



EARNEST

EARly Nutrition programming- long term follow up of Efficacy and Safety Trials and integrated epidemiological, genetic, animal, consumer and economic research

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Parental understanding of the concept of early nutritional programming in selected EU countries

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The programming concept suggests that poor early nutrition is a root cause of an array of medical problems later in life summarised as the 'metabolic syndrome'. Evidence in support of early nutritional programming, which began with animal models, is now growing, and further research in this area is ongoing to uncover the nature of adaptive responses, underlying mechanisms, triggers and critical windows of time. The survey reported in this paper investigated the extent to which new mothers thought that lifelong health was influenced by diet as a baby, compared to alternative theories that suggest that health is determined by genetic predispositions to certain inherited conditions, and by lifestyles and behaviours, such as diet and exercise, which impact on weight and cardio-vascular risks.

The study focussed on first time mothers because it was felt that they were likely to have recently collected information on infant feeding. Moreover, the views of mothers having their second or subsequent child may be influenced by their previous feeding experiences, and by the extra time pressures they faced caring for a larger family. The survey instrument asked respondents for their perceptions of the importance of infant nutrition in the first year of life, and did not cover the intra uterine period. Breastfeeding, which has historically been associated with protection against infections, is now purported to reduce the risk of a wide range of conditions (including hypertension, diabetes, cardio-vascular disease and some cancers) relative to that associated with feeding of infant formula, and to thereby generate significant cost savings for health care systems. Following a systematic review of a large body of evidence, the WHO issued a global declaration, recommending that all infants should be exclusively breastfed for the first six months of life. The survey asked new mothers about their milk feeding and weaning intentions, and the underlying reasons, so that the importance of health outcomes for the baby, as an influence on intended behaviours, could be explored. The study was conducted in five geographically dispersed European countries, with varied cultures and health systems (England, Finland, Germany, Hungary and Spain), so that international comparisons could be made.

Ethical approval for the study was obtained from the relevant authorities in each country. First time mothers were invited to complete a questionnaire whilst they were in the maternity hospital shortly after the delivery of their babies. Ward staff identified mothers who met the inclusion criteria: primiparus, following vaginal or caesarean deliveries, with healthy singleton babies not requiring special care, and who were able to read the information leaflet about the study in the local language. Ante and post natal care in some of the study countries is provided in a large number of doctor offices or clinics, so recruitment in centralised maternity units facilitated the process of obtaining a cross section of mothers. The catchment areas of the hospitals in the localities of the researchers included populations from varied socio-economic backgrounds, and were used for recruitment of participants.

The target recruitment was 400 new mothers per country. This was based on the sample size requirement of 392 necessary to identify, using a two-sided test of size 5% and power 80%, an underlying difference of 10% between any two countries with regard to any specific prevalence (such as the proportion of mothers intending to wean onto solid foods at 6 months or later). Research nurses in the study hospitals in Finland, Germany, Hungary and Spain provided information about the study to new mothers in the post natal ward. A convenience sampling approach was used. Some mothers may have been missed because they had been discharged, or because they were busy with their baby when the research nurse visited the ward. Those wishing to take part completed a consent form, which recorded their contact details. They were then given a copy of the questionnaire, which they self completed anonymously and returned to the researcher. No research nurses were available in the maternity hospitals in England, and the research team started the recruitment process by making daily visits to study hospitals to invite new mothers to take part. This method had to be replaced due to resource constraints, and the consent form and questionnaire were distributed instead to mothers in their hospital discharge packs, together with a stamped envelope, addressed to the research team, for the return of the completed documents.

Two meetings attended by researchers from each country were held to design the questionnaire and agree the items. The initial version was produced and piloted in England, and then translated into Finnish, German, Hungarian and Spanish, and further tested in each of those countries. Slight adaptations were made to accommodate local cultural differences. The final survey instrument was in three sections over four sides of paper, and took between five and ten minutes to complete.

The first section of the questionnaire asked respondents about their baby: date due, date arrived (to establish gestation); weight at birth; gender. The second section asked about infant feeding: the method intended until weaning onto solid foods (exclusive breast/breast and formula/exclusive formula); the reason for the stated intention (open question); how many months after birth they intended to introduce foods other than breast or formula milk; the reason underlying the stated weaning time intention (open question); whether they thought that what a baby is fed over the first few months will affect its health during first year, and in years to come (yes/no), and the reasons underlying each view (open questions). It also asked respondents about the extent (extremely/very much/moderately/slightly/not at all) to which they thought: diet as a baby, genetics, and seven environmental and lifestyle factors influence health as an adult; a baby's diet will influence his/her lifelong preference for unhealthy foods, risk of being overweight and seven other longer term diseases or chronic conditions; their decisions about how to feed their baby were influenced by 17 sources of information, grouped into three categories: family and friends (partner, parents, other relatives, friends); health care professionals (doctor, midwife, staff in hospital, other health professionals, private ante natal class); media (leaflets, advertisements, television and radio programmes, internet, books, magazines, videos/DVDs).

