Sexual & Reproductive Healthcare 17 (2018) 43–49

Contents lists available at ScienceDirect

Sexual & Reproductive Healthcare

journal homepage: www.elsevier.com/locate/srhc

First-time mothers' confidence mood and stress in the first months postpartum. A cohort study

Ingeborg Hedegaard Kristensen[a,*], Marianne Simonsen[b], Tea Trillingsgaard[c], Maiken Pontoppidan[d], Hanne Kronborg[a]

[a] Section of Nursing, Department of Public Health, Aarhus University, Høegh-Guldbergs Gade 6A, DK 8000 Aarhus C, Denmark
[b] Department of Economics and Business Economics, Aarhus University, Fuglesangs Allé 4, 8210 Aarhus V, Denmark
[c] Department of Psychology and Behavioural Sciences, Aarhus University, Bartolins Allé 9, 8000 Aarhus C, Denmark
[d] The Danish National Centre for Social Science Research, Herluf Trollesgade 11, 1052 Copenhagen K, Denmark

ARTICLE INFO

Keywords:
First-time mothers
Maternal confidence
Maternal mood
Parental stress
Cohort
Community setting

ABSTRACT

Objectives: The aims were to describe first-time mothers' confidence, mood and stress 2 and 6 months postpartum and to investigate the extent to which the tools measuring maternal confidence and maternal mood used alone or together at 2 months postpartum predict first-time maternal confidence, mood and stress 6 months postpartum.

Design: A cohort including 513 first-time mothers' self-reported questionnaires concerning three scales: The Karitane Parenting Confidence Scale (KPCS), the Edinburgh Postnatal Depression Scale (EPDS), and the Parental Stress Scale (PSS) collected 2 and 6 months postpartum. Descriptive statistic, simple and multiple linear regression analysis were used.

Results: First-time mothers' with confidence scores below the clinical cut-off (KPCS < 40) fell significantly from 25% to 14% ($p < 0.001$), symptoms of depression above the clinical cut-off (EPDS ≥ 8) fell significantly from 16% to 12% ($p < 0.001$), and parental stress as a mother fell significantly from a mean of 32.88 to 30.98 ($p < 0.001$). The KPCS assessed at 2 months postpartum was the strongest predictor for both maternal confidence ($R^2 = 0.38$) and parental stress ($R^2 = 0.26$) 6 months postpartum.

Conclusion: The results support the assumption that parenthood is a complicated period for first-time mothers characterised by low confidence, symptoms of depression and high stress which improve over time for the majority of mothers. The KPCS at 2 months postpartum was the strongest predictor of the measures used. Further research is needed to identify parents who are struggling, especially for health professionals' whose role is to support parents in their parenthood the first period after birth.

Introduction

Becoming a mother can be an overwhelming experience characterised by happiness as well as strain [1,2]. Low maternal confidence [3], symptoms of depression [4] and parental stress [5] have been identified as aspects that may affect the early mother-infant relationship and impact the infant's future health [6–8]. Studies have documented how parenting behaviour and the quality of the parent-infant relationship may influence the building of a healthy early relationship [4,9,10]. First-time mothers tend to show lower levels of maternal confidence and higher levels of stress than multiparous mothers [3,11]. Levels of and changes in first-time mothers' confidence and parental stress levels in the first months after birth are unknown [12], but an interview study suggests that maternal confidence increases and parental stress decreases as mothers become more comfortable and skilled in parenting [12]. High maternal confidence has been shown to be associated with higher maternal sensitivity [5], which can be characterised as being alert, attentive and responsive to the infant's small cues in the parenting role [13]. Associations have been found between a postnatal depressive diagnosis in the mother and her infant's cognitive and emotional development [6,8,14,15]. Among Danish first-time mothers, 7–8% have symptoms of postpartum depression 5 weeks after birth measured by the EPDS ≥ 12 [16]. International studies find that a first-time mother's symptoms of postpartum depression improves over

Abbreviations: EPDS, Edinburgh Postnatal Depression Scale; KPCS, Karitane Parenting Confidence Scale; PSS, Parental Stress Scale

* Corresponding author.
E-mail addresses: Ihk@ph.au.dk (I.H. Kristensen), msimonsen@econ.au.dk (M. Simonsen), teatri@psy.au.dk (T. Trillingsgaard), mpo@sfi.dk (M. Pontoppidan), hk@ph.au.dk (H. Kronborg).

https://doi.org/10.1016/j.srhc.2018.06.003
Received 3 October 2017; Received in revised form 18 June 2018; Accepted 23 June 2018

time from a prevalence of about 8% in the first week to about 2% 6 months after birth measured by the Edinburgh Postpartum Depression Scale (EPDS) ≥12 [17].

