

## **Executive summary**

### **The effectiveness of public health interventions to improve the nutrition of post partum women**

#### **Background**

The nutrition of new mothers is an important public health subject. Improvement in dietary intake postpartum is likely to have a positive impact on a mother's health, and may have an impact on her baby's health, her own health in subsequent pregnancies, and possibly on her future health. Mothers who were disadvantaged in their pre-pregnancy and pregnancy nutrition will be in greater postpartum nutritional need. This may be exacerbated by anaemia and consequent morbidity following blood loss at the birth (MacArthur *et al.* 1991). For many mothers, the postpartum year will be part of an inter-pregnancy interval, and these women need also to meet preconception nutrition needs at this time.

Weight related issues postpartum, especially for low-income women, include both under- and over-weight. Most recent literature, however, concentrates on the need for weight loss and the prevention of overweight/obesity. The desire reported by many postnatal mothers to return to their pre-pregnancy weight as soon as possible has been reported as a factor in making infant feeding decisions, but little is known about healthy weight and BMI for postnatal women or how best to achieve these.

Around 700,000 women in the UK are within the first postpartum year at any one time, spanning an age range from the mid teens to 40+ (Macfarlane *et al.* 2000). Challenges they encounter during this year will vary depending on their parity, socio-economic and ethnic background, their health and wellbeing, the health of their baby, whether they breast or formula feed, and their family circumstances. Whatever their circumstances, all have to deal with the day to day demands of the care of a new baby, while also meeting their own physical and emotional needs.

#### **Objectives**

To determine the effectiveness of public health interventions for postpartum mothers that aim to improve maternal nutrition and health, in particular those that target mothers in low-income households.

#### **Methods**

This review was carried out by the Mother and Infant Research Unit (MIRU) at the University of York between February 2006 and April 2006 and was updated between January and March 2007 by MIRU and NICE.

#### **Literature Search**

Literature searches for this review were conducted by the Centre for reviews and dissemination, University of York with input from the MIRU review team.

Initially, a scoping search was undertaken in order to direct and refine the final search strategy.

All of the searches were conducted using a stepped approach to identify relevant systematic reviews (SRs), randomised controlled trials (RCTs) and non-randomised studies (cohorts, qualitative studies and surveys). 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 (RCTs) 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.

### **Selection criteria**

To be included in the review, the studies had to examine postpartum women living in developed countries from any socio-economic background. Where data were available, the review also considered the following population subgroups: mothers in lower socio-economic groups; mothers 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; mothers with weight change in pregnancy above or below the normal range; mothers with BMI above or below the normal range in pregnancy and/or post-natally. Studies that included mothers with clinical conditions that required specialist advice, secondary dietary management or clinical therapeutic advice, were excluded from the review. Studies of mothers with multiple births were not excluded.

The review included all public health-type interventions that aimed to improve the nutrition of postpartum women. Interventions that took place during the first year after birth were included. Interventions that occurred during pregnancy only were not considered. It must have been possible for the intervention to be delivered by practitioners at the primary care level. Interventions of interest included: food / nutrient supplementation; dietary advice/ counselling / education, in particular, aimed at achieving and maintaining healthy postpartum BMI/ weight; Interventions to *deliver* dietary advice/ counselling/ education/ supplementation, in particular, interventions aimed to promote folic acid intake/status; interventions to improve access to healthy foods; interventions to improve relevant nutrition knowledge among practitioners.

### **Outcomes of interest**

This review reported specifically on maternal outcomes. Infant outcomes have been reported in other reviews. Any maternal nutrition/health outcome that a mother may experience during the first year postpartum, was included in this review: anaemia; fatigue/exhaustion/tiredness; infections e.g. mastitis; change in dietary intake; change in nutrient and micronutrient intake; nutrient status, for example iron status; appropriate weight loss/ gain; breastfeeding duration.