The final section of the questionnaire asked about the background of the mother and her household: year and country of birth; language spoken at home; living arrangements (partner/single/with others); education (left full time schooling less than or equal to 16 vs greater than 16 years of age); qualification in health or nutrition (yes/no); special diet (yes/no); annual household pre tax income (grouped by quintiles of each country); employment status pre pregnancy; health related behaviours i.e. physical activity and healthy eating (extremely/very much/moderately/slightly/not at all), smoking pre and during pregnancy; height and pre-pregnancy weight, for BMI; whether mother had ever been told by a doctor that they were overweight/obese, or had diabetes, cancer, high blood pressure, heart disease, eczema/asthma/hay fever, food allergy.

Ten maternity units were involved in the study, and a total of 2071 new mothers completed the baseline questionnaire across the five countries. The length of time it took to recruit the required sample size varied depending upon resources available in the different locations. The proportion of eligible mothers who participated depended on the availability of researchers within the study hospitals. It was particularly low in England because face-to-face recruitment of mothers had to be abandoned after two months and questionnaires were distributed with discharge information. A comparison of the socio-economic and demographic characteristics and infant feeding intentions of English mothers recruited by face-to-face and remote means revealed no significant differences (data not shown), so the responses of both groups were analysed together.

All mothers who provided data at baseline were mailed a follow up questionnaire when their baby was eight months old. This asked them to self report their milk feeding and weaning behaviours, and repeated the baseline question on sources of information on infant feeding.

There were significant differences in the means (or percentages) across all five countries for each variable, except the gender of the baby. Lower proportions of mothers recruited in Spain had completed education beyond the age of 16 years and been in full time employment before becoming pregnant. Higher proportions of Spanish mothers came from households in the lowest income quintile, were smokers, and reported less healthy eating and lower physical activity prior to their pregnancies,

than the mothers in the other four countries. Almost 60% of mothers recruited in England reported annual household incomes in the top fifth of the national distribution.

Infant feeding intentions

Over 80% of all mothers stated an intention to exclusively breastfeed their baby, ranging from 68% in England to 97% in Hungary. A total of 70% of mothers stated that they would not start to wean onto solid foods until their baby was six months old, ranging from just over one half in Finland and Spain to over 80% in Germany and Hungary.

Across the five countries, intention to exclusively breastfeed was associated with better health behaviours: 74.7% (78.2%) of mothers who smoked during (prior) to their pregnancy intended to breastfeed vs. 82.9% (83.8%) who did not smoke ($p=0.012$, $p=0.003$); 78.9% of mothers stating they were moderately, slightly or not healthy eaters intended to exclusively breastfeed vs. 86% who were very or extremely healthy eaters ($p=0.0005$). No socio-demographic variables were associated with intention to exclusively breastfeed. However, mothers who intended to wean their baby onto solid foods at six months or later were significantly older, and had received more education, than mothers who intended to wean earlier (30.3 vs. 29.3 years, $p=0.0005$; 71.7% vs. 57.7% were educated beyond the age of 16 years, $p=0.0005$). Similarly, more mothers with a BMI <30 (70.9%), who smoked during (prior) to pregnancy (71.7%, 72.4%), and who were in full time employment prior to pregnancy (72.4%) intended to wean ≥ 6 months than those who were obese (59.6%, $p=0.017$), did not smoke during (prior) pregnancy (48.2%, $p=0.0005$; 64.1%, $p=0.001$), and who had not had full time employment (62.4%, $p=0.0005$). More mothers without a qualification in health or nutrition stated an intention to introduce solid foods at or after 6 months, than mothers with a qualification (72.7% vs. 60.1%, $p=0.0005$).

Although the proportions varied between countries, the most frequently stated reason for intending to exclusively breast feed (cited by 42% of mothers) was that 'breast is best'. Almost half of mothers (48%) referred to the benefits of breastfeeding for the health of the baby: 23% specified a generic health advantage, and 25% mentioned specific health considerations. Immune function and allergy prevention were the specific health advantages most frequently cited (13% and 7% of all mothers respectively), although this largely reflected awareness of these issues in Germany (24%, 22%), England (6%, 22%) and to a lesser extent in Finland (5%, 13%). Mothers in England, Germany and Finland offered more reasons per person (mean of ≥ 2) than the mothers in Hungary and Spain (1.0, 1.4 respectively). The number of mothers stating an intention to exclusively feed formula to their baby was relatively small (3% of participants). The reasons stated were predominantly associated with health problems of the mother and /or baby (70% of mothers), a desire to share responsibility (13%) and return to work (13%; 39% in Germany).