During the postpartum period, first-time mothers express that they have an unmet need for guidance [3,12,18]. The World Health Organization [19] recommends that families are supported to increase parents' competences. Identifying mothers struggling with low confidence, low mood and high stress in the postpartum period is therefore important for health professionals who are expected to promote well-being among new families in their work. However, only few standardised screening tools have been evaluated in a community setting to assess maternal confidence, maternal mood and parental stress. One of these tools is the EPDS, developed to assess maternal mood [20–22]. Even though the EPDS is the measure most widely used by health professionals, its ability to identify symptoms of postpartum depression has not yet been tested in a Danish context [23]. That also applies to the newly developed screening tool, the Karitane Parenting Confidence Scale (KPCS), developed to assess parenting confidence [24].

The objective of the present study was to investigate levels of and changes in maternal confidence, maternal mood and parental stress from 2 to 6 months postpartum among first-time mothers. Another objective was to investigate the extent to which the two screening tools, the KPCS and the EPDS, used alone or together at 2 months postpartum predicted first-time maternal confidence, maternal mood and parental stress at 6 months postpartum.

Methods

Study design and setting

The present study used data from the comparison group in a quasi-experimental study and included data from 513 first-time mothers [25]. Using a cohort design, we obtained self-reported data from mothers at 2 and 6 months postpartum. The study was conducted in a community setting comprising six municipalities in the Central Denmark Region. In the comparison group, participants received standard care in the Danish home visiting programme, which provides universal prevention with three or more home visits by health visitors during the first 6 months postpartum [26]. As a part of the quasi-experimental study, the intervention group of first-time mothers received supplemental intervention, and these mothers were not included in the study population [23].

Participants, data collection and questionnaires

All first-time mothers who gave birth and were living at home in the study period were invited to participate at the first home visit by the health visitor. In the present study, we excluded mothers in need of psychological or psychiatric treatment and therefore admitted to hospital, family institution or prison, as well as mothers who had moved out of the study area or had insufficient Danish skills.

Data were collected online, except for two mothers who got a paper version because they had no mail access. Data were collected from September 2013 to December 2014. The baseline and follow–up self-reported questionnaires were sent by e-mail with a link to the online questionnaire 2 and 6 months postpartum, respectively. Reminders were sent once by e-mail and once by text message 2 and 3 weeks after the first questionnaire had been forwarded. Standardised questions were used whenever possible; non-standardised items and the order of the questions were pilot-tested to ensure relevance, acceptability and comprehensibility; and they were revised once.

Measures

Background variables related to both mother and infant were assessed at baseline. Maternal factors included age, education level, employment status, cohabitation, smoking status, self-perceived health, planned pregnancy, abortion consideration and the mother's previous infant care experience. Self-perceived health was measured using a single item from the FS-36 addressing general health: "How is your health in general?" [27]. The five response categories were dicotomised into two groups: Very good/good or fair/bad/very bad. Planned pregnancy and abortion consideration were measured using two single items: "Was this pregnancy planned?" The two response categories were: Yes or no. Those mothers who answered no were furthermore asked: "Have you seriously considered having an abortion?" The two response categories were: Yes or no. Previous infant care experience was measured using a single item: "Have you tried to care for an infant? The four response categories were dichotomised into two groups: Yes often/sometimes or seldom/never. Severe life events were measured using a single item: "Have you in the past 2 years experienced a severe life event? The two response categories were: Yes or no.

Infant factors included infant's sex, gestational age and if the mother and the infant had been separated for > 2 h postpartum.

Outcome variables were related to the mother and were assessed at baseline and follow-up at 2 and 6 months postpartum.

Maternal confidence was measured using the KPCS. The KPCS is a 15-item task-specific questionnaire tailored to parents with infants up to 12 months old [24]. Each item is rated on a scale from 0 to 3. The clinical cut-off point is KPCS score (< 40). The KPCS has not been validated in a Danish context but in the English language in an Australian context, showing a good level of sensitivity (86%) and specificity (88%) [28]. Internal consistency across the 15 items in the current sample was acceptable with a Cronbach's alpha coefficient of reliability of 0.78 at 2 months and 0.74 at 6 months [29].

Maternal mood was measured using the EPDS. The EPDS is a 10-item questionnaire where each item is rated on a scale from 0 to 3 [20]. Although the EPDS has not been validated in a Danish context, the EPDS has been validated internationally in a number of languages [23]. The clinical cut-off points in different language versions of the EPDS range from 7 to 14 [23]. Although internationally the most commonly used clinical cut-off is an EPDS score ≥12, in the present study we defined a clinical EPDS at ≥8 according to Danish health visitors' definition in clinical practice. A Norwegian validation of the EPDS in a community sample showed an excellent sensitivity of 96% and an acceptable specificity of 78% [30]. A Swedish validation of a community sample showed a similar sensitivity of 96%, but an unacceptable specificity of 49% [31]. The internal consistency of the EPDS score across the questionnaire in the current sample showed that Cronbach's alpha coefficient was acceptable at 2 months, 0.79, and good at 6 months, 0.83 [29].

