INTRODUCTION

Preterm birth often leads to an unexpected disruption of pregnancy for the parents, leading to an untimely transition to parenthood. Parents are faced with the fear of medical complications or even the loss of their infant. Hence, most parents whose infants require neonatal care experience higher levels of emotional distress, anxiety and depression than parents of healthy and term infants. This phenomenon can be ascribed not only to a stressful birth experience, the infant’s health status and separation from the infant but also to inadequate emotional support.

Parental stress may lead to sub-optimal parent-infant relationships, child development and parental health. However, several studies on stress in parents of preterm-born infants revealed different patterns of stress in mothers and fathers of preterm infants during the first year after birth.
Several studies have reported increased levels of stress in mothers of preterm infants over time, whereas others show decreased stress in mothers but increased stress in fathers, or no change at all in parental stress. On the other hand, mothers of both term and preterm infants often experience higher levels of parental stress compared with fathers. While some studies indicate that mothers with a lower educational level report higher parental stress, others have shown no association. A Swedish study found that more highly educated fathers perceived higher levels of stress. Parental stress was often higher in parents of infants with lower gestational age and birth weight. Moreover, being a parent of preterm twins was a strong predictor of increased parental stress because of a higher demand for caring and nursing.

Knowledge about the development of parental stress over time is inconsistent. Furthermore, most parenting studies have included only mothers as participants. Therefore, it is vital to investigate parental stress in both mothers and fathers after discharge from a neonatal intensive care unit (NICU) to gain a wider knowledge about its trajectory and influencing factors. Moreover, the Swedish context of this study might contribute to a broader understanding of parental stress in fathers. Sweden supports shared parental leave: for instance, Swedish law requires that fathers are required to take 3 months of parental leave.

The aims of this study were to compare experiences of stress in mothers and fathers of preterm infants during the first year of life, assess changes in parental stress and explore potential predictors of parental stress.

**Key Notes**
- Patterns of stress and its predictors over time in parents of preterm infants need to be investigated.
- Parental stress was influenced by several factors, and mothers and fathers showed different patterns of stress during the first year.
- Our findings identified vulnerable groups of parents and different needs in mothers and fathers regarding at what time parental support is most beneficial.

**TABLE 1** Characteristics of participating mothers (n = 493), fathers (n = 329) and their preterm infants (n = 547)

| Demographic variables | Total Mean ± SD n (%) | Median [IQR] | Mothers Mean ± SD n (%) | Median [IQR] | Fathers Mean ± SD n (%) | Median [IQR] |
|-----------------------|-----------------------|--------------|-------------------------|--------------|-------------------------|--------------|
| **Age, year**         |                       |              |                         |              |                         |              |
|                       | 31.5±5.6              |              | 30.6±5.2                |              | 33.6±5.9                |              |
| **Educational level** |                       |              |                         |              |                         |              |
| Higher education      | 357 (49)              |              | 258 (52)                |              | 99 (41)                 |              |
| Upper secondary school or less | 376 (51) |              | 235 (48)                |              | 141 (59)                |              |
| **Parity**            |                       |              |                         |              |                         |              |
| First-time parents    | 408 (56)              |              | 278 (57)                |              | 130 (54)                |              |
| Parents with more than one child | 323 (44) |              | 213 (43)                |              | 110 (46)                |              |
| **Country of birth**  |                       |              |                         |              |                         |              |
| Sweden                | 754 (91.7)            |              | 447 (90.7)              |              | 307 (93.3)              |              |
| Other country         | 68 (8.3)              |              | 46 (9.3)                |              | 22 (6.7)                |              |
| **Mode of delivery**  |                       |              |                         |              |                         |              |
| Vaginal birth         | 479 (57)              |              | 277 (56)                |              | 193 (59)                |              |
| Caesarean section     | 350 (43)              |              | 215 (44)                |              | 135 (41)                |              |
| **Multiple birth**    |                       |              |                         |              |                         |              |
| Singleton             | 728 (89)              |              | 441 (89)                |              | 287 (87)                |              |
| Multiple              | 94 (11)               |              | 52 (11)                 |              | 42 (13)                 |              |
| Infant gestational age|                       |              |                         |              |                         |              |
| <32 wk                | 34 [2]                |              | 34 [2]                  |              | 34 [2]                  |              |
| 32-36 wk              | 34.5 [2]              |              | 34 [2]                  |              | 35 [2]                  |              |
| **Birth weight, gram**| 2306 ± 638            |              | 2295 ± 638              |              | 2322 ± 639              |              |
| Length of stay, days  | 23 [21]               |              | 23 [21]                 |              | 23 [20.5]               |              |

