

Antenatal peer support workers and initiation of breast feeding: cluster randomised controlled trial

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ABSTRACT

Objective To assess the effectiveness of an antenatal service using community based breastfeeding peer support workers on initiation of breast feeding.

Design Cluster randomised controlled trial.

Setting Community antenatal clinics in one primary care trust in a multiethnic, deprived population.

Participants 66 antenatal clinics with 2511 pregnant women: 33 clinics including 1140 women were randomised to receive the peer support worker service and 33 clinics including 1371 women were randomised to receive standard care.

Intervention An antenatal peer support worker service planned to comprise a minimum of two contacts with women to provide advice, information, and support from approximately 24 weeks' gestation within the antenatal clinic or at home. The trained peer support workers were of similar ethnic and sociodemographic backgrounds to their clinic population.

Main outcome measure Initiation of breast feeding obtained from computerised maternity records of the hospitals where women from the primary care trust delivered.

Results The sample was multiethnic, with only 9.4% of women being white British, and 70% were in the lowest 10th for deprivation. Most of the contacts with peer support workers took place in the antenatal clinics. Data on initiation of breast feeding were obtained for 2398 of 2511 (95.5%) women (1083/1140 intervention and 1315/1371 controls). The groups did not differ for initiation of breast feeding: 69.0% (747/1083) in the intervention group and 68.1% (896/1315) in the control groups; cluster adjusted odds ratio 1.11 (95% confidence interval 0.87 to 1.43). Ethnicity, parity, and mode of delivery independently predicted initiation of breast feeding, but randomisation to the peer support worker service did not.

Conclusion A universal service for initiation of breast feeding using peer support workers provided within antenatal clinics serving a multiethnic, deprived population was ineffective in increasing initiation rates.

Trial registration Current Controlled Trials ISRCTN16126175.

INTRODUCTION

Breast feeding confers numerous advantages to the health of babies and their mothers, but a large proportion of women, especially in developed countries, do not initiate breast feeding.¹ In 2005 only 77% of women in England and Wales initiated breast feeding.² Although this has increased from 71% since 2000,³ there is still variation across groups, with lower rates in socioeconomically deprived populations and in some ethnic minority groups. The UK government has set a target for primary care trusts to increase initiation rates for breast feeding by 2% year on year. Among other interventions to achieve this, peer support is being used.

Several systematic reviews have evaluated interventions to increase breast feeding.⁴⁻⁷ These found evidence from randomised controlled trials of benefit from peer or lay support on breastfeeding exclusivity and continuation mainly in women who had decided to breast feed, but no randomised controlled trials evaluating the effects on initiation of breast feeding. One subsequent small randomised controlled trial based in the United Kingdom found no improvement in initiation rates from antenatal peer support.⁸ Only non-randomised studies have suggested benefit from such support on initiation rates, but these are inconclusive as a result of confounding, selection bias, or losses to follow-up.⁶

We evaluated the effectiveness of a community based antenatal service using peer support workers on initiation of breast feeding in a multiethnic deprived population.

METHODS

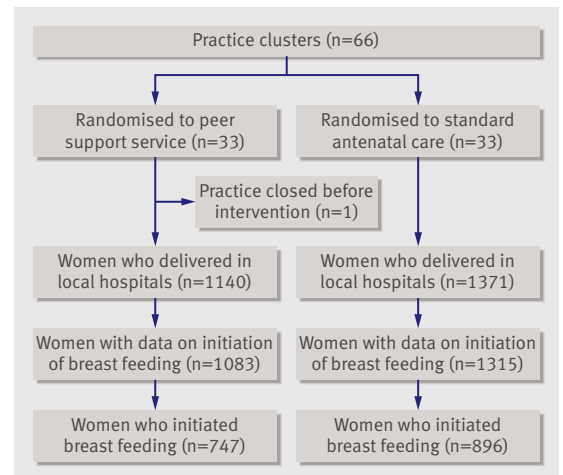
The study was a cluster randomised controlled trial, with the general practice antenatal clinic as the unit of randomisation. We considered a cluster design as necessary because of the high risk of contamination if peer support workers were to be located in antenatal clinics that served women in both intervention and control groups. The study setting was a primary care trust within a deprived urban area of Birmingham, which has 5500-6000 deliveries per year of which about

90% are to women from ethnic minority groups, with more than a quarter to women born outside the UK.⁹ Most of the deliveries are in three hospitals (96%), with 3% in more distant hospitals and about 1% at home. We included all general practices in the primary care trust in the study. In some cases more than one practice shared the same antenatal clinic: as the peer support workers worked directly with the antenatal clinics for the purposes of trial allocation we considered these practices as one cluster. The size of the clinics varied. Eight teams of midwives worked for the primary care trust, with midwives from each team providing care at several antenatal clinics. Randomisation was stratified by size of antenatal clinic and by midwifery team and undertaken using a computer program by the trial statistician, who was blind to the identity of the antenatal clinics.

