Livestock Science 130 (2010) 110–114

Contents lists available at ScienceDirect

Livestock Science

journal homepage: www.elsevier.com/locate/livsci

Nutrition in vulnerable communities in economically marginalized societies ☆

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ARTICLE INFO

Keywords:
Nutrition
Vulnerable communities
Dietary modification strategies
Animal source foods

ABSTRACT

Childhood malnutrition is highly prevalent in developing countries. Globally 35% (3.5 million) of child deaths before the age of five years were attributed to under nutrition in 2004. Vulnerable communities generally consume a diet based mainly on plant-based staples, and a low consumption of animal source foods, fruit and vegetables predisposes these communities to micronutrient deficiencies.

In this paper, South African data is used to illustrate the poor diet and consequences thereof in vulnerable communities. Childhood malnutrition and maternal overweight often co-exist in the same community. Dietary modification strategies to address malnutrition should therefore focus on the nutritional quality of the diet, rather than on energy content only. Animal foods are particularly rich sources of bio-available iron, zinc and vitamin A (the micronutrients of greatest concern), and these nutrients are difficult to obtain in adequate amounts from plant foods alone. Foods of animal sources (particularly muscle tissue) also enhance the absorption of the less bio-available non-heme iron. Dietary modification strategies need to be introduced from a very young age. In the developed world, commercially available baby products play an important role in meeting the nutritional requirements of infants, but in developing countries cost and possible contamination (bottle feeds) prohibit the use of baby products. Addition of small amounts of foods of animal sources can improve the nutritional quality of the diet, as well as the nutritional status and functional outcomes of vulnerable populations. A moderate increase in the consumption of animal source foods will provide critical nutritional benefits without a significant increase in the risk of chronic diseases in the poor. Constraints for frequent consumption of animal source foods include availability, affordability and lack of cold storage facilities. Adequate dietary intake is essential for good nutrition, but frequent infections can also lead to malnutrition. The underlying causes of malnutrition, i.e. inadequate care on the one hand, and insufficient health services and an unhealthy environment on the other hand, should also therefore be addressed.

1. Introduction

Childhood malnutrition is highly prevalent in developing countries. Globally 35% (3.5 million) of child deaths before the age of five years were attributed to under nutrition in 2004. Stunting, severe wasting and intrauterine growth restriction had the highest disease burden, accounting for 21% of under-five deaths. Vitamin A and zinc deficiencies were the two micronutrients with the largest disease burdens. Vitamin A deficiency resulted in 6% (0.6 million) of under-five deaths, and zinc deficiency in 4% (0.4 million) of under-five deaths (Black et al., 2008).

Vulnerable communities generally consume a diet based mainly on plant-based staple foods. Animal source foods are good sources of vitamin A, vitamin B_{12}, riboflavin, calcium,

☆ This article is part of the special issue entitled "10th World Conference on Animal Production (WCAP)" guest edited by Norman Casey.

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doi:10.1016/j.livsci.2010.02.015

iron and zinc. A low consumption of animal source foods predisposes vulnerable communities to deficiencies in these micronutrients. This paper will use mostly South African data to illustrate the poor diet and consequences thereof in vulnerable communities.

2. Dietary intake of South African infants and children

A study of 475 South African rural KwaZulu-Natal infants aged 6–12 months showed that the complementary diet consisted mostly of a porridge made with maize meal (Faber, 2005), which is a bulky food low in nutrient density. Using maize meal as complementary food is not unique to South Africa, as it is used for infant feeding in many African countries (Bentley et al., 1991; Lartey et al., 1999; Huffman et al., 2000). In the South African study, 17% of the 475 infants consumed animal products and 26% consumed dairy products during the 24 h recall period (the day prior to the survey). These low intakes of animal and dairy products contributed towards the low nutrient density of the complementary diet for iron, zinc and calcium, which had nutrient densities half of that desired (Faber, 2005).