### **Data extraction and quality assessment**

Two reviewers independently screened all titles and abstracts identified in the literature search. Full paper copies were obtained and independently assessed for inclusion by two reviewers. Any disagreements regarding whether or not a paper met the inclusion criteria was resolved by consulting a third reviewer. All of the studies that met the inclusion criteria were critically appraised by two reviewers in accordance with criteria described in NICE (2005). A study was graded using a code '++', '+' or '-', 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. Each included study was assessed to determine its applicability to UK settings.

### **Key research questions**

The research questions for this review were as follows:

1. What diet and/or physical activity programmes effectively aid postpartum weight loss?
2. What is the effectiveness of dietary counselling in improving postpartum nutrition?
3. What methods of delivering supplements in the postpartum period are effective?
4. What supplements effectively improve maternal nutritional status?

### **Results**

A total of 1503 citations were screened and full paper copies of 15 systematic reviews (SR's), 69 randomised controlled trials (RCT's) and 4 UK studies of other types were assessed for inclusion as evidence. Of these studies, 14 studies, all RCT's (reported in 18 papers), met the inclusion criteria for this review. No systematic reviews and no other types of UK study were included.

There is a dearth of high quality evidence for interventions which may improve maternal nutritional status in the first year post partum. No studies were identified in the literature that addressed question 3, regarding the effectiveness of ways of delivering supplements in the postpartum period to improve maternal nutrition. Only one study, a 1- RCT (Lagstrom et al 1999) was identified which was of relevance to question 2. This study reported the effects on the mothers' diet of a dietary counselling intervention aimed at reducing fat intakes among children. The broader applicability of the evidence to mothers is uncertain as the original study randomised children.

The evidence from this review therefore falls into two main categories: the evidence from studies concerning weight loss in the first year post partum; and the evidence from studies of the effect of micronutrient supplementation on post partum maternal nutritional status.

With the exception of two studies, all of the RCT's identified in this review have been graded as 1- studies. In most cases this is due to lack of information on the method of randomisation and in two studies is due to inadequate randomisation. In other cases, the grading is due to high drop out rates or loss to follow up.

There is a particular dearth of evidence regarding the effectiveness of interventions among mothers from socially disadvantaged and vulnerable groups. One study (a 1-RCT by Doyle et al 2001) investigated the effectiveness of taking a multi vitamin and mineral supplement and a supplement of docosahexanoic acid among post partum women from a deprived inner city area of London who had had a live low birth weight

baby and who were planning a further pregnancy. Another study (a 1+ RCT by Keizer 1995) investigated the effectiveness of providing predominantly white adolescent mothers from low income households with folic acid in the post partum period.

### **What diet and/or physical activity programmes effectively aid postpartum weight loss?**

Four RCT's (all 1-) investigated the effectiveness of interventions which aimed to promote post partum weight loss through diet and/or physical activity (Leermakers et al 1998, Lovelady et al 2000 and 2001, McCrory et al 1999, and O'Toole et al 2003). These studies were all conducted in the US among predominantly white women who were not noted to be from disadvantaged groups. It is important to note that the women included in these analyses appear to be highly motivated to lose weight.

All four studies took different approaches but all resulted in weight loss: Lovelady reported a mean weight loss of 0.5kg/week; McCrory a mean weight loss of 1kg/week; O'Toole a mean weight loss of 5.6kg at 12 weeks and 7.3kg at one year; and Leermakers reported that on average participants lost 79% of excess post partum weight with 33% returning to their pre-pregnancy weight.

#### **Evidence statement 1**

There is evidence from four RCT's (all 1-) that diet and exercise programmes are effective in enabling some post partum women to lose weight gained during pregnancy. This finding is based on US studies of women not noted to be from disadvantaged groups and who appear to be highly motivated to lose weight.

Two studies compared the effectiveness of diet plus exercise with the effectiveness of either exercise alone (Lovelady et al 2000, 2001) or diet alone (McCrory et al 1999).

Lovelady showed greater loss of weight and fat mass among exclusively breastfeeding women who were 4-14 weeks post partum and who had a baseline BMI of 25-30, through combining individually prescribed diets (energy intake restricted to no more than 1800kcal/day) and 45 minutes aerobic exercise on 4 days/week, than through one session of vigorous exercise once a week with no dietary restriction.