Intervention

The intervention was a new community based antenatal breastfeeding service using peer support workers developed by the primary care trust mainly to increase its rate of initiation of breast feeding, which was lower than many primary care trusts in the UK. The service was in addition to usual antenatal care provided by midwives. It comprised 11 peer support workers for breast feeding who were recruited, as far as possible, to be peers of the women in the clinics in which they worked on the basis of ethnicity and language and to have had personal successful breastfeeding experience of several months' duration. They were trained by the infant feeding team within the primary care trust, which included specialist midwives and other health workers. The training was daily over eight weeks, based on the Unicef baby friendly breastfeeding management course, and addressed cultural beliefs and barriers appropriate to the local population. The peer support workers were oriented into the environment of the community antenatal service, and worked in their positions for three months. When we considered that the support service was fully operational the evaluation procedures were piloted for a month. The planned level of contact by a peer support worker was to make an initial introduction in the antenatal clinic followed by a minimum of two contacts, one at 24-28 weeks' gestation and the other around 36 weeks' gestation. The first of these could directly follow the initial introduction, but at least one contact was to be in the home. The duration of each support session was based on need. The peer support worker followed up women who initiated breast feeding to give postnatal support. The purpose of the antenatal consultations was to provide advice and information on the benefits of breast feeding and to be able to support women with particular cultural barriers or concerns. The peer support workers were managed by the infant feeding team but were also responsible to, and worked with, the midwives in the antenatal clinics.

All pregnant women registered with practices in the primary care trust randomised to provide the new peer



Patient flow through trial

support worker service were offered contact with a peer support worker. The peer support workers kept a log of women who reached 24-28 weeks' gestation, noting those who refused support and why. For those women who had a support session the peer support worker recorded any history of infant feeding and plans for feeding before giving advice, when and where each session took place, and issues covered. Women in the control clusters received standard antenatal care, which included usual information and advice from midwives on breast feeding, without input from community peer support workers. Intrapartum and early postpartum hospital care was the same for women in both intervention and control groups, which may have included advice and support from hospital (rather than community) midwives and peer support workers, the numbers of peer support workers having increased as part of the overall breastfeeding initiative of the primary care trust.

Outcome assessment

The primary outcome was initiation of breast feeding, defined as a positive response to whether the infant had had breast milk either at the time of delivery or by the time of hospital discharge, as recorded in the hospital records. Data were obtained anonymously from the three main hospitals that provide maternity care for women in the primary care trust for deliveries during the study period of 1 February to 31 July 2007. We did not include the few women who delivered in other hospitals or at home in the assessment of outcome, although those from intervention clusters would have been offered contact with a peer support worker antenatally. From hospital records we obtained information on general practice identifying code, date of delivery, age, parity, mode of delivery, ethnic group, and Townsend deprivation score. As data on outcome were supplied to the research team in an anonymised format the local research ethics committee approved that individual patient consent was not required.

Sample size

At the time the peer support worker service was planned in 2005, the initiation rate for breast feeding within the primary care trust was 58% and about 6000 deliveries took place per year. Members of the primary

care trust considered that full and continued implementation of the service would be worthwhile with a 6% increase in initiation of breast feeding. To estimate the sample size for a cluster randomised trial we needed an estimate of the degree of clustering at the practice level, which was available from a previous randomised trial of postnatal care.¹⁰ Using the approach of a previous study,¹¹ and taking the interpractice correlation coefficient to be 0.005 as indicated in that trial, we inflated the sample size by 2.45 times from a non-cluster randomised trial. We therefore required a total of just under 3000 women to estimate a 6% absolute difference in initiation of breast feeding with a power (1- β) of 90%.