About 70% of the mothers stating an intention to wean onto solid foods at six months or later cited 'recommendation' as the underlying reason. Whilst 46% did not specify the source of the recommendation, 8% reported that it came from a health professional, and 16% from an informal source such as family members or friends. Only 5% of mothers mentioned a health benefit for the baby as the explicit reason for delaying weaning until the baby reached six months. A relatively small number of mothers declared an intention to wean early (at 4 months or before) and the most important reasons underlying this were returning to work, wanting to involve others, having insufficient milk, wanting to introduce variety and because they thought the baby would be hungry.

The intentions stated suggest high rates of exclusive breastfeeding for six months in line with WHO recommendations. However, other pan-European studies have suggested low rates of breastfeeding

and poor weaning practices, such that action plans to increase exclusive breastfeeding rates have been produced. A lot of evidence exists to show that exclusive breastfeeding and later weaning are more prevalent amongst higher income, better educated and more health conscious sections of the population, and these associations were also observed in this study. The reasons given by respondents for intending to breastfeed or to feed formula milk to their baby, and the frequencies of citing health reasons for breastfeeding intentions, also closely reflect those recorded in a UK national survey.

Influences of infant feeding on future health

A total of 95.6% of mothers agreed that how a baby is fed affects its health over the first years of life (range: 94.2% Germany to 97.5% Spain). Slightly lower proportions thought that infant feeding affected health in years to come (88.5% overall, range 85.1% Hungary to 92.5% Spain). The specific reasons stated for why a baby's diet influences its health in the first year (n=2855 reasons stated), and in years to come (n=2007) related to: benefits from breastfeeding in general (22.7%, 17.4% of reasons respectively), and for immune function (22.2%, 20.5%); reduced risk of infection and disease or health in general (10.4%, 13.6%); the importance of nutrition in general (11.5%, 13.9%), and of particular nutrients or the composition of breast milk (13.3%, 6.3%); impact on growth and development (9.3%, 9.4%); protection against allergy (5.1%, 8.8% overall, and 13.1% and 17.9% in Germany), and other long term conditions (obesity, diabetes, cancer, CVD, bone, food preferences: 3.4%, 8.8%).

Although differences exist between countries, when considering the whole sample, more mothers thought that adult health is influenced by physical activity, diet in childhood, adolescence and adulthood, genetics and exposure to cigarette smoke than thought it is affected by diet as a baby, (which was viewed as having a similar influence as environmental pollution). Only family income was rated as significantly less important than diet as a baby as an influence on adult health. Bivariate analysis found that mothers reporting less education (leaving school at ≤ 16 years of age) thought that diet as a baby and genetics had less influence on adult health than those mothers who continued education beyond 16 years. No other socio-economic or demographic variable, nor country, was significantly associated with mothers' views about the influence of the other lifestyle and environmental factors on adult health (data not shown).

When considering a range of diseases and conditions, food allergy (cancer) was cited by the largest (smallest) proportion of mothers as being extremely or very much influenced by diet as a baby. In general, higher (lower) proportions of mothers in Spain (Hungary) than in the other countries thought that baby diet affected lifelong risks of chronic conditions. Mothers in Germany particularly attributed food and other allergies to diet as a baby.

Influences on infant feeding intentions

Over 80% of first time mothers in the study countries who took part in the survey stated an intention, shortly after birth, to exclusively breastfeed their baby. A range of general explanations were offered for this decision, and 25% of these mothers stated a specific reason related to the health of their baby. Most frequently, and particularly in the German and English samples, these reasons were that breastfeeding boosts the immune function and helps prevent allergy. Although 70% of mothers stated an intention to wait until their baby was at least six months old before starting to wean onto solid foods, less than 5% mentioned a reason for this associated with the health of the infant. Most stated that they were following recommendations.

The sample of mothers in this study considers diet as a baby to be a less important influence on lifelong health than many lifestyle and behavioural factors and genetics. Overall, risk of food allergy is the health issue associated with baby diet by the largest number of mothers, but this is due to the high proportion of mothers in Germany (>70%) who hold this belief. Less than one half of mothers consider baby diet to have an extremely or very important impact on lifelong risk of overweight, eczema/asthma/hay fever, diabetes, osteoporosis, high blood pressure, heart disease, cancer, or the development of unhealthy food preferences. These relatively low levels of recognition of the impact of early nutrition on lifelong health may reflect the limited attention paid to this issue in consumer information and the policy documents and guidelines for health professionals in the study countries. The evidence on the link between infant nutrition and lifelong health is incomplete and sometimes inconsistent, and expert debate remains about the details of the health effects of infant feeding and the need to delay weaning onto solid foods until the baby is six months of age. Until the scientific basis is fully established, accepted and disseminated, coherent messages will not reach consumers.