Parental stress was measured using the Parental Stress Scale (PSS). The PSS is a 18-item questionnaire, and each item is rated on a scale from 1 to 5 [2]. A clinical cut-off point for the PSS has not been recommended. The PSS has not been validated in a Danish context, but the internal consistency of the PSS has been validated among Spanish first-time mothers showing an acceptable Cronbach's alpha coefficient of 0.76 [29]. Its internal consistency across the 18-item scale in the current sample revealed a good Cronbach's alpha coefficient at both 2 months, 0.85, and 6 months, 0.84.

Statistical analysis

For the first objective, descriptive statistics of background variables and differences in maternal mood, maternal confidence and parental stress between 2 and 6 months postpartum were tested with paired t-tests for continuous variables and Fisher's exact test for categorical variables. Effect sizes for changes in KPCS, EPDS and PSS were based on comparison of means using Cohen's d with Cohen's $d > 0.2$ indicating small, > 0.5 indicating moderate and > 0.8 indicating larger effect size [32]. Pearson correlation coefficients (r) were calculated to investigate how strongly the three measurements (KPCS, EPDS and PSS) were internally related at both 2 and 6 months postpartum. Results are

reported using the Pearson correlation coefficient r to explain the strength of the linear relationship between measurements. The numerical value of r ranges from −1.0 to +1.0. The closer the coefficient is to +1.0 and −1.0, the greater the strength of the relationship [29].

For the second objective, using linear multiple regression, we investigated the extent to which the two screening tools, the KPCS and the EPDS, used alone or together at 2 months postpartum predicted first-time mothers' maternal confidence, maternal mood and parental stress at 6 months postpartum. In the regressions analyses, we first used simple regression with all background variables as exposure variables and two screening tools, the KPCS and the EPDS 2 and 6 months postpartum, as outcome variables. Next, we used multiple regression with the following exposure variables in the three models: (1) total KPCS alone, (2) total EPDS alone and (3) both total KPCS and total EPDS 2 months postpartum to predict the outcomes of total KPCS, total EPDS and total PSS scores at 6 months postpartum. We also used total KPCS and EPDS 6 months postpartum as outcome variables together with the following exposure variables: mother's previous infant care and abortion consideration because they were significantly associated with the outcomes variable in the simple regression analysis.

Results of multiple regressions are reported in R^2 explaining how close the data are to the fitted regression line. R^2 is defined as the coefficient of multiple determinations explaining the variation, where 0% indicates that the model explains none of the variability and 100% indicates that the model explains all the variability of the response around the mean [32]. In the additional logistic multiple regression analyses, the exposure variables KPCS and EPDS were dichotomised in the three models according to their clinical cut-offs, KPCS < 40 and EPDS ≥8 [23,24], to predict outcomes at 6 months postpartum. Statistical analyses were performed in STATA version 13.0.

Results

Study profile

The study population counted 513 (56%) eligible first-time mothers who answered questionnaires at both 2 and 6 months postpartum (see flow diagram, Fig. 1).

First-time mothers' characteristics

The characteristics of the mothers appear from Table 1. Two months postpartum, the prevalence of mothers with confidence scores below the clinical cut-off (KPCS < 40) was 130 (25%), the prevalence of mothers with symptoms of depression above the clinical cut-off (EPDS ≥ 8) was 83 (16%) and the mean of mother's stress was 32.88. Six months postpartum, the prevalence of mothers with confidence scores below the clinical cut-off (KPCS < 40) was reduced significantly to 72 (14%) ($p < 0.001$). The prevalence of mothers with symptoms of depression above the clinical cut-off (EPDS ≥ 8) was reduced significantly to 59 (12%) at 6 months ($p < 0.001$). The average of mother's parental stress (PSS) was reduced significantly to a mean score of 30.98 at 6 months ($p < 0.001$). Changes in mothers' characteristics from 2 to 6 months postpartum represented in effect sizes (Cohen's *d*) were small and almost identical across the three measures: KPCS $d = -0.28$ (95% CI; −0.40:−0.14), EPDS $d = 0.24$ (95% CI;0.11:0.37) and PSS $d = 0.24$ (95% CI;0.11:0.37).

Measurements

Table 2 shows the correlation coefficients between the measurements KPCS, EPDS and PSS at 2 and 6 months postpartum. PSS r = 0.72 was highly correlated, and KPCS r = 0.62 and EPDS r = 0.39 were moderately correlated between 2 and 6 months. All three measures were internally moderately correlated when measured at the same point in time with correlation coefficients ranging from 0.50 to 0.65.

