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Factors associated with the duration of exclusive breast-feeding in asthmatic families

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Abstract

This study was part of a randomized controlled trial in which verbal and written advice about exclusive breast-feeding for 6 months was provided to Dutch women expecting a child with a high risk of developing asthmatic traits. Eighty-nine women completed a theory-based self-report questionnaire between the third and sixth months of pregnancy, which served as the baseline measurement. The aim of this study was to examine the factors that influence the duration of exclusive breast-feeding. Cox multiple regression analysis showed a positive significant association between the duration of exclusive breast-feeding and the mother's breast-feeding knowledge ($P < 0.01$), her intended hours of work per week after maternity leave ($P < 0.01$) and her age ($P \leqslant 0.05$). Short-term, that is <5 weeks, or no previous breast-feeding experience of multiparous women appeared to be negatively associated with the duration of breast-feeding ($P < 0.001$). Furthermore, women who received the educational programme were more likely to succeed in breast-feeding exclusively for 6 months than the control group (48% versus 27%, $P < 0.05$). This study suggests that extra educational support is beneficial, and especially necessary for multiparous women with an earlier short-term, <5 weeks, or no breast-feeding experience, since they are at risk of discontinuing exclusive breast-feeding before completing the advisable 6-month period.

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Introduction

Exclusive breast-feeding is internationally the preferred way of feeding infants during the first 6 months of their lives, and is recognized as being one of the most natural and best forms of preventive medicine [1, 2]. The impact of breast-feeding on the development of allergies has been investigated for a long period of time. Exclusive breast-feeding has proved to protect against infection in infants [3, 4], but the protective effect against respiratory illnesses remains controversial [5–9]. Differences in study design, statistical methods and possible biases have complicated the interpretation of many studies [10]. Nevertheless, a protective effect of exclusive breast-feeding for a longer period (>4 months) on asthmatic traits in children at the age of 4 and 6 years has been demonstrated in a few studies [11, 12]. Moreover, it appeared that exclusive breast-feeding is especially beneficial for children with a predisposition for asthma, due to the preventive effect on the development of allergic symptoms [13–15].

Even though recent Dutch figures indicate an increase in breast-feeding rates, the latest statistics still show that only 25% of Dutch mothers feed their children mainly breast milk during the first

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6 months [16]. Moreover, in a recent Dutch randomized trial (PREVASC study) that focused on families with a history of asthma, only 10% of the women in the experimental group, in which mothers were strongly advised to give exclusive breast milk for up to 6 months, actually did continue to breast-feed exclusively for 6 months [17]. Factors that are responsible for cessation of breast-feeding have been studied previously [e.g. 18–22]. However, relatively few of these studies were founded on a theoretical framework even though using a framework can be helpful in explaining how the factors are related to each other, which is important when attempting to influence breast-feeding behaviour [23–25]. Moreover, the influence of psychosocial factors on the duration of exclusive breast-feeding have seldom been studied, while attitudes, social influence and self-efficacy are more modifiable than sociodemographic factors and can, therefore, provide valuable information for future breast-feeding support programmes [e.g. 18–20]. This study was intended to rectify this situation by using the Attitude–Social influence–self-Efficacy model (ASE model) [24, 25]. This approach was novel in that the ASE factors in relation to the duration of breast-feeding were collected from a specific target group, who could benefit in particular from breast-feeding exclusively for 6 months. The ASE model has been successfully applied in several studies to explain various aspects of preventive health behaviour, such as breast cancer screening [26], smoking cessation [27] and recently also in predicting breast-feeding initiation [28]. The ASE model has been influenced by several social cognition models and concepts such as the theory of planned behaviour (TPB) [29], concepts of social pressure [30] and Bandura's social learning theory and his constructs of modelling and self-efficacy [31]. The ASE model states, just as the TPB, that behaviour is a function of a person's intention [32]. In the ASE model it is assumed that three types of proximal cognitive variables primarily determine behavioural intention: attitudinal beliefs, social influences and self-efficacy expectations. The model also postulates that intention predicts subsequent behaviour. Furthermore, the distal or external variables, such as behavioural factors (e.g. previous experience and knowledge) and sociodemographic variables (e.g. age), are assumed to be moderated by the three proximal factors.

