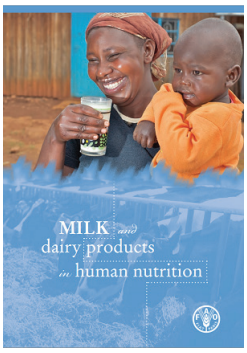
The Role of Dairy in Optimal Nutrition and Under-Nutrition – The First 1000 Days

The Issue

The critical window for adequate child growth and cognitive development is between conception and 24 months of age and hence many recent international nutrition initiatives focus on optimising nutrition in the "first 1000 days".

Growth and development is most rapid in fetal and early neonatal life and is influenced by nutrition. Stunting in young children reflects the combined impact of poor maternal nutrition, inadequate infant nutrition, illness and infections. This leads to poor growth and brain development. Adequate nutrition to support and drive appropriate growth at this stage of life is critical and can have long lasting consequences on health and performance throughout life.

Despite progress in addressing micronutrient inadequacies in the world, several billion adults and children continue to be affected by one or more nutrient deficiencies.[1] There have been improvements in child nutritional status according to key anthropometric indicators of stunting, wasting, underweight and nutrition related mortality.[1] However, even those who consume sufficient energy for growth may not be nutritionally secure; it is estimated that almost two billion people are deficient in one or more micronutrients, mainly because of eating poor-quality diets.[2] In addition nearly 43 million children under 5 years were overweight in 2011 (80% lived in developing countries)[3] which increases the complexity around finding appropriate nutrition solutions that address both excess of calories and lack of key micronutrients. Diets that contain nutrient-rich foods rather than energy dense/nutrient poor foods are key to solve the double burden of malnutrition.



FAO estimates can be found in *Milk and Dairy Products in Human Nutrition*, FAO, 2013

The facts

In the period 2010-12 the FAO estimates that approximately 870 million people were undernourished – 132 million fewer than in 1990, but still far too many people lack adequate nutrition for optimal development and health.[1] Malnutrition contributes to 45% of deaths of children under 5 and 40% of maternal deaths. Malnutrition during pregnancy impacts foetal growth and results in low birth weight, which is linked to poor developmental outcomes. Further, 1 in 4 children in the world are stunted[4, 5] which is now recognised as the critical indicator for undernutrition.

- Undernutrition during pregnancy, affecting foetal growth, and in the first 2 years of life is a major determinant of both stunting of linear growth and subsequent risk of obesity and non-communicable diseases such as diabetes and cardiovascular disease in adulthood
- Inadequate growth before 2 years of age (including antenatal factors) is linked to impaired brain development and performance
- Stunting is now recognised as the critical indicator for undernutrition
- The effects of stunting cannot be reversed after a certain age;[6] catch up growth does not make up for the losses due to stunting before 2 years – ie prevention is critical

Milk and dairy products as a nutrient dense source of macro and micronutrients play a key role in healthy human nutrition and development throughout life, especially in childhood.[1] Cows' milk provides energy

and high-quality protein (defined as protein that supports optimal growth). It is an excellent source of all the essential amino acids including lysine which is often limiting in plant/cereal based diets.[1] The protein fraction contains peptides and other bioactive factors that may have specific effects on growth and recovery from undernutrition.[7] Milk and dairy products can make a significant contribution to meeting the required nutrient intakes of calcium, magnesium, selenium, riboflavin, vitamin B12 and pantothenic acid.[1] Milk can also be an important source of zinc in children at risk for micronutrient deficiencies.[8,9] The value of milk includes delivery of more highly bioavailable forms of some nutrients, for example calcium and vitamin B12, compared with that in other foods in the diet.[10,11]

The benefits of diets that contain milk and dairy products include

- the beneficial effect on weight gain and linear growth among nutritionally or socio-economically disadvantaged young children. The strongest effects may be seen on the growth of children with existing undernutrition. [12-15]
- a treatment for undernutrition both in industrialized countries where almost all products used for enteral feeding of malnourished hospitalized children and adults are milk-based [7] and in developing countries, leading to higher recovery rates.
- increased skeletal bone mass in younger people.[1]
- decreased risk of dental caries, including the relationship between maternal consumption and dental health in their children;[16] hard cheese decreases the risk of dental erosion.[17]

In Pregnancy/lactation

There is evidence to suggest that adding dairy products to the diets of undernourished pregnant women is beneficial for child development and general health.[1] Observational studies in developed countries comparing high and low milk consumption in pregnancy have reported improvements in fetal growth and infant birthweight with higher, moderate milk consumption.[18,19] A recent study has also reported that calcium and milk supplementation during pregnancy is associated with significantly greater bone mineral density (BMD) and suppressed bone resorption in Chinese women with habitual low calcium intake.[20]

The composition of breastmilk can be influenced by the diet and nutritional status of the breastfeeding mother. Key nutrients which can be affected in this way include B vitamins (thiamin, riboflavin, B6 and B12 but excluding folate), vitamin A,D, selenium, iodine and long chain omega 3 lipids such as DHA.[21] For exclusive breastfeeding, the energy and nutrient needs of the maternal diet can be even greater than during pregnancy. If these needs are not met, as could be the case in developing countries, this may be detrimental to the health and development of the infant. For these reasons it is particularly important that the maternal diet is optimised during the breast feeding period to ensure the nutritional intake of the breastfed infant is not compromised.