When we applied simple regression with total KPCS and total EPDS as outcomes, significant associations were found between KPCS 2 months postpartum and mother's previous infant care experience (coef. −0.82 (95% CI; −1.41:−0.22), p = 0.01), and between EPDS 2 months postpartum and mother's earlier abortion consideration (coef.-2.05 (95% CI; −3.98:−0.11), p = 0.04). No associations were found with regard to mother's age, cohabiting with infant's father, employment, education or infant's gender. Results not shown.

Table 3 shows the results of the multiple linear regressions analyses which were performed to predict the outcomes of total KPCS, total EPDS and total PSS scores at 6 months based on early information about total KPCS and total EPDS 2 months postpartum. For the three models predicting confidence measured by total KPCS at 6 months: model 1, total KPCS at 2 months, showed the strongest predictive value, ($R^2 = 0.38$), explaining 38% of the variance; in model 2, total EPDS had a predictive value of ($R^2 = 0.17$), explaining 17% of the variance; and in model 3, total KPCS and total EPDS had a predictive value of ($R^2 = 0.36$), explaining 36% of the variability. For the three models predicting maternal mood measured by total EPDS at 6 months postpartum, total EPDS used alone or together with total KPCS at 2 months had the strongest predictive value, ($R^2 = 0.15$), explaining 15% of the variability. For the three models predicting parental stress measured by

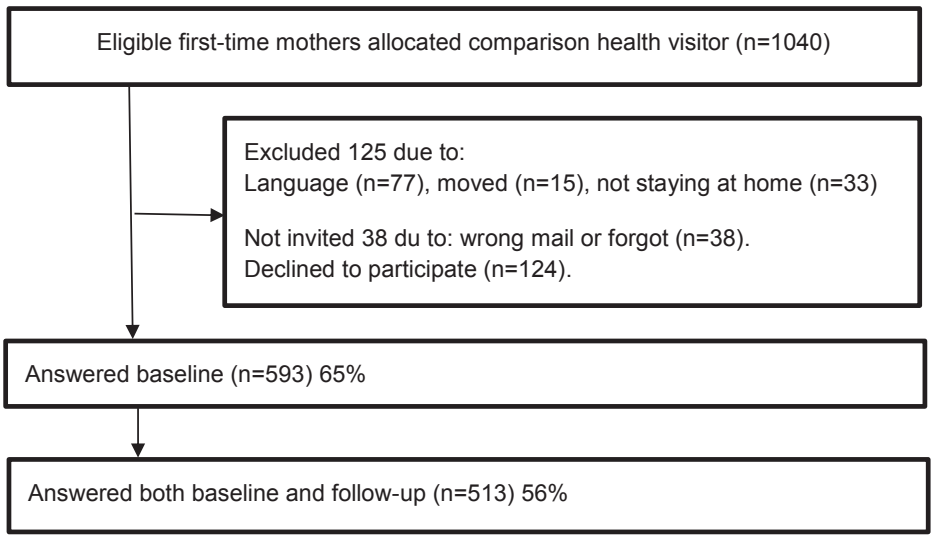

Fig. 1. Flow diagram of first-time mothers in the study population.

Table 1
The characteristics of first-time mothers in terms of socio-economic group, birth-related factors and maternal confidence, maternal mood and parental stress at 2 and 6 months postpartum.

	First-time mothers 2 months postpartum (N = 513)		First-time mothers 6 months postpartum (N = 513)		p-value
	n (%)	Mean (SD)	n (%)	Mean (SD)	
Age	513	30.34 (3.75)			
Lives with infant's father	489 (95)				
Education at bachelor level or higher	390 (76)				
Employed	327 (64)				
Non-smoking	247 (87)				
Previous infant care experience	204 (40)				
Planned pregnancy	456 (88)				
No severe abortion consideration	497 (97)				
Boy	254 (50)				
Gestational age in weeks	513	39.79 (1.60)			
Not separated > 2 hrs postpartum	513 (85)				
Total confidence KPCS *	513	40.98 (3.27)	513	41.78 (2.68)	< **0.001**[c]
KPCS < 40	130 (25)		72 (14)		< **0.001**[d]
Total mood EPDS**	513	4.63 (3.23)	513	3.85 (3.35)	< **0.001**[c]
EPDS ≥8	83 (16)		59 (12)		< **0.001**[d]
EPDS low < 8	385 (75)		401 (78)		
EPDS moderate ≥8 < 12	70 (14)		48 (9)		
EPDS high ≥12	13 (4)		11 (3)		< **0.001**[d]
Total stress PSS**	438	32.88 (7.71)	438	30.98 (7.27)	< **0.001**[c]
No severe life events**	401 (78)				
Self-perceived good health	447 (87)				

Note: **Bold** significant at 5% level.
* High score favourable.
** Low score favourable. Statistical analysis.
[c] Paired t-tests.
[d] Fisher's exact test. Cases with missing values are not included; variables had missing values below 6.

