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Dairy in the nutritional empowerment of women

Scientific excellence
Industry applicability
Strategic networking
Global influence

1. Introduction

The empowerment of women - their ability to make life choices (Pratley, 2016) - is central to the United Nations sustainable development goal (SDG) 5: "Achieve gender equality and *empower all women and girls"*. It includes matters affecting woman-specific health and is hence also linked to SDG 3 (*"Ensure healthy lives and promote well-being for all at all ages")* and SDG 2 ("*End hunger, achieve food security and improved nutrition and promote sustainable agriculture*") (https://sdgs.un.org/#goal_section). Women's nutrition empowerment refers to maternal nutrition (i.e. pregnant and lactating women, and mothers of young children [Keats et al., 2021]) as well as to adolescent girls, non-pregnant and non-lactating women of reproductive age, and older women (Fox et al., 2019). Since the decision making about what food to serve is one of the indicators of women's empowerment (Pratley, 2016), the nutrition-related health concerns of women are implicitly part of the holistic approach to achieve SDG 5.

This fact sheet reviews scientific evidence of women's dairy-related health and nutrition across the life course, and it outlines some potential roles of women's empowerment programmes in these instances. Systematic reviews are the primary source of information. (Mal)nutrition refers to protein-energy undernutrition, micronutrient deficiencies like vitamin and mineral shortages (also called "hidden hunger"), and diet-related non-communicable diseases such as overweight/obesity. These conditions are sometimes collectively labelled the "triple burden of malnutrition", which may co-exist in an individual or within a household, especially in nutritionally insecure low- and middle-income countries (LMIC) (Faber & Wenhold, 2016). Industrialised countries are, however, not "immune" against the paradox of obesity coupled with poor protein and micronutrient status up to the point of disordered eating (Cheung et al., 2021; Kim et al., 2019). Food insecurity tends to be associated with poor dietary intakes, including dairy consumption below recommendations, among women (Johnson et al., 2018).

2. Maternal Nutrition

The health and nutrition of pregnant and lactating women is closely linked to the physical growth, health, cognitive development and earning potential of their offspring and future generations (Barker & Thornburg, 2013; Langley-Evans, 2015). In order to break the intergenerational cycle of malnutrition, motherhood-related nutrition receives major international attention, especially for LMIC (Blakstad et al., 2022; Keats et al., 2021; Victora et al., 2021; Vir, 2016; Wilkins et al., 2021).

2.1 Nutrition and dairy related maternal health

The increased nutritional needs of pregnant and breastfeeding women are well-known and are reflected in the recommended dietary allowances. The high biological value of the proteins in dairy products can optimise the synthesis of supportive tissues in the mother, the growth of the (unborn) baby and milk production. Calcium is another core nutrient during pregnancy and lactation. Many women – in industrialised and particularly in LMIC – are not meeting the intakes recommended for maintaining their own needs and for the skeletal development of the (unborn) infant (Cormick et al., 2019). Since human or other milk is at least initially the (sole) source of intake for infants, its composition and safety are paramount. Human milk composition is dynamic and influenced by many factors, including the mother's age, parity, nutritional status, and also infant factors, like the baby's age (Ballard et al., 2013). Maternal dietary intake might be related to breast milk nutritional composition, yet studies are inconclusive (Adhikari et al., 2022; Kheika et al., 2017). Exclusive breastfeeding for the first six months of an infant's life remains the World Health Organization recommendation.

The triple burden of malnutrition is at play during pregnancy. Dietary patterns of the mother are among the many causative factors related to foetal growth restriction, preterm birth and low birth weight of the newborn (Raghavan et al., 2019). Vegetarianism as a dietary pattern among pregnant women has been shown to be related to low birthweight babies (Tan et al., 2019). Iodine deficiency during pregnancy is associated with increased risk of abortions, stillbirth, congenital abnormalities and cretinism (neurological and growth defects) in the offspring (Zimmerman, 2012). For the general population, and hence also for pregnant women, dairy may be an important source of iodine, in addition to iodised salt and marine fish (Bath et al., 2022). The relatively short-term consequences of these conditions for the baby are well-known. Furthermore, maternal undernutrition (famine), inadequate dietary (protein) intake, micronutrient (e.g. iron, folic acid, calcium) deficiencies, inadequate and excessive gestational weight gain and obesity (body mass index ≥30kg/m2 before pregnancy) have extensively and systematically been related to the development of non-communicable diseases in the offspring later in life (Blakstad et al., 2022; Litvak et al., 2020; Wilkins et al., 2021). Numerous systematic reviews have highlighted the risks of maternal obesity for the mother, the outcome of the pregnancy and the infant (Corrales et al., 2019; Lau et al., 2014; Mamun et al., 2014; Marchi et al., 2015). Collectively, the terms nutrition programming or the Developmental Origins of Health and Disease have been used to describe the intergenerational effect of malnutrition (Barker & Thornburg, 2013; Langley-Evans, 2015).