The aim of this study was to investigate which factors measured in the second trimester of pregnancy were predictors for the duration of exclusive breast-feeding in this specific group of women. The results of this present study will be used to improve the educational breast-feeding programme provided to families with a history of asthma.

Methods

Design and study population

The study population participated in a cluster randomized controlled trial, which was started in 2002 in the south-eastern part of the Netherlands. Families were eligible when (i) the mothers were <7 months pregnant and (ii) at least one first-degree relative (mother, biological father or sibling) had asthma that had been diagnosed by a doctor. Families were recruited from March 2002 till March 2003 using posters and flyers put up at the practices of participating midwives and advertisements in local papers. A family was excluded in case of intrauterine or neonatal death, serious birth defects (illness or malformation), breast surgery of mother, major language problems or moving outside the Netherlands. The participants were randomized at the family practice level in order to reduce the possibility of contamination. This cluster randomized design resulted in 89 participating families who attended 84 different practices. The analyses were based at individual level rather than at cluster level since this is an almost one-to-one match.

Written informed consent was obtained from all participants. The Medical Ethical Committee of Maastricht University and the Maastricht University Hospital approved the study.

Intervention: an educational breast-feeding programme

The nutritional message given by the educational programme was to breast-feed exclusively for 6 months and to postpone giving solid foods until

the child reaches the age of 6 months. The families in the intervention group were visited twice prenatal and once postnatal. The trained research assistant provided basic information about breast-feeding, asthma and allergies, including a leaflet, during these visits. The educational programme was based on the principles of the ASE model [24, 25] and on the results of previously held focus group interviews among participants of the PREVASC study [17]. The barriers and problems that families experienced concerning breast-feeding behaviour were discussed during the focus group interviews. Important topics arising from the focus groups were integrated in a booklet. The booklet included practical information regarding breast-feeding and expressing milk alternated with the personal experiences of three mothers and one father that were used as models.

The families in the control group were visited once prenatal but received no information about breast-feeding, asthma and allergies. They received the usual care according to the guidelines of the Dutch College of General Practitioners [33] in which breast-feeding is recommended for 6 months for all babies in the Netherlands.

Data collection

Definition of the predictor variables

Data concerning maternal and family characteristics were obtained from the mothers through a self-report breast-feeding questionnaire [34]. This questionnaire, which was based on the ASE model, was piloted for readability and comprehensibility among 150 Dutch-speaking women who had a history of asthma and were pregnant or had recently given birth [35]. The values of Cronbach's alpha for the internal consistency estimates of the various concepts ranged from 0.75 to 0.89 [35]. The questionnaire, which was filled in between the third and sixth month of pregnancy, elicited the demographic information: e.g. maternal age, maternal educational level and maternal intended future employment status. In the Netherlands, the maternity leave has a legally minimum duration of 16 weeks. The maternity leave begins 4–6 weeks before the expected date of birth. Information about the biomedical factors was gathered during a home visit 3 months post-partum. The ASE model components were measured as follows:

ASE attitudinal beliefs. A bipolar five-point scale was used to assess the positive and negative attitudinal beliefs (29 items) about breast-feeding behaviour with end points of 'totally agree' (+2) and 'totally disagree' (−2). The positive attitudinal beliefs referred to what women might expect to gain by breast-feeding exclusively for 6 months, such as 'Breast-feeding for 6 months will protect my child from developing eczema'. The negative beliefs contained statements about negative consequences of breast-feeding for 6 months. An example is 'Breast-feeding my child for 6 months requires a lot of effort'.

Positive and negative emotions (10 items) were measured on five-point scales and contained the end points 'never' (1) and 'very often' (5). Women reported to what extent they anticipated positive or negative emotions regarding succeeding or failing to breast-feed exclusively for 6 months, for example, 'If I succeeded in breast-feeding for 6 months I would feel very proud'. A mean score was calculated for the attitudinal beliefs and emotions.

