Lisa Smithers
Ellen McIntyre

The impact of breastfeeding

Translating recent evidence for practice

Background
Recent research is improving our understanding of how breastfeeding influences long term health and development.

Objective
This article summarises research published from 2004 to 2009 relating to breastfeeding of healthy full term infants to selected outcomes of public health relevance and community interest: intelligence quotient, anthropometry and cardiovascular health.

Discussion
Evidence from a large cluster randomised trial shows breastfeeding is associated with higher intelligence quotient at 6 years of age. Breastfed infants initially grow more slowly than artificially fed infants, but anthropometrical differences do not persist into childhood, suggesting other factors may have a stronger influence on anthropometry. Observational studies indicate cholesterol and blood pressure are moderately lower in adults who were breastfed in infancy, although further research is needed to confirm causality and clarify the full extent of benefit. Support of breastfeeding by general practitioners is an important health promotion strategy as even modest health benefits may have important implications at a population level.

Keywords: breastfeeding; health promotion, public health

Exclusive breastfeeding in the first 6 months of life and continued breastfeeding for at least 12–24 months thereafter is supported by governments, medical organisations and the World Health Organization (WHO).[1,2] In developed countries, breastfeeding lowers morbidity and mortality, and contributes to reducing healthcare costs.[3]

In line with the Australian Medical Association Statement on Breastfeeding and the strong focus on prevention, general practitioners need to maintain a working knowledge on the effects of breastfeeding. However many GPs lack the time and resources to critically appraise the vast body of literature. In 2007, two independent organisations systematically reviewed the breastfeeding literature published until March 2006.[4,5] Since then, new evidence has emerged that may provide greater clarity to the issue. This article summarises recent research that is of public health relevance and community interest. Rather than conducting another systematic review, it provides some context for discussing the study design issues that have made teasing out the effects of breastfeeding from other confounding influences challenging.

Literature search

The MEDLINE, Cochrane and EMBASE databases were searched for relevant articles using the keywords: breast milk, human milk or breastfeeding; and cholesterol, blood pressure, adiposity, body mass index and intelligence quotient. Searches were limited to humans, articles published in English between 2004–2009, and were supplemented by hand searching reference lists. The last search was conducted in May 2010. The inclusion and exclusion criteria were designed to be broadly generalisable to Australia. Articles involving healthy, full term infants from countries with medium to high development, as defined by the United Nations Human Development Index, were deemed eligible.[6] Studies involving children born preterm or with disease were excluded. Greater emphasis was placed on randomised trials or systematic reviews. High quality cohort studies with adjustment for multiple confounders were used to guide the discussion.

The literature search identified 519, 84 and 94 articles in MEDLINE, Cochrane and EMBASE respectively, totalling 717 articles once duplicates were removed. After screening

titles and abstracts, 37 articles were retrieved for further investigation. Twenty-two papers are included in the review;[4,5,7–26] 10 were identified by hand searching.

Evaluating the data

The evidence supporting short term effects of breastfeeding (eg. reducing infections) is stronger than studies examining longer term outcomes. Long term health is influenced by genetic propensity and environmental factors that act over many years to prevent or promote disease development. For example, genetic factors including familial high cholesterol, lifestyle or environmental factors (eg. smoking, high saturated fat diets) have strong effects on the risk of developing cardiovascular disease (CVD), long after breastfeeding has ceased.[27] Therefore it is difficult to measure all the influences on development of a disease in the intervening period. Another major problem in determining the long term effects of breastfeeding is that most studies are observational. Observational studies describe associations (not causality) and are unable to remove or account for all potential biases between women who choose to breastfeed their infant, from those who do not.

In Australia, women who breastfeed are older and have higher education, thereby having different socioeconomic characteristics to the wider population.[28] Furthermore, a lack of clarity in defining breastfeeding terms (exclusive, full, partial)[29] has introduced another level of uncertainty. Hence, teasing out the effects of breastfeeding from other environmental factors is challenging.

The 'gold standard' for ascribing causality is the randomised controlled trial, where the participant is randomly allocated to an intervention. Neither they nor the researcher can choose who receives treatment or placebo. If randomisation is successful, the background socioeconomic characteristics between the treatment and placebo groups are balanced and any effect can be attributed to the treatment.[30] Clearly it is unethical to randomise an infant to artificial feeding but a fascinating trial helping unravel some of the evidence associated with breastfeeding is the PROBIT (Promotion of Breastfeeding Intervention) Trial. PROBIT is a cluster randomised trial where hospitals in the Republic of Belarus were randomly assigned to usual infant feeding practices or the WHO Breastfeeding Support Program.[31,32] Since randomisation was based on the hospital, which included women from a range of socioeconomic settings, the trial overcame the background characteristics or biases at the mother/infant level. Infants born at hospitals implementing the breastfeeding intervention had higher rates of exclusive breastfeeding, compared with those born at hospitals following usual practices. The trial was large enough (n=17 046) to evaluate health outcomes associated with breastfeeding. The results at 1 year showed gastrointestinal infections and eczema was reduced in the breastfeeding intervention group compared with standard practice.[31]