McCrory showed significant weight loss among exclusively breastfeeding women, who were 8-16 weeks post partum, with a baseline BMI of 20-30, through an intensive short term (11 day) programme which compared the effects of diet alone, and diet plus exercise, with a control group. The energy restriction in this programme was severe, restricting energy intake by around a third in the 'diet only' group, and the exercise was intensive with participants on average exercising for 86 minutes/day on 9 of the 11 days of the programme. While both resulted in statistically significant weight loss compared to the control group, the combination of diet plus exercise was preferable as participants in the 'diet only' group lost lean body mass. No data on the maintenance of the achieved weight loss in this short term intervention was reported.

**Evidence statement 2**

There is evidence from 2 RCT's (both 1-) that a combination of diet and physical activity results in more effective and preferable weight loss than diet alone or physical activity alone.

**Evidence statement 3**

There is evidence that physical activity as part of a combined diet and physical activity intervention to promote weight loss, is more effective when frequent and regular, than when vigorous and less frequent.

Two RCT's (both 1-) by Leermakers et al (1998) and O'Toole et al (2003) found that integrated programmes of activity that support participants in combining diet and regular physical activity in order to promote weight loss in the post partum period, are more effective than interventions that provide information alone.

Both studies were conducted in women who were 5kg or more heavier than their pre-pregnancy weight. Although the approaches differed in practical detail, the common characteristics were: the promotion of a combination of diet and physical activity; the inclusion of strategies for behaviour change; tailoring of the diet and physical activity to either individual needs or the specific needs of post partum women; the inclusion of some group sessions; the provision of written material; regular and ongoing contact with programme staff either by telephone, through correspondence 'homework' or in group sessions; and the duration of the intervention, with one study lasting 6 months (Leermakers) and the other a year (O'Toole).

**Evidence statement 4**

There is evidence from 2 RCT's (both 1-) that integrated programmes of activity which support participants in combining diet and regular physical activity in order to promote weight loss in the post partum period are more effective than interventions which provide information alone.

**Evidence statement 5**

There is evidence from 2 RCT's (both 1-) that the characteristics of programmes which are effective in enabling some women to lose weight in the post partum period are those which: combine diet and physical activity; include strategies for behaviour change; tailor the intervention to individual or group needs; include some group sessions and written materials; provide ongoing support and contact with programme staff; and are of a sufficient duration to make sustained lifestyle changes.

Of the four studies that focussed on the promotion of weight loss, two were conducted among women who were breastfeeding, (McCrory et al 1999, and Lovelady 2000, 2001), one exclusively (Lovelady 2000, 2001) one among both breastfeeding and non-breastfeeding women (O'Toole et al 2003)) and one in non-breastfeeding women (Leermakers et al 1998). The first two of these reported the effects of weight loss on lactation and infant growth. The intensive short-term intervention by McCrory reported no difference in the quality or quantity of breast milk or in infant growth among the intervention groups compared to the control group. The second study reported that infant growth did not appear to be affected but stated that the study may not have been sufficiently powered to demonstrate such effects.

#### **Evidence statement 6**

There is evidence from one RCT (1-) that short term weight loss of 1kg /week achieved through a combination of diet plus physical activity in healthy post partum women has no detrimental effect on milk quantity or quality and does not appear to affect infant weight gain.

A second RCT (1-) combining diet and physical activity in healthy post partum women (BMI 25-30) over a longer time period and resulting in a mean weight loss of 0.5kg/week did not appear to affect infant weight or length. However the study may not have been sufficiently powered to demonstrate such effects.

#### **What supplements effectively improve maternal nutritional status?**

Nine studies were identified which investigated the effects of various supplements on maternal nutritional status in the post partum period.

##### *Fish oil/ omega 3 fatty acids:*

Three RCT's (all 1-) supplemented women with fish oils or omega 3 fatty acids from various sources. The first by Doyle et al (2001) supplemented women from a deprived inner city area of London who had had a previous live low birth weight baby and were planning a further pregnancy with 150mg/day fish oil and a multi-vitamin and mineral supplement. Although the supplementation resulted in an increase in mean serum folate, mean erythrocyte folate, and mean serum ferritin, no results are reported relevant to the supplementation with fish oil.

