EXECUTIVE SUMMARY

Maternal and Child Nutrition: 0-6 Months - Milk Feeding

Background

Nutrition is of fundamental importance for the growth, development and health of an infant during the first six months of life. There is clear evidence of the health benefits of breastfeeding for both the mother and her infant in the short and longer term.

The Department of Health (England) and the World Health Organisation recommends breast milk as the best form of nutrition for infants and exclusive breastfeeding is recommended for the first six months of an infant's life with continued breastfeeding alongside the introduction of appropriate types and amounts of solid foods (Department of Health 2003 World Health Organisation 2001). A national target was set in the Department of Health Priorities and Planning Framework 2003-2006 for England, to 'deliver an increase of two percentage points per year in breastfeeding initiation rates, focussing especially on women from disadvantaged groups (Department of Health 2003). In the UK, women from disadvantaged communities are significantly less likely to start breastfeeding and more likely to discontinue breastfeeding prematurely when they do start.

Infants who are fed infant formula milk are at greater risk of illness and infections, for example, gastroenteritis. The risks are increased when the manufacturers instructions on, adequate cleaning and sterilising of feeding equipment and the reconstitution and storage of formula milk are not followed.

Objectives

- To review the existing evidence on the effectiveness of public health interventions to promote the initiation, and increase the duration of, breastfeeding.

- To review the existing evidence on what interventions effectively reduce the risk of:
    - Contamination of feeding equipment
    - Storage and reheating of breast milk
    - Reconstitution of formula

- To assess the available evidence on the effectiveness of different methods used to express breast milk.

- To assess the effectiveness of supplemental feeding modes (e.g. cup, spoon, bottle) in babies who are otherwise breastfed.

- To review the existing evidence on the effectiveness of vitamin supplementation in infants who are partly breastfed or exclusively formula fed

Methods

Selection Criteria

A worldwide search of a number of databases was conducted to identify relevant systematic reviews (from 1995 onwards). Secondly, a worldwide search for randomised controlled trials was conducted (from 1990 onwards). Finally, the search included any type of study – but this search focused on studies from the UK published from 1990 onwards.

Studies not published in English were excluded from the review.

All of the searches were conducted using a stepped approach to identify relevant systematic reviews, randomised controlled trials and non-randomised studies (cohorts, qualitative studies and surveys) that examined interventions to promote safe and healthy milk feeding practices in babies born at term, and up to the age of six months. The babies could be exclusively breastfed, partially breastfed, or exclusively formula fed. Low birth weight babies were excluded from the rapid review. To be included in the review, the studies had to be conducted in developed countries.

In some cases (e.g. interventions aimed at promoting the initiation and duration of breastfeeding), pregnant women were also included. Where data were available, the review also considered the following population subgroups:

- Mothers and babies from lower socioeconomic groups
- Mothers and babies living in areas of deprivation including inner city areas
- Black and minority ethnic groups
- Mothers aged under 18
- Unsupported mothers
- Mothers from groups who are likely to be nutritionally vulnerable, including those who are homeless, travellers, refugees or asylum seekers, disabled women, prisoners

Studies of mothers with multiple births were not excluded.

(The search terms/strategy used to address initiation and duration of breastfeeding was based on those used in Fairbank 2000 and Renfrew 2005)

Outcomes

Various outcomes were included depending on the intervention examined. These included:

- Rates of initiation of breastfeeding
- Mean duration of breastfeeding
- Reducing risks for contamination of formula/breast milk
- Optimising reconstitution of formula
- Morbidity in the baby (i.e. infection, gastroenteritis)
- Improving the quantity of breast milk expression
- Ease of breast milk expression
- Nutrient status of the child, for example iron status
- Harm (including an assessment of whether increased initiation of breastfeeding has any adverse effects on mean duration)

Data sources

To identify relevant systematic reviews we searched the Cochrane Database of Systematic reviews (Issue 2 2006), the Database of Abstracts of Reviews of Effects

(DARE), the Health Technology Assessment database and Ongoing Reviews Register (all from 1995 to June 2006). To identify randomised controlled trials, we searched MEDLINE, EMBASE, CENTRAL, CINAHL, and PsychINFO.

Data Extraction and Quality Appraisal

All of the studies that met the inclusion criteria were critically appraised by two reviewers in accordance with criteria described in NICE (2006). A study was graded using a code '++', '+' or '- ' (poorest quality)[1] based on the extent to which the potential sources of bias had been minimised. If there was any discrepancy in a grade given to a study by the two reviewers, the opinion of a third reviewer was sought. It is noted that these grades reflect the quality of the author's reporting of their study.

Each included study was assessed to determine its applicability to UK settings. Notes on applicability are presented in the data extraction tables. In addition, a search was conducted for non-randomised UK studies from 1990 onwards to identify additional relevant studies.

For UK studies that addressed peer support and the initiation and duration of breastfeeding, only those conducted after 1999 were evaluated in this review, as this was the year the Department of Health established the Infant Feeding Initiative. Key points have been extracted from Dykes (2003) – a publication which evaluated the Infant Feeding Initiative.

Synthesis

Due to heterogeneity of design among the studies, a narrative synthesis was conducted.

Research questions

The research questions for this review relate to the promotion of safe and healthy milk feeding practices in healthy babies born at term, up to around six months of age. In particular, this review sought to assess studies that considered babies born to low-income mothers. Five key topic areas were addressed:

- Breastfeeding
- Contamination of equipment/storage and heating of breast milk/reconstitution of formula
- Expressing breast milk
- Supplemental feeding modes
- Vitamin supplementation in infants who are breastfed

Question about Breastfeeding

1 What public health interventions aimed at mothers effectively increase the initiation and duration of breastfeeding in normal healthy term babies?

Questions about contamination of equipment/storage and heating of breast milk/reconstitution of formula

[1] See NICE (2006). Methods for development of NICE public health guidance. Version 1.

2 What interventions effectively reduce the risks of contamination of equipment used in bottlefeeding, and in the storage and reheating of breast milk? In addition, what interventions reduce the risks associated with the reconstitution of formula?

Questions about expressing breast milk

3 What are the most effective methods to express breast milk?

Questions about Supplemental feeding modes

4 What supplemental feeding modes (e.g. cup, spoon, bottle) are most effective?

Questions about vitamin supplementation in infants who are breastfed

5 What is the effectiveness of vitamin supplementation in infants who are partly breastfed or exclusively formula fed?

The following sub questions will be relevant where effectiveness data are available:

a) How does the structure and content of the intervention influence effectiveness?
b) Does effectiveness vary be gender, age, ethnicity, religious practices or social/professional group of those receiving or delivering the intervention?
c) Does effectiveness vary with site/setting or intensity/duration of the intervention?
d) What are the views of those receiving and delivering the intervention?
e) Is there evidence of unintended or harmful effects?
f) Are there barriers to replication of effective interventions?