The poor diet persists during childhood. The National Food Consumption Survey that was done in 1999 showed that the diet of 1–9 year old South African children was predominantly cereal based (maize and bread), and consumption of fruit and vegetables and foods of animal sources was low. At the national level, dietary intake was below 67% of the Recommended Dietary Allowances (RDA) for several of the micronutrients, including calcium, vitamin A, iron and zinc (Labadarios et al., 2005). Animal foods are particularly rich sources of these nutrients, and these nutrients are difficult to obtain in adequate amounts from plant foods alone. Not only is the South African diet generally low in iron and zinc content, but the absorption of these two nutrients is inhibited by the phytate present in maize meal (Davidson, 1996; Gibson and Ferguson, 1996).

3. Nutritional status of South African children

South Africa has the double burden of under nutrition and overweight. A national survey that was done in 2005 showed that 18% of 1–9 year old South African children were stunted (indicator of chronic malnutrition), 9% were underweight and 4.5% were wasted (indicator of acute malnutrition) (Labadarios, 2007, pp. 121–160). Steyn et al. (2005) showed that stunting is associated with an increased risk of overweight in children. Maternal overweight and obesity in South Africa is high; 27% of females were overweight and 25% were obese in 2005 (Labadarios, 2007, pp 502–505).

A national survey that was done in 2005 showed that 64% of 1–9 year old South African children were vitamin A deficient (Labadarios, 2007, pp. 409–446), 28% were anaemic, 13% had a poor iron status (Labadarios, 2007, pp. 505–522), and 45% had a low zinc status (Labadarios, 2007).

Vitamin A deficiency is associated with an impaired immune response with lowered resistance against infection (Gibson, 2005). In 2000, 3069 (3.2%) deaths in 0–4 year old South African children were attributed to vitamin A deficiency; the vast majority (96.9%) of these deaths were accounted for by diarrhoeal diseases (Nojilana et al., 2007a).

Iron deficiency in pregnant women is a risk factor for maternal and perinatal mortality. More than 3000 perinatal deaths were attributed to iron deficiency in South Africa in 2000 (Nojilana et al., 2007b).

Childhood malnutrition and maternal overweight co-exist in the same community, and often within the same household (Faber et al., 2001). Dietary modification strategies to address malnutrition should therefore focus on the nutritional quality of the diet (particularly those micronutrients of greatest concern, namely iron, zinc and vitamin A), rather than on energy content only. Foods that are rich sources of highly bio-available vitamin A are fish-liver oil, liver and egg yolk. Foods that are rich sources of bio-available iron are liver, kidney, and red meat, followed by chicken and fish. Foods that are rich sources of zinc are meat, liver and fish (Gibson, 2005).

4. Dietary modification to improve nutritional quality of the diet

Dietary modification refers to a collection of strategies that aim to increase the following:

(i) Production, availability of and access to micronutrient-rich foods through, for example, agricultural approaches;
(ii) Consumption of micronutrient-rich foods through behaviour change, which is achieved using communication, social marketing and nutrition education strategies; and
(iii) bio-availability of micronutrients in the diet, through improved methods of food preparation, preservation and cooking.

5. Infant feeding and fortified products

Dietary modification strategies need to be introduced from a very young age. Children aged 6–23 months are the most vulnerable in terms of childhood malnutrition (Labadarios et al., 1995). Smuts et al. (2008), for example, showed that the prevalence of childhood malnutrition doubled from the first to the second year of life. The nutritional quality of complementary foods offered during this period is often poor relative to nutritional requirements (PAHO/WHO, 2003). Dietary modification strategies should therefore focus on improving the nutritional quality of the complementary diet of infants in vulnerable communities.

In the developed world, commercially available baby products play an important role in meeting the nutritional requirements of infants (Skinner et al., 1997; Fox et al., 2006). Iron fortified formula milk is a major source of dietary iron in the developed world (Soh et al., 2002), and the use thereof can prevent anaemia (Daly et al., 1996). In communities of poor socio-economic status, however, contamination (Bergstrm, 2003) and incorrect preparation (Faber and Benadé, 2001, 2007) of bottle feeds are of concern, and the use of formula milk is therefore not encouraged.

Whereas infant cereals were shown to contribute significantly to the micronutrient intakes of American infants (Fox et al., 2006), micronutrient deficiencies were observed in South African infants in an urban area where more than 80% of the infants consumed fortified infant cereals. Dietary