

Special Feature

Breast-feeding: A Commentary by the ESPGHAN Committee on Nutrition

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ABSTRACT

This medical position article by the European Society for Paediatric Gastroenterology, Hepatology, and Nutrition summarises the current status of breast-feeding practice, the present knowledge on the composition of human milk, advisable duration of exclusive and partial breast-feeding, growth of the breast-fed infant, health benefits associated with breast-feeding, nutritional supplementation for breast-fed infants, and contraindications to breast-feeding. This article emphasises the important role of paediatricians in the implementation of health policies devised to promote breast-feeding. The European Society for Paediatric Gastroenterology, Hepatology, and Nutrition Committee on Nutrition recognises breast-feeding as the natural and advisable way of supporting the healthy growth and development of young children. This article delineates the health benefits of breast-feeding, reduced risk of infectious diarrhoea and acute otitis media being the best documented. Exclusive breast-feeding for around 6 months is a desirable

goal, but partial breast-feeding as well as breast-feeding for shorter periods of time are also valuable. Continuation of breast-feeding after the introduction of complementary feeding is encouraged as long as mutually desired by mother and child. The role of health care workers, including paediatricians, is to protect, promote, and support breast-feeding. Health care workers should be trained in breast-feeding issues and counselling, and they should encourage practices that do not undermine breast-feeding. Societal standards and legal regulations that facilitate breast-feeding should be promoted, such as providing maternity leave for at least 6 months and protecting working mothers. *JPGN* 49:112–125, 2009. **Key Words:** Breast-feeding—Breast milk—Health benefits—Public health. © 2009 by European Society for Pediatric Gastroenterology, Hepatology, and Nutrition and North American Society for Pediatric Gastroenterology, Hepatology, and Nutrition

Breast milk is the natural food for infants. The degree of health benefits derived from breast-feeding is higher in developing countries than in developed countries, and is inversely proportional to the socioeconomic level of the population, which is obviously lower in developing than in developed countries. Evidence from developing

countries demonstrates that under conditions of poor hygiene breast-feeding can be a matter of life or death. It has been estimated that 1.3 to 1.45 million deaths in 42 high-mortality countries could be prevented by increased levels of breast-feeding (1,2). In a recent analysis of the health consequences of child undernutrition, it was estimated that suboptimal breast-feeding was responsible for 1.4 million child deaths and 44 million disability-adjusted life-years, equivalent to 10% of the disability-adjusted life-years in children younger than 5 years (3).

Breast-feeding is also associated with a demonstrable impact on infant morbidity in industrialised countries, for

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example, a reduction of gastrointestinal infection and acute otitis media (4–6). There is, however, no conclusive evidence that breast-feeding affects infant mortality in industrialised countries (7). As described later in this article, there is also some evidence that breast-feeding has positive effects on health in later life. The effects of breast-feeding on the health of the mother are not covered in this article, but a recent analysis found evidence that breast-feeding was associated with a reduced risk of type 2 diabetes mellitus, breast cancer, and ovarian cancer in the mother (5).

Although paediatricians are key people in the field of child health as counselors, educators, and opinion builders, it is regrettable that too many health professionals limit their advocacy of breast-feeding to the oversimplification that “breast is best.” In some European countries, low rates of initiation and short duration of breast-feeding are clearly unsatisfactory. A study performed in the United States showed that when clinicians are positive about the importance of breast-feeding, mothers are more likely to continue exclusive breast-feeding (8). Support from clinicians is also positively associated with breast-feeding duration (9). Paediatricians can and should actively protect, promote, and support breast-feeding, taking into account both public health aspects and the mother’s wishes.

The aim of this position article is to summarise the current situation with regard to breast-feeding, knowledge of the composition of human milk, advisable duration of exclusive and partial breast-feeding, growth of the breast-fed infant, health benefits associated with breast-feeding, supplementation of breast-fed infants and contraindications to breast-feeding, as well as defining the role of paediatricians in the implementation of health policies seeking to promote breast-feeding. This position article focuses on term-born infants living in Europe.