ASE social influences. Social norms were measured on bipolar five-point scores by 1 general item and 11 sub-questions assessing the normative beliefs of significant other people regarding breast-feeding. An example is 'My mother thinks I should really breast-feed my child (+2) or should really not breast-feed my child' (−2). A mean score was calculated for each participant.

The extent of social support that women expected if they intended to breast-feed was measured on bipolar five-point scales (five questions), with end points of 'totally agree' (+2) and 'totally disagree' (−2). An example is 'If I breast-feed my child, I can expect to receive enough practical help'.

Social pressure was measured by one general item and four sub-questions on a five-point scale with end points 'never' (5) and 'very often' (1). An example is 'Has anyone ever put pressure on you to bottle-feed your child?' A mean score was calculated for both constructs.

Modelling was assessed by six questions, forming one modelling index score (yes/no; 0–6). This measured whether respondents knew other women who had breast-fed their child, such as their mother, sister or a colleague.

ASE self-efficacy expectations. Self-efficacy expectations were assessed by means of 16 items in which respondents were asked to evaluate how certain they were to breast-feed for 6 months during different situations (e.g. when their child is sick, during holidays, when the mother is not feeling well), on bipolar five-point scales with end points of 'very certain' (+2) and 'very uncertain' (−2). A mean score was calculated for the 16 items.

ASE intention. The item 'Do you intend to breast-feed your child?' measured intention on a dichotomous scale (yes/no).

ASE intended duration. Intended duration of breast-feeding was measured by asking the women to state the number of weeks they intended to exclusively breast-feed their child (number of weeks/do not know yet). Women who responded with 'I do not know yet' were considered to have 0 weeks of intention.

ASE intention to prepare. Women were asked if they intended to read information or prepare themselves otherwise to breast-feed for 6 months. Answers were on a bipolar five-point scale.

Breast-feeding knowledge. Breast-feeding knowledge was measured by 20 multiple-choice questions (right/wrong/do not know). Item content included techniques for nursing a newborn, nutrition during lactation, milk supply, sore nipples, the law concerning breast-feeding during work time and safe milk storage. Possible scores on the test ranged from 0 to 20, with a higher score reflecting greater knowledge about breast-feeding.

Definition of the outcome variable

According to a recent study [36], in which the validity of maternal recall of breast-feeding practice was investigated, the ideal study design would be to assess breast-feeding patterns prospectively form birth and follow children over time to provide valid outcomes. In our study, the parents registered their child's feeding behaviour daily on a diary card during the first 6 months post-partum. This diary card was also used in a previous study [17]. Daily, the parents marked one of the following options: (i) breast milk, (ii) formula, (iii) breast milk and formula, (iv) breast milk and solids (fruit or vegetables), (v) formula and solids or (vi) breast milk and formula and solids. The breast-feeding questionnaire contained control questions about breast-feeding behaviour and the introduction of solids. For example, 'What was the first feeding your child received after birth?' and 'How old was your child when you first introduced solids?' The diary cards were matched with the control questions in order to provide reliable and valid outcomes. Exclusive breast-feeding was defined according to the guidelines of the World Health Organization as a situation in which no other types of milk or solids were given except vitamins and minerals [1, 2]. The duration of exclusive breast-feeding was counted in weeks for the analysis.

Procedures

The questionnaires were mailed to the participants between the third and sixth months of pregnancy. The questionnaires were filled in before the first home visit took place and were collected during that particular visit.

Data analysis

Survival analysis was used to examine the duration of exclusive breast-feeding as it provides a good understanding of breast-feeding behaviour over time. This type of analysis was also used due to the presence of censored data. The term 'censored data' refers to data from the women who continued to breast-feed exclusively beyond the advised 6 months (26 weeks). The duration of the non-starting mothers was set at 0.1 weeks; otherwise these women would be excluded from the analysis. Differences in baseline characteristics between the women who continued to breast-feed for at least 6 months compared with the women who discontinued prematurely were measured by several univariate Cox regression analyses.