Table 2
Correlation between measurements 2 and 6 months postpartum with regard to maternal confidence (KPCS), maternal mood (EPDS) and parental stress (PSS).

N = 513	EPDS 2 months Coef. (n)	EPDS 6 months Coef. (n)	KPCS 2 months Coef. (n)	KPCS 6 months Coef. (n)	PSS 2 months Coef. (n)	PSS 6 months Coef. (n)
EPDS 2 months	1.00 (468)					
EPDS 6 months	**0.39** (427)	1.00 (460)				
KPCS 2 months	**−0.55** (445)	**−0.27** (429)	1.00 (477)			
KPCS 6 months	**−0.42** (422)	**−0.62** (436)	**0.65** (435)	1.00 (464)		
PSS 2 months	**0.56** (448)	**0.32** (427)	**−0.65** (456)	**−0.50** (433)	1.00 (478)	
PSS 6 months	**0.43** (427)	**0.50** (441)	**−0.51** (436)	**−0.65** (445)	**0.72** (438)	1.00 (468)

Note: **Bold** values indicate significant correlations at 5% level. N = 513. Analysis: Pearson correlation coefficient r. Cases with missing values are not included in the analysis.

total PSS at 6 months postpartum, KPCS at 2 months postpartum showed the strongest predictive value, (R^2 = 0.26), explaining 26% of the variability; and model 3 explained 25% of the variability.

In additional multiple logistic regression analyses based on clinical cut-offs of the KPCS and EPDS measured 2 months postpartum, the predicted value of the three models were generally lower that the predicted value obtained with the total KPCS and total EPDS measured 2 months postpartum. Results not shown.

Table 4 shows the multiple linear regression analyses, we entered the exposure variables age, education, previous infant care and

Table 3
Predictors for total maternal confidence, mood and stress 6 months postpartum and their relationship with mother's total confidence and total mood 2 months postpartum.

	Total confidence (KPCS) 6 months			Total mood (EPDS) 6 months			Total stress (PSS) 6 months		
N = 513 2 months	Model 1 Coef. (CI)	Model 2 Coef. (CI)	Model 3 Coef. (CI)	Model 1 Coef. (CI)	Model 2 Coef. (CI)	Model 3 Coef. (CI)	Model 1 Coef. (CI)	Model 2 Coef. (CI)	Model 3 Coef. (CI)
Total KPCS	**0.50** (0.44:0.56)		**0.43** (0.36:0.51)	**−0.29** (−0.38:−0.19)		−0.02 (−0.14:0.09)	**−1.16** (−1.34:−0.98)		**−0.86** (−1.10:−0.63)
Total EPDS		**−0.34** (−0.44: −0.27)	−0.09 (−0.17:0.02)		**0.41** (0.32:0.50)	**0.39** (0.28:0.50)		**0.90** (0.70:1.10)	**0.48** (0.18:0.64)
R^2	0.38	0.17	0.36	0.07	0.15	0.15	0.26	0.16	0.25
n	436	423	405	426	424	403	433	425	404

Note: **Bold** values indicate significant association at 5% level. Multiple linear regression analyses: Model 1: KPCS. Model 2: EPDS. Model 3: KPCS + EPDS. Non-adjusted R^2. Cases with missing values are not included in analysis.

Table 4
Predictors for total confidence 6 months postpartum and their relationship with mothers previous infant care and abortion consideration, confidence and mood 2 months postpartum.

		Total confidence (KPCS) 6 months								
N = 513		Model 1			Model 2			Model 3		
	2 months.	Coef.	(CI)	R^2	Coef.	(CI)	R^2	Coef.	(CI)	R^2
n = 428	Infant care	−0.23	(0.65:0.18)	0.38						
	Abortion consideration	0.58	(−0.74:1.92)							
	Total KPCS	**0.50**	(0.44:0.57)							
n = 419	Infant care				**−0.50**	(−0.98:−0.02)	0.18			
	Abortion consideration				0.24	(−1.39: 1.86)				
	Total EPDS				**−0.34**	(−0.42: −0.27)				
n = 398	Infant care							−0.22	(−0.64:0.22)	0.37
	Abortion consideration							0.24	(−1.19:1.68)	
	Total KPCS							**0.44**	(0.36:0.51)	
	Total EPDS							**−0.10**	(−0.18:−0.02)	

Note: **Bold** values indicate significant association at 5% level. Multiple regression analyses: Model 1: KPCS. Model 2: EPDS. Model 3: KPCS + EPDS. Adjusted R^2. Cases with missing values are not included in analysis.

abortion consideration into the three models: (1) total KPCS alone, (2) total EPDS alone and (3) both total KPCS and total EPDS 2 months postpartum to predict the outcome of total KPCS scores at 6 months. Model 1, total KPCS at 2 months, showed the strongest predictive value for total KPCS at 6 months postpartum, ($R^2 = 0.38$), explaining 38% of the variance. In model 2, total EPDS had a predictive value of ($R^2 = 0.18$), explaining 18% of the variance. Results are shown in Table 4.