CURRENT SITUATION

Estimates on the prevalence of breast-feeding in Europe were reported in 2003 (10). The reported situation in 29 European countries in the study is extremely heterogeneous. The rate of initiation of breast-feeding was more than or equal to 90% in 14 countries and ranged from 60% to 80% in 6 other countries. The lowest rates (<60%) were reported in France, Ireland, and Malta. The rate of any breast-feeding at 6 months was more than 50% in only 6 countries. This is a compilation of self-reported data from individual experts in different countries, and caution is needed when interpreting the results because of the lack of a standardised method of data collection. The limited data quality indicates that no standard approach to representative data collection on breast-feeding practices exists, and understanding of definitions (exclusive, full, and partial breast-feeding) differs markedly among

countries. Clearly, a common monitoring system should be a high priority.

The available data show that breast-feeding rates and practices fall short of those considered desirable by many professional organisations and scientific societies. For example, it is regrettable that the International Code of Marketing of Breast milk Substitutes, endorsed in 1981, is not fully applied and submitted to independent monitoring (11). The legislation for working mothers meets on average the International Labour Organization standards, but covers only women with formal employment. In Europe, voluntary mother-to-mother support groups and trained peer counsellors were present, respectively, in 27 and 13 of the 29 countries studied (10). There is room for many countries to improve their policies and practices to better protect, promote, and support breast-feeding, and paediatricians should play an active role in this process.

The implementation of a health policy supporting breast-feeding is important to increase the rate of initiation of breast-feeding as well as the duration of exclusive breast-feeding and partial breast-feeding. The example of Norway illustrates that positive changes can happen. Total breast-feeding rates in Norway increased from <30% at 12 weeks in 1968 to >80% in 1991. Undisturbed and prolonged contact between mother and baby became more common in Norway, as did more respect for the needs of the nursing couple, and more individualised care (12).

COMPOSITION OF HUMAN MILK

The biological characteristics of human milk have been reviewed in detail elsewhere (13–15). Human milk is not a uniform body fluid but a secretion of the mammary gland of changing composition. Foremilk differs from hindmilk, and colostrum is strikingly different from transitional and mature milk. Milk changes with time of day and during the course of lactation. Human milk consists not only of nutrients, such as proteins, lipids, carbohydrates, minerals, vitamins, and trace elements that are of paramount importance to fulfill the nutritional needs of young infants and ensure normal growth and development. Human milk also contains numerous immune-related components such as sIgA, leukocytes, oligosaccharides, lysozyme, lactoferrin, interferon- γ , nucleotides, cytokines, and others. Several of these compounds offer passive protection in the gastrointestinal tract and to some extent in the upper respiratory tract, preventing adherence of pathogens to the mucosa and thereby protecting the breast-fed infant against invasive infections. Human milk also contains essential fatty acids, enzymes, hormones, growth factors, polyamines, and other biologically active compounds, which may play an important role in the health benefits associated with breast-feeding.

Maternal diet may have a significant influence on the production and/or composition of human milk when the mother is malnourished or eats an unusually restrictive diet. Malnourished mothers have approximately the same proportion of protein, fat, and carbohydrate as well-nourished mothers, but they produce less milk. The provision of supplemental food is able to improve milk production and the duration of exclusive breast-feeding among undernourished women (16). In contrast, well-nourished women do not show any benefits from energy or protein supplementation. For several nutrients, however, the content in breast milk reflects the diet of the mother. This is the case for several vitamins, for example, vitamin D, vitamin A, and water-soluble vitamins, and for iodine and the composition of fatty acids. Breast-fed infants of mothers following a strict vegan diet are at high risk of severe megaloblastic anemia and neurological abnormalities because of vitamin B₁₂ deficiency (17). The Committee recommends supplementation of breast-fed infants (or their breast-feeding mothers) with vitamin B₁₂ if lactating mothers follow a vegan diet.