Information sources used by new mothers and perceived influence of written information

Books, partners and health professionals were the most influences on infant feeding decisions for the first time mothers in this study, followed by leaflets, magazines, parents and the internet. Advertising, TV, DVD and radio media were reported to be the least important sources. The influence of almost all sources was greater at eight months than at birth. The findings are consistent with previous research showing that mothers access multiple and concurrent sources of information, that the relative importance of these vary over time (and that cross cultural differences exist. In England and Finland, for example, GPs/doctors play a smaller role than in the other countries. Our data revealed no consistent associations between the characteristics of mothers and use of written materials to inform infant feeding decisions.

Regression modelling uncovered scattered significant associations between the characteristics of mothers and reporting that infant feeding decisions were moderately, very much or extremely influenced by leaflets/magazines/books in individual countries, but no consistent patterns emerged. There was no evidence that mothers' age, health behaviours, employment status, household income or country of residence predicted reliance on any of the types of written materials.

This study confirms earlier work that shows that parents use multiple sources of information when making feeding choices for their infants, and that reliance on different sources varies according to social, cultural and health system factors. Mothers in the current study reported that they were influenced most by health professionals, partners, books and leaflets. Attitudes of physicians and hospital staff, and interventions aimed at improving the knowledge and understanding of partners and other family members, are known to be instrumental in improving breastfeeding rates. It is important that each source accessed by parents passes on evidence-based messages. However, the quality of available information can vary. Health professionals may have gaps in knowledge, differences in opinions and attitudes or poor communication skills. Multifaceted approaches, incorporating written materials, face-to-face advice and institutional change have been shown most effective at improving breastfeeding rates.

Conclusions

Just over one half of first time mothers who had expressed an intention at birth to exclusively breast feed their infant did not fulfil that intention. Similarly, over 60% of mothers stating an intention not

to introduce other foods to their infants before 6 months did not meet this aspiration. Proportions varied by country. Generally younger mothers and those reporting less formal education and less good health behaviours for themselves (diet, exercise, smoking) were less likely to follow the WHO recommendations for exclusive breastfeeding to six months. This discrepancy between stated intentions and behaviours suggests that mothers may be aware of best practice recommendations, but that they do not necessarily follow them.

Views expressed by the mothers themselves support this conclusion. Mothers report that they are influenced by many and varied sources in making their infant feeding decisions, and most do not perceive lack of knowledge about healthy infant feeding choices as a constraint on their behaviours. Moreover, the healthiness of the food, and its likely effect on child's immediate and lifelong health are reported to be important influences on choice. Whilst child care delegation and convenience (providing a healthy diet is perceived as time consuming) are cited by mothers as the main factors limiting ability to feed their baby in a way that reduces lifelong risk of disease, there is also evidence that they tend to consider adult lifestyle as a more importance influence than diet as a baby.

These relatively low levels of recognition of the impact of early nutrition on lifelong health may reflect the limited attention paid to this issue in consumer information and the policy documents and guidelines for health professionals in the study countries (see WP4.2). The evidence on the link between infant nutrition and lifelong health is incomplete and sometimes inconsistent, and expert debate remains about the details of the health effects of infant feeding and the need to delay weaning onto solid foods until the baby is six months of age. Until the scientific basis is fully established, accepted and disseminated, coherent messages will not reach consumers.

Recent studies have shown low rates of breast feeding and poor weaning practices in Europe, particularly amongst low income groups. In this context, the information environment facing consumers plays a strategic role, and the findings from this study are timely. Marked variation in the importance of different sources of information between countries is observed, and a better understanding is required about which dissemination strategies are most effective in different cultural settings, and for different socio-economic and ethnic groups. There is a need to evaluate the impact on infant feeding practices of alternative means of providing information to parents, and at different stages, including the effect of health professional endorsements, and the growing importance of the internet. It is also important to ascertain the extent to which lifelong health considerations for the infant influence parents' decisions, and how the importance of such factors can be enhanced in their perceptions.

Good nutrition is paramount for physical and mental development, and promotion of healthy infant feeding behaviours is a major public health challenge. Parental awareness of the influence of early nutrition on lifelong health is required if they are to make health protecting choices for their infants. Pragmatic factors such as comfort, convenience and cost may override health considerations, particularly if parents do not understand the potential seriousness of the consequences of their decisions, or they assess the likelihood of personal susceptibility to be low. In this study, many mothers were aware of recommendations regarding the duration of exclusive breastfeeding, but did not articulate the reasons underlying this. Improved knowledge of the possible future impact of early nutritional experiences, and the mechanisms involved, may be needed to encourage health enhancing behaviours. Lay knowledge of issues surrounding food and health has been shown to vary with socio-economic status, but education and support can improve decisions regarding breastfeeding, including amongst mothers from lower income groups. The policy and information environment is central to ensuring that scientific findings are disseminated to health professionals in an effective manner, and that clear and consistent messages are communicated to consumers about healthy infant feeding behaviours.