Table 1 | Variables of women allocated to peer support for breast feeding or to standard antenatal care by a midwife. Values are numbers (percentages) of women

Variables	Peer support group	Control group	Total
Hospital:			
Women's	411 (38.0)	497 (37.8)	908 (37.9)
Heartlands	236 (21.8)	208 (15.8)	444 (18.5)
City	436 (40.3)	610 (46.4)	1046 (43.6)
Total	1083	1315	2398
Month of delivery:			
February	166 (15.3)	202 (15.4)	368 (15.3)
March	173 (16.0)	223 (17.0)	396 (16.5)
April	186 (17.2)	206 (15.7)	392 (16.3)
May	188 (17.4)	242 (18.4)	430 (17.9)
June	195 (18.0)	220 (16.7)	415 (17.3)
July	175 (16.2)	222 (16.9)	397 (16.6)
Total	1083	1315	2398
Age of mother:			
≤20	105 (9.7)	135 (10.3)	240 (10.0)
21-25	331 (30.6)	398 (30.3)	729 (30.4)
26-30	359 (33.1)	399 (30.3)	758 (31.6)
31-35	194 (17.9)	249 (18.9)	443 (18.5)
≥36	94 (8.7)	134 (10.2)	228 (9.5)
Total	1083	1315	2398
Mode of delivery:			
Spontaneous vaginal	783 (72.3)	902 (68.6)	1685 (70.3)
Instrumental vaginal	78 (7.2)	127 (9.7)	205 (8.5)
Caesarean section	222 (20.5)	286 (21.7)	508 (21.2)
Total	1083	1315	2398
Parity:			
Primiparous	376 (35.1)	440 (33.9)	816 (34.4)
Multiparous	695 (64.9)	858 (66.1)	1553 (65.6)
Total	1071	1298	2369
Parity not known	12	17	29
Ethnic group:			
White British	87 (8.4)	129 (10.3)	216 (9.4)
African-Caribbean	130 (12.6)	217 (17.3)	347 (15.1)
Pakistani	435 (42.0)	490 (39.0)	925 (40.4)
Indian	115 (11.1)	91 (7.2)	206 (9.0)
Bangladeshi	110 (10.6)	133 (10.6)	243 (10.6)
Other Asian	40 (3.9)	42 (3.3)	82 (3.6)
Mixed	40 (3.9)	38 (3.0)	78 (3.4)
Other	78 (7.5)	117 (9.3)	195 (8.5)
Total	1035	1257	2292
Ethnic group not known	48	58	106
Townsend 10th:			
First	746 (70.2)	906 (69.9)	1652 (70.0)
Second	126 (11.9)	152 (11.7)	278 (11.8)
Third	78 (7.3)	88 (6.8)	166 (7.0)
Fourth to 10th	113 (10.6)	151 (11.6)	264 (11.2)
Total	1063	1297	2360
Townsend 10th not known	20	18	38

Women of unknown breastfeeding status were excluded.

Statistical analysis

We undertook the statistical analysis according to the intention to treat principle. The women in the trial were described by a range of criteria prespecified in the data collection instrument. To account for over dispersion for the comparison of outcomes between trial groups, a conventional manner is to treat clusters (in this case the antenatal clinics) as random effects in the analysis.¹² In this way extra binomial variability can be accounted for in both the point estimate of the effect of treatment and the confidence intervals describing the degree of over dispersion in a manner adaptive to the observed clustering. For the analysis of the primary outcome we prespecified in our statistical analysis plan a non-linear mixed model with a logit link and binomial error, including a random effect with a Gaussian error structure. In the principal model we included only the intervention group as a fixed effect and the cluster as a random effect. Missing data were not imputed. In further prespecified exploratory analyses we examined the potential impact of the midwifery team (which covered more than one practice) by adding the team delivering care as a further fixed effect. The effect of parity, ethnicity, age, deprivation score, mode of delivery, and hospital on initiation of breast feeding was also examined. We did not adjust for multiple testing, as a single primary analysis had been prespecified in the statistical analysis. We used multiple imputation techniques to examine the potential effects of missing data. All analyses were done in SAS version 9.1 (SAS Institute, Cary, NC).

RESULTS

Of 66 general practice antenatal clinic clusters in the primary care trust, 33 were randomly allocated to the peer support service (intervention group) and 33 to standard antenatal care (figure). One small intervention practice closed after randomisation but before intervention. During the six months of the study 2511 women delivered in the three hospitals; 1140 (45.4%) received antenatal care in the 32 intervention practices and 1371 (54.6%) in the 33 control practices. Data on initiation of breast feeding were available for 2398 women (95.5%); 1083 (95.0%) in the intervention group and 1315 (96.0%) in the control group.