Results

The searches for systematic reviews randomised controlled trials and UK studies identified 460, 3752 and 1235 citations respectively, totalling 5447 citations. Two reviewers independently screened all 5447 titles and abstracts identified in the literature search. Full paper copies of 28 systematic reviews, 87 randomised controlled trials and 25 UK studies were obtained and independently assessed for inclusion by two reviewers. Any disagreements regarding whether or not a paper met the inclusion criteria was achieved by consulting a third reviewer.

In total, 24 studies met the inclusion criteria (eight Systematic reviews and 16 Randomised control trials. In addition, 13 corroborative UK studies have been included. These studies have not been data extracted, but their key points have been summarised in tables below.

The majority of studies (11 Randomised control trials) focused on the initiation and/or duration of breastfeeding, four studies (three Systematic reviews and one randomised control trial) assessed contamination of milk or reconstitution of formula, three Randomised control trials examined breast milk expression, and

one randomised control trial evaluated teat types for bottlefeeding. Full references of the included studies are listed at the end.

Question about Breastfeeding

What public health interventions aimed at mothers effectively increase the initiation and duration of breastfeeding normal term babies?

Peer Support Programmes

Peer support programmes may vary considerably in design and delivery. Peer support programmes, volunteer councellors and postnatal support workers have been presented separately as described by the study. The peer support programmes presented have ben developed by the healthcare service. Further to this, the effectiveness of such programmes may vary according to the ethnicity, age and culture of women recruited in the study, and acceptability to the population group. Peer support programmes are also included in evaluation of multi-faceted interventions.

This review identified three randomised control trials that evaluated peer support interventions aimed at improving initiation or duration of breastfeeding. These studies update the results from systematic reviews. The earliest systematic review was by Fairbank (2000). This systematic review included four non-randomised controlled trials Caulfield et al (1998)++, Schafer et al (1998)++ and Kistin et al (1994)- and McInnes (1998)++ and concluded that peer support offered antenatally to women on low-incomes who intended to breastfeed was effective at increasing the rate of both breastfeeding initiation and duration.

Authors from Fairbank et al. (2000) systematic review conclude peer support programmes as standalone interventions have been shown to be effective in both the antenatal and postnatal periods, for women who expressed a wish to breastfeed, but not for women who had decided to bottle feed. More generally, three out of five effective WIC interventions with women on low incomes included a peer support programme.

Renfrew et al (2005) concluded that effective peer support interventions were those that were given very soon after birth to women who did not have to request the support in order to receive it.

In addition, the following randomised controlled trials added new evidence to these systematic reviews.

One 1++ study Muirhead (2006) examined the effectiveness of peer support on the rates of ‘any’ and ‘exclusive’ breastfeeding up to 8 weeks. Two hundred and twenty five women in Ayrshire, Scotland were randomised to receive education and support from trained peer supporters in the antenatal and postnatal periods, or to the control arm with standard care including home visits from the community midwife for 10 days, visits from the health visitor after the 10th day, and breastfeeding support groups and workshops. The intervention allowed for peer support until 16 weeks after hospital discharge. No information on the socio-economic status of the women were reported. The loss to follow-up was minimal (2.2%). Thirteen women in the intervention group did not receive peer support. There were no baseline differences in those who received and did not receive support; all participants were entered into the analysis. At six weeks, ‘any breastfeeding’ occurred in 31.3% of women in the intervention group and 29.2 % in the control group (95% CI –10.0 -14.0). Exclusive

breastfeeding at six weeks was 24.1% in the intervention group and 21.2% in the control group (95% CI -8.1 – 13.8). Corresponding figures for 'any breastfeeding' at 16 weeks were 23.2% and 17.7% (95%CI –5.0-16.0) and 1.8% and 0% for 'exclusive breastfeeding' (95% CI –0.7-4.2). None of the comparisons were statistically significant. Cumulative breastfeeding survival (Kaplan-Meier) was higher in the intervention group for all participants (p=0.5), for women who intended to breastfeed (p=0.4) and for those who started to breastfeed (p=0.4). First time mothers appeared to benefit from the intervention.

One 1- study Chapman (2004a) evaluated the impact of an existing peer counselling programme for a low-income, predominantly Hispanic population in a large city in the USA. Two hundred and nineteen women who intended to breastfeed were randomised to receive breastfeeding education, support and counselling from peer counsellors or the control group with routine breastfeeding education, written information, hands-on assistance in hospital and postnatal access to a telephone helpline. The intervention was designed to give one prenatal visit offering breastfeeding education and assessment with optional viewing of an educational video, daily intra-partum hospital visits involving hands-on assistance and further education, and three postnatal home visits offering one-to-one counselling with optional free breast pump and further access to peer counsellor services on request. The first postnatal visit was designed to be within 24 hours after hospital discharge; however there was no information on the cut-off date for the intervention i.e. 2 or 3 months postnatally. Fifty three percent of the women received at least one prenatal visit, which lasted a mean of 69 minutes, 94% received at least one hospital visit, and 50% received at least one postnatal home visit. The loss to follow-up at six months was 12.7%, with no significant differences between the groups. Peer counselling significantly reduced the number of women not initiating breastfeeding (RR 0.39, 95%CI 0.18-0.86). Although not significant, the authors state that fewer women in the intervention group were not breastfeeding at one and three months postpartum compared to the control group (RR 0.72 95% CI 0.50, 1.05 and RR 0.78 95%CI 0.61, 1.00 respectively). The impact of the intervention on exclusive breastfeeding was not apparent.

Chapman (2004b) reports on process outcomes from Chapman (2004a). In the first month, 45% percent of women received postnatal home visits and 51% received telephone contact. In the second month the figures dropped to 8% and 12% respectively. The first quartile of breastfeeding duration among women who received prenatal visits was significantly higher than those who did not receive home visits (1.8 month vs. 0.5 month, p <0.05). Similarly, among participants who received both hospital and postnatal contact breastfeeding duration was higher than for those who did not receive this contact (1.8 month vs. 0.5 month, p <0.05).

One 1- study Anderson (2005) evaluated the effect of peer counselling to promote exclusive breastfeeding in the same population and setting as the earlier study, but at a later date. One hundred and eighty two women who were intending to breastfeed, the majority of whom were Hispanic or Black, were randomised to receive breastfeeding education and counselling from trained peer counsellors during antenatal, intra-partum and postpartum visits until three months after the birth of their baby, or to the control group which involved lactation education and support as per the Baby Friendly Hospital Initiative (BFHI) directives, plus lactation consultant services while in hospital, and postnatal access to a 24-hour breastfeeding helpline. The differences between this and the earlier study were an increase in the number of prenatal and postnatal visits (from 1 prenatal and 3 postnatal to 3 and 9 respectively). In addition, breastfeeding education was extended to the woman's

family. Twenty-seven women in the intervention group and 20 in the control group were lost to follow-up by three months, with no significant differences between them in the final sample. At hospital discharge, fewer women in the intervention group did not initiate breastfeeding (RR 2.48, 95% CI 1.04, 5.90). Non-exclusive breastfeeding was higher in the intervention compared to the control group (RR 1.35, 95%CI 0.94 - 1.93) at hospital discharge, but in the postnatal period, prevalence of non-exclusive breastfeeding rates were consistently higher in the control group; at three months it was 73% in the intervention group compared to 97.2% in the control group (RR 1.33, 95% CI 1.14,1.56).

