omega – 3 – fats also help keep the immune system healthy. Omega – 6 - fats help in promoting immune health and blood clotting. Breast milk has high levels of polyunsaturated fats (eicosanoic, arachidonic and gamma linoleic), which help reduce risk of child being infected with HIV especially when nursed by HIV positive mothers. PUFA stimulate and regulate appetite in babies so that the infant does not consume too much food to develop a lot of fat cells that will predispose the baby to obesity and diet related non communicable diseases (diabetes, cardiovascular diseases, hypertension).

Carbohydrate

Breast milk contains 7.1% carbohydrates [7]. The main carbohydrate in breast milk is milk sugar known as lactose. Other carbohydrates found in breast milk in remarkable quantity are the oligosaccharides, known as human milk oligosaccharides (HMOS). Human milk oligosaccharides are prebiotic agents that selectively encourage the growth of beneficial (probiotic) organisms (bifido bacteria and lactobacilli), that protect the baby’s gut and help fight diseases like infant diarrhoea. Human milk oligosaccharides prevent infection from entering the baby’s bloodstream and lowers the risk of brain inflammation in babies.

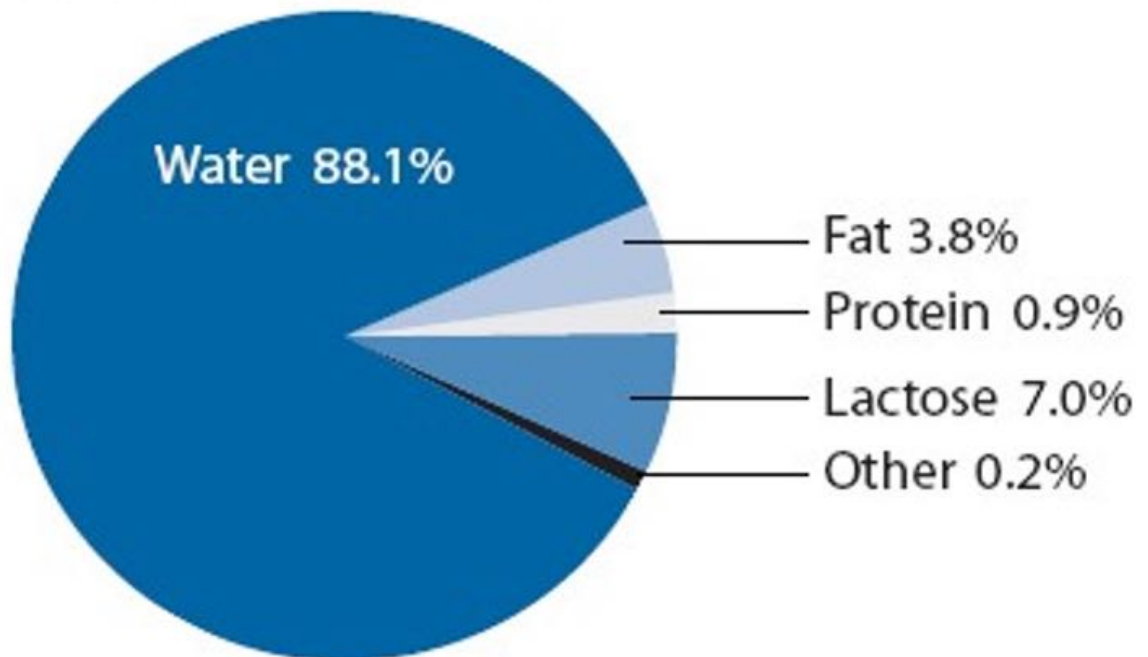


Figure 2: Nutrient composition of breast milk

Source: LINKAGES PROJECT, FAQ SHEETS 5: 2004.

