BMJ Open

Factors associated with maternal postpartum fatigue: an observational study

Jane Henderson, Fiona Alderdice, Maggie Redshaw

To cite: Henderson J, Alderdice F, Redshaw M. Factors associated with maternal postpartum fatigue: an observationalstudy. *BMJ Open* 2019;**9**:e025927. doi:10.1136/bmjopen-2018-025927

► Prepublication history and additional material for this paper are available online. To view these files, please visit the journal online (http://dx.doi.org/10.1136/bmjopen-2018-025927).

Received 8 August 2018
Revised 7 June 2019
Accepted 13 June 2019

NPEU, Nuffield Department of Population Health, University of Oxford, Oxford, UK

Correspondence to
Dr Maggie Redshaw;
maggie.redshaw@npeu.ox.ac.uk

ABSTRACT

Objectives To assess the prevalence of postpartum fatigue at 10 days, 1 month and 3 months, and to describe the sociodemographic and clinical characteristics of women with fatigue and the associations with infant characteristics, maternal–infant attachment, and partner and midwifery support.

Setting Maternity care in England. Secondary analysis of 2014 National Maternity Survey.

Participants Participants were a random sample of 10 000 women selected by the Office for National Statistics using birth registration records. Women aged less than 16 years or if their baby had died were excluded. Questionnaires were sent to women at 3 months post partum and asked about well-being and care during pregnancy, labour, birth and post partum. Specifically, women were asked whether they experienced fatigue/severe tiredness at 10 days, 1 month or 3 months post partum. Responses were received from 4578 women (47% response rate).

Results Decreasing but substantial proportions of women, 38.8%, 27.1% and 11.4%, experienced fatigue/severe tiredness at 10 days, 1 month and 3 months, respectively. These figures varied significantly by maternal age, level of deprivation, education and parity. Women reporting depression, anxiety, sleep problems and those breast feeding were at significantly increased risk (eg, OR for depression in women with fatigue at 3 months: 2.99 (95% CI 2.13 to 4.21)). Significantly more negative language was used by these women to describe their babies, and they perceived their baby as more difficult than average (eg, two or more negative adjectives used by women with fatigue at 3 months: OR 1.86 (95% CI 1.36 to 2.54)). Women with postpartum fatigue had greater partner support but were significantly less likely to report seeing the midwife as much as they wanted.

Conclusions Postpartum fatigue is not inevitable or universal, although early in the postnatal period it affects a substantial proportion of women. Predictors include age and parity, but practical help and support from partners and midwives may be protective factors.

Strengths and limitations of this study

- Maternal fatigue after childbirth is often seen as a trivial health issue common to women with young children, but is infrequently the subject of research.
- The study used a large, population-based random sample based on birth registration.
- The response rate was 47%, and in common with other surveys there was under-representation of hard-to-reach groups.
- The study was a cross-sectional survey conducted at 3 months post partum, and women may not have accurately remembered some of the details reported.

BACKGROUND

Postpartum fatigue (PPF) has been defined rather variably and generally includes a decreased capacity for physical and mental activity after childbirth, a persistent lack of energy, impairments in concentration and attention not easily relieved by rest or sleep.[1–7] It occurs within a context of situational factors, with a range of demographic, individual, antenatal and postnatal clinical factors that may influence the experience of women and their families. The prevalence of PPF has not been studied extensively as it has been perceived as an unavoidable, temporary and relatively trivial symptom commonly experienced in early parenthood. It is typically marked by disrupted sleep due to night-waking infants, difficulties settling the baby and night-time feeding.

Literature findings relating to the prevalence of PPF vary according to measurement methods and timing of measurement after birth. Apart from simple self-report symptom checklists which ask about fatigue, tiredness, exhaustion and vitality, there are a number of scales relating to fatigue, including the Lee Fatigue Scale,[8] the Fatigue Assessment Scale[9] and the vitality subscale of the Psychological General Well-Being Index.[10] However, these measures were not developed specifically for PPF, where different issues, such as interrupted sleep, may be more salient. Use of a simple self-report symptom question has suggested the proportion of women with PPF to be 42% in the first few days after birth,[11] 37%–64% at 5–6 weeks,[12 13] 25%–67% at

12–24 weeks[12 14] and 18%–66% at 1–2 years.[12 14] These wide variations in prevalence may, to some extent, be due to severity: in one study[15] 83% of women were fatigued at 4–6 weeks, but none considered it a major problem.

Different groups of women in the population may also differ in the prevalence of PPF. For example, in a study of low-income American women, 63% reported being severely fatigued at both 1 and 3 months,[16] whereas only 25% of recent mothers reported PPF in a relatively affluent Dutch population.[12] Clinical issues reported to be associated with higher rates of PPF include aspects of the pregnancy and birth such as antenatal fatigue, longer duration of labour and instrumental or operative delivery, and clinical problems in the postpartum period such as anaemia, infection and haemorrhage.[12 17–20] At the same time demographic and situational factors such as low socioeconomic status, unemployment, primiparity and higher maternal age were associated, although not found to be significant in all studies.[21] For example, some reported that socioeconomic disadvantage was associated with poorer sleep and higher rates of PPF,[22 23] but a review of PPF commented that middle-income women appeared to be at highest risk.[17]

Due to the parental nocturnal infant caregiving that is needed, sleep disruption in the early postpartum period is normal. Sleep efficiency, the proportion of time spent asleep relative to time spent in bed, is lowest immediately after birth and thereafter improves as the baby's sleep pattern shifts to nocturnal hours.[22] However, in exhausted mothers melatonin is transmitted to the infant in breast milk, which can delay the establishment of mature sleep cycles.[18] PPF has been shown to be related to fragmented sleep[24] but not sleep more generally.[25] It also seems that women who worry more about insufficient milk and those with breastfeeding problems tend to have higher levels of fatigue,[26] possibly due to spending more time involved in breast feeding. However, overall the relationship between PPF and breast feeding is unclear, with some studies reporting an association,[12 26] while others not.[21 27]