Abbreviations: IQR, interquartile range; SD, standard deviation.
2 | METHODS

2.1 | Design

This study was a longitudinal cohort study conducting secondary analyses of data that were initially collected in a multicentre randomised controlled trial (RCT). The intervention was proactive breastfeeding support for mothers after the preterm infants’ discharge from a neonatal unit. The mothers in the intervention group received daily telephone calls from a member of a breastfeeding support team while the mothers in the control group received reactive support in which they could initiate telephone contact themselves. Although the intervention was mostly addressed to the mothers, fathers were not excluded if they answered the telephone or initiated a telephone call. As part of the RCT, data were collected on parental stress in mothers and fathers at 8 weeks after discharge from the NICU and 6 months and 12 months postpartum. The intervention group perceived lower total stress levels and lower scores than the controls for role restriction and social isolation at 8 weeks. In this study, parents from both the intervention and the control group were included.

2.2 | Setting and participants

The study took place in Sweden at six levels IIIa and IIIb NICU settings. In Sweden, parents receive preliminary parental benefits from the government while their infants are hospitalised in a NICU and they are on temporary leave from employment. Leave days from work because of, for example, a child’s illness are not deducted from the number of days of ordinary parental leave. The preliminary parental benefit consists of a maximum of 120 days per year, which can be divided equally between both parents. After hospital discharge, parents will receive parental benefits that all parents are entitled to by law, which is 80% of the parents’ wages. Parental leave consists of 480 days per child, 90 of which are reserved for each parent and cannot be transferred. The parental benefit for 390 of the 480 days is income-based; for the remaining 90 days, compensation is based on a minimal level.

Eligible participants included three groups: parents of preterm infants with a gestational age of fewer than 37 weeks who were admitted to one of the NICUs for at least 48 hours, breastfeeding mothers and their partners. Excluded from the study were parents whose infants had serious medical conditions and parents whose infants were
The collected demographic data comprised information on the parents’ age, educational level, country of birth, mothers’ parity, mode of delivery, whether the infants were singletons or twins, length of stay at the NICU, and infants’ birthweight and gestational age. At 8 weeks after discharge from the NICU and at 6 and 12 months postpartum, mothers and fathers received the Swedish Parenthood Stress Questionnaire (SPSQ). The SPSQ is the modified Swedish version of the Parenting Stress Index (PSI), an inventory measuring self-reported parental stress. Compared with the PSI that contains two domains and seven dimensions, the SPSQ includes one domain with five dimensions: feeling of incompetence, role restriction, social isolation, health problems and spousal relationship problems. The instrument consists of 34 items on a five-point Likert scale with higher scores indicating higher levels of parental stress.

In this study, the internal consistency (Cronbach's alpha) for the SPSQ was 0.89 at 8 weeks, 0.89 at 6 months and 0.90 at 12 months for the SPSQ. Additionally, the parents received a single question on self-reported general health from the Short Form Health Survey (SF-36). This question on perceived general health was answered on a five-point scale, ranging from poor health to excellent health.

### 2.4 Analysis

To compare parental stress between mothers and fathers at 8 weeks after discharge, 6 and 12 months postpartum the SPSQ total scores and scores on each dimension were used. Student's independent sample t tests were performed and presented with means, standard deviations and effect sizes. The effect size was calculated by Cohen’s d (d), with d = .2 indicating a small effect, d = .5 a medium effect and d = .8 a large effect.

To assess predictors for parental stress, separate analyses were performed in two steps for mothers and fathers. First, Student’s
independent sample t test was performed to compare potential predictors of parental stress for each time point. Potential predictors included upper secondary school or less/higher education, first-time parents/parents with more than one child, singletons/twins and gestational age <32 weeks/32-36 weeks.

Because general health was a continuous variable, linear regression was used to analyse the association with parental stress, presented with the unstandardised beta, the standard error for the unstandardised beta and the coefficient of determination. Second, linear mixed-effects modelling was applied to describe the association between each of the potential predictors for the SPSQ total scores and scores on each dimension separately over time. Thus, linear mixed-effects modelling included repeated measurements at 8 weeks after discharge and 6 and 12 months postpartum with fixed effects of time. Hence, the correlation between repeated measurements was considered. We used the covariance structure AR1, and model assumptions were verified. The results from the linear mixed-effects model analyses are presented with estimates, which should be interpreted as the mean difference in SPSQ scores and 95% confidence intervals. Reference levels were proactive breastfeeding support, higher education, parents with more than one child and twins. All reference levels were coded as 1. If the estimated value was positive, the parental stress level was lower in the reference group; if the value was negative, the parental stress level was higher in the reference group. The regression models included confounders from the primary study.19 These confounders were chosen based on previous studies.1,6-9