A report on the Department of Health funded projects that were commissioned as part of the Infant Feeding Initiative (1999) provides detailed analysis of the peer support projects (Dykes 2005).

Evidence statement 1
Three ++ non-Randomised control trials included in Fairbank (2000) evaluated peer support programmes. The interventions included training of peer supporters, antenatal and postnatal support (telephone, home visits group or contact at clinic that was initiated by the peer supporter. The studies found a statistically significant increase in the initiation and or duration of breastfeeding among women from low-income groups who intended to breastfeed (Caulfield et al1998, Schafer et al 1998, McInnes 1998).

Evidence statement 2
One 1++ randomised control trial evaluated a peer support programme including; peer support training, one antenatal visit, postnatal support (not necessarily within 72 hours) by telephone or home visit and support groups. The study found no significant difference in breastfeeding initiation and duration rates (up to 16 weeks) compared to routine care in a general population in Scotland (Muirhead 2006).

Volunteer Counsellors
Renfrew (2005), systematic review included two studies evaluating volunteer breastfeeding counsellors (Dennis 2002 and Graffy 2004). In both studies breastfeeding councellors from the local voluntary organisation were evaluated.

This review provides evidence from one 1++ trial Dennis (2002) that postnatal telephone support instigated by the supporter within 48 hours postnatally to relatively well-educated mothers, was effective in increasing ‘any’ and ‘exclusive’ breastfeeding up to three months.

A UK 1++ study Graffy (2004) demonstrated that volunteer support offered to high income women was not effective at promoting breastfeeding duration; however it is noted that the offer was made in the antenatal but not in the postnatal period, and that women were expected to ask for help from volunteers after they went home.

Evidence statement 3
Two 1++ Randomised control trials included in the Renfrew (2005) evaluated volunteer breastfeeding counsellors. The first found telephone support instigated by the supporter within 48 hours of hospital discharge significantly increased the duration of any and exclusive breastfeeding at 4, 8 and 12 weeks compared to conventional care in relatively well-educated mothers who were breastfeeding at study recruitment. The other study found one antenatal visit at which the offer of

postnatal support was made along with a contact card and leaflets had no effect on breastfeeding initiation or duration rates (Dennis 2002 and Graffy 2004).

Postnatal Support Worker

Renfrew systematic review (2005) considered two randomised controlled trials that evaluated additional postnatal support interventions to women regardless of infant feeding intention. The authors conclude one 1++ study Morrell et al (2000) provides evidence that additional postnatal support interventions, not including additional breastfeeding support, were not effective in supporting breastfeeding.

Evidence statement 4

One 1++ randomised control trial in Renfrew (2005) evaluated an intervention that included up to ten visits from a trained support worker for up to three hours per day in the first 28 days postnatal, (as well as usual care). The study reported no significant increases in the duration of breastfeeding. Women were recruited from the general UK population (Morrell et al 2000).

Professional support

Healthcare professional appraisal/ support in infant feeding can be defined as support and appraisal provided by a healthcare professional from within the health care system. Two randomised controlled trials of healthcare professional support met the inclusion criteria in addition to the systematic reviews by Fairbank et al. (2000) and Renfrew et al, (2005).

Fairbank (2000) included one randomised control trial Oakley (1990) (not graded) on social support from healthcare professionals in the UK. This study targeted low-income women with a high risk of having a low birth weight baby, and found that the intervention, which consisted of home visits, telephone calls and access to helpline during the 2nd and 3rd trimester from a midwife. The study found social support from health professionals was not found to significantly increase rates of breastfeeding initiation, although there was some improvement in comparison to the control group. It was noted that women welcomed the social support from the midwife.

Renfrew (2005) included five studies of healthcare professional support (Porteous 2000; Pugh 2002; Pugh and Milligan 1998; Wrenn 1997 Quinlivan et al 2003). One 1++ small (n=52) randomised controlled trial (Porteous 2000) found intensive, regular postnatal support that included daily hospital visits, telephone call within 72 hours, home visit within the first week postnatally, phone number/pager to contact the midwife and weekly phone calls for four weeks with further home visits if required. The intervention was delivered by a trained midwife to a sample of relatively affluent women who were breastfeeding at recruitment improved both ‘any’ and ‘exclusive’ breastfeeding at four weeks (although the results were not significant).

Another 1+ study (Pugh 2002) found that breastfeeding-specific support from peers and professionals working together are effective at increasing breastfeeding rates among women who plan to breastfeed so long as it is pro-actively offered to new mothers soon after birth.

Planned, structured support from health professionals that does not include additional breastfeeding support is not effective at increasing breastfeeding duration rates (Wrenn 1997 and Quinlivan et al 2003).

A 1- study Di Napoli (2004) evaluated the effectiveness of breastfeeding counselling and support by a midwife on the initiation and duration of breastfeeding. Six hundred and five pregnant women living in Rome who intended to breastfeed, had telephone access, and who had healthy term babies were randomised after completing a questionnaire with a trained interviewer one day before discharge from hospital. Women in the control group appeared to be older but they did not differ by previous breastfeeding experience. A midwife who had attended the UNICEF 18-hour intensive training course on breastfeeding techniques and management delivered the intervention. The midwife made a 30-minute home visit within seven days of discharge, and this was followed by telephone counselling (no further details were provided). Once every two weeks over the next six months, a trained interviewer administered a questionnaire by phone. The control group had no specific intervention. There was complete follow-up for 45.9%, partial follow-up for 43.6% and no follow-up for 10.4% subjects. Of the 303 subjects assigned to the intervention group, 44 (14.5%) refused the intervention. There were no significant differences between the intervention and control groups in duration of breastfeeding after controlling for confounding factors. For those in the intervention group who refused the home visit, there was a significant increased risk of discontinuing breastfeeding at 4 months and 6 months (HR 1.52, 95%CI 1.07,2.17 and HR1.61 95%CI: 1.13,2.31 respectively).

Evidence statement 5
One randomised control trial included in Fairbank (2000) evaluated social support from a midwife that included, a minimum of 3 home visits (at 14, 20 and 28 weeks antenatally), plus 2 telephone contacts or brief home visits between these times. Midwives provided a 24-hour on call support service on any topic but they did not provide the standard clinical care. The study found an increase in breastfeeding initiation rates that was not statistically significant (Oakley 1990).

Evidence statement 6
Four Randomised control trials, in Renfrew (2005) evaluated health professional support. One 1++ randomised control trial included frequent postnatal visits and telephone support from a skilled, knowledgeable midwife and found breastfeeding duration rates increased significantly in women who had planned to breastfeed. One 1+ randomised control trial evaluated intra-partum visits in hospital and postnatal home visits with telephone support from a community nurse and peer counsellor to be effective in increasing the duration of exclusive breastfeeding amongst minority women on low-income (Porteous 2000 and Pugh 2002),

Evidence statement 7
One 1+ randomised control trial evaluated structured support from a health professional (one intra-partum and postnatal visit, and one phone call) and found no significant increases in breastfeeding rates at 6 weeks in women from the US armed forces. An Australian 1++ randomised control trial evaluated a series of structured postnatal home visits for teenage mothers starting at one week postnatal, that included amongst other things, discussions on infant feeding by a midwife in addition to routine hospital services. No increases in any breastfeeding rates were demonstrated (Wrenn 1997 and Quinlivan et al 2003).