Maternal well-being is of concern postnatally, and several studies have examined the relationship between PPF and depression.[3 4 15 16 19 28 29] While PPF may have a role in contributing to depression, it is thought to be a separate although related theoretical construct. While the two are correlated, it is unclear to what degree depression leads to fatigue, or fatigue to depression; they do not necessarily occur contemporaneously. In one study, fatigue at 1 week predicted depression at 4 weeks.[19]

Few studies have been conducted to explore the association between maternal fatigue and attachment to the baby. However, infant characteristics, such as preterm birth, have been found to be associated with both maternal fatigue and delayed infant attachment.[30] Similarly, a study which examined maternal fatigue and maternal–infant attachment following different modes of delivery and different rooming-in policies found that the mother–infant relationship was adversely affected when women were experiencing fatigue following caesarean delivery.[18]

A qualitative interview-based study which used a fatigue symptoms checklist[7] reported that social and practical support from a woman's partner or family was the strongest factor in protection against postnatal fatigue.[16] Similarly, it is assumed, but not proven, that more support from midwives is likely to have a beneficial effect.[31] In the UK, postnatal care is provided in the community by midwives for the first few weeks and thereafter by health visitors. Women normally see their general/family practitioner about 6 weeks after birth for a postnatal check.

The time points chosen in this study reflect the different situations of very recent mothers (10 days after giving birth),[11] physical recovery and adjustment in the relatively short term to the presence of a new baby (1 month),[12] and to changing infant behaviour and the developing relationship over a slightly longer period (3 months),[32 33] as well as those used in other studies.[12 13 16]

This study aimed to focus on individual characteristics and experiences in a large population of women who had recently given birth, addressing the knowledge gaps and variation in prevalence of postnatal fatigue that have been described. Thus the specific purpose of the present study was to address the following research questions:

- What is the prevalence of PPF at 10 days, 1 month and 3 months?
- What are the sociodemographic and clinical characteristics of women who experience PPF at 10 days, 1 month and 3 months after childbirth?
- Is there an association between maternal PPF and the mother–infant relationship at 3 months?
- Is there an association between partner and midwifery support in the postnatal period and PPF?

METHODS

National Maternity Survey 2014

This study used data from the cross-sectional National Maternity Survey conducted in England in 2014.[34] A random sample of 10 000 women who gave birth during a 2-week period, excluding those aged less than 16 years and those whose baby had died, were selected by the Office for National Statistics from birth registrations. They were sent a questionnaire 12 weeks after the birth asking about clinical events and care during pregnancy, labour and birth, and in the postnatal period. Questionnaires could be returned by Freepost, completed online or completed by telephone with the aid of an interpreter if necessary. Up to three reminders were sent to non-respondents using a tailored reminder system.[35]

Exposure and outcome measures

Women were asked questions about postnatal health, including 'Did you experience any of the following 10 days, one month, and three months after the birth of your baby?' as used in previous National Maternity Surveys, with answer options including 'Fatigue/severe tiredness' among various other postnatal symptoms. The time points

of 10 days, 1 month and 3 months had been selected pragmatically to reflect the range of experience up to the time of the survey. Women were asked whether they had mental health problems and asked to complete the Edinburgh Postnatal Depression Scale (EPDS). Questions were also asked about sociodemographic variables, including age, parity, Index of Multiple Deprivation (an area-based measure representing the level of socioeconomic deprivation of the neighbourhoods in which the respondents lived, comprising elements related to income, employment, education, health, crime, barriers to housing and services, and living environment), ethnicity and age on completing full-time education; prepregnancy and antenatal health and well-being, variables related to labour and birth, including duration of labour and mode of delivery; multiple birth, a checklist relating to postnatal maternal health and symptoms; infant health and feeding at 3 months; perceptions of their baby at 3 months indicated by the number of positive and negative adjectives circled from a list of 16; and indicators of maternal–infant relationship reflected in women's sense of when their baby belonged to them, on a 6-point scale ranging from 'during pregnancy' to 'not quite yet', and whether she considered her baby more or less difficult than average. Postnatal partner support was estimated by summing the scores for five activities: changing baby's nappy, supporting feeding, helping when the baby cries, bathing the baby and playing with the baby; each scored 1–4 and summed (high score=more support). Midwifery support was estimated by women responding that they had/had not received enough help and advice about the baby's crying, sleeping and feeding, and also whether the woman would have liked to see the midwife more or less often in the postnatal period. The full list of variables included in the analysis is given in the online supplementary appendix.

Analyses

Descriptive statistics were used to describe the prevalence of fatigue at 10 days, 1 month and 3 months, with proportions and means as appropriate. Associations with PPF were tested using the χ^2 test. A cut-off of 13 or more was used for the EPDS. To assess the sociodemographic and clinical characteristics of women who experience PPF, separate logistic regression models were estimated for each time point. Analyses were thus carried out separately for PPF at 10 days, 1 month and 3 months as it was anticipated that different variables may be important at different time points. Four groups were entered: (1) sociodemographic variables; (2) antenatal and intrapartum variables; (3) indicators of the mother–infant relationship; and (4) partner and midwife support. Due to the large number of comparisons made in determining the key predictors of PPF, only variables which were statistically significant at p<0.001 were entered into binary logistic regression. All logistic regression analyses were adjusted for maternal age, parity, Index of Multiple Deprivation, ethnicity and age left full-time education as these were potential confounding factors. A full case analysis was carried out as missing data were generally less than 5%.