Multiple Cox regression analysis with backward elimination was carried out to estimate the independent contribution and the corresponding hazard ratios (HRs) of each considered external variable with respect to the duration of exclusive breast-feeding. A final multiple Cox regression analysis was used to determine which variables (including the external variables that contributed with statistical significance) were significantly associated with the duration of exclusive breast-feeding. The HRs and the corresponding 95% confidence intervals (CIs) were calculated for these variables. The external variables of maternal age, hours of paid employment per week after maternity leave, decision on breast-feeding, breast-feeding knowledge and breast-feeding experience were entered together with the ASE variables in the final model. The variable 'exposed to the breast-feeding programme' was treated as a possible confounder.

The data of the baseline measurement was used in the analyses for the present paper in order to avoid any effect on the psychosocial variables due to the intervention programme. Statistical significance was assumed for P-values $\leqslant 0.05$. SPSS (version 11.0) was used for analysis.

Results

Participants

A total of 113 families indicated interest in the study and received project information. The following participants were excluded: families with no family history of asthma according to their general practitioner ($n = 2$), women who had experienced a miscarriage ($n = 2$) and women who had had breast surgery and were unable to breast-feed ($n = 3$). Seventeen families did not return the informed consent form so that a final total of 89 families were enrolled in this study. The characteristics of the 89 women are shown in Table I. The mean age of the women was 31.5 years. Less than half of the women were expecting their first child (42%) and almost 87% of the women had a positive intention to start breast-feeding, with 36 (40%) women intending to breast-feed for a period of 6 months. A high level of education was found for more than half of the women (54%). The majority of the women (67%) made their decision on breast-feeding before pregnancy and only a few women participating in this study smoked during their pregnancy (4%). Most of the women had the intention of returning to work after their maternity leave (87%) for an average of 19 hours per week, after a mean of 14 weeks of maternity leave when the child was born. There was no statistically significant difference in time point to go back to work for women with different educational levels.

Initiation and duration of exclusive breast-feeding

Initiation of breast-feeding occurred in 78 (88%) mother–infant pairs, and 62% and 37% of the infants were still being breast-fed exclusively at the ages of 3 months and 6 months, respectively.

Control factors

Demographic, biomedical factors and the exposure to the educational breast-feeding programme were analyzed as possible confounders in relation to the duration of exclusive breast-feeding. When evaluated separately, only participation in the intervention group was significantly related to the duration of exclusive breast-feeding. In the simultaneous Cox regression analysis, which also included the psychosocial factors, the membership of the intervention group, the mother's future intended employment status and her age appeared to be statistically significant in relation to the duration of exclusive breast-feeding.

Study variables

The HRs estimated in the univariate Cox regression analysis are shown in Table I. The mothers who continued to breast-feed exclusively for 6 months were more likely to have made the feeding choice before pregnancy ($P < 0.01$), a higher breast-feeding knowledge ($P < 0.001$), a positive intention to start breast-feeding ($P < 0.001$), a positive intention to breast-feed for 6 months ($P < 0.05$), more positive attitudes ($P < 0.01$), a higher social norm ($P < 0.05$), and a higher level of self-efficacy ($P < 0.01$)

Table I. *Sociodemographic, biomedical and psychosocial characteristics of the participating mother–infant pairs. HRs, 95% CIs, ASE variables, scales, number of items and Cronbach's alpha (α) are shown*