Table 1 shows the hospital, month of delivery, and other characteristics of women by trial group. Although there were generally no clinically important differences between the groups, the intervention group did have more deliveries in one of the three hospitals and fewer African-Caribbean women than the control group.

Primary outcome

Initiation rates for breast feeding did not differ between intervention and control groups; 69.0% and 68.1%. The cluster adjusted odds ratio was 1.11 (95% confidence interval 0.87 to 1.43, $P=0.40$, interpractice correlation coefficient 0.07; table 2). These rates excluded women with missing data on initiation of breast feeding. If missing data were assumed to be for women who had not initiated breast feeding then initiation rates would be 65.5% and 65.4%. Multiple imputation techniques provided a similar result to the analysis using complete data: cluster adjusted odds ratio 1.10 (0.86 to 1.42, $P=0.44$).

Effects of mothers' characteristics

Initiation of breast feeding varied according to several sociodemographic and delivery characteristics (table 3). Initiation was lower in Heartlands Hospital, younger and older women, those who had a Caesarean section, and multiparous women. Differences were large according to ethnic group, with the lowest initiation of breast feeding among white British women and the highest among African-Caribbean women. Substantial variation was found among Asian ethnic groups, with the lowest initiation of breast feeding among Bangladeshi women and the highest among women of Indian (subcontinent) origin. No difference was found for deprivation score, but 70% of the sample was in the lowest 10th. Multivariable analysis with adjustment for cluster showed that being from an ethnic minority group compared with being white British, and being primiparous were independently associated with an increased likelihood of initiating breast feeding (table 4). Accounting for confounding factors in the multivariable model, however, had little effect on the primary outcome.

Peer support worker logs

Logs completed by the peer support worker were analysed for women in the intervention group with a recorded expected date of delivery between 1 February

and 31 July 2007. Records of a contact were available for 912 women (80.0% of deliveries during the period), and 846 (74.2%) had a support session. Of the women contacted, 64 (7%) refused a support session because they had already decided to bottle feed ($n=21$) or breast feed ($n=43$). The mean duration of the first support session was 13.1 (SD 10.2) minutes, and 799 (94.4%) took place in the clinic, with only 11 (1.3%) at home. Of the 846 women who accepted a first support session, 351 (41.5%) had a second session, again predominantly in the clinic, and 25 (3.0%) a third. The first support session took place at a mean of 28 (SD 6.5) weeks' gestation and the second at 34.5 (SD 3.6) weeks.

Before the start of the first support session the women were asked whether they had made any plans about feeding: 500 (59.1%) planned to breast feed, 174 (20.6%) were considering breast feeding, 35 (4.1%) planned to use both breast and bottle, 51 (6%) planned to bottle feed, and 64 (7.6%) were undecided. The issues discussed in the first support session included health benefits for the baby of being breast fed ($n=809$, 95.6%), health benefits for the mother ($n=794$, 93.9%), convenience of breast feeding ($n=689$, 81.4%), cost of feeding ($n=603$, 71.3%), perceived difficulties of breast feeding ($n=499$, 59.0%), partner's attitudes towards breast feeding ($n=362$, 42.8%), family attitudes towards breast feeding ($n=309$, 36.5%), discard of colostrum ($n=265$, 31.3%), and other cultural issues ($n=56$, 6.6%).

DISCUSSION

This large cluster randomised controlled trial showed no effect on initiation of breast feeding of a universal community based antenatal breastfeeding peer support service provided in a primary care trust with a high proportion of women from ethnic minority groups and a deprived population. Peer support was chosen by the primary care trust as the option most likely to increase initiation of breast feeding among women with these characteristics, as suggested by evidence into practice briefing by the UK health service.¹³ However almost all the evidence on the effect of peer support on initiation of breast feeding has been from non-randomised studies, and we found no evidence on universal peer support from trials. Thus it was considered good practice to evaluate the peer support worker service, alongside its implementation, in a randomised controlled trial.