Discussion

Breastfeeding and IQ

A number of studies have published conflicting results in this area, with high quality studies published in support[5] and refuting[4,7] the hypothesis that breastfeeding enhances intelligence quotient (IQ), leading to confusion among practitioners.[8] For illustration purposes we have included an observational study published before 2004 that shows the duration of breastfeeding is associated with higher IQ in adulthood.[33] Mortensen et al attempted to address potential biases by accounting for a large number of social, educational, pregnancy and birth factors associated with IQ. In contradiction, Der et al[7] demonstrated maternal intelligence was a strong predictor of child IQ and discounted previous studies that did not adjust for maternal IQ as simply detecting the residual effect of the mother's IQ on the child. The PROBIT trial has provided some clarity by demonstrating 6 point improvement in IQ at 6 years in children from the breastfeeding intervention group compared with standard practice.[9] Other research suggests an interaction between our genetic makeup and exposure to breastfeeding may influence our intelligence potential, where some genotypes have higher IQs in response to breastfeeding while others are unaffected.[10]

Breastfeeding, obesity and cardiovascular health

Breastfeeding research has suggested a protective effect on risk factors for common chronic diseases including type 2 diabetes[11,12] and obesity.[4,5,13] The mechanism underlying these effects may be via early nutrition 'programming' of metabolism by milk growth factors,[14] hormones,[34,35] or proteins.[15] Breastfeeding influences serum insulin-like growth factor, which is associated with favourable growth and a reduction in CVD risk factors.[14] Other research suggests that breast milk hormones help regulate appetite and energy intake,[35] carbohydrate or lipid metabolism, thus affecting macronutrients used for energy or fat deposition.[34,36]

At least two well designed studies have demonstrated that breastfed infants have slower growth trajectories than formula fed infants in the first year.[16,32] These differences have been attributed to the higher protein content of artificial milk,[15] differences in sucking patterns, and maternal-infant interactions.[17] Interestingly, the PROBIT trial showed that early differences in growth were not sustained[32] as no anthropometrical differences were found at 6 years.[18] In contrast, three systematic reviews of observational data, mainly from the United States, United Kingdom and Europe, have concluded that breastfeeding reduces the odds of overweight and obesity (adjusted odds ratio 0.6–0.9) in middle childhood or later.[19,38] These findings have been attributed to latent effects of breastfeeding, unmeasured confounding, statistical modelling techniques and early introduction of solids.[19,20,22,23] Although causality has not been established, the mounting evidence has led to breastfeeding being promoted as an obesity prevention strategy,[37–39] possibly because of the urgency to address obesity rates. Although there are differences in the prevalence of obesity between Australians and Belarussians,[40] following up the PROBIT trial participants will be important for understanding the longer term effects of breastfeeding on adiposity.

Consistent with the anthropometrical outcomes, the PROBIT study reported no effect of breastfeeding on blood pressure in childhood.[18] However, large systematic reviews of observational studies suggest that breastfeeding lowers risk factors for CVD including 1.4 mmHg reduction in systolic and 0.5 mmHg diastolic blood pressure,[24] 0.2 mmol/L lower total cholesterol levels,[25] and 0.6 lower

odds of type 2 diabetes in adulthood.[11] As with intelligence, teasing out the specific effect of breastfeeding from other factors confounding the association with CVD risk factors remains difficult.[26,42] Therefore, further research is needed to determine the full extent of benefit of breastfeeding to CVD risk factors. Lowering CVD risk has important health and economic implications, particularly in Western countries where CVD is a major cause of mortality.[42,43]

Breastfeeding promotion by GPs

General practitioners have an important role in supporting lactating women and promoting breastfeeding. Many women are influenced by their GP's opinion[44] and may discontinue exclusive breastfeeding if a healthcare provider suggests formula feeding.[45] A range of internet based resources are available to GPs (*Table 1*).[46–48] Furthermore, support services are available to mothers who present with breastfeeding difficulties that cannot be resolved in the usual consultation time, including referral to an accredited lactation consultant, hospital based breastfeeding support programs, community midwives or breastfeeding counsellors available at the Australian Breastfeeding Association telephone helpline.[47] These services should be offered and accessed as soon as an issue develops to alleviate anxiety and build maternal skills around breastfeeding.

Table 1. Clinical resources for breastfeeding promotion or advice

- Australian Breastfeeding Association
  www.breastfeeding.asn.au/bfinfo/index.html
- International Board of Lactation Consultant Examiners (guide to lactation education)
  www.iblce.edu.au/Guidetoeducation.php
- Academy of Breast-feeding Medicine (clinical protocols)
  www.bfmed.org/Resources/Protocols.aspx

Conclusion

General practitioners can use the high quality evidence on the long term effects of breastfeeding to educate, inform and support breastfeeding among consumers and the community. Recent evidence from a large cluster randomised trial confirms that exclusive breastfeeding for the first 6 months is associated with higher IQ, but not growth at 6 years. Observational studies suggests breastfeeding may lower blood pressure, serum cholesterol and adiposity in adulthood, but the evidence is complicated by many other confounding factors including genetic potential, environmental and lifestyle exposures (eg. diet, smoking). Consequently, further research is necessary to demonstrate the specific contribution of breastfeeding to health in adulthood.

Summary of important points

- Exclusive breastfeeding of healthy full term infants in the first 6 months of life can improve childhood IQ.
- Breastfed babies grow slower than formula fed babies in the first year, but no anthropometrical differences are evident by 6 years of age.
- Although serum cholesterol and blood pressure appear to be reduced among adults who were breastfed in infancy, further research is necessary to confirm causality.

Authors

Lisa Smithers BAppSc, GradDipHumNutr, PhD, is a Postdoctoral Research Fellow in early life nutrition, Department of Population Health and Epidemiology, University of South Australia, Adelaide, South Australia. lisa.smithers@unisa.edu.au

Ellen McIntyre OAM PhD, IBCLC, is a lactation consultant and Acting Director, Primary Health Care Research & Information Service, Discipline of General Practice, Flinders University, Adelaide, South Australia.

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correspondence **afp@racgp.org.au**