	N = 89 (%)	M	⩾6 months breast-feeding (n = 33)	<6 months breast-feeding (n = 56)	HR	95% CI[a]
Sociodemographic factors						
Maternal age in years at birth of child		31.5	32.3	31.0	0.93	0.86–1.00
Maternal education level[b]						
Low	5.6		6.1	5.4	1.00	
Intermediate	40.4		33.3	44.6	1.44	0.44–4.79
High	53.9		60.6	50.0	0.96	0.29–3.16
Intention to return to work	87.6		39.7	60.3	1.48	0.72–3.02
Intended hours of work after maternity leave		18.7	21.7	17.0	0.98	0.95–1.00
Maternity leave in weeks after birth		14.7	15.5	14.2	0.99	0.95–1.03
Asthma level						
Single (mother or father and/or sibling)	97.7		96.9	98.2	1.00	
Double (mother + father and/or sibling)	2.3		3.1	1.8	0.88	0.12–6.36
Smoking during pregnancy (yes)	4.5		0	7.1	2.68	0.95–7.33
Biomedical factors						
Medical setting of birth						
Home	36.4[c]		42.4	32.7	1.00	
Hospital	63.6		57.6	67.3	1.25	0.71–2.20
Delivery						
Vaginal	85.2[c]		90.9	81.8	1.00	
Caesarean	14.8		9.1	18.2	1.24	0.72–2.84
Birth weight in grams		3430	3338	3482	1.00	1.00–1.001
Gender of infant						
Boy	47.8[d]		57.6	48.2	1.00	
Girl	52.2		42.4	51.8	1.10	0.65–1.86
Intervention (breast-feeding programme)						
Control group	50.6		36.4	58.9	1.00	
Intervention group	49.4		63.6	41.1	0.59	0.35–1.00*
Psychosocial factors						
Primiparous	41.6		45.5	39.3	1.00	
0–5 weeks experience	16.9		3.0	25.0	3.44	1.66–6.56**
⩾6 weeks experience	41.6		51.5	35.7	0.83	0.46–1.53
Feeding decision before pregnancy	67.4		78.8	60.7	0.47	0.28–0.82**
Intention to start breast-feeding	86.5		97.0	80.4	0.25	0.13–0.54**
Intention to breast-feed for 6 months	40.4		51.5	33.9	0.54	0.31–0.95*
Known models who breast-feed (0–6)			2.9	2.4	0.87	0.71–1.07
Breast-feeding knowledge (0–20)			15.2	12.9	0.89	0.82–0.95**

ASE variables	Scale	Items (α)	⩾6 months	<6 months	HR	95% CI
Attitudes	+2 to −2[e]	29 (0.87)	0.62	0.38	0.47	0.30–0.79*
Emotions	1–5[f]	10 (0.91)	3.06	2.74	0.78	0.58–1.05
Social norm	+2 to −2[g]	12 (0.86)	0.80	0.58	0.51	0.30–0.93*
Social support	+2 to −2[h]	5 (0.71)	1.16	1.19	1.07	0.71–1.64

Table I. *Continued*

ASE variables	Scale	Items (α)	⩾6 months	<6 months	HR	95% CI
Social pressure	1–5[i]	4 (0.73)	4.53	4.67	1.26	0.74–2.18
Self-efficacy	+ 2 to −2[j]	16 (0.92)	0.86	0.55	0.52	0.36–0.80**
Intention to prepare	+2 to −2[k]	3 (0.69)	0.79	0.66	0.88	0.71–1.12

[a]From univariate Cox regression analyses.
[b]Low: completed primary school and vocational school, intermediate: completed intermediate secondary or vocational school, and high: completed the highest level of secondary or vocational school or university.
[c]One missing value.
[d]Total of 92 children due to three sets of twins.
[e]+2 = totally agree, −2 = totally disagree with advantages or with disadvantages of breast-feeding.
[f]1 = never, 5 = very often experiencing negative or positive emotions concerning breast-feeding.
[g]+2 = I should really breast-feed my child, −2 = I should really not breast-feed my child.
[h]+2 = totally agree, −2 = totally disagree that enough social support received.
[i]5 = never, 1 = very often felt social pressure concerning breast-feeding.
[j]+2 = very certain to breast-feed for 6 months, −2 = very uncertain to breast-feed for 6 months.
[k]+2 = totally agree should prepare yourself, −2 = totally disagree should prepare yourself.
*$P \leqslant 0.05$; **$P \leqslant 0.01$.