RECOMMENDATIONS FOR DURATION OF BREAST-FEEDING

Before 2001, the World Health Organization (WHO) recommended that infants be exclusively breast-fed for 4 to 6 months with the introduction of complementary foods (any fluid or food other than breast milk) thereafter. The issue of the optimal duration of exclusive breast-feeding, comparing mother and infant outcomes with exclusive breast-feeding for 6 months versus 3 to 4 months, was assessed in a systematic review of the available literature commissioned by WHO in early 2000 (18). Only 2 of the 20 eligible identified studies were randomised trials of different exclusive breast-feeding duration that were both conducted in Honduras, a developing country. All studies performed in industrialised countries were only observational. The review showed that infants who continue to be exclusively breast-fed for 6 months did not experience any deficit in weight or length gain as compared with infants exclusively breast-fed for a shorter period (3–4 months), although larger sample sizes would be required to rule out modest increases in the risk of malnutrition. The data were conflicting with respect to iron status but suggested that, at least in developing countries where iron stores of newborn infants may be suboptimal, exclusive breast-feeding without iron supplementation during the first 6 months of life may compromise haematologic status. The review concluded that “large randomized trials are recommended in both developed and developing countries to ensure that exclusive breast-feeding for 6 months does not increase the risk of undernutrition (growth faltering), to confirm the health benefits reported thus far, and to investigate other potential effects on

health and development, especially over the long-term.” A study on breast-feeding promotion performed in Belarus showed that during the period from 3 to 6 months, morbidity because of gastrointestinal infections was significantly lower in infants who were exclusively breast-fed for 6 months than in those who were mixed breast-fed as of 3 or 4 months of age (19). However, the extent to which conditions and practices in Belarus resemble those in European industrialised countries may be questioned.

At the 54th World Health Assembly on May 18, 2001, the WHO emphasized “exclusive breast-feeding for 6 months on a global public health recommendation, taking into account the findings of the WHO expert consultation on optimal duration of breast-feeding and the provision of safe and appropriate complementary food with continued breast-feeding up to 2 years of age or beyond.” However, it was stated in the expert consultation that the recommendation applies to populations and it was also recognised that some mothers will be unwilling or unable to follow this recommendation, and that these mothers should also be supported to optimise their infant’s nutrition (20). The issue of optimal duration of exclusive breast-feeding has been a matter of intense debate during the past few years, reflecting the limited availability of scientific evidence from industrialised countries to inform the WHO recommendation and the fact that problems encountered in the industrialised countries are different from those in economically developing countries (21). In industrialised countries, there is at present no scientific evidence that introducing complementary foods to breast-fed infants between 4 and 6 months of age is a disadvantage relative to introduction after 6 months (22,23).

On the basis of available data, the Committee recently concluded that full or exclusive breast-feeding for around 6 months is a desirable goal. In exclusively or partially breast-fed infants, complementary feeding, such as any solid or liquid food other than breast milk or infant formula and follow-on formula, should not be introduced to the diet of any infant before 17 weeks or delayed after 26 weeks of age (23).

The WHO recommends continued breast-feeding for at least 2 years, and the American Academy of Pediatrics recommends it for at least 1 year (20,24). For countries with low infectious disease burden, as is typical for Europe, the optimal duration with respect to health outcomes of any breast-feeding after introduction of complementary feeding is uncertain because of lack of data. Breast-feeding should be continued by mother and child for as long as mutually desired, and must be based primarily on considerations other than health outcomes.

GROWTH OF BREAST-FED INFANTS

Given the health and nutritional benefits of breast-feeding, the correct interpretation of the growth pattern of

healthy breast-fed infants has great significance in terms of public health.