Patient and public involvement

Patients were not directly involved in the conceptualisation or design of this study. Women were selected at random for the survey by the Office for National Statistics from birth registrations. The survey questions, including those relating to postnatal health, were developed in consultation with a research advisory group with representatives from user groups, maternity services liaison committees and members of national charities associated with maternity care. The reports from the National Maternity Surveys are available on the National Perinatal Epidemiology Unit (NPEU) website.

RESULTS

In total 4578 women completed and returned the questionnaires (47% response rate after exclusion of undeliverable questionnaires). Response was such that women born outside the UK, younger women and those residents of more deprived areas were significantly less likely to respond.[34]

Prevalence of PPF

According to the symptom checklist, 38.8%, 27.1% and 11.4% of women experienced fatigue/severe tiredness at 10 days, 1 month and 3 months, respectively. Of those women who reported PPF at 10 days, 46% also reported it at 1 month; however, of those who reported PPF at 1 month, only 30% also reported it at 3 months. These figures varied significantly by maternal age, Index of Multiple Deprivation (an area-based measure of deprivation), whether the woman had left full-time education before age 16 and parity, such that PPF was more common in women who were older, primiparous, more highly educated and residents of *less* deprived areas. There were marginal differences by ethnicity (table 1).

Associations between risk factors and PPF

Sociodemographic and predictive variables that were significantly associated with PPF (p<0.001) in univariate analyses were entered into binary logistic regressions separately for PPF at 10 days, 1 month and 3 months; the results are shown in table 2. Different variables were important at different times, with the exception of maternal age which was significant throughout. Women aged 20–24 years were significantly less at risk of PPF at each time point compared with those aged 30–34, with ORs of 0.60, 0.45 and 0.40, respectively, at 10 days, 1 month and 3 months. At 1 month women aged 25–29 years were also at significantly reduced risk (OR=0.58), and at 3 months women aged 40 or over were at significantly increased risk (OR=2.00) compared with those aged 30–34 years. Multiparous women were at significantly reduced risk of PPF at 1 month and, to a lesser

Table 1 Description of sample sociodemographic characteristics

	Fatigue at 10 days			Fatigue at 1 month			Fatigue at 3 months		
	Yes	No	P value	Yes	No	P value	Yes	No	P value
	n (%)	n (%)		n (%)	n (%)		n (%)	n (%)	
Maternal age (years)									
16–19	40 (2.3)	60 (2.2)		24 (2.0)	76 (2.3)		10 (1.9)	90 (2.2)	
20–24	164 (9.3)	366 (13.2)		99 (8.1)	431 (13.1)		28 (5.4)	502 (12.5)	
25–29	475 (27.0)	742 (26.8)		263 (21.4)	954 (28.9)		120 (23.2)	1097 (27.3)	
30–34	634 (36.1)	939 (33.9)		477 (38.8)	1096 (33.2)		192 (37.1)	1381 (34.4)	
35–39	347 (19.7)	522 (18.8)		279 (22.7)	590 (17.9)		114 (22.0)	755 (18.8)	
40+	98 (5.6)	143 (5.2)		87 (7.1)	154 (4.7)		54 (10.4)	187 (4.7)	
Total	1758 (100.0)	2772 (100.0)	**	1229 (100.0)	3301 (100.0)	***	518 (100.0)	4012 (100.0)	***
Index of Multiple Deprivation									
1	373 (21.2)	524 (18.9)		285 (23.2)	612 (18.5)		129 (25.0)	768 (19.1)	
2	334 (19.0)	525 (18.9)		273 (22.2)	586 (17.7)		97 (18.8)	762 (19.0)	
3	377 (21.4)	550 (19.8)		244 (19.9)	683 (20.7)		113 (21.9)	814 (20.3)	
4	366 (20.8)	602 (21.7)		234 (19.1)	734 (22.2)		109 (21.1)	859 (21.4)	
5 (most deprived)	308 (17.5)	572 (20.6)		192 (15.6)	688 (20.8)		69 (13.3)	811 (20.2)	
Total	1758 (100.0)	2773 (100.0)	*	1228 (100.0)	3303 (100.0)	***	517 (100.0)	4014 (100.0)	**
Ethnicity									
White	1443 (83.3)	2270 (84.4)		1041 (85.9)	2672 (83.2)		434 (84.8)	3279 (83.8)	
Mixed	35 (2.0)	52 (1.9)		28 (2.3)	59 (1.8)		12 (2.3)	75 (1.9)	
Asian	194 (11.2)	248 (9.2)		106 (8.7)	336 (10.5)		43 (8.4)	399 (10.2)	
Black	48 (2.8)	110 (4.1)		29 (2.4)	129 (4.0)		18 (3.5)	140 (3.6)	
Other	12 (0.7)	11 (0.4)		8 (0.7)	15 (0.5)		5 (1.0)	18 (0.5)	
Total	1732 (100.0)	2691 (100.0)	*	1212 (100.0)	3211 (100.0)	*	512 (100.0)	3911 (100.0)	
Left full-time education aged <16 years									
No	1525 (87.4)	2198 (80.4)		1068 (87.8)	2655 (81.4)		450 (87.5)	3273 (82.5)	
Yes	220 (12.6)	537 (19.6)		149 (12.2)	608 (18.6)		64 (12.5)	693 (17.5)	
Total	1745 (100.0)	2735 (100.0)	***	1217 (100.0)	3263 (100.0)	***	514 (100.0)	3966 (100.0)	**
Parity									
Primiparous	973 (56.4)	1232 (45.6)		672 (55.9)	1533 (47.5)		247 (48.4)	1958 (50.0)	
Multiparous	752 (43.6)	1470 (54.4)		531 (44.1)	1691 (52.5)		263 (51.6)	1959 (50.0)	
Total	1725 (100.0)	2702 (100.0)	***	1203 (100.0)	3224 (100.0)	***	510 (100.0)	3917 (100.0)	

*p<0.05, **p<0.01, ***p<0.001.

extent, at 10 days compared with primiparous women. Leaving full-time education aged 16 years or less was significantly protective at 10 days but not subsequently. Reported postnatal health problems, particularly depression and anxiety, were significantly associated with PPF at each time point. In addition, at 10 days and 1 month, post-traumatic stress disorder symptoms were significantly raised, and at 3 months sleep problems not associated with the baby were higher in women who had PPF. Women who were still breast feeding at 3 months, either exclusively or partially, were also at increased risk of PPF. Raised EPDS score, although statistically significant in the univariate analysis, dropped out in the multivariate logistic regression.