In additional multiple linear regressions analysis performed to predict the outcome of total EPDS 6 months, we again entered the exposure variables previous infant care and abortion consideration into the three models. Model 1, 2 and 3 all had a predicted value for total EPDS at 6 months postpartum of ($R^2 = 0.09$–0.16), model 1 explaining 9% of the variability 1, and model 2 and 3 explaining 16% of the variability. Results not shown.

Discussion

Overall, our results supported the assumption that the early perinatal period is a period where first-time mothers are struggling as evidenced by 25% of mothers reporting low confidence with scores below the clinical cut-off < 40 on the KPCS and 16% reporting low maternal mood with scores above the clinical cut-off ≥8 on the EPDS. Our results also showed that mothers' confidence, stress and mood improved over time from 2 to 6 months postpartum. No associations were found with regard to mother's age, cohabiting with infant's father, employed, education, infant's gender and mother's mood measured by the EPDS or mother's confidence measured by the KPCS. The measures KPCS, EPDS and PSS were internally correlated. Total KPCS obtained 2 months postpartum was the strongest predictor of first-time mothers still struggling with low confidence, mood and high stress level 6 months postpartum.

The findings of a lower level and a gradual reduction in parental stress and restoration of confidence during the first months postpartum are in agreement with findings in previous qualitative studies (3). However, to the best of our knowledge, the prevalence of KPCS and PSS has not previously been examined in a cohort study. We found that 4% of mothers had a high EPDS score (≥12) 2 months postpartum. This percentage was lower than the previously reported prevalence of 7–8% among Danish first-time mothers measured 5 weeks postpartum [16]. A German cohort study confirmed the latter study, reporting that 8% of first-time mothers had a high EPDS score (≥12) 3 weeks postpartum with a decrease to 2% 6 months postpartum [17]. This proportion of high EPDS (≥12) among a general study population of first-time mothers at 6 months postpartum is almost identical to the 3% found in the present study. Findings of associations between mothers with symptoms of depression and mothers who did not plan the pregnancy and had considered having an abortion are in line with previous findings [33].The level of mother's confidence, mood and stress 2 months postpartum may be explained by a number of factors related to becoming a mother. It is well-known that first-time mothers feel insecure when faced with the new responsibility of caring for an infant [1]. Our findings of associations between mothers who had no previous infant care experience and confidence as a mother are in agreements with other findings showing that lack of experience may be an important factor [11]. The results showed how the early stressors and changes in level of mother's confidence, mood and stress from 2 to 6 months postpartum for most mothers were of a temporary nature. Hence, persistent crying peeks around 5–8 weeks postpartum and infant poor sleeping generally improves over time [34]. After some weeks, most mothers and infants have learned to read each other's cues, and mother's confidence and mood may improve as they become more skilled at parenting. Associations between maternal lack of experience [12], skills in infant care [5] and mother's successful termination of the infant's crying and sleeping disturbances [34] have previously been found to influence mother's confidence, mood and stress [5,35,36]. This underlines the need for providing early postnatal support, especially to first-time mothers, and the need to be able to identify mothers with extended need for support although mothers' confidence, stress and mood improved over time from 2 to 6 months postpartum.

The moderate inter-correlations between the KPCS, EPDS and PSS measures are consistent with previous findings of correlations between maternal mood, maternal confidence and parental stress when using alternative measures such as the parental self-efficacy scale [37], the Beck Depression Inventory [38] and the Parenting Stress Index [39]. Our findings suggest that early knowledge about mother's confidence obtained using the KPCS measured at 2 months postpartum may be the best questionnaire in the health professional's toolbox with which to predict and intervene in order to prevent low maternal confidence, mood and high stress 6 months postpartum. Further validation studies of the measures EPDS, KPCS and the PSS used in the present study are needed to examine their reliability and validity in a community setting. Furthermore, future studies should be conducted before using them as screening tolls both to examine their sensitivity and specificity and to establish the clinical cut-offs in a Danish context for identifying at-risk mothers with a need for extended support from health professionals in the postnatal period.