Lactation Consultant/Breastfeeding Advisor/Breastfeeding Consultant (trained, skilled and knowledgeable about breastfeeding)

Interventions involving healthcare professionals vary considerably in design and delivery. The effectiveness of such programmes may vary according to the level of knowledge experience and skills of the person delivering the intervention as well as the ethnicity, age and culture of the study sample and the acceptability to the population group. Some studies Bonuck (2005) evaluated the effectiveness of lactation consultants on breastfeeding outcome. More frequently a breastfeeding consultant, breastfeeding advisor or a trained, skilled, knowledgeable person in breastfeeding delivered a number of interventions in the studies in this review. This was achieved in some instances by the researcher delivering the intervention, for example, Duffy (1997).

A 1+ study Bonuck (2005) evaluated the effectiveness of a lactation consultant on the intensity of breastfeeding at 52 weeks. Three hundred and eighty women in the US were randomised to receive two prenatal home visits with breastfeeding education and assessment, prenatal weekly telephone visits, hospital visits and postnatal home visits offering continued practical support and help with establishing social support in family/school/workplace/clinic with offer of a nursing bra and breast pump, or to the control arm with only standard care, access to WIC breastfeeding co-ordinator but no access to the lactation consultant. Women were recruited from health centres serving low-income, primarily Hispanic and/or black women. The loss to follow-up at 12 months was >20%; there were however, no differences between the initial and final sample. The intervention group was more likely to be breastfeeding through to week 20 (53% vs. 39.3%). Exclusive breastfeeding rates were low in both groups, and no between-group differences in exclusive breastfeeding were found. Breastfeeding intensity[2] was lower in the intervention group at 13 weeks (OR 1.90, 95% CI 1.13, 3.20) and 52 weeks (OR 5.25, 95% CI 2.44 -11.29), indicating more breastfeeding as a result of the intervention.

Four good quality randomised controlled trials in Renfrew et al (2005) included trained, skilled, knowledgeable health professionals. One 1+ study (Duffy et al 1997) clearly demonstrated than an antenatal group teaching session on positioning and attachment given by the researcher, a breastfeeding expert, is effective at increasing the duration of exclusive breastfeeding at six weeks postpartum among women on low incomes. Another 1+ study (Brent el at 1995) evaluated a comprehensive approach that was successful in increasing breastfeeding rates among women who intended to breastfeed that included early support and ongoing availability of a lactation consultant in the postnatal period. A further 1++ study (Redman et al 1995) included antenatal education and structured postnatal contact by a lactation consultant found no difference in breastfeeding duration rates. A 1+ study (Serafino-Cross and Donovan 1992) evaluated more concentrated postnatal support by a lactation consultant and found a significant increase in breastfeeding duration rates.

Evidence statement 8
One randomised control trial evaluated the effect of a lactation consultant conducting two educational antenatal visits, weekly antenatal telephone contacts, a hospital intra-partum contact and postnatal home visits compared with standard care in women on low-incomes who were primarily Hispanic and black living in the US. The

[2] Breastfeeding intensity measured the proportion of breast feeding to formula feeding. A higher score denoted a higher proportion of formula feeding.

study found the intervention significantly increased breastfeeding duration rates up to 20 weeks (Bonuck 2005).

Evidence statement 9
Four Randomised control trials in Renfrew (2005) included trained skilled, knowledgeable health professionals delivering interventions. Of these, one 1+ randomised control trial found a group antenatal education specifically on positioning and attachment significantly increased exclusive breastfeeding rates at 6 weeks among low-income women who intended to breastfeed. A 1+ randomised control trial included; 2-4 (10-15 minutes) individual antenatal sessions, training of health professionals and early frequent postnatal support that continued throughout the first year in a population of mostly white women on low-income. It found a significant increase in the breastfeeding initiation and duration rates. A 1++ randomised control trial included; group antenatal education at 24-28 weeks, support in hospital, postnatal contact at 2-3 weeks and 3 months and found no difference in exclusive breastfeeding duration rates in women intending to breastfeed. One1+ randomised control trial included, 5-8 home visits lasting up to an hour during the first 2 months with telephone support. Visits were concentrated in the first 2 weeks. The study found significant increase in breastfeeding duration rates at 2 months postnatal (Duffy 1997, Brent 1995, Redman 1995 and Serafino-Cross and Donovan1992).

Individual Breastfeeding Education in the Antenatal period

Breastfeeding education interventions are those that provide factual or technical information about breastfeeding to a specific target group either in a hospital or a community setting or given one-to-one on an individual basis.

The authors of Tedstone et al (1998) 2++ systematic review concluded one-to-one education sessions were more successful than group sessions when they were aimed at promoting initial breastfeeding with women who had already made a decision to bottle feed. The effectiveness of prenatal educations sessions in initiating breastfeeding was enhanced by contact with peer counsellors.

The authors of Fairbank (2000) 2++ systematic review conclude one-to-one educational programmes were more effective for women who planned to bottle feed, whereas group programmes were more effective for women who planned to breastfeed. This evidence is based on studies of low income black Americans.

Renfrew et al (2005) evaluates a 1++ study (Fredrickson 1995) conducted in the US among low-income women at a WIC clinic evaluated breastfeeding antenatal education and non-formula hospital discharge packs The authors conclude this trial provides a strong evidence base for the potential effectiveness of a tailored, individual teaching and knowledge-based intervention to increase breastfeeding duration among women on low-incomes who intend to breastfeed.

A 1++ study Labarere (2003) examined the effectiveness of a structured one-to-one hospital education intervention on ‘any’ and ‘exclusive’ breastfeeding at 17 weeks. One hundred and six mother-infant dyads in France were randomised to a single 30-minute one-to-one session of providing information, discussion and a leaflet with information on how to combine breastfeeding and employment, or to the control arm with usual verbal encouragement to breastfeed. The losses to follow-up in the intervention and control groups were 12.2% and 6.7% respectively. ‘Any breastfeeding’ in the intervention group was 34.4% and 40.2% in the control group

(RR 0.86, 95% CI 0.52, 1.40), while 'exclusive breastfeeding' was 14.0 % and 14.4 % (RR 0.97, 95% CI 0.42, 2.22).

One 1+/- study (Kistin 1990) graded 1- by Renfrew and 1+ by Fairbank targeted black American women on low incomes of whom approximately one third planned to breastfeed. The three-armed trial compared the effect of at least one group education session with a discussion of the benefits and potential problems of breastfeeding to a similar session delivered one-to-one to standard clinic care. The one-to-one education session was found to have a significant increase in duration rates in hospital and at two weeks postpartum but not at six and twelve weeks when compared to the control group. Authors in Renfrew (2005) conclude analysis by feeding intention suggests the strength of he individual session appears to be in changing women's minds or getting them to initially consider breastfeeding.