The mother–infant relationship

Table 3 shows the indicators of maternal–infant attachment in women with and without PPF at 10 days, 1 month and 3 months, adjusted for sociodemographic variables. At each time point, women who had PPF used significantly more negative adjectives to describe their baby and perceived their baby as more difficult than average. Women who had PPF, especially at 3 months, experienced significant delay in feeling that their baby belonged to them in addition to having more negative feelings about their baby, although it was relatively uncommon for women to describe their baby as belonging to them 'not quite yet' (n=29).

Table 2 Predictors of PPF: binary logistic regression

	Fatigue at 10 days	Fatigue at 1 month	Fatigue at 3 months
	OR (95% CI)	OR (95% CI)	OR (95% CI)
Maternal age (years)			
16–19	0.91 (0.55 to 1.51)	0.64 (0.36 to 1.15)	1.01 (0.45 to 2.24)
20–24	0.62 (0.48 to 0.79)***	0.54 (0.40 to 0.71)***	0.44 (0.28 to 0.70)**
25–29	0.91 (0.76 to 1.09)	0.63 (0.52 to 0.77)***	0.87 (0.66 to 1.14)
30–34	1.00 (ref)		
35–39	1.00 (0.83 to 1.22)	1.13 (0.92 to 1.39)	1.04 (0.79 to 1.38)
40+	1.20 (0.86 to 1.66)	1.39 (0.99 to 2.95)	2.00 (1.34 to 2.98)**
Parity			
Primiparous	1.00 (ref)		
Multiparous	0.83 (0.71 to 0.97)*	0.81 (0.68 to 0.97)*	1.21 (0.95 to 1.54)
Left full-time education			
Aged 16 or more years	1.00 (ref)		
Aged <16 years	0.64 (0.52 to 0.78)***	0.74 (0.59 to 0.93)*	0.82 (0.60 to 1.13)
Mode of delivery			
SVD	1.00 (ref)		
Instrumental	1.23 (1.00 to 1.52)	0.99 (0.79 to 1.25)	0.87 (0.63 to 1.21)
Planned CS	1.03 (0.83 to 1.27)	1.21 (0.96 to 1.52)	1.30 (0.96 to 1.76)
CS due to unforeseen problem	1.06 (0.84 to 1.34)	1.09 (0.85 to 1.41)	1.06 (0.75 to 1.51)
Labour duration (min)†	1.00 (1.00 to 1.00)*	1.00 (1.00 to 0.00)*	1.00 (1.00 to 1.00)**
Postnatal depression			
10 days	2.08 (1.79 to 2.42)***	1.65 (1.40 to 1.95)***	1.24 (0.98 to 1.56)
1 month	1.27 (1.03 to 1.56)*	2.13 (1.72 to 2.63)***	1.28 (0.96 to 1.71)
3 months	1.17 (0.86 to 1.60)	1.62 (1.18 to 2.23)**	2.99 (2.13 to 4.21)***
Postnatal anxiety			
10 days	2.49 (2.04 to 3.04)***	1.36 (1.10 to 1.67)**	1.13 (0.84 to 1.52)
1 month	1.28 (0.98 to 1.67)	2.77 (2.13 to 3.61)***	1.54 (1.09 to 2.18)*
3 months	0.87 (0.61 to 1.25)	1.08 (0.76 to 2.55)	2.42 (1.65 to 3.56)***
Postnatal sleep			
10 days	1.05 (0.72 to 1.54)	0.95 (0.64 to 1.41)	0.80 (0.46 to 1.38)
1 month	1.39 (0.92 to 2.08)	0.90 (0.58 to 2.38)	0.95 (0.55 to 1.65)
3 months	1.04 (0.67 to 1.59)	2.20 (1.43 to 4.38)***	2.87 (1.80 to 4.60)***
PTSD			
10 days	4.31 (2.88 to 6.45)***	1.02 (0.70 to 1.48)	0.79 (0.48 to 1.32)
1 month	0.78 (0.48 to 1.27)	3.67 (2.27 to 9.92)***	1.40 (0.79 to 2.48)
3 months	0.88 (0.48 to 1.61)	0.61 (0.33 to 1.12)	1.84 (1.00 to 3.38)*
Postnatal mental health problems	0.93 (0.72 to 1.21)	0.59 (0.44 to 0.79)***	0.76 (0.53 to 1.09)
Infant feeding at 3 months			
Formula only	1.00 (ref)		
Breast only	1.06 (0.91 to 1.24)	1.19 (1.00 to 1.42)	1.38 (1.08 to 1.76)*
Combined	1.17 (0.95 to 1.45)	1.33 (1.06 to 1.67)*	1.73 (1.29 to 2.33)***
Other	0.30 (0.06 to 1.45)	0.97 (0.21 to 7.50)	0.59 (0.06 to 5.68)
Infant health poor at 3 months	1.22 (1.00 to 1.49)	1.14 (0.91 to 1.41)	1.52 (1.15 to 2.00)*

NB: Only variables significant in earlier iterations of logistic regression included (see online supplementary appendix for a full list of variables).
*p<0.05, **p<0.01, ***p<0.001.
†Duration of labour in minutes marginally positively associated with PPF.
CS, caesarean section; PPF, postpartum fatigue; PTSD, post-traumatic stress disorder; ref, reference group; SVD, spontaneous vaginal delivery.