One of the strengths of this study is its cohort design where the same study population of first-time mothers is investigated during a period of 6 months after birth. The response rate reached 56% among eligible

first-time mothers, which resulted in a relatively large community study population of 513 first-time mothers who closely resembled the background population of Danish first-time mothers with regard to maternal age, gestational age at birth and smoking status [16]. It is a limitation that this study does not report stressors related to infant characteristics such as persistent crying and poor sleeping which have been shown to be associated with low maternal confidence and high parental stress [34,36]. The external validity of the study may be affected by a low participation rate among mothers with lower socio-economic status who are generally less likely to participate in research.

Conclusions

About 25% of first-time mothers experienced a period with low maternal confidence, low maternal mood and high parental stress; yet, for most mothers, their confidence, mood and stress improved in the first 6 months after birth. The KPCS obtained 2 months postpartum was the strongest predictor for identifying mothers who were still struggling with low confidence and high level of parental stress 6 months postpartum.

The study identifies potential areas in clinical practice where intervention may be needed to support first-time mothers in the months following birth in order to ensure early identification of families at risk. In the future, more research in this area is required.

Competing interests

The authors declare that they have no competing interests.

Ethics approval and consent to participate

The Central Denmark Region Committee on Health Research Ethics found that no biomedicine was involved in the project and therefore there was no need for ethical approval (ref.no. 2012-164). Approval was obtained from the Danish Data Protection Agency (ref.no. 2012-41-1018). Participant consent was obtained from all first-time mothers.

Funding

This work was supported by the AU RECEIV Aarhus University [grant number 908792], Folkesundhed i Midten (Collaboration on public health issues among 18 Danish municipalities and the Central Denmark Region) [grant number 12362] and the NovoNordisk Foundation [grant number 11946].

Authors' contributions

IHK is the first author of the article and was responsible for the development of the intervention and funding. All authors participated in the design of the study. IHK and MS are responsible for the statistical analyses and all authors have been involved in drafting and editing the manuscript and have read and approved the final version.

Availability of data and material

The raw data for this study are stored on a secure electronic drive within Aarhus University where the researchers are employed. The data are confidential not available for public access.

Acknowledgements

The authors wish to thank the families and the health visitors who participated in the study and the funding organisations.

Appendix A. Supplementary material

Supplementary data associated with this article can be found, in the online version, at https://doi.org/10.1016/j.srhc.2018.06.003.