The authors from Renfrew et al (2005) concluded one 1++ study (Serwent et al 1996) provides evidence that a formal paediatric visit in the antenatal period is not likely to be effective at increasing breastfeeding duration rates among black American women on low incomes.

Evidence statement 10
One 1++ randomised control trial evaluated a single, 30-minute, one-to-one discussion and leaflet on 'breastfeeding and employment' by a midwife or intern. The intervention did not significantly increase exclusive, or any, breastfeeding at 17 weeks postpartum. This study was conducted in France on a relatively affluent group of women (Labarere et al 2003).

Evidence statement 11
One 1++ randomised control trial in Renfrew et al (2005) evaluated a single discussion at WIC registration (mean 12 minutes) and discharge packs at delivery. The study found breastfeeding duration was highest among mothers who had planned to breastfeed but had low breastfeeding knowledge (Fredrickson 1995).

Evidence statement 12
This three-armed 1+/- randomised control trial compared at least one group, antenatal, breastfeeding session (50-80 minutes, lead by the researchers) with a single one-to-one breastfeeding session (15-30 minutes) and standard care. The study found significantly higher breastfeeding initiation rates in both intervention groups among US black women on low-incomes (Kistin 1990).

Evidence statement 13
One 1++ randomised control trial evaluated a didactic one-to-one, antenatal discussion among a population of African-American women on low incomes with a paediatrician (who had received specific training) at a scheduled hospital visit. The advantages of breastfeeding were included in material covered. The study found no significant increase in breastfeeding initiation or duration rates (Serwint et al 1996).

Group Breastfeeding Education in the Antenatal Period

Breastfeeding education interventions are those that provide factual or technical information about breastfeeding to a specific target group either in a hospital or a community setting or given one-to-one on an individual basis.

Breastfeeding education varies across studies, in terms of, methods, content and duration. Breastfeeding education may be a stand-alone or a one off session or may be included in a health education programme.

The authors of Fairbank et al. (2000) conclude group health education can be effective among women from different ethnic and low-income groups in westernised countries.

Three education interventions were included in the Renfrew (2005) that evaluated the effect of group antenatal sessions on the duration of breastfeeding (Kistin 1990, Duffy et al 1997 and Rossiter 1994). One 1+/- randomised control trial presented above Kistin (1990) found group education sessions demonstrated a statistically significant increase in duration rates of breastfeeding compared to the control group in hospital and at twelve weeks postpartum but not at two and six weeks. The authors Renfrew (2005) conclude analysis by feeding intention suggests the strength of the group classes appears to be in helping women who had already considered breastfeeding to maintain their decision to breastfeed at twelve weeks. Although either individual or group education was significantly more effective than standard care, there were no statistically significant differences between group and individual education.

A 1+ study (Duffy et al, 1997) in Renfrew et al (2005) clearly demonstrated an antenatal group teaching session on positioning and attachment is likely to be effective at increasing the duration of exclusive breastfeeding at six weeks postpartum among women on low incomes

A 1+/- study (Rossiter, 1994) graded 1- by Renfrew and 1+ by Fairbank, evaluated a culture-specific group education programme to promote breastfeeding among Vietnamese women in Australia and found group sessions to be effective compared to women who only received a leaflet.

The three following randomised controlled trials added new evidence to the systematic reviews.

A 1++ randomised controlled trial (Forster 2004) compared the effectiveness of two education interventions on the duration of ‘any’ and ‘exclusive’ breastfeeding. Nine hundred and eighty one relatively disadvantaged women living in Australia were randomised to a 1.5 hour class on practical aspects of breastfeeding, or to two one hour classes exploring family and community attitudes towards, and experiences of, breastfeeding, or to the control arm with standard care. Classes for both interventions took place in interactive small groups when women were in mid-pregnancy. The classes were well received by those who attended. Losses to follow-up at six months were 9.1%, 10.3% and 8.5% in the practical skills group, the attitudes group and standard care respectively. Women from all three groups accessed breastfeeding information the hospital’s routine information, with more women in the standard group accessing this information compared to the two intervention groups. Neither intervention increased breastfeeding initiation and duration compared with standard care. Initiation rates were 97% for the practical skills group; 95% for the attitudes group and 96% for standard care. At six months ‘any breastfeeding’ rates were 55%, 50% and 54% respectively; and exclusive breastfeeding was 36%, 34% and 35%.

A 1+ cluster randomised control trial Lavender (2005) evaluated the effectiveness of an antenatal breastfeeding education intervention on individual expectations of breastfeeding duration. One thousand three hundred and twelve women in England

were randomised through clusters to receive a single educational support afternoon session in the antenatal period along with their local community midwife, or to the control arm with standard care, which included breastfeeding advice from attending midwives and information on hospital parent education classes. The sessions were co-ordinated by a qualified infant-feeding co-ordinator. There were no between group differences in the proportion of women who attained their expected duration of breastfeeding (OR 1.2, 95% CI 0.89-1.6, *p <0.2*). There were no differences in breastfeeding rates at discharge ((OR 1.2, 95% CI 0.8, 1.7, *p* <0.3), or rates of exclusive breastfeeding at 4 months (OR 1.1, 95% CI 0.6,1.8, *p* <0.8).

One 1- randomised control trial Wolfberg (2005) assessed the effectiveness of an educational intervention designed to encourage fathers to advocate breastfeeding and to support his partner if she chose to breastfeed. Five hundred and sixty seven women were contacted, but only 59 completed the study; it is not clear how many were randomised to intervention and control arms. The intervention consisted of informal, interactive non-didactic breastfeeding classes for expectant fathers who were encouraged to talk about their beliefs, concerns and values about breastfeeding, including misconceptions about interference with relationships. The classes approached issues such as the cosmetic impact on a woman's breast; and experimented with the message that 'men can be advocates by facilitating their partners decision to breastfeed'. The men were encouraged to support each other in their commitment as advocates. Control group classes focussed on baby care and safety. Breastfeeding initiation was 74% in the intervention group and 41% in the control group (*p* < 0.02). By 6 weeks breastfeeding rates had dropped to 35% and 19 % respectively (*p* <0.13).

Evidence statement 14
One 1+ randomised control trial evaluated a single, group, antenatal practical breastfeeding session and two group, antenatal, attitudes sessions (that included fathers). The study found no significant increase in exclusive or any breastfeeding at 6 months when compared to women who received standard care. The study population consisted of relatively disadvantaged, low-income Australian women with culturally diverse backgrounds – but the majority of these women (92.5%) planned to breastfeed (Forster et al 2004).

Evidence statement 15
One 1+ cluster randomised control trial evaluated a single group antenatal, education session supervised by a lactation consultant and attended by a local midwife (who had received lactation training). The intervention did not increase breastfeeding duration when compared with standard antenatal care from lactation trained midwives (Lavender et al (2005).