2.2 Maternal/female empowerment

Maternal nutrition empowerment interventions can be direct or indirect, focused or general, targeting specific nutrition problems, or in a multisectoral way zoom in on underlying determinants of women's nutritional status (Keats et al., 2021). Interventions to specifically increase dairy intake have been educational, multi-faceted or focused on purchasing patterns, and conducted in various settings (Nikniaz et al., 2020).

In a randomized control trial in Burkina Faso Heckert et al. (2019) provided evidence that a nutrition-sensitive maternal empowerment programme provided a pathway by which child wasting (low weight for length) was reduced. The women's choices related to purchasing, healthcare, family planning and the communication with their spouses changed. This study shows that general, yet nutrition-sensitive empowerment of women provides dual benefits: it improves the women's lives and, in turn, conveys tangible benefits for their children's nutritional (anthropometric) status.

A similar conclusion was reached in a comprehensive review relating childhood stunting (low length/ height for age) to more direct, maternal nutrition interventions in South Asia (Vir, 2016). The emphasis was placed on reaching the women before and during pregnancy by focusing on the women's nutritional status (i.e. anthropometry like height, obesity and gestational weight gain; dietary diversity and micronutrient status like iron deficiency anaemia) and the infants' intrauterine growth, birthweight and the most prominent form of infant protein-energy undernutrition, i.e. stunting.

A systematic review of the effectiveness of interventions to promote breastfeeding did not show significant improvements of infant weight and length, yet the small reductions in body mass index for age and weight for length z-scores might be beneficial for reduction of overweight and obesity in future. The established benefits of breastfeeding as such are, however, undisputed (Giugliani et al., 2015).

Even though Santoso et al. (2019) found an inconclusive relationship between women's empowerment and child nutrition, they concluded that this is probably due to limitations in the way the studies were designed and the indicators of empowerment that were used. Usually, nutrition promotion is only one of the components included in female empowerment programmes. Microfinancing (Gichuru et al., 2019) and women's autonomy (Carlson et al., 2015) are examples of other aspects.

In relation to intake of dairy and dairy-related nutrients, Jung et al. (2014) systematically reviewed the effectiveness of behaviour change interventions aimed at increasing maternal calcium intake from dairy. They noted limited effectiveness and recommended that interventions should be based on behaviour change theories and be target-group relevant, emphasising context-specificity.

Despite the aforementioned, a meta-analysis covering 14 studies and over 100 00 pregnant women concluded that the intake of a higher number of dairy products during pregnancy was associated with greater infant birth weight and length. Furthermore, a lower risk of having small for gestational age and low birth weight infants was found (Perez-Roncero et al., 2020). The association between milk and dairy intake during pregnancy and the head circumference of the foetus and newborn was, however, inconclusive (Karimbeiki et al., 2017). Chia et al. (2019) concluded that healthy dietary patterns, characterised by high intakes of vegetables, fruits, wholegrains, low-fat dairy, and lean protein-rich foods, were associated with lower risk of preterm birth.

3. Dairy related nutrition of girls and non pregnant and non lactating women

Whilst pregnant and lactating women are often (mis)taken as the only target group included in SDG 5, they are outnumbered by the rest of the female world population partly due to reduced childbearing and longer lifespans. Women's nutritional wellbeing should not only be valued because of their reproductive potential, but as a fundamental human right (Fox et al., 2019).

3.1 Adolescent girls

Adolescents are a critical, yet largely neglected, age group in terms of general nutrition (Krebs et al., 2017), and also in relation to dairy intake. Available evidence linking dairy and calcium intake to bone health in this age group has hence been graded as "limited" (Wallace et al., 2021). Girls aged between 11 and 14 undergo major physical changes. This is associated with increased needs for most nutrients - especially calcium and iron - at a life stage when the behaviour changes typical of puberty often result in haphazard food choices. Poor dietary habits, including limited intake of dairy have been highlighted in many settings, e.g. girls from LMIC (Keats et al., 2018), vulnerable groups in industrialised countries such as Aboriginal adolescents from Canada (Gates et al., 2014) and developed countries in general (Dror, 2014).

Low calcium intakes during adolescence may negatively affect peak bone mass and may be a contributing factor for osteoporosis later in life. (Weaver et al., 2016). Rouf et al. (2018) reported that young adults respond favourably to dairy promoting interventions, even though the effect was small. Nonetheless, the general recommendation for women is to include physical activity in programmes that are aimed at improved bone health (Xu et al., 2018).

Teenage pregnancies present a particular challenge, because the nutritional requirements of the pregnancy, including the growing foetus are superimposed on those of the adolescent girl (Marvin-Dowle et al., 2016).

Among athletes the female triad is a combination of low energy availability, menstrual dysfunction and low bone mineral density. The latter may lead to stress fractures, yet the management focusses on correcting the relative energy deficiency, with calcium intake secondary to that (Gross & Joy, 2020; Madoff & French, 2022). There is some evidence that cow's milk intake or milk protein supplementation may have beneficial effects on physical performance, recovery of muscle function and muscle protein synthesis (Alcantara et al., 2019; Casagranda, 2019).