Vitamins and Minerals

Breast milk contains just the right quantity and quality of vitamins and minerals needed for healthy growth of the baby and brain development. Brain develops rapidly in the first 2 years of life, which coincides with the period of breastfeeding. The vitamins and minerals and their roles in brain development are as follows:

- Iron- brain cell formation.
- Zinc- DNA synthesis, neurotransmitter release.
- Copper- metabolism of iron (ceruloplasmin) needed for brain development.
- Selenium-acts as an antioxidant to ensure proper development of the brain.
- Iodine – cell proliferation.
- Magnesium – provides neuroprotective effect to the brain.
- Vitamin A- produces the pigments in the retina of the eye for good eye sight.
- Folate – DNA methylation, neural tube closure, Glial cell proliferation.
- Vitamin B₁₂- Epigenetics (methylation reactions), neural tube defects (independent from folate), Glial cell proliferation and myelination, signal transmission.
- Vitamin D – Deficiency impairs neurogenesis often in a permanent way, involved in myopia, programmed cell death.
- Vitamin K – contributes to sphingolipid synthesis, which is involved in cell proliferation, differentiation and cell to cell interactions.

Stem Cells

Breast milk contains stem cells, which are able to cross the gut and migrate into the blood of the baby. From the blood, the cells travel to various organs including the brain, where they turn into functional cells to help the organ function well. The cells replace the skin cells as they shed off.

Bioactive Components

Many bioactive components of breast milk are natural substances, which are passed from the mother to the baby through breast milk. They include immunoglobulins, hormones, enzymes, somatic cells, stem cells and other proteins. This makes breast milk uniquely suitable to optimally support growth and development of an infant.

BREASTFEEDING AND NUTRITION LANDSCAPE

Exclusive breastfeeding protects babies from malnutrition in all its form.

Undernutrition

- Exclusive breastfeeding protects infants from stunting, wasting and underweight. This is because breast milk is uniquely made by nature for optimal growth and development.
- Exclusive breastfeeding protects infants from a variety of illnesses and infections that will negatively affect baby's growth and predispose the child to stunting and wasting. This is because breast milk contains a lot of anti-infective substances (IgA, lactoferrin, alpha-lactalbumin, lysozyme and HMOS) that serve as vaccine to protect the baby from infections like diarrhoea, pneumonia and meningitis. Babies that are not exclusively breastfed have a 15 times higher chance of having diarrhoea, which may lead to stunting, wasting and death [8]. Early initiation of breastfeeding within 1 hour of birth prevents babies from being exposed to water, which is a source of contamination and infection.
- Exclusive breastfeeding prevents iron deficiency in babies. This is because breastmilk contains lactoferrin, which binds iron to facilitate its absorption and bioavailability.
- Exclusive breastfeeding reduces the incidence of iron deficiency anaemia in mothers. Breast feeding causes the mother's body to release oxytocin, which stimulates contraction to help shrink the uterus back to pre-pregnancy size while expelling the placenta. The contraction also shut off the maternal blood vessels that formerly fed the baby and discourage excessive bleeding. Exclusive breastfeeding delays onset of ovulation and menstruation to reduce blood loss from menstruation. Breastfeeding mothers usually resume their menstrual cycles 20 to 30 weeks later than mothers who do not breastfeed.

Over nutrition

- Exclusive breastfeeding reduces the risk of infants becoming overweight or obese as a child or adult. Polyunsaturated fatty acids (PUFA) regulate appetite in babies

so that they do not develop a lot of fat cells to predispose obesity. Obesity is the risk factor for many chronic diseases like type 2 diabetes, heart diseases and many cancers.

- Exclusive breastfeeding reduces the incidence of overweight and obesity in mothers. Breastfeeding helps mothers to lose weight as fat accumulated during pregnancy is used to produce breast milk.
- Exclusive breastfeeding protects mothers from chronic diseases like ovarian and breast cancers, heart diseases, endometrial cancer and osteoporosis.

Breastfeeding causes hormonal changes that delay ovulation and menstruation. This reduces a woman's life time exposure to hormones like estrogen, which can promote breast cancer cell growth. During breastfeeding a woman sheds breast tissue. The shedding can help remove cells with potential DNA damage thus, reducing chances of developing breast cancer. It has been shown that each year a mother breast feeds, it reduces her risk of developing breast cancer by 6%. Breastfeeding also can help lower ovarian cancer risk by preventing ovulation. The less a woman ovulates, the less exposure to estrogen which promotes cancer cell formation in the ovary.