Evidence statement 16
One 1+ randomised control trial included in Renfrew (2005) examined a one-hour group, antenatal, breastfeeding session on positioning and attachment given by a lactation consultant. Most participants were from a low-income group. The study demonstrated significantly higher rates of exclusive breastfeeding at 6 weeks compared to women who received standard antenatal care (Duffy et al 1997).

Evidence statement 17
One 1+/- Australian randomised control trial evaluated a small, informal group antenatal, breastfeeding session in immigrant Vietnamese woman on low-incomes. It found significantly higher breastfeeding initiation and duration rates amongst women who received the intervention as opposed to a leaflet alone (Rossiter 1994).

Postnatal Breastfeeding Education

Two randomised controlled trails were identified that evaluated postnatal education. Both studies were tailored to women's individual needs. One 1++ study Pollard (1998) in Renfrew et al (2005) found mothers who completed a daily breastfeeding log in the invention were likely to breastfeed three times longer than mothers not completing the intervention. The authors conclude the self-monitoring intervention guided by social cognitive learning theory received many positive accolades from participant and demonstrated it may improve breastfeeding for older, higher-education and women strongly motivated to succeed.

A 1++ study Labarere (2005) evaluated the effectiveness of a health care professional intervention on breastfeeding duration. Two hundred and thirty one new mothers in France who were breastfeeding at hospital discharge were randomised to the intervention, which consisted of a routine, preventive outpatient consultation with a breastfeeding trained primary care physician within two weeks of hospital discharge. The control arm included the usual verbal encouragement for breastfeeding from maternity services staff, paediatrician assessment for successful breastfeeding in hospital on day of discharge, a telephone help line and routine clinic visits each month from month one to month six, along with 10 weeks of paid maternity leave. Just under 80% mothers in the intervention group attended the early postnatal consultation; 7% mothers in the control group also received the intervention. Mothers in the intervention group were more likely to report exclusive breastfeeding at four weeks (83.9% vs. 71.9%; HR 1.40, 95%CI 1.01, 1.34) and longer duration of breastfeeding (18 weeks vs. 13 weeks; HR 1.40, 95% CI 1.03, 1.92).

Evidence statement 18
One 1++ randomised control trial in Renfrew (2005) evaluated a postnatal breastfeeding question/answer education session supported by a self-assessment tool (mothers diary of breastfeeding behaviour) in women from high-income groups who plan to breastfeed. The intervention was effective in increasing breastfeeding duration rates, when compared to women provided with a notebook that contained information only (Pollard 1998).

Evidence statement 19
One 1++ randomised control trial evaluated the effect of an outpatient appointment 2 weeks after the birth with a physician/ paediatrician (who had received 5 hrs lactation training) in well-educated women on high incomes. The study found significant increases in exclusive breastfeeding at four weeks and extended overall duration of breastfeeding (Labarere et al 2005).

Breastfeeding literature

Nine randomised controlled trials evaluating education interventions were included in the review by Renfrew et al (2005). Three of these studies evaluated the effect of an educational intervention that provided written information in either the ante- or postnatal periods. None of the three studies was shown to be effective at achieving a statistically significant increase in the duration of breastfeeding among women on low or high incomes.

Fairbank et al (2000) and Renfrew et al (2005) systematic review conclude there is evidence that breastfeeding literature alone among the general population is not effective in promoting breastfeeding among women of different income and ethnic groups in the UK, Republic of Ireland and the USA. Breastfeeding literature and formal education among low-income groups in the USA were not effective at promoting initiation of breastfeeding. However, evidence was based on small-scale studies.

Evidence statement 20
One 1+ randomised control trial in Fairbank (2000) evaluated giving a fact sheet on breastfeeding followed by a questionnaire (3 minutes) in late pregnancy to women in Ireland. The study found no significant differences in both initiation and rates of breastfeeding at 4 weeks postpartum. One 1+ randomised control trial compared a 10 minute, one-to-one, breastfeeding discussion and booklet with a 10-minute one-to-one, breastfeeding session without a booklet at 10-20 days postnatal during a paediatric visit amongst Italian speaking women in Italy. The study found no significant differences in breastfeeding rates at 6 months (Loh et al 1997 and Curro et al 1997).

Antenatal Education and professional telephone support

In Renfrew et al (2005) five of nine randomised controlled trials were evaluations of a combined intervention of breastfeeding education and postnatal support delivered by health professionals, three were conducted among women on higher incomes who intended to breastfeed. The postnatal support offered was structured, limited telephone calls from a health professional. None of these trials demonstrated a statistically significant increase in the duration of breastfeeding as a result of the intervention.

Renfrew et al (2005) concludes combined antenatal education and limited postnatal telephone support for high-income women and women who intend to breastfeed have been shown not to be effective.

Evidence statement 21
One 1++ randomised control trial in Renfrew (2005) compared a package of multiple interventions (including, a single 3 hour group, antenatal, breastfeeding session, postnatal telephone support at 2-3 weeks and 3 months) with an optional home visit and discussion group (participants had no significant differences in demographic variables). No significant differences in breastfeeding duration rates were observed; both groups had a high prevalence of breastfeeding (Redman 1995).

Evidence statement 22
One 1+ randomised control trial in Renfrew et al (2005) evaluated interventions among women who intended to breastfeed and who planned to return to work within 12 weeks postpartum. The interventions included, a 2-3 hour group, antenatal breastfeeding session (lecture style) given by a lactation consultant, postnatal telephone support at 1, 4 and 6 weeks postnatal. Participants were mostly young, white well-educated women. No significant differences in breastfeeding duration rates were observed; both groups had a high prevalence of breastfeeding (Rojjanairat 2000).

Professional training

It has been shown support from an appropriately skilled knowledgeable practitioner can have a positive effect on both women's initiation and experience of breastfeeding. There is variation in the amount and scope of pre and post graduate /registration education available to those healthcare professionals who support breastfeeding women in the UK. Training varies in terms of content, delivery and length.

A number of studies in this review have included breastfeeding education training for healthcare professionals to increase knowledge or skills in breastfeeding as part of multi-faceted interventions or training specifically to deliver an intervention (Wright et al 1997 (in Fairbank (2000), Brent et al 1995 in Fairbank (2000) and Renfrew (2005), and Labarere et al 2005).

Nine studies were identified in Renfrew et al (2005) all of which focused on breastfeeding education of health professionals or those working in the health care setting. Five were relevant to those working with women from disadvantaged backgrounds. Of these two 2+ before-after studies (Ingram et al 2002 and Hartley and O'Connor 1996) evaluated different breastfeeding educational training programmes. Hartley and O'Connor (1996) included medical, nursing and secretarial staff. The authors describe the training as a didactic approach to the provision of information about breastfeeding. Rates of breastfeeding at 24 hours postnatal increased from 15% to 31% following the education programme ($p<0.3$). At 2 weeks postpartum, an increase was still apparent (13%vs 21%, $p<0.2$). Ingram et al (2002) evaluated hospital midwives teaching a mother about positioning an attachment using a 'hands-off' approach. Data collected at 2 weeks postpartum reflect significant differences in exclusive and any breastfeeding, at 6 weeks postpartum no significant differences were detected. The authors conclude the teaching of breastfeeding using a 'hand-off' approach by the midwives can be cascaded from a trainer to midwives to women following an approach that seems relatively inexpensive in resource requirements, including staff time.