Table 3 Indicators of maternal–infant attachment associated with PPF: binary logistic regression adjusted for sociodemographic factors†

	Fatigue at 10 days	Fatigue at 1 month	Fatigue at 3 months
	OR (95% CI)	OR (95% CI)	OR (95% CI)
When woman first felt baby belonged			
During pregnancy	1 (ref)	1 (ref)	1 (ref)
Immediately after birth	0.96 (0.81 to 1.13)	0.90 (0.75 to 1.09)	0.96 (0.74 to 1.26)
First few days	1.27 (1.02 to 1.57)*	1.28 (1.02 to 1.62)*	1.77 (1.31 to 2.39)***
First few weeks	1.60 (1.27 to 2.00)***	1.61 (1.27 to 2.05)***	1.39 (0.99 to 1.95)
Only recently	2.12 (1.52 to 2.94)***	2.23 (1.60 to 3.10)***	2.52 (1.68 to 3.77)***
Not quite yet	2.48 (1.14 to 5.43)*	2.90 (1.34 to 6.27)**	4.13 (1.77 to 9.64)**
Number of negative adjectives used about baby			
0	1 (ref)	1 (ref)	1 (ref)
1	1.20 (1.01 to 1.43)*	1.21 (0.99 to 1.48)	1.27 (0.94 to 1.70)
2 or more	1.64 (1.35 to 2.00)***	1.52 (1.22 to 1.89)***	1.86 (1.36 to 2.54)***
Baby considered more or less difficult than average			
Difficult	1 (ref)	1 (ref)	1 (ref)
Average	0.52 (0.37 to 0.73)***	0.60 (0.43 to 0.84)**	0.36 (0.25 to 0.52)***
Easier	0.42 (0.30 to 0.60)***	0.44 (0.31 to 0.63)***	0.30 (0.20 to 0.45)***

*p<0.05, **p<0.01, ***p<0.001.
†Adjusted for maternal age, parity, Index of Multiple Deprivation, ethnicity and age left full-time education.
PPF, postpartum fatigue; ref, reference group.

Women were also asked about physical well-being in the first few days and at 3 months after giving birth, with answer options 'very well', 'quite well', 'tired and uncomfortable', 'exhausted' and 'very ill'. In the first few days and at 3 months, 13% and 5%, respectively, reported feeling 'Exhausted', but of these women only 68% and 55%, respectively, also reported feeling 'Fatigue/severe tiredness'. Those who reported feeling 'exhausted' or 'very ill' were also significantly more likely to report feeling that their baby belonged to them 'only recently' or 'not quite yet' (15.6% of 'exhausted', 14.3% of 'very ill' women reported 'only recently/not quite yet' compared with 4.8% overall).

Partner and midwife support

We postulated that women who had less support from their partner may be at greater risk of PPF. However, this was not borne out in the results (table 4). On the contrary, after adjustment for sociodemographic variables, women whose partner was more involved in practical postnatal care (changing nappies, supporting feeding, helping when the baby cried, bathing and playing with the baby) were *more* likely to be experiencing PPF at 3 months and, to a lesser degree, at 1 month. Similarly, the number of days of paternity leave was positively associated with PPF at 1 month, although this was of only marginal significance.

Women with PPF at 3 months were significantly more likely to be seen for longer by their midwife in the postnatal period; however, these women were also significantly less likely to report that they saw the midwife as much as they wanted. Women with PPF were also more likely to report not receiving enough help and advice about the baby's feeding (at 10 days), crying (at 1 month) and sleeping (at 3 months). Women with PPF also tended to use more peer, online and web support, with OR (95% CI) of 1.45 (1.26 to 1.67), 1.25 (1.08 to 1.45) and 1.35 (1.17 to 1.55), respectively, for women with PPF at 10 days, and slightly lower ORs at 1 and 3 months (data not shown).

DISCUSSION

This study provides new data on the prevalence of PPF at 10 days, 1 month and 3 months based on women's own report. It clarifies the role of demographic, clinical and care factors in relation to PPF, and importantly describes the associations with the mother–infant relationship and partner and midwife support. The prevalence findings for PPF after giving birth were 38.8%, 27.1% and 11.4% at 10 days, 1 month and 3 months, respectively, in this large-scale, population-based study. These figures are somewhat lower than estimates from other studies,[11–14] which may reflect the manner in which the questions were asked. For example, in a US study using a 30-item checklist,[3] 44% of women were 'severely fatigued' at 12 weeks, whereas the current survey used self-report of 'Fatigue/severe tiredness'. Women were asked about general physical well-being in the first few days and at 3 months after giving birth: 13% and 5%, respectively, reported feeling

Table 4 Protective factors associated with PPF: binary logistic regression adjusted for sociodemographic factors†