Infant mortality

- Breastfed babies have better arousal from sleep at 2- 3 months of age and, therefore, are protected against sudden infant death syndrome (SIDS). This is because of the unique protein content of breast milk.
- Exclusive breastfeeding reduces the risk of babies dying before their first birthday. Research shows that if 90% of families breastfeed their babies exclusively for the first 6 months, nearly 1,000 deaths among infants could be prevented [9]. Initiating exclusive breastfeeding within 1 hour of birth reduces contamination and infection that precipitate childhood illness like diarrhoea or pneumonia, which could cause child mortality.
- Exclusive breastfeeding improves child survival. WHO estimated that death of around 820,000 under 5 children could be prevented globally every year with exclusive breastfeeding [4].
- Breast milk protects premature infants from life – threatening gastrointestinal diseases thus reducing infant mortality.

The ultimate aim of breastfeeding is to ensure optimal growth and development of babies and to free all individuals both young and adults from malnutrition.

BREAST FEEDING AND NATIONAL DEVELOPMENT

Exclusive breastfeeding improves cognitive development and intelligent quotient (IQ) of breastfed infants. Intelligent quotient of exclusively breastfed babies is higher than that of non-breastfed by up to 3.8 points. The exclusively breastfed infants with higher IQ are more likely to complete their education and contribute positively to national development. The exclusively breastfed child is likely to have a well-developed brain to actualize his/her potentials for meaningful development of nations. Productivity, GDP and economy will be enhanced. Human capital is an invaluable resource that develops a nation, and not material resources. A nation cannot compete internationally when most of its population is intellectually compromised due to poor brain development as a result of inadequate breastfeeding.

Exclusive breastfeeding will reduce stunting to increase GDP. Reduction in stunting can increase GDP by 3 – 16% in Africa. Children who escape stunting are 33% more likely to escape poverty as adults. They can raise adult wages by 5 – 50%. Exclusive breastfeeding prevents chronic diseases like diabetes, cardiovascular diseases and cancers in adulthood, which could deprive the nation of valuable intelligent human capital needed for national development.

Exclusive breastfeeding reduces the burden on the healthcare system. It impacts:

- health care costs
- health care facilities
- lost time and productivity by parents (absenteeism) as a result of taking care of the sick child
- insurance costs as a result of death caused by not practicing optimal breastfeeding
- medical costs by employers from the company's or institution's health scheme.

Breastfeeding is economical. It saves fuel, money, energy and time, which could be used in other areas, for development of the nation.

STRATEGIES TO IMPROVE BREASTFEEDING IN AFRICA

African countries should pass new policies to protect, promote and support breastfeeding in the following areas:

- Mothers should be allowed to go for full paid maternity leave for at least six (6) months to enable them practice exclusive breastfeeding for the first six months of baby's life.
- All establishments and institutions should create nursing mothers' rooms or crèche within their facilities so that mothers can breastfeed during break periods.
- Communities should use influential people to advocate for exclusive breastfeeding for the first six months of a baby's life and continued breastfeeding with adequate complementary food for 2 years in places of worship and schools.
- Nutrition Champions should be appointed in African countries to advocate for optimal breastfeeding by mothers.

- Public Health campaigns on breastfeeding should be routinely done in communities to promote breastfeeding. Such campaigns should declare water and other fluids unhealthy. One of the major messages for such campaigns should be that “**water and other fluids are unhealthy for babies less than six months of age**”.
- African countries should include breastfeeding as the best foundation for infant and young child feeding in their nutrition, health and science curriculum from preschool to post-secondary education.

CONCLUSION

Optimal breastfeeding is the best foundation for infant and young child feeding because it provides the child with all the nutrients and bioactive factors for normal growth and development. This will prevent malnutrition in all its forms. Malnutrition robs children of their future because they cannot develop optimally to actualize their potentials. They start life disadvantaged both in physical and cognitive development and cannot contribute effectively to national development. African countries should scale up optimum breastfeeding as an intervention to change the ugly nutrition landscape of the continent. This will facilitate development in Africa.

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