A 1++ randomised controlled trial (Labarere 2005), demonstrated that a single outpatient consultation with appraisal and support from a specially trained primary care physician/paediatrician within two weeks of birth to relatively affluent women resulted in a significant impact on exclusive breastfeeding at four weeks and longer duration of breastfeeding. Professional support offered once by a trained primary care physician in an outpatient setting appears to work more effectively than telephone counselling following a home visit by a midwife.

Evidence statement 23
Post registration or update training for healthcare professionals to increase knowledge or skills in breastfeeding as part of multi-faceted interventions or training specifically to deliver an intervention can be effective (Brent et al 1995, Wright et al 1997 and Labarere et al., 2005).

Evidence statement 24
Two 2+ before-after studies in Renfrew et al (2005) evaluated a breastfeeding training programme for hospital health professionals and found a significant increase in breastfeeding duration rates (Ingram et al 2002 and Hartley and O'Connor 1996).

Professional training (Baby Friendly Hospital Initiative)

Renfrew et al (2005) identified two before-after studies evaluating the UNICEF Baby Friendly Hospital Initiative (BFI) training. One study (not graded) Cattaneo and Buzzetti (2001) provide evidence of impact of the UNICEF training that included, an increase in health professionals' knowledge and significant differences ($p>0.05$) in the number of mothers exclusively breastfeeding at discharge from hospital, full breastfeeding at 3 months and any breastfeeding at 6 months postnatal. While in another study (not graded) Durand et al (2003) found no difference in the proportion of women breastfeeding at 12 weeks; however, positive changes were observed after the educational intervention in healthcare professionals practice.

Evidence statement 25
Two 2+ before-after studies in Renfrew et al (2005) evaluated the UNICEF Baby Friendly Hospital Initiative (BFI) training for health professionals in hospital settings. One study found significant increases in breastfeeding rates at 6 months where initial breastfeeding rates were low. The BFI training did not increase breastfeeding rates at hospital discharge where breastfeeding rates were relatively high (Cattaneo and Buzzetti 2001 and Durand et al 2003).

Multi-faceted Interventions

Renfrew (2005) systematic review included nine Randomised control trials that were termed mulit-faceted (more than one component). Of these, five comprised of antenatal education and postnatal support at varying levels. Two of these were delivered to women on low-incomes (Brent et al 1995 and Redman et al 1995). Among women from low-income groups, the comprehensive approach evaluated in One 1+ Brent et al (1995) (also in Fairbank 2000) included antenatal education tailored to individual women's needs (regardless of intention to breast feed or feed infant formula milk), proactive visits in hospital and at home after birth, and ongoing availability of lactation consultant. It also included breastfeeding education of health care staff caring for mothers and babies.

Fairbank (2000) systematic review included one randomised control trial and ten before-after studies and found multifaceted interventions to be effective in increasing initiation, duration and exclusivity of breastfeeding. Most of the multi-faceted interventions that were found to be effective comprised a media campaign and or peer support programme combined with structural changes to the health service or in fewer cases combined with health education activities. Wright et al (1997) a before-after study implemented interventions in both hospital and community setting and included culture-specific health education materials targeting American Indian pregnant women and new mothers the study reported a highly significant positive effect on initiation rates ($p<0.0001$) compared to the control group.

Evidence statement 26

One 1+ randomised control trial in in Fairbank (2000) and Renfrew (2005) evaluated education and support, including; individual education that was given to all women in both groups (mostly white on low-incomes), support in the ante-, intra- and postpartum period and into the first year of infancy. This included training of health professionals, daily inpatient visits, telephone call 48hrs after discharge, lactation clinic at 1 week and lactation consultant present at all health clinics up to one year

after the birth. Significant increases were found in the initiation and duration of breastfeeding (Brent 1995).

Evidence Statement 27
One 2++ before-after study in Fairbank (2000) conducted among American Indian women evaluated the adoption of hospital policy and practices which were culture-specific together with a media campaign. The latter included, the ten steps in the Baby Friendly Hospital Initiative, a peer support programme and a public health campaign. The study found a statistically significant increase in breastfeeding initiation rates (Wright et al 1997).

Media programmes

There is a lack of good quality evidence about the impact of media activity on initiation and duration rates of breastfeeding. Fairbank (2000) included two before-after studies both of which included measured attitudes towards breastfeeding in relation to media campaigns. The limited evidence available suggests that a media campaign as a stand-alone intervention, and particularly television commercials, may improve attitudes towards, and increase initiation rates of breastfeeding.

Evidence statement 28
One 2+ before-after study in Fairbank (2000) evaluated media campaigns (predominantly television commercials) and found limited evidence of an increase in breastfeeding initiation rates (Friel et al 1989).

What interventions effectively reduce the risks of contamination of equipment used in bottlefeeding, and in the storage and reheating of breast milk? In addition, what interventions reduce the risks associated with the reconstitution of infant formula?

Cleaning and sterilizing feeding equipment

Two systematic reviews provide evidence that good quality studies on methods of cleaning and sterilisation are lacking, and that there is no evidence from the available studies on the relative effectiveness of different cleaning and sterilising techniques. One 2+ systematic review (Renfrew 2003) provided evidence that reconstitution of formula from powder may be associated with errors. No studies were identified in the literature search that examined risks associated with storage and reheating of breast milk. All of these results are directly applicable to UK infants.

Two systematic reviews were identified that addressed contamination or cleaning and sterilisation of infant feeding equipment Bernath (2001) and a 2- systematic review McLoughlin (forthcoming). No relevant randomised controlled trials were found in the literature search. One systematic reviews (Bernath 2001) aimed to compare the effectiveness of sterilisation with disinfection of shared feeding equipment on rates of cross infection in mothers and infants, but no studies were included in this review.

The other 2- systematic review (McLoughin forthcoming) aimed to evaluate ways of reducing infections from the use of infant feeding equipment in the home. This systematic review included eight studies: five conducted in the UK and three were conduced in the USA (published between 1962 and 1987). None of the included

studies were randomised controlled trials, and all were deemed to be of relatively poor quality. The authors concluded that the current evidence provides no information on the relative effectiveness of cleaning and sterilisation methods currently used.

Storage and reheating of breast milk

No relevant randomised controlled trials on storage and reheating of breast milk were identified in the literature search. Therefore, the Programme Development Group (PDG) sought 'expert testimony. This report on the Handling and Storage of Expressed Breast Milk from the Food Standards Agency is available separately.

Reconstitution of infant formula

One 2+ systematic review (Renfrew 2003) examined the risks associated with errors in reconstituting formula. Five studies were included in this review, only one of which was a randomised control trial (published in 1991). This randomised control trial compared the energy content of ready-to-feed and powdered formula. The authors report that the results from these studies were difficult to interpret due to methodological problems and small sample sizes. All studies, however, found errors in reconstitution with a tendency to over-concentrate feeds, although under-concentration also occurred.