The lack of effect shown in this trial is consistent with the findings of a randomised controlled trial in one general practice in Scotland,⁸ which aimed to increase

Table 2 | Breastfeeding status in women allocated to peer support for breast feeding or to standard antenatal care by a midwife

Breastfeeding status	Peer support group		Control group		Total	
	No (%)	% of total	No (%)	% of total	No (%)	% of total
Initiated	747 (69.0)	65.5	896 (68.1)	65.4	1643 (68.5)	65.4
Not initiated	336 (31.0)	29.5	419 (31.9)	30.6	755 (31.5)	30.1
Total	1083 (100)	—	1315 (100)	—	2398 (100)	—
Not known	57	5	56	4	113	5.5
Overall total	1140	100	1371	100	2511	100

the initiation and continuation of breast feeding. This report was published after the start of our trial and too recently to be included in systematic reviews. Antenatal peer support comprised one home visit, with further visits if requested. The trial included 235 unselected

Table 3 | Initiation of breast feeding and variables for women. Values are numbers (percentages) of women

Variable	Breast feeding initiated	Breast feeding not initiated	Total
Hospital:			
Women's	630 (69.4)	278 (30.6)	908
Heartlands	285 (64.2)	159 (35.8)	444
City	728 (69.6)	318 (30.4)	1046
Total	1643 (68.5)	755 (31.5)	2398
Month of delivery:			
February	255 (69.3)	113 (30.7)	368
March	272 (68.7)	124 (31.3)	396
April	267 (68.1)	125 (31.9)	392
May	298 (69.3)	132 (30.7)	430
June	280 (67.5)	135 (32.5)	415
July	271 (68.3)	126 (31.7)	397
Total	1643 (68.5)	755 (31.5)	2398
Age of mother:			
≤20	152 (63.3)	88 (36.7)	240
21-25	511 (70.1)	218 (29.9)	729
26-30	543 (71.6)	215 (28.4)	758
31-35	289 (65.2)	154 (34.8)	443
≥36	148 (64.9)	80 (35.1)	228
Total	1643 (68.5)	755 (31.5)	2398
Mode of delivery:			
Spontaneous vaginal delivery	1163 (69.0)	522 (31.0)	1685
Instrumental	155 (75.6)	50 (24.4)	205
Caesarean section	325 (64.0)	183 (36.0)	508
Total	1643 (68.5)	755 (31.5)	2398
Parity:			
Primiparous	624 (76.5)	192 (23.5)	816
Multiparous	997 (64.2)	556 (35.8)	1553
Total	1621 (68.4)	748 (31.6)	2369
Parity not known	22 (75.9)	7 (24.1)	29
Ethnic group:			
White British	106 (49.1)	110 (50.9)	216
African-Caribbean	294 (84.7)	53 (15.3)	347
Pakistani	573 (61.9)	352 (38.1)	925
Indian	161 (78.2)	45 (21.8)	206
Bangladeshi	137 (56.4)	106 (43.6)	243
Other Asian	67 (81.7)	15 (18.3)	82
Mixed	56 (71.8)	22 (28.2)	78
Other	167 (85.6)	28 (14.4)	195
Total	1561 (68.1)	731 (31.9)	2292
Ethnic group not known	82 (77.4)	24 (22.6)	106
Townsend 10th:			
First	1129 (68.3)	523 (31.7)	1652
Second	182 (65.5)	96 (34.5)	278
Third	114 (68.7)	52 (31.3)	166
Fourth to 10th	189 (71.6)	75 (28.4)	264
Total	1614 (68.4)	746 (31.6)	2360
Townsend 10th not known	29 (76.3)	9 (23.7)	38

Table 4 | Multiple logistic regression for initiation of breast feeding

Variable	Odds ratio (95% CI)
Parity:	
Primiparous	1.0 (Reference)
Multiparous	0.57 (0.46 to 0.70)
Not known	1.03 (0.42 to 2.51)
Ethnic group:	
White British	1.0 (Reference)
African-Caribbean	6.48 (4.32 to 9.72)
Pakistani	1.89 (1.38 to 2.58)
Indian	3.78 (2.45 to 5.84)
Bangladeshi	1.56 (1.07 to 2.29)
Other Asian	4.83 (2.57 to 9.08)
Mixed	2.81 (1.59 to 4.97)
Other	6.17 (3.78 to 10.07)
Not known	3.63 (2.12 to 6.20)
Mode of delivery:	
Spontaneous vaginal	1.0 (Reference)
Instrumental vaginal	1.05 (0.73 to 1.51)
Caesarean section	0.70 (0.56 to 0.88)

women, with group allocation stratified for previous experience of breast feeding. Initiation rates were similar—54.5% in the peer support group and 53.1% in the control group. Continuation of breast feeding to four months was also similar between the groups.