Infants following the WHO recommendations for prolonged and exclusive breast-feeding, and who lived under conditions favouring the achievement of genetic growth potentials, appeared to show a decrease of growth progression in the first year compared with the National Center for Health Statistics-WHO international growth references, on the basis of predominantly formula-fed infants (25). Observational studies published in the 1990s were consistent in identifying different patterns of growth in breast-fed and formula-fed infants, breast-fed infants showing a reduced rate of accretion, particularly in weight for age, from the third month up to the 12th month of life, with partial catch up by the age of 24 months (26–29). These observations led to the development of new WHO growth standards on the basis of infants following the WHO recommendations on breast-feeding, which were released in 2006 (30–32). Comparing these standards with the previous National Center for Health Statistics-WHO reference confirmed the different growth patterns between breast-fed and formula-fed infants. With the new standards the risk of making an incorrect assessment regarding the adequacy of growth in breast-fed infants, and to mistakenly advise unnecessary supplementation or cessation of breast-feeding is reduced (33).

A number of studies have found associations between a high growth velocity during the first months of life and an increased risk of noncommunicable diseases later in life (34,35). Such observations are consistent with growth pattern in the breast-fed infant representing the ideal.

METHODOLOGICAL ISSUES FOR ASSESSING HEALTH BENEFITS ASSOCIATED WITH BREAST-FEEDING

Breast-feeding is associated with many health benefits for both infant and mother. Because the maternal decision to breast-feed is influenced by numerous health-related factors, it is difficult to draw firm conclusions on the causal relationship between breast-feeding and health outcomes (36). For obvious reasons, it is unethical to randomise healthy infants to breast milk or infant formula. However, there is published evidence arising from 2 different intervention studies. The first study was performed in the United Kingdom in the early 1980s, and involved preterm infants (mean gestational age 31 weeks, mean birth weight 1400 g) who were randomised to receive either banked breast milk, preterm or standard formula, with some infants also receiving mother's milk (37). The second study, the Promotion of Breast-feeding Intervention Trial (PROBIT) is a cluster-randomised trial involving 31 Belarusian maternity hospitals and their affiliated clinics that were randomised to either breast-

feeding promotion on the basis of the WHO/UNICEF Baby Friendly Hospital Initiative or standard care (38). The hospitals forming the control group continued with the existing infant feeding practices. All singleton full-term infants with a birth weight of at least 2.5 kg born at the included hospitals were enrolled in the PROBIT study. Because all infants in this study were initially breast-fed, effects of different duration of total and exclusive breast-feeding rather than differences between breast- and formula-feeding can be explored.

Other available information is limited to observational studies, and confounding is, therefore, an important consideration. Educational, socioeconomic, and lifestyle factors such as smoking are strongly associated with the mother's decision to breast-feed. In industrialised countries, mothers who breast-feed have a higher socio-economic status and higher level of education than mothers who choose to formula-feed, whereas the opposite pattern is usually present in developing countries. There is also recall bias on the nature and duration of breast-feeding. Some studies compare infants who were never breast-fed with infants who received any breast-feeding. Other studies compare infants who were exclusively breast-fed with infants who were partially breast-fed. A few studies take into account the influence of the duration of breast-feeding on health benefits. Another relevant issue when interpreting the results from older cohorts is that the composition of infant formula has much improved during the last 30 years.

Three meta-analyses on the health benefits of breast-feeding in developed countries have been published recently, from the Dutch State Institute for Nutrition and Health, the Agency for Healthcare Research and Quality, US Department of Health and Human Services, and the WHO (4,5,39) (Table 1). Even in studies controlling for known confounding variables, residual confounding is still a concern. Caution is therefore needed when interpreting data on the controversial issue of health benefits related to breast-feeding. Because almost all of the data available on breast-feeding and health are gathered from observational studies, association or concomitance should be inferred rather than causality.