Evidence statement 29

A 2+ systematic review found the reconstitution of infant formula milk from powder may be associated with errors with a greater tendency to over-concentrate feeds (Renfrew et al (2003).

What are the most effective methods to express breast milk?

Three studies evaluated methods/techniques to express breast milk. Two of the studies compared types of breast pumps (Fewtrell 2001; Zinaman 1992), and the other compared sequential versus simultaneous breast pumping (Auerbach 1990). One 1+ randomised control trial Fewtrell (2001) conducted in mothers of relative high socioeconomic status in the UK found no significant differences in milk volume or fat content obtained using a mini-electric breast pump compared to a manual breast pump. Findings from a 1– (Zinaman 1992) study suggest that a bi-lateral electric breast pump available in the US produces prolactin responses similar to natural infant suckling. This electric breast pump produced significantly higher prolactin levels than battery-operated and 'mechanical' pumps, or hand expression. In addition, a 1+ randomised control trial (Auerback 1990) conducted in the US found no difference in the fat content or volume of breast milk produced using either unlimited sequential (single breast) pumping or unlimited simultaneous (double breast) pumping. With the exception of the one study that compared breast pumps available in the US, the other studies are directly applicable to UK women. Pumps available in the US may be bought on-line.

Overall, the studies on breast milk expression did not report enough information to determine if effectiveness varied by gender, age, ethnicity etc. Not surprisingly, it has been consistently demonstrated that double pumping produces the greatest volume of milk. There was, however, contradictory evidence regarding which type of pumping was preferred by the women included in the studies. In one trial, the women preferred a double pump - due to larger volumes of milk obtained in less time,

whereas in another study, the double pump was rated as the most uncomfortable to use. In yet another study, the manual pump was preferred over an electric pump (both types were used for sequential pumping). Only one of the studies evaluated if the time since the last breastfeed affected the amount of and fat content of the milk expressed (Fewtrell 2001). In this study, the authors reported that there were no significant differences within the individual mothers in the time since last feed prior to expression. It is noted that the studies were conducted on infants ranging from 28 to 42 days of age (Zinaman 1992), approximately 8 weeks of age (Fewtrell 2001), 5 to 35 weeks of age (Auerbrach 1990).

Evidence statement 30
One 1+ randomised control trial compared a specific brand of mini-electric breast pump with a specific brand of manual breast pump. No significant differences were found in the volume of milk expressed or its fat content (Fewtrell et al 2001).

Evidence statement 31
One 1+ randomised control trial compared pumping each breast sequentially with both breasts simultaneously. Women preferred simultaneous pumping which also produced a greater volume of milk. No significant differences were found in milk fat concentrations (Auerbach 1990).

What supplemental feeding modes (e.g. cup, spoon, bottle) are most effective?

Only one 1- study Field (1997) was identified that examined supplemental feeding modes in healthy term babies. This study conducted in the US examined infant behaviours and vagal tone changes in 40 one-month old infants fed from a bottle using a breast-like teat compared to infants bottle-fed using a standard teat. The mothers had a mean age of 23.8 years, were of relatively low socioeconomic status, and were predominately African-American. The results (based on one 20 minute bottlefeeding session) demonstrated that infants who fed on the breast-like teat spent significantly less time asleep, more time actively awake and less time fussing or crying ($p<0.05$ for all). There was no difference between the percentages of time the infants were quietly or actively awake. The authors also assessed vagal tone as this measure of heart rate (associated with respiration) is lower during breastfeeding and higher after breastfeeding in comparison to bottlefeeding. The authors also demonstrated a significant decrease in vagal tone during feeding, and a significant increase after feeding in infants using the breast-like teat compared to infants feeding with the standard teat ($p<0.05$ for both).

What is the effectiveness of vitamin supplementation in infants who are partly breastfed or exclusively formula fed?

Three studies were identified that examined either iron or zinc supplementation on the growth status and/or visual acuity in infants (Dewey, 2002; Friel 2003; Walravens 1992). However, as all of these studies included infants greater than six months of age, these studies will be considered for inclusion in the review of infants 6 to 24 months of age.

Conclusion

Peer support

Overall, the systematic reviews and randomised controlled trials demonstrate a positive trend for peer support on the initiation and duration of 'any' and 'exclusive' breastfeeding, although the results were not always statistically significant.

Healthcare service professional appraisal and support

The systematic reviews (Fairbank 2000; Renfrew 2005;) demonstrate that generally, professional support improves breastfeeding initiation rates and prevents early cessation of 'any' and 'exclusive' breastfeeding; however, the results do not always reach statistical significance. As in the case of peer support, there is a trend towards an increase in breastfeeding duration, as well as 'any' or 'exclusive' breastfeeding with professional support.

Breastfeeding education

The systematic reviews and randomised controlled trials demonstrate antenatal classroom education and discussion has a positive effect on breastfeeding initiation, and that group education on positioning and attachment has a positive effect on the duration of exclusive breastfeeding. Written information alone or in combination with formal interactive health education had a limited impact on breastfeeding initiation rates. Overall, the four randomised control trials included in this review demonstrated no significant impact of education interventions on the initiation and duration of breastfeeding, although some positive trends were observed. It appears that educational interventions do not consistently appear to be as effective as other interventions, and that an intervention aimed at partners of women intending to breastfed merits further research.

The systematic review Fairbank et al (2000) and Tedstone et al ( ) conclude one-to-one education sessions were more successful than group sessions when they were aimed at promoting initial breastfeeding with women who had already made a decision to bottle feed, whereas group programmes were more effective for women who planned to breastfeed. The effectiveness of antenatal educations sessions in initiating breastfeeding was enhanced by contact with peer counsellors.

Contamination of equipment/storage and heating of breast milk/reconstitution of formula

There is a lack of evidence on ways of minimising risks to babies who are fed infant formula, or expressed breast milk in a bottle. No studies of parents' views of effective ways of preparing infant formula feeds in the home have been identified.

Similar issues exist for ways of cleaning and sterilising infant feeding equipment, whether for expressed breast milk or for formula feeding. There is no evidence to inform the best techniques to use, and effective ways of enhancing compliance.

Expression of breast milk

Three Randomised control trials were included in the review that examined the effectiveness of methods used to express breast milk. As it is not possible to directly compare the results of these studies, further research is needed to directly compare

a double pump available in the UK with both the mini-electric breast pump and a manual pump on milk volume and fat content. Until such a study exists, it is not possible to recommend what type of breast pump available to women in the UK is most effective using the current evidence base.

Supplemental feeding modes

Good quality evidence on the effectiveness of supplemental feeding modes in healthy term babies is lacking.

The authors of Renfrew et al (2005) concluded that (based on two studies) cup feeding may have better breastfeeding duration outcomes than bottlefeeding for babies delivered by caesarean section. The characteristics of the babies who need supplements during the neonatal period, and the conditions under which a cup or bottle and teat may be most preferable and need to be further explored.

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