Other randomised controlled trials of interventions incorporating antenatal peer support have been selective, including only women considering breast feeding, with postnatal peer support to increase continuation or exclusivity as their primary purpose. Although only one of these trials specified initiation as an outcome, five reported data on initiation. A UK trial, where selection for eligibility meant that initiation of breast feeding was high, found no effect of home based peer support on any breastfeeding outcomes.¹⁴ Two small trials in the US did find an effect of peer support on initiation of breast feeding where the intervention incorporated home based antenatal peer contact as well as daily postpartum peer support in hospital.^{15,16} Two trials in the developing world, where initiation was almost 100%, examined timing of initiation, and one found early initiation to be more common in the peer support group,¹⁷ whereas the other found no difference.¹⁸

Strengths and weaknesses of the study

Our trial is larger than any other of the peer support trials that reported on initiation of breast feeding we found through a systematic search of the literature. The coverage of women was high but the intensity of the peer contact may be a limitation because this was less than planned. The service was universal, with 80% of women offered support and 74% taking up the offer. Two antenatal sessions were planned but these were attended by only 42% of women. In addition one session should have been at home but this rarely took place, and many sessions were short. It is possible that

more contacts took place than were recorded, since a parallel qualitative study found that some peer support workers had difficulties in completing the activity logs, which is perhaps unsurprising given that the peer support workers were selected for their peer characteristics rather than administrative experience. Moreover, despite recruiting peer support workers who were ethnically and linguistically appropriate for the local population, exact matches for the large number of ethnic and linguistic groups were not possible.

Another limitation of the trial could be that data on initiation of breast feeding were obtained from the routinely collected maternity records, which are not generally considered to be as error free as data specifically collected by a research team. However, this allowed a low loss to follow-up, at only 5%, and the quality of the data was similar across trial groups. Moreover, primary care trusts in the UK use such hospital based data to assess their targets for initiation of breast feeding.

Although the study groups did not differ in initiation rates a 10% absolute increase occurred from the rate when the primary care trust had decided to set up the new service. During this period other initiatives to increase initiation of breast feeding, especially its recording, were also implemented. This included increased hospital based peer support and much closer scrutiny and subsequent changes to the quality of the data given to primary care trusts by the hospitals to inform initiation rates. This illustrates the necessity of robust evaluation using a randomised controlled design rather than studies with a before and after design.

Meaning of the study

The lack of effect found from the predominately antenatal clinic based peer support worker service evaluated in this study suggests that such a service should not be adopted as standard care. If the service had included more home based contact it might have had an effect, although in the two other UK trials^{8,14} peer support was entirely home based and no improvement occurred in any breastfeeding outcomes. The service might have needed to be more intensive, and in the other UK trials contact antenatally comprised only one visit for most women, fewer than in the present trial. In the two US trials, however, substantial improvements in initiation of breast feeding were shown, with only one and three antenatal contacts

alongside peer support in hospital.^{15,16} Perhaps the amount of advice on breast feeding and support already provided routinely in antenatal clinics in the UK allows for little additional gain from other interventions to increase initiation rates. A more intensive universal home based service would require greater investment. Rather than providing this, peer support might be more effective if targeted at specific groups, such as those women not planning to breast feed, which was around 40% of participants in this study, or those for whom routine advice on breast feeding is less accessible because of linguistic difficulties. Future service interventions, however, must be subject to proper evaluation.

Conclusion

We conclude that a universal, predominantly antenatal clinic based, peer support worker service for initiation of breast feeding serving a multiethnic deprived population is ineffective in increasing initiation rates.

Contributors: CMacA, KJ, NF, C-LD, JC, and KK designed the study. CMacA, KJ, and LI coordinated the day to day management of the trial. NF was the trial statistician. CMacA, KJ, LI, RH, JB, and KK sat on a trial management committee. CMacA, KJ, LI, NF, C-LD, JB, and KK formed the trial steering committee. CMacA drafted the manuscript and all authors commented on the manuscript and approved the final draft. CMacA is the guarantor. The funding body was not involved in the study design, collection, analysis, or interpretation of the data. RH, JB, and JC contributed to the writing of the paper.

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Competing interests: RH, JB, JC are from the Heart of Birmingham Primary Care Trust and were involved in the employment and management of the peer support workers.

Ethical approval: Not required.

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WHAT IS ALREADY KNOWN ON THIS TOPIC

Peer or lay support is effective in prolonging exclusive breast feeding

Non-randomised studies show an association between peer support and higher rates for initiation of breast feeding

WHAT THIS STUDY ADDS

A universal, predominantly antenatal clinic based, peer support worker service for breast feeding is ineffective in increasing initiation rates

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