In contrast to energy deficiency, overweight and obesity among children and adolescents is globally rising at an alarming rate. Babio et al. (2022) found in a systematic review of cross-sectional studies an inverse association between total dairy consumption and obesity among children and teenagers. However, the evidence from prospective studies was limited and inconclusive. When specifically investigating the difference between whole vs reduced fat milk, Vanderhout et al. (2020) and O'Sullivan et al. (2020) concluded that higher cow-milk fat intake was associated with lower childhood adiposity, and hence questioning the promotion of reduced fat milk for prevention of childhood obesity.

3.2 Women of reproductive age

In the absence of risk factors for poor dietary intake or compromised nutritional status (e.g. due to disease), very little nutrition research zooms in on non-pregnant, non-lactating healthy women in the age group 20-35 years. Food insecurity, typically associated with poverty, is known to increase the risk of malnutrition, not only in LMIC, but world-wide. Furthermore, food insecurity seems to be more likely among female-headed households (Negesse et al., 2020). A systematic review showed that food insecurity among American and Canadian women was, amongst others, negatively and significantly associated with lower frequencies of intake of dairy and lower intakes of protein, calcium, iron, folate, magnesium, and vitamins A and C (Johnson et al., 2018).

Given the high and increasing global prevalence of overweight and obesity among women, the role of dairy in the development thereof as well as during weight management deserve attention. On the one hand the nutrient density of reduced fat dairy foods (i.e. its high nutrient compared to energy content [Wallace et al., 2021]) contribute to ensuring adequate nutrient levels in energy-restricted (weight loss) diets. On the other hand, emerging evidence points to unique, beneficial properties of dairy products as such: the so-called matrix effect, which is not limited to weight management but extend to non-communicable diseases (metabolic syndrome).

3.3 Older women

In relation to bone health dairy products provide the raw materials (calcium, phosphorus, magnesium, zinc, vitamin D [especially in countries with relevant fortification] and protein) for bone strength, yet the role of dairy in bone health and fracture risk have been questioned in some observational studies. This has resulted in several follow-up investigations. Van den Heuvel and Steijns (2018) critically reviewed existing systematic reviews that focussed on stronger research designs (randomised clinical trials and prospective studies) globally. They concluded that the beneficial role of dairy products for bone mineral content or bone mineral density has been sufficiently established in Chinese and Caucasian girls and women. In Caucasian women, drinking milk also reduces fracture risk.

Similarly, a recent systematic review (Wallace et al., 2021) found that moderate grade evidence indicates that intake of low or non-fat dairy products within a healthy usual dietary pattern may be associated with improved bone mineral density of the total body and at some sites also be associated with fewer fractures in older adults. This concurs with the conclusions of Shi et al. (2020) who specifically focussed on randomised controlled trials among postmenopausal women, and a study subsequently published by Iuliano et al. (2021) who showed that dairy foods were an practical approach to reduce the risk of falls and fractures commonly occurring in the elderly.

According to an internationally supported consensus paper adequate dietary protein is necessary is for optimal bone growth and maintenance of healthy bone. Variation in protein intakes within the “normal” range accounts for 2–4% of bone mineral density variance in adults. In older people with osteoporosis, higher protein intake (≥0.8-g/kg body weight/day) is associated with higher bone mineral density, slower bone loss, and lower risk of hip fracture, provided that dietary calcium intakes are adequate (Rizzoli et al., 2018).

Apart from bone health the role of milk as such and of dairy protein in combatting sarcopenia (i.e. age-related decline in muscle mass and strength) has also been reviewed (e.g. Du et al. 2019; Granic et al., 2020a). In an authoritative meta-analysis Hanach et al. (2019) concluded that 14-40g/ day of dairy proteins, can significantly increase the appendicular muscle mass in middle-aged and older adults. Cuesta-Triana et al. (2019) added reduced frailty to the beneficial effects, but both reviews indicated that the type of protein and dairy product are still unclear. Granic et al. (2020a; 2020b) did, however, specify that the so-called "myoprotective" (muscle-sparing) properties are associated with fluid milk and non-liquid dairy products alike.

4. Conclusions

The proteins and micronutrients contained in dairy are important for preventing protein energy undernutrition (especially stunting) and hidden hunger (micronutrient deficiencies) of vulnerable groups, including women and their offspring, particularly those living in LMIC. In addition, more and more convincing evidence supports a positive role of dairy foods in preventing and managing diet-related non-communicable diseases (e.g. overweight/ obesity). Study designs and duration, the type of dairy investigated (the matrix effect), the outcomes (i.e. endpoint disease or condition) studied and the characteristics of the study population (their baseline dietary intakes and nutritional status, life stage and lifestyle, race-ethnicity and other concurrent, context-specific factors) are among the factors to be considered when evaluating the role of dairy in women's health.

Comprehensive maternal nutrition empowerment that includes the promotion of dairy intakes is core to achieving SGD 2, 3 and 5. Food-based approaches, such as food based dietary guidelines that include milk and milk-products are examples. This can improve the health of the pregnant and lactating woman and also of future generations. Teenaged girls, especially when pregnant or physically very active, are especially vulnerable and stand to gain from holistic empowerment initiatives. The older woman deserves this attention for reducing fractures and preventing loss of lean body mass.

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