To analyse changes in parental stress from 8 weeks to 12 months in mothers and fathers, linear mixed-effects modelling was performed. The analysis included all predictors as confounders in separate models for the total SPSQ scores and scores on each dimension. Because proactive support in the original RCT had an impact on parental stress at 8 weeks for mothers but not for fathers, the randomisation groups were included in the analyses for mothers. The results from the linear mixed-effects model are presented with estimates and 95% confidence intervals, which can be interpreted as the mean difference in SPSQ scores between compared groups after adjusting for confounders. Statistical significance was set at P < .05. All analyses were performed in the Social Package for the Social Sciences (SPSS) version 25 (IBM SPSS Statistics, IBM Corporation).

### 3 | RESULTS

Socio-demographic characteristics of the participants and their infants are shown in Table 1.

There were no differences in total parental stress scores between mothers and fathers (Table 2). In the analyses of each dimension of the SPSQ, mothers felt significantly more restricted than fathers in their parental role at all time points, whereas fathers felt significantly more socially isolated than mothers at all time points. Additionally, mothers reported more health problems at 8 weeks. The SPSQ scores of the participants are listed in Table 2.

#### 3.1 | Predictors and stress patterns during the first year: mothers

Predictors of parental stress for the SPSQ total scores and scores for each dimension in mothers by time point are presented in Table S1.

Table 3 summarises the findings from the linear mixed-effects model in which the effects of each potential predictor for the SPSQ total scores and scores for each dimension were analysed separately over time. Mothers in the proactive telephone support group in the RCT reported less overall stress and felt less restricted in their parental role than mothers in the reactive telephone support group during the first year. Comparing mothers with high education with those with low education, the higher educated mothers felt less socially isolated but more restricted in their parental role and reported more health problems. Mothers who had older children at home reported more health problems than first-time mothers. Compared with mothers of singletons, mothers of twins experienced increased feelings of the overall stress and role restriction. Mothers of infants with lower gestational age reported higher overall stress and felt more restricted in their parental role than mothers of infants with higher gestational age. Mothers with lower self-perceptions of general health reported higher total stress and more stress in each dimension of the SPSQ than mothers with higher self-perceptions (Table 3).

The linear mixed-effects analysis of maternal stress from 8 weeks to 12 months, in which we adjusted for relevant confounders, showed decreased stress over time in the total score (P = .018), particularly between 8 weeks and 6 months (P = .005). The mothers reported that they felt more competent (P = .003), less restricted in their parental role (P = .018) and less socially isolated over time (P = .030) (Table 4).

#### 3.2 | Predictors and stress patterns during the first year: fathers

Predictors of parental stress on the SPSQ total scores and scores for each dimension in fathers by time point are presented in Table S2.

Findings from the linear mixed-effects model of predictors for the SPSQ total scores and scores for each dimension are presented in Table 3. Fathers with older children at home reported more health problems than first-time fathers. Compared with fathers of singletons, fathers of twins had increased feelings of overall stress, role restriction and health problems. Fathers with lower general health perceptions reported higher total stress and more stress in all five dimensions of the SPSQ than fathers with higher general health perceptions (Table 3).

The covariate-adjusted linear mixed-effects analysis of paternal stress showed no difference in stress from 8 weeks to 12 months.
(P = .138). In contrast, there was a statistically significant increase in stress between 6 and 12 months (P = .048). Fathers reported more stress in the spousal relationship (P = .014) and more health problems (P = .004) over time (Table 4).

4 | DISCUSSION

In this study, mothers and fathers reported parental stress in different dimensions as well as different patterns of stress levels during the preterm infants’ first year of life. The major findings showed that, in comparison with fathers, mothers felt more restricted in their parental role but less socially isolated at all time points. Factors associated with parental stress during the first year of postnatal life were having a very preterm infant with a gestational age of fewer than 32 weeks for mothers and having twins and poorer self-perceived general health for both mothers and fathers. In addition, mothers showed decreasing stress during the infant’s first year, especially between 8 weeks and 6 months, whereas fathers experienced increased stress between 6 and 12 months. These findings will now be discussed in turn.