	Fatigue at 10 days	Fatigue at 1 month	Fatigue at 3 months
	OR (95% CI)	OR (95% CI)	OR (95% CI)
Partner details			
Single mother	1.19 (0.87 to 1.62)	1.22 (0.86 to 1.71)	0.82 (0.50 to 1.33)
Score for partner help PN‡	1.00 (0.98 to 1.03)	1.05 (1.02 to 1.08)**	1.12 (1.08 to 1.16)***
Days of paternity leave	1.01 (1.00 to 1.02)	1.02 (1.00 to 1.03)*	1.01 (1.00 to 1.03)
Midwife support			
Number of times saw an MW at home	1.03 (1.00 to 1.07)	1.02 (0.98 to 1.06)	1.00 (0.95 to 1.06)
Age of baby at last visit (per additional day)	1.00 (1.00 to 1.00)	1.00 (1.00 to 1.00)	1.01 (1.00 to 1.01)***
Would have liked to see an MW…			
More often	1 (ref)		
Less often	0.73 (0.49 to 1.09)	0.87 (0.57 to 1.35)	0.68 (0.37 to 1.23)
Saw MW as much as wanted	0.81 (0.67 to 0.97)*	0.76 (0.62 to 0.92)**	0.68 (0.52 to 0.88)**
Received enough help and advice about baby's…			
Crying	0.79 (0.60 to 1.04)	0.69 (0.51 to 0.93)*	0.99 (0.65 to 1.50)
Sleeping	0.82 (0.62 to 1.10)	0.81 (0.59 to 1.10)	0.50 (0.33 to 0.76)**
Feeding	0.77 (0.63 to 0.95)*	0.86 (0.69 to 1.07)	0.92 (0.68 to 1.23)

*p<0.05, **p<0.01, ***p<0.001.
†Adjusted for maternal age, parity, Index of Multiple Deprivation, ethnicity and age left full-time education.
‡Score for partner help: changing baby's nappy, supporting feeding, helping when the baby cries, bathing the baby and playing with the baby; each scored 1–4 and summed (high score=more support).
MW, midwife; PN, postnatally; PPF, postpartum fatigue; ref, reference group.

'exhausted', but of these women only two-thirds or less also reported having 'Fatigue/severe tiredness'. This indicates that framing effects and how the question is asked may affect response.

The importance of older maternal age and primiparity as risk factors for PPF has been previously recognised[7 26 36]; however, low education and low socioeconomic status were previously thought to be risk factors,[17 23] whereas in this large, population-based study they were protective against PPF. Even when assessed in binary logistic regression, women aged less than 30 and those who had left full-time education aged less than 16 years were consistently at lower risk of PPF. Residence in the most deprived quintile was also protective against PPF at 3 months, but this was of only marginal significance. It has been postulated that there are several different types of fatigue—normal, pathophysiological, situational and psychological[23]—and it is possible that risk factors differ between these groups.

Clinical factors such as operative or instrumental delivery were associated with PPF in univariate analyses, but only duration of labour was positively associated with fatigue at each time point in the multivariate analyses, consistent with the literature.[17] As has been reported elsewhere,[3 4 19] poorer maternal mental health, as indicated by postnatal depression and anxiety, was strongly associated with PPF, especially at 3 months. Women may have felt that it was normal to be tired and to experience low mood in the early weeks after childbirth, but significant fatigue at 3 months begins to be perceived as a problem.

The association between breast feeding and PPF was strongest at 3 months especially for women who combined breast and bottle feeding. Although this makes sense intuitively, previous research has not reported on associations between mixed feeding and PPF; findings from other studies relating to breast feeding and PPF vary.[21 26 27]

Maternal–infant attachment appears to be negatively affected by PPF, with such women being more likely to report that they felt their baby belonged to them only relatively recently, using more negative terms to describe their baby, and they considered their baby more difficult than average. It is possible that these babies were actually more difficult: slightly more of them were premature and more had health problems at 3 months, suggesting that poor infant health is a contributor to PPF. Other research has also found that, after adjusting for maternal depression and anxiety, positive infant behaviour, as indicated by smile count, is associated with positive maternal attachment.[37] These findings reflect the complexity of the relationship between PPF, maternal attachment, and infant health and behaviour.

Some previous research has also reported associations between PPF and maternal–infant attachment.[3 12 16 22 38] Other reported associations include poorer mental and physical health, difficulties with relationships and employment, and early weaning.[2 4 14 18 21 26] Personal and social

development and eye–hand coordination aspects of infant development, as measured using the Griffiths Scales, were also significantly affected in infants of chronically fatigued mothers.[38] In one qualitative interview study,[16] chronically fatigued women used more negative language in describing their baby or themselves, such as 'Angry', 'Body shut down', 'Resent baby', 'Beat/Exhausted', 'Overwhelmed' and 'Can't think straight'.

An important finding of this study is that support from partners was greatest in women who were suffering from PPF, suggesting reverse causality, that partners were taking more paternity leave and were more involved in baby care because it was needed. This would parallel the 'compensation/buffering' model,[39] in which partners of women with depression became more involved in baby care, to compensate for poorer maternal well-being and fatigue.

Longer postnatal contact with the midwife was greatest for women with PPF, again suggesting that help was being targeted where it was needed. Even so, women with PPF were significantly less likely to report that they saw a midwife as much as they would have liked or that they received enough help and advice about baby care from midwives. It may be that, even though these women received more support than average, they would have liked more. It may also be the case that the type of support was unhelpful, particularly lacking continuity. Barriers to continuity of postnatal carer include shift patterns, part-time work, staff shortages and travel time.[40] However, individualised, women-centred care can still be achieved with good communication and antenatal care planning.[41]

Strengths and limitations

This study was based on a large, population-based random sample of recent mothers, with considerable diversity among respondents. The importance of some specific risk, care and individual factors was identified. However, the response rate was 47% and, in common with many other surveys,[42–44] there was significant under-representation of hard-to-reach groups. PPF was as reported by women using a single item as part of a symptom checklist rather than one of the many scales. The cross-sectional survey was conducted at 3 months post partum, and thus causality cannot be inferred from associations found and women may not have accurately remembered some of the details reported. In particular, while fatigue at the time of the survey is likely to be accurately reported, fatigue at 10 days and 1 month may be less well recollected and subject to recall bias. However, studies comparing women's reports of events around childbirth with medical records or other recorded data have demonstrated good recall.[45 46]