In Infancy

Breastmilk is the best source of nutrition for under 6 months, and continues to be a key source of energy and essential fatty acids and other nutrients in the diet; it is recommended that breastfeeding is continued along with appropriate complementary foods up to 2 years of age or beyond.[22] Adequate dietary intake is especially critical in the period from 6 to 18 months of a child's life when a child's growth rate is high. At six months, nutrient-rich foods must be introduced, including animal-source foods, as breastmilk alone is no longer adequate to support normal growth and mental development.[1] At six months, stores of several nutrients, for example iron and zinc, are often falling in exclusively breast-fed infants, with iron status a particular concern after this age.[1,23] For infants younger than 12 months, unmodified cow's milk is not recommended as it may displace other iron-rich foods.[1]

Young children

A higher intake of animal sourced foods (ASF) has been associated with better growth, micronutrient

status, cognitive performance, motor development and activity in children,[9,15] although the effects on cognitive function and activity were more pronounced in children consuming meat rather than milk.

Milk is a nutrient-rich package of energy, protein, minerals, vitamins, particularly fat soluble vitamins and lactose, which are important nutrients to support child growth. Milk fat contributes about half of the energy in whole milk. For this reason, milk can play an important role in the diets of young children in populations with a very low fat intake,[7] where the availability of other animal-source foods is limited. Skimmed milk is not recommended as a major food source during the first two years of life because it does not contain essential fatty acids and lacks fat-soluble vitamins.

Challenges and Gaps

Access to affordable dairy products that can help to address inadequate nutrition for optimal growth and development in the critical window of development, is confounded by a number of challenges.

- The true prevalence of lactose maldigestion in some populations is unknown however, it is estimated approximately 70% of the population has primary lactase deficiency: requiring avoidance of dairy products. Most individuals can tolerate some dairy products and can progressively improve tolerance.[24] Perceived lactose intolerance and self-diagnosis of lactose maldigestion may also contribute to the avoidance of milk products where it may not be necessary.
- The perception of milk allergy is far more frequent than confirmed Cows' milk allergy:[24] Allergy to cow-milk protein primarily occurs in infancy and childhood but is usually outgrown by age five.[26]
- The safety of milk and dairy products must be ensured to protect consumers, particularly vulnerable consumers such as children and pregnant women.
- Unmodified cows' milk is not recommended for consumption under 12 months of age – is a poor source of iron needed for optimal growth and development in infancy and may displace iron-rich foods from the diet.[1] Therefore suitable modified products must be available if breastfeeding is not possible.
- Limited market access, and the need to determine whether nutrition can be improved through milk fortification or other infant feeding strategies[1]
- The introduction of foods at six months of age should focus on nutrient-rich foods, particularly those containing iron. Nutrient-poor foods should be limited as these foods can contribute to poor-quality diets and displace nutrient-rich foods such as animal sourced foods.

Limited access to appropriate dairy nutrition may lead to poor health outcomes:

- People with cows' milk allergy have a significant risk of poor bone health and early osteoporosis.[27]
- In general children's diets that are low in dairy (albeit in older children) have been associated with increased risk of fracture in children[28,29] and a doubling of hip fracture later in life as seen in American postmenopausal women, independent of current milk or calcium intake.[30]

Perhaps the greatest impediment to increasing consumption of dairy products by the poor is their price. Like other animal-source foods, dairy products tend to be a more expensive source of energy compared with cereal staples in developing countries. At times of economic stress livestock products are replaced by other proteins or starchy staples, and consumption of animal products generally rises as incomes rise.[31]

Conclusions and Recommendations

FAO states that a balanced diet is a core part of food security and ensuring access to sufficient safe and nutritious food will help eradicate hunger and poverty. Milk and dairy products hold potential to improve nutrition and livelihoods for hundreds of millions of poor people throughout the world. Milk, yoghurt, ghee and cheese are known and accepted foods in many cultures, making it easy to encourage people to consume them. It seems highly likely that

there would be an improvement in the food security of the poor if more dairy products were added to their diet.[1]

Milk and dairy products can play a particularly important role in human nutrition in both developed and developing countries especially where the diets lack diversity through either poor food choices or poverty.[1] Milk and dairy products can add much needed diversity to plant-based diets and can contribute to promoting child growth. They are nutrient dense and provide energy, high-quality protein and micronutrients in an easily absorbed form that can benefit both nutritionally vulnerable people and healthy people when consumed in appropriate amounts.

In children with poor nutritional status, the addition of milk to the diet is likely to supply nutrients that are important for growth.[12] Milk is also an efficient vehicle for delivering several critical micronutrients and improving the nutritional status of pregnant and lactating women and the growth of young children. Policy-makers must ensure that not only sufficient staple foods are produced but a variety of micronutrient-rich foods are accessible to the world's poor and malnourished.

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