Our findings that mothers felt significantly more restricted in their parental role than fathers is consistent with earlier findings and is not necessarily a negative development. This is because, during the first months after birth, the infant’s needs are a priority and the centre of attention, particularly for mothers of preterm infants. However, mothers also experienced a more restricted role than fathers at 6 and 12 months. Traditionally, mothers are considered the primary caregiver in the home and thus, for this reason, may feel more restricted. However, Olsson et al reported that fathers experienced an equal form of parenthood than they would have experienced after a term birth. They felt as important as the mothers, because they had the opportunity to remain in the NICU thanks to their parental leave. Parents of twins seemed to experience higher levels of stress because of the demands of taking care of two infants. Many studies exclude parents of twins, which is undesirable, given that a higher percentage of twins are born preterm. More studies are needed to clarify the complexity of having prematurely born twins.

Our study demonstrated that the perceptions of mothers and fathers of their general health status during the first year after the infant’s birth influenced their levels of parental stress at all time points. A single-item question on general health constituted a powerful question with strong associations with several health outcomes, and consequently, it was not surprising to find it also associated with parental stress.

The present finding that mothers’ stress levels decreased during the first year contrasts with previous studies reporting unchanged or increased stress levels in mothers of preterm infants over time. The level of perceived stress decreased the most between 8 weeks and 6 months, which is a positive finding. We have previously presented data on the positive impact of proactive breastfeeding support until 8 weeks after discharge. Concerning these data, proactive support was beneficial for the whole period until 12 months. Hypothetically, there are other reasons for the decreased stress in mothers. One explanation might be that after the unexpectedly early transition to parenthood, it takes time for the mother to process and adjust to having a preterm infant. This, in turn, could result in decreased stress over time in mothers, especially between 8 weeks and 6 months. Another reason might be that mothers accumulate skills and knowledge during their time at the NICU, making the experience of preterm birth less stressful with time.

Fathers’ stress increased between 6 and 12 months, although not significantly over the whole first year. Two dimensions, health problems and spousal relationship problems, increased significantly during the first year. In Sweden, this trajectory may be associated with the pattern of parental leave, with mothers mainly being home for the first 6-7 months, with the father at home for...
the remainder of the parental leave. This increased responsibility of fathers may lead to elevated stress levels between 6 and 12 months. The increased stress in the dimension of spousal relationships is a cause for concern. Noergaard et al reported that fathers experienced a challenge in balancing the traditional norms of being the breadwinners and their new role as caregivers. Another reason for increased stress in the spousal relationship could be that fathers have more difficulty coping with role alteration after the birth of an infant, given that they also feel more socially isolated. A Swedish study found that social isolation in fathers and spousal relationship problems is risk factors for parental separation.

Another Swedish study found that fathers who shared parental leave equally with the mothers reported less parental stress than fathers who shared parental leave unequally. With equal sharing of parental leave, fathers might feel better prepared and more confident in caring for their infant.

### 4.1 Strengths and limitations

A strength of this study was its large study population and the follow-up of over 12 months, which provides insight into the development of parental stress over time and the contributing factors of stress. Another strength is the inclusion of fathers because the impact of becoming a father of a preterm infant is often overlooked as the main focus remains on the mother. We used the SPSQ and SF-36, both of which are validated and reliable instruments. Because the SPSQ is specifically designed to measure parental stress from 1 to 12 months postpartum, the validity of the SPSQ in our study was high.

An important limitation of this study was that the intervention mostly addressed mothers. Although fathers were not excluded from the intervention of proactive breastfeeding support, they might have benefited more from greater involvement in the study. Other
limitations include missing data on fathers’ educational level and parity, loss to follow-up among parents with foreign backgrounds and lower educational levels. Finally, mothers who were not breastfeeding at discharge were excluded. For these reasons, the present results might not be representative of the whole population of parents of preterm infants in Sweden. Furthermore, we conducted several types of analysis that might imply more mixed and indistinct results. Such multiple testing would also increase the risk of type 1 errors. Although our analyses showed robust P-values and good effect sizes, the differences in SPSEQ scores were small and hence they may lack clinical significance. Still, the insight about patterns of parental stress during the first year of the infant’s life and its contributing factors should play a prominent role in building of knowledge and designing future studies.

5 | CONCLUSION

The present study identified important factors influencing parental stress in parents of preterm infants. We found that mothers and fathers of preterm infants exhibited different patterns of stress during the first year after birth. Consequently, clinical implications might include offering more support to the most vulnerable groups of parents of preterm infants, including mothers of very preterm infants and parents of twins. In addition, support programmes should be offered at a later point during the first year after birth to allow fathers on paternity leave to participate