Implications for healthcare professionals

These findings highlight that, for some women, PPF can be severe and long-lasting and may require intervention. Several interventions to reduce PPF have been evaluated in good-quality randomised controlled studies.[14 22 31 47 48] These were a mixture of self-management, telephone support, exercise and education, and all were reported to be beneficial except for the purely self-directed intervention which used the Tiredness Management Guide to help women to self-manage their fatigue.[48] Supportive interventions and availability of additional advice and support targeted to those women with the greatest need are to be encouraged. The nature of the additional advice and support should be tailored to the needs of individual women. The association with more negative perceptions of their infant and of infants who may have been ill or born preterm may be a key point for health professionals working in postnatal care to consider. There is also a need for antenatal preparation for women and their partners in approaching the transition to parenthood so that they have realistic expectations, can enlist practical help and emotional support when required postnatally, and enhance their own coping skills.

Implications for research

The cross-sectional nature of this study has precluded teasing out of the interaction between PPF and postnatal depression. Although the two are clearly linked, the nature of the relationship is unclear. Further exploration of the impact of PPF on the developing mother–child and partner relationships, and the influence of method of infant feeding, in prospective longitudinal studies, is also likely to better illuminate the way in which individual differences may contribute. There is a wide range of estimates of point and period prevalence of PPF in the literature which requires further elucidation.

CONCLUSIONS

PPF is not inevitable or universal, although early in the postnatal period it affects a substantial proportion of women. Associations with infant characteristics and maternal attachment are described which may affect families. Predictors of PPF include age and parity; possible protective factors include practical help and support from partners, as well as input from midwives.

Acknowledgements Our special thanks go to the women and their families who completed the survey. The Office for National Statistics was responsible for drawing the sample and managing the mailings but bear no responsibility for the analysis or interpretation.

Contributors MR designed the National Maternity Survey. MR, FA and JH were responsible for the research questions. JH analysed the data. MR, FA and JH wrote the manuscript.

Funding This paper reports on an independent study which is funded by the NIHR Policy Research Programme in the Department of Health and Social Care. The views expressed are not necessarily those of the Department.

Competing interests None declared.

Patient consent for publication Not required.

Ethics approval Ethical approval for the survey was obtained from the NRES committee for Yorkshire and the Humber – Humber Bridge (REC reference 14/YH/0065). Completion and return of the questionnaire was taken as implicit consent to participate.

Provenance and peer review Not commissioned; externally peer reviewed.

Data sharing statement Further analyses of these data are planned. The data will be made available by the NPEU when these are complete.