HEALTH BENEFITS ASSOCIATED WITH BREAST-FEEDING

Prevention of Infections

The preventive effect on infections is by far the most important health benefit in relation to breast-feeding, especially in developing countries. The Dutch and the Agency for Healthcare Research and Quality (AHRQ) meta-analyses concluded that breast-feeding was convincingly associated with a lower risk of gastrointestinal infection and of acute otitis media (AOM), whereas the protective effect on other respiratory tract infections was

TABLE 1. Comparison of recent systematic reviews and meta-analyses on health effects of breast-feeding in developed countries

Criteria	WHO, 2007 (39)	US Agency for Healthcare Research and Quality, 2007 (5)	Dutch State Institute for Nutrition and Health, 2005 (4)
Study addressed an appropriate and clearly focused question	Well covered	Well covered	Well covered
Description of the methodology used is included	To assess the long-term effects of BF on blood pressure, diabetes and related indicators, serum cholesterol, overweight and obesity, and intellectual performance	To review the evidence on the effects of breast-feeding on short- and long-term infant and maternal health outcomes in developed countries	To give an overview of the literature on health effects of breast-feeding (taking the beneficial and harmful effects together) for mother and infant
Literature search is sufficiently rigorous to identify all relevant studies	Well covered	Well covered	Well covered
Types of studies included in the review	MEDLINE (1966–March 2006); Scientific Citation Index databases; references lists; authors were contacted if study did not provide sufficient data	SR/MA; RCT; non-RCT comparative trials, prospective cohort, and case-control studies	Mainly observational
Language Setting	Observational (nearly all); RCTs	SR/MA; RCT; non-RCT comparative trials, prospective cohort, and case-control studies	Mainly observational
Study quality is assessed and taken into account	English; French; Portuguese; Spanish	English only	English, Dutch
There are enough similarities between the studies selected to make combining them reasonable	High-income countries and in predominantly white populations	Developed countries only for updates; no difference for earlier studies	Only populations from Western Europe, North America, Australia, New Zealand
Risk of bias	Graded for methodological quality using a standardised protocol	Graded for methodological quality	Every article tested on its quality; if an article did not fulfill every quality requirement the study was excluded
	Well addressed; heterogeneity assessed	Well addressed; heterogeneity discussed or assessed (if authors performed their own MA)	Not applicable (no formal pooling was performed)
	Almost all data were gathered from observational studies	Almost all data were gathered from observational studies	Almost all data were gathered from observational studies
Main results in infants	WHO, 2007	US Agency for Healthcare Research and Quality, 2007	Dutch State Institute for Nutrition and Health, 2005
Otitis media	—	↓	Convincing evidence ↓
GI infections	—	↓	Convincing evidence ↓
Respiratory infections	—	—	Possible evidence ↓
Severe lower RTI	—	↓	—
Atopy	—	—	Possible evidence ↓
Atopic dermatitis	—	↓	Eczema Probable evidence ↓
Asthma (young children)	—	↓	Probable evidence ↓
Wheezing	—	—	Probable evidence ↓
Obesity	↓ OR 0.78 (0.72 to 0.84)	↓	Convincing evidence ↓
Type 1 diabetes	—	↓	Possible evidence ↓
Type 2 diabetes	↓ OR 0.63 (0.45 to 0.89)	↓	—
Childhood leukaemia	—	↓	Possible evidence ↓
SIDS	—	↓	Insufficient evidence
NEC	—	↓	—
Cardiovascular diseases	—	Not clear	No evidence
Crohn disease	—	—	Possible evidence ↓
Ulcerative colitis	—	—	Insufficient evidence
Infant mortality	—	—	—

(continued)

TABLE 1. *Continued*

Criteria	WHO, 2007 (39)	US Agency for Healthcare Research and Quality, 2007 (5)	Dutch State Institute for Nutrition and Health, 2005 (4)
High blood pressure	↓systolic MD -1.2 mmHg (-1.7 to -0.7) ↓diastolic MD -0.49 mmHg (-0.87 to -0.11)	—	Convincing evidence ↓
Serum cholesterol	Adulthood ↓ MD -0.18 mmol/l (-0.3 to -0.06) Children and adolescents NS	—	—
Intelligence and schooling	↑ MD 4.9 (2.97 to 6.92)	—	—
Intellectual and motor development	—	—	Probable evidence ↑

BF = breast-feeding, MA = meta-analysis, MD = mean difference, NA = not assessed, NEC = necrotising enterocolitis, NS = not significant, OR = odds ratio, RCT = randomised controlled trial, RTI = respiratory tract infection, SIDS = sudden infant death syndrome, SR = systematic review, WHO = World Health Organization.