The other two studies however, did show an effect of supplementation with fish oils. Jensen et al (2000) supplemented women with docosahexanoic acid in amounts ranging from 170-260mg/day from four sources: standard eggs; DHA enriched eggs; fish oils; and an algae-derived supplement of DHA. Helland et al (1998) supplemented women with varying doses of cod liver oil. Both studies took place up to the eighth week post partum in lactating women and showed increases in the DHA content of maternal plasma (Jensen) and breast milk (Helland) in a dose dependent manner.

#### **Evidence Statement 7**

There is evidence from two RCT's (both 1-) that supplementing mothers up to the eighth week post partum with supplements of docosahexanoic acid (DHA) from a variety of sources increases the amount of DHA in maternal plasma and in breast milk in a dose dependent manner.

*Iron:*

Two RCT's (a 1- study by Mara et al 2001 and a 1++ study by Krafft et al 2005) investigated the effect of supplementing women with 80mg/day iron from within the first few days of delivery to 2 and 3 months post partum respectively. Mara also gave 350 micrograms/day folic acid. Both studies resulted in an increase in haemoglobin levels among supplemented women compared to non-supplemented controls after one month and three months respectively. The study by Krafft also resulted in increased iron stores and the study by Mara in red cell count and haematocrit, though in Mara the effect was not observed at three months.

**Evidence Statement 8**

There is evidence from two RCT's (a 1++ and a 1-) that supplementing women with iron from early in the post partum period for at least two months can significantly increase levels of haemoglobin compared to non-supplemented controls.

*Folic acid:*

Two RCT's (a 1+ study and a 1- study) investigated the effect of supplementing post partum women with folic acid. The studies differed markedly from each other in terms of subject group, dosage, and in duration and timing of supplementation.

The 1+ study by Keizer et al 1995, was among low income white adolescent mothers and provided 300 micrograms/day folic acid for 4 weeks from within one week of delivery. This resulted in increased erythrocyte folate compared to the control group at 4 weeks and appeared to prevent the decline in erythrocyte folate seen in controls during the first three months of lactation.

The 1- study by Mackey et al (1999) was among lactating women from middle to high income households and provided the intervention group with 1mg/day folic acid from 3-6 months post partum. Both intervention and control groups received a multi-vitamin and mineral supplement. No difference in plasma folate levels were seen between intervention and control groups at 3 and 6 months, but at 6 months, the intervention group had significantly higher erythrocyte folate levels and haemoglobin levels.

**Evidence statement 9**

There is evidence from 1 RCT (1+) that supplementing predominantly white adolescent mothers from low income households with 300 micrograms folic acid/day for 4 weeks (commencing within one week of delivery prevented a decline in erythrocyte folate levels for the first 3 months of lactation.

**Evidence statement 10**

There is evidence from 1 RCT (1-) that supplementing lactating women from middle to high income households with 1mg/day folic acid from 3-6 months post partum resulted in significantly higher erythrocyte folate concentrations at 6 months than in controls.

*Calcium:*

Two RCT's (both 1-) supplemented women with 1g/day calcium from early in the post partum period into the weaning period. One study (Cross et al 1995) focussed on lactating women who exclusively breastfed for at least three months, the other Kalkwarf (1997) included both lactating and non lactating women. Neither study showed any difference in bone mineral density or indicators of bone turnover in women receiving the supplement compared to non-supplemented controls. Cross concluded that it is part of the normal physiological process of lactation to lose bone mineral density in the spine and that this is not prevented by calcium supplementation. In addition, Kalkwarf concluded that bone mineral density increases after weaning regardless of being supplemented or not supplemented with calcium.

**Evidence statement 11**

There is evidence from two RCT's (both 1-) that supplementing women with calcium during lactation has no beneficial effect on bone mineral density. Loss of bone mineral density in the spine appears to be part of the normal physiological process of lactation and it increases again during weaning. Supplementation with calcium does not appear to have any effect on this process.

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