REFERENCES

1. Aaronson LS, Teel CS, Cassmeyer V, *et al*. Defining and measuring fatigue. *Image* 1999;31:45–50.
2. Chau V, Giallo R. The relationship between parental fatigue, parenting self-efficacy and behaviour: implications for supporting parents in the early parenting period. *Child: Care, Health and Development* 2015;41:626–33.
3. Doering Runquist JJ, Morin K, Stetzer FC. Severe fatigue and depressive symptoms in lower-income urban postpartum women. *West J Nurs Res* 2009;31:599–612.
4. Giallo R, Gartland D, Woolhouse H, *et al*. Differentiating maternal fatigue and depressive symptoms at six months and four years post partum: Considerations for assessment, diagnosis and intervention. *Midwifery* 2015;31:316–22.
5. Milligan R, Lenz ER, Parks PL, *et al*. Postpartum fatigue: clarifying a concept. *Sch Inq Nurs Pract* 1996;10:279–91.
6. North American Nursing Diagnosis Association. *NANDA nursing diagnoses: definitions and classifications, 2001-2002*. Philadelphia, 2001.
7. Pugh LC. Childbirth and the measurement of fatigue. *J Nurs Meas* 1993;1:57–66.
8. Lee K, Hicks G, Nino-Murcia G. Lee's Fatigue Scale: University of Buffalo, USA; 1991 [8/3/18]. https://ubir.buffalo.edu/xmlui/handle/10477/2951
9. Michielsen HJ, De Vries J, Van Heck GL. Psychometric qualities of a brief self-rated fatigue measure: the Fatigue Assessment Scale. *J Psychosom Res* 2003;54:345–52.
10. Grossi E, Groth N, Mosconi P, *et al*. Development and validation of the short version of the Psychological General Well-Being Index (PGWB-S). *Health Qual Life Outcomes* 2006;4:88.
11. Glazener CMA, Abdalla M, Stroud P, *et al*. Postnatal maternal morbidity: extent, causes, prevention and treatment. *Br J Obstet Gynaecol* 1995;102:282–7.
12. Bakker M, van der Beek AJ, Hendriksen IJM, *et al*. Predictive factors of postpartum fatigue: a prospective cohort study among working women. *J Psychosom Res* 2014;77:385–90.
13. McGovern P, *et al*. Postpartum health of employed mothers 5 weeks after childbirth. *Ann Fam Med* 2006;4:159–67.
14. Giallo R, Cooklin A, Dunning M, *et al*. The efficacy of an intervention for the management of postpartum fatigue. *J Obstet Gynecol Neonatal Nurs* 2014;43:598–613.
15. Cheng CY, Pickler RH. Perinatal stress, fatigue, depressive symptoms, and immune modulation in late pregnancy and one month postpartum. *ScientificWorldJournal* 2014;2014:1–7.
16. Doering JJ, Sims DA, Miller DD. How postpartum women with depressive symptoms manage sleep disruption and fatigue. *Res Nurs Health* 2017;40:132–42.
17. Pugh LC, Milligan R. A framework for the study of childbearing fatigue. *ANS Adv Nurs Sci* 1993;15:60–70.
18. Lai Y-L, Hung C-H, Stocker J, *et al*. Postpartum fatigue, baby-care activities, and maternal–infant attachment of vaginal and cesarean births following rooming-in. *Appl Nurs Res* 2015;28:116–20.
19. Mori E, Tsuchiya M, Maehara K, *et al*. Fatigue, depression, maternal confidence, and maternal satisfaction during the first month postpartum: A comparison of Japanese mothers by age and parity. *Int J Nurs Pract* 2017;23:e12508.
20. Van Der Woude D, Pijnenborg JMA, Verzijl JM, *et al*. Health status and fatigue of postpartum anemic women: a prospective cohort study. *Eur J Obstet Gynecol Reprod Biol* 2014;181:119–23.
21. Gay CL, Lee KA, Lee S-Y. Sleep patterns and fatigue in new mothers and fathers. *Biol Res Nurs* 2004;5:311–8.
22. Doering JJ, Dogan S. A postpartum sleep and fatigue intervention feasibility pilot study. *Behav Sleep Med* 2018;16:185–201.
23. Gardner DL, Campbell B. Assessing Postpartum Fatigue. *MCN Am J Matern Child Nurs* 1991;16:264–6.
24. Lee KA, Zaffke ME. Longitudinal changes in fatigue and energy during pregnancy and the postpartum period. *J Obstet Gynecol Neonatal Nurs* 1999;28:183–91.
25. Rychnovsky J, Hunter LP. The relationship between sleep characteristics and fatigue in healthy postpartum women. *Womens Health Issues* 2009;19:38–44.
26. Wambach KA. Maternal fatigue in breastfeeding primiparae during the first nine weeks postpartum. *J Hum Lact* 1998;14:219–29.
27. Callahan S, Séjourné N, Denis A. Fatigue and breastfeeding: an inevitable partnership? *J Hum Lact* 2006;22:182–7.
28. Giallo R, Gartland D, Woolhouse H, *et al*. "I didn't know it was possible to feel that tired": exploring the complex bidirectional associations between maternal depressive symptoms and fatigue in a prospective pregnancy cohort study. *Arch Womens Ment Health* 2016;19:25–34.
29. Runquist JJ. A depressive symptoms responsiveness model for differentiating fatigue from depression in the postpartum period. *Arch Womens Ment Health* 2007;10:267–75.
30. Henderson J, Carson C, Redshaw M. Impact of preterm birth on maternal well-being and women's perceptions of their baby: a population-based survey. *BMJ Open* 2016;6:e012676.
31. Thome M, Alder B. A telephone intervention to reduce fatigue and symptom distress in mothers with difficult infants in the community. *J Adv Nurs* 1999;29:128–37.
32. Zeifman DM, St James-Roberts I, Roberts SJ I. Parenting the crying infant. *Curr Opin Psychol* 2017;15:149–54.
33. St James-Roberts I, Roberts M, Hovish K, *et al*. Descriptive figures for differences in parenting and infant night-time distress in the first three months of age. *Prim Health Care Res Dev* 2016;17:611–21.
34. Redshaw M, Henderson J. *Safely delivered: a national survey of women's experience of maternity care*. NPEU: Oxford, 2014.
35. Mail DDA. internet surveys. *The tailored design method*. 2nd edn. New Jersey: John Wiley & Sons, 2007.
36. Mori E, Maehara K, Iwata H, *et al*. Comparing older and younger Japanese primiparae: fatigue, depression and biomarkers of stress. *Int J Nurs Pract* 2015;21(Suppl. 1):10–20.
37. Nolvi S, Karlsson L, Bridgett DJ, *et al*. Maternal postnatal psychiatric symptoms and infant temperament affect early mother-infant bonding. *Infant Behav Dev* 2016;43:13–23.
38. Parks PL, Lenz ER, Milligan RA, *et al*. What happens when fatigue lingers for 18 months after delivery? *J Obstet Gynecol Neonatal Nurs* 1999;28:87–93.
39. Goodman SH, Lusby CM, Thompson K, *et al*. Maternal depression in association with fathers' involvement with their infants: spillover or compensation/buffering? *Infant Ment Health J* 2014;35:495–508.
40. Bowers J, Cheyne H, Mould G, *et al*. Continuity of care in community midwifery. *Health Care Manag Sci* 2015;18:195–204.
41. Forster DA, Savage TL, McLachlan HL, *et al*. Individualised, flexible postnatal care: a feasibility study for a randomised controlled trial. *BMC Health Serv Res* 2014;14:569.
42. Alderdice F, Hamilton K, McNeill J, *et al*. *Birth NI: a survey of women's experience of maternity care in Northern Ireland*. Belfast: Queen's University Belfast, 2016.
43. Care Quality Commission. *survey of women's experience of maternity care. Statistical release*. London: CQC, 2015.
44. Cheyne H, Critchley A, Elders A, *et al*. *Having a baby in Scotland 2015: listening to mothers. National report*. Edinburgh: NHS Scotland, 2015.
45. Bat-Erdene U, Metcalfe A, McDonald SW, *et al*. Validation of Canadian mothers' recall of events in labour and delivery with electronic health records. *BMC Pregnancy Childbirth* 2013;13(Suppl 1):S3.
46. Quigley MA, Hockley C, Davidson LL. Agreement between hospital records and maternal recall of mode of delivery: evidence from 12 391 deliveries in the UK Millennium Cohort Study. *BJOG* 2007;114:195–200.
47. Dritsa M, Da Costa D, Dupuis G, *et al*. Effects of a home-based exercise intervention on fatigue in postpartum depressed women: results of a randomized controlled trial. *Ann Behav Med* 2008;35:179–87.
48. Troy NW, Dalgas-Pelish P. The effectiveness of a self-care intervention for the management of postpartum fatigue. *Appl Nurs Res* 2003;16:38–45.