than the women who did not succeed in breast-feeding exclusively for 6 months. The mothers who discontinued breast-feeding before 6 months had either a previous short-term experience of breast-feeding or none at all. The HRs estimated in the final Cox regression analysis are shown in Table II and separately in Fig. 1. The following factors had a statistically significant, positive association with the duration of breast-feeding in the multivariate analysis: amount of hours of paid employment after maternity leave ($P < 0.01$), maternal age ($P \leqslant 0.05$) and the women's breast-feeding knowledge ($P < 0.01$). A negative association with duration of breast-feeding was found for multiparous women with no or short-term breast-feeding experience ($P < .001$). Finally, participation in the intervention group had a significant positive association with the duration of exclusive breast-feeding ($P < 0.05$). It appeared that 48% of the women who received the educational programme continued to breast-feed exclusively for 6 months, compared with 27% of the controls.

Discussion

Breast-feeding exclusively is important preventive health behaviour, despite the controversy about the outcomes of studies investigating the association between asthma and the protective effect of breast-feeding. From a public health point of view, even a small protective effect would be important, since asthma is a highly prevalent chronic disease in children [37] and breast-feeding behaviour is modifiable by breast-feeding programmes.

The purpose of this paper was to investigate which factors measured in the second trimester of pregnancy were predictors for continuing to breast-feed exclusively for 6 months in this specific group of women. Firstly, it is no surprise that earlier, successful breast-feeding experience influences the duration of breast-feeding the next child. However, this study showed that not only no earlier breast-feeding but also a short previous breast-feeding experience in multiparous women, both predict early cessation of breast-feeding their next child. Unfortunately, other studies did not measure the duration or the quality of earlier experiences, so that in general these studies conclude that any previous breast-feeding experience was positively associated with breast-feeding the next child [38–41]. It is informative that earlier negative or short-term breast-feeding experiences are predictors for future early cessation. These experiences of women cannot be undone, but discussing the things that went wrong with a health professional, for example, a midwife

Table II. *Factors shown to influence the duration of exclusive breast-feeding identified in the multiple Cox regression analysis*

	B	SE	HR	95% CI
Experience				
Primiparous	Reference	Reference	Reference	Reference
Multiparous (0–5 weeks experience)	1.53	0.44	4.61	1.94–10.92***
Multiparous (≥6 weeks experience)	0.38	0.48	1.31	0.57–3.75
Higher breast-feeding knowledge	−0.14	0.06	0.87	0.77–0.98*
Higher maternal age	−0.08	0.04	0.92	0.85–1.00*
More hours work per week after maternity leave	−0.05	0.02	0.96	0.93–0.99**
Exposure to breast-feeding programme	−0.70	0.33	0.50	0.26–0.95*

*$P \leq 0.05$; **$P < 0.01$; ***$P < 0.001$.

or general practitioner, may help to overcome barriers in the future. Therefore, it seems relevant to always ask women with previous breast-feeding experience about the quality and duration of this.

Secondly, the number of hours per week the mother planned to return to paid employment was positively associated with the duration of exclusive breast-feeding. This is remarkable since most studies reported a negative association between the intention to return to work after maternity leave and the duration of breast-feeding [42–44] or no association at all. An explanation could be that working mothers in industrialized countries such as the Netherlands, who are ambitious concerning their working career, might also be better organizers than women who stay at home or who only return part-time to their job. In addition, another hypothesis is that full-time working mothers may have a feeling of guilt not spending enough time with their child and compensate by offering their child the best possible nutrition.

Thirdly, this study confirmed the importance of mother's breast-feeding knowledge as has been shown in previous studies [45–50]. A higher knowledge level early in pregnancy was associated with a longer duration of exclusive breast-feeding. Therefore, an important goal for educational programmes is to inform women early in pregnancy about the advantages, and more importantly to prepare them for common problems regarding breast-feeding, and to outline a realistic picture and not to give fantasy stories.