References

[1] Nyström K, Ohrling K. Parenthood experiences during the child's first year: literature review. J Adv Nurs 2004;46(3):319–30.
[2] Berry JO, Jones WH. The parental stress scale: initial psychometric evidence. J Soc Pers Relat 1995;12(3):463–72.
[3] Phelps JL, Belsky J, Crnic K. Earned security, daily stress, and parenting: a comparison of five alternative models. Dev Psychopathol 1998;10(1):21–38.
[4] Lilja G, Edhborg M, Nissen E. Depressive mood in women at childbirth predicts their mood and relationship with infant and partner during the first year postpartum. Scand J Caring Sci 2011;23:245–53.
[5] Jones TL, Prinz RJ. Potential roles of parental self-efficacy in parent and child adjustment: a review. Clin Psychol Rev 2005;341–63.
[6] Cogill SR, Caplan HL, Alexandra H, Robson KM, Kumar R. Impact of maternal postnatal depression on cognitive development of young children. Br Med J (Clin Res Ed) 1986;292(6529):1165–7.
[7] Felitti VJ, Anda RF, Nordenberg D, Williamson DF, Spitz AM, Edwards V, et al. Relationship of childhood abuse and household dysfunction to many of the leading causes of death in adults. The Adverse Childhood Experiences (ACE) Study. Am J Prev Med 1998;14(4):245–58.
[8] Sroufe LA. Attachment and development: a prospective, longitudinal study from birth to adulthood. Attach Hum Dev 2005;7(4):349–67.
[9] Costa NM, Weems CF, Pellerin K, Dalton R. Parenting stress and childhood psychopathology: an examination of specificity to internalizing and externalizing symptoms. J Psychopathol Behav Assess 2006;28(2):113–22.
[10] Egeland B, Farber EA. Infant-mother attachment: factors related to its development and changes over time. Child Dev 1984;55(3):753–71.
[11] Kapp M. Mothers' perception of confidence with self-care and infant care. J Perinat Educ 1998;7(4):17–25.
[12] Leahy-Warren P, McCarthy G, Corcoran P. First-time mothers: social support, maternal parental self-efficacy and postnatal depression. J Clin Nurs 2012;21(3–4):388–97.
[13] Crittenden PM. Unpublishes CARE-index infants codenig manual; 2006.
[14] Kingston D, Tough S. Prenatal and postnatal maternal mental health and school-age child development: a systematic review. Matern Child Health J 2014;18(7):1728–41.
[15] Caplan HL, Cogill SR, Alexandra H, Robson KM, Katz R, Kumar R. Maternal depression and the emotional development of the child. Br J Psychiatry 1989;154:818–22.
[16] Maimburg RD, Vaeth M. Postpartum depression among first-time mothers – results from a parallel randomised trial. Sex Reprod. Healthc 2015;6(2):95–100.
[17] Goecke TW, Voigt F, Faschingbauer F, Spangler G, Beckmann MW, Beetz A. The association of prenatal attachment and perinatal factors with pre- and postpartum depression in first-time mothers. Arch Gynecol Obstet 2012;286(2):309–16.
[18] Kronborg H, Væth M, Kristensen I. The effect of early postpartum home visits by health visitors: a natural experiment. Public Health Nurs 2012;29(4):289–301.
[19] Wilkinson R, Marmot M. Social determinants of health: the solid facts. Copenhagen: WHO Regional Office for Europe; 2003. p. 31–2.
[20] Cox JL, Holden JM, Sagovsky R. Detection of postnatal depression. Development of the 10-item Edinburgh Postnatal Depression Scale. Br J Psychiatry 1987;150:782–6.
[21] Hewitt C, Gilbody S, Brealey S, Paulden M, Palmer S, Mann R, et al. Methods to identify postnatal depression in primary care: an integrated evidence synthesis and value of information analysis. Health Technol Assess 2009;13(36):145–230.
[22] Murray L, Carothers AD. The validation of the Edinburgh Post-natal Depression Scale on a community sample. Br J Psychiatry 1990;157:288–90.
[23] Zubaran C, Schumacher M, Roxo MR, Foresti K. Screening tools for postpartum depression: validity and cultural dimensions. Afr J Psychiatry 2010;13(5):357–65.
[24] Črnčec R, Barnett B, Matthey S. Review of scales of parenting confidence. J Nurs Meas 2010;18(3):210–40.
[25] Kristensen IH, Simonsen M, Trillingsgaard T, Kronborg H. Video feedback promotes relations between infants and vulnerable first-time mothers: a quasi-experimental study. BMC Pregnancy Childbirth 2017;17(1):379.
[26] Poulsen A, Brot C. Vejledning om forebyggende sundhedsydelser til børn og unge [Guidelines on Prevenive Health Schemes for Children and Adolescrnts]. Sundhedsstyrelsen: Kbh.; 2011.
[27] SF-36 Health Survey – Optum.com. https://campaign.optum.com/optum-outcomes/what-we-do/health-surveys/sf-36v2-health-survey.html.
[28] Črnčec R, Barnett B, Matthey S. Development of an instrument to assess perceived self-efficacy in the parents of infants. Res Nurs Health 2008;31(5):442–53.
[29] De Vet HCW, Terwee CB, Mokking LB, Knol DL. Measurement in Medicine. 1st ed. NY: Cambridge University Press; 2011.
[30] Berle JØ, Aarre TF, Mykletun A, Dahl AA, Holsten F. Screening for postnatal depression. Validation of the Norwegian version of the Edinburgh Postnatal Depression Scale, and assessment of risk factors for postnatal depression. J Affect Disord 2003;76(1–3):151–6.
[31] Wickberg B, Hwang CP. The Edinburgh Postnatal Depression Scale: validation on a Swedish community sample. Acta Psychiatr Scand 1996;94(3):181–4.
[32] Rousson V. Measurement in Medicine, by H.C.W. de Vet, C.B. Terwee, L.B. Mokkink, D.L. Knol. J Biopharm Stat 2013:277–9.

[33] Nelson DB, Lepore SJ. The role of stress, depression, and violence on unintended pregnancy among young urban women. J Women's Heal 2013;22(8):673–80.
[34] Palmstierna P, Sepa A, Ludvigsson J. Parent perceptions of child sleep: a study of 10,000 Swedish children. Acta Paediatr 2008;97(12):1631–9.
[35] Benoit D, Zeanah CH, Boucher C, Minde KK. Sleep disorders in early childhood: association with insecure maternal attachment. J Am Acad Child Adolesc Psychiatry 1992;31(1):86–93.
[36] Papousek M, von Hofacker N. Persistent crying in early infancy: a non-trivial condition of risk for the developing mother-infant relationship. Child Care Health Dev 1998;24(5):395–424.
[37] Fox CR, Gelfand DM. Maternal depressed mood and stress as related to vigilance, self-efficacy and mother-child interactions. Early Dev Parent [Internet] 1994;3(4):233–43.
[38] Beck AT, Ward CH, Mendelson M, Mock J, Erbaugh J. An inventory for measuring depression. Arch Gen Psychiatry 1961;4:561–71.
[39] Loyd BH, Abidin RR. Revision of the parenting stress index. J Pediatr Psychol 1985;10(2):169–77.