The strength of evidence in the Dutch meta-analysis was qualified as convincing, probable, possible, or insufficient.

The criteria used to make this distinction were

1. Convincing evidence: evidence on the basis of epidemiological studies showing consistent associations between exposure and disease, with little or no evidence to the contrary. The available evidence is based on a substantial number of studies, including prospective observational studies. The association should be biologically plausible.

2. Probable evidence: evidence on the basis of epidemiological studies showing fairly consistent associations between exposure and disease, but where there are perceived shortcomings in the available evidence or some evidence to the contrary. Shortcomings in the evidence may be any of the following: insufficient duration of trials (or studies); insufficient trials (or studies) available; inadequate sample sizes; incomplete follow-up. Again, the association should be biologically plausible.

3. Possible evidence: evidence based mainly on findings from case-control and cross-sectional studies. Insufficient randomised controlled trials, observational studies or nonrandomised controlled trials are available. Most trials are required to support the tentative associations, which should also be biologically plausible.

4. Insufficient evidence: evidence on the basis of findings of a few studies that are suggestive, but are insufficient to establish an association between exposure and disease. Better designed research is required to support the tentative associations.

In addition to these 4 categories the following qualifications were used:

1. Conflicting evidence: several studies with sufficient power show opposite effects, so it is impossible to conclude whether breast-feeding has a positive, negative, or no effect on the disease outcome.

2. No evidence: 1 or 2 studies with little power, so no clear statement can be given about the strength of evidence.

more doubtful (4,5). The meta-analysis by AHRQ showed that breast-feeding was always associated with a lower risk of AOM than exclusive bottle-feeding (odds ratio [OR] 0.77, 95% confidence interval [CI] 0.64–0.91) (5). The reduction in the risk of AOM was greater when comparing exclusive breast-feeding with exclusive bottle-feeding, either for more than 3 to 6 months duration (OR 0.50, 95% CI 0.36–0.70). Chien and Howie (40) identified 14 cohort studies and 2 case-control studies from developed countries that qualified for inclusion in their systematic review/meta-analysis on the relation between breast-feeding and the development of gastrointestinal infections in children younger than 1 year of age. The summary crude odds ratio of the 14 cohort studies for the development of gastrointestinal infections in breast-fed infants was 0.36 (95% CI 0.32–0.41), whereas that of the 2 case-control studies was 0.54 (95% CI 0.36–0.80). A recent case-control study of good/adequate methodology from England showed that breast-fed infants had a reduced risk of diarrhoea compared with nonbreast-fed infants (OR 0.36, 95% CI 0.18–0.74) (41). However, the protective effect of breast-feeding did not persist beyond 2 months after cessation of breast-feeding. There is no clear protective effect of breast-feeding on the occurrence of lower respiratory

tract diseases. However, breast-feeding may have a preventive role in the risk of severe lower respiratory tract infections, severe being defined by the need for hospitalisation. A meta-analysis of 7 cohort studies showed a 72% reduction in the risk of hospitalisation secondary to respiratory diseases in healthy full-term infants less than 1 year of age who were exclusively breast-fed for at least 4 months compared with those who were formula-fed (relative risk 0.28, 95% CI 0.14–0.54) (42). The protective effect of breast-feeding against the risk of hospitalisation for lower respiratory infection was recently confirmed in the United Kingdom Millennium Cohort study (6). Collectively the available data indicate an association of breast-feeding with a well-documented reduced risk of infectious diarrhoea as well as AOM, and a possible protection against other infections where level of evidence is less convincing.

Cardiovascular Health

Blood Pressure

A randomised trial in the early 1980s comparing the use of banked human milk with preterm formula for feeding premature infants showed that mean diastolic