Fourthly, maternal age was found to be a predictor for continuation of breast-feeding just as was found in previous studies. Age above 25 years has been repeatedly associated with a longer duration of breast-feeding [18, 19]. It is probable that older women know more about the benefits of breast-feeding and have more realistic outcome expectations [51].

Finally, it seems remarkable that not a single ASE factor in the final multiple regression analysis was significantly associated with the duration of exclusive breast-feeding, although the univariate analysis showed that self-efficacy, attitudes, social norm and intention do have a significant relation with the duration of exclusive breast-feeding. A recent prospective study, which measured social cognition model components, showed in a multivariate analysis that mother's knowledge, her intention, previous breast-feeding experience, and self-efficacy appeared to be associated with exclusive breast-feeding duration up to 4 months [49]. Swanson and Power [23] used the TPB and concluded that subjective norms were important determinants for continuing to breast-feed exclusively the first 6 weeks. We failed to show any independent association between exclusive breast-feeding duration for up to 6 months and a social cognition model component, such as self-efficacy or subjective norms, in a multivariate model. Nevertheless, the ASE factors are implicitly associated with the duration of exclusive breast-feeding for up to 6 months, since the educational ASE model breast-feeding programme

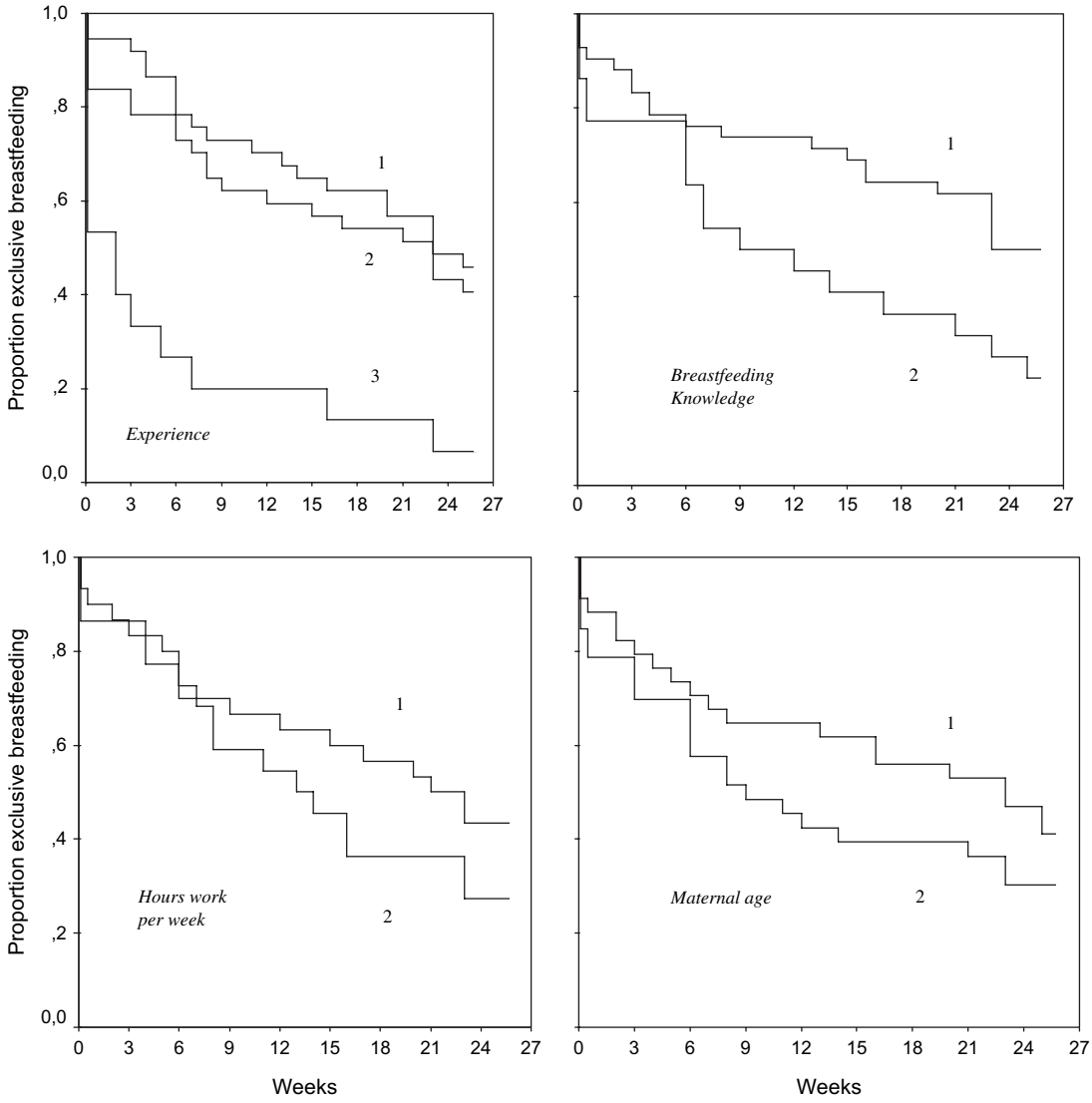

Fig. 1. Proportion of exclusive breast-feeding in relation to experience, knowledge, hours of work per week and maternal age. Numbers next to the curves refer to the categorization. Experience: (1) multiparous ⩾ 6 weeks experience, (2) primiparous, (3) multiparous 0–5 weeks experience. Breast-feeding knowledge: (1) 15–20 correct answers (66th percentile), (2) 0–12 correct answers (33rd percentile). Hours work per week after maternity leave: (1) ⩾22 hours per week (66th percentile), (2) ⩽16 hours per week (33rd percentile). Maternal age: (1) ⩾33 years (66th percentile), (2) ⩽30 years (33rd percentile).

appeared to be a significant contributor in the final multivariate model.

The majority of women (88%) participating in this study started breast-feeding. The proportion of children who still received breast milk exclusively after 6 months was 37%. It could be that the predisposition for asthma in the families may have made these women more knowledgeable and sensitive about the preventive effects of exclusive breast-feeding and was, therefore, responsible for

the relatively high breast-feeding rate in this study. The authors do not believe that this is a limitation of this study as it is particularly this high-risk group which might benefit from breast-feeding. On the other hand, a substantial proportion of the participants belonged to a relatively higher educated study group and had a low smoking status so that this may restrict the external validity. It is known from other breast-feeding studies that non-smoking women with a high educational level are more motivated to start breast-feeding than women with a lower educational level who smoke [52–54]. Furthermore, the breast-feeding programme introduced to half of the women and/or the exposure of the psychosocial determinants assessment (instrument reactivity) in all women by means of the extended breast-feeding questionnaires might have influenced the overall breast-feeding prevalence and duration. Moreover, taking part in a trial can motivate people to do well since they are part of a scientific project in which they are being followed. Finally, the modest sample size (n = 89) might have limited the extent to which significant associations between the independent variables and the duration of exclusive breast-feeding could be detected.

In summary, the findings illustrate that it is essential to ask women about their previous breast-feeding experience—in terms of duration and quality—and to discuss reasons for previous failures or barriers. These women might not have the motivation and the tools to face the common problems. Women's confidence should be boosted, so that they will be strong enough to overcome early-stage breast-feeding problems. Clear and realistic breast-feeding information ('it is not easy, but worthwhile') given early in pregnancy will motivate and prepare women to start and to continue to breast-feed exclusively for up to 6 months. Implications for future intervention are the need to emphasize the benefits of longer continuation of breast-feeding and to prepare women psychologically and practically so that they will succeed in breast-feeding for a longer period. The special breast-feeding educational programme for families with a predisposition for asthma helps to improve breast-feeding rates and should be actively included in the prenatal activities of the midwives or general practitioners and public health nurses for this specific target group.

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Conflict of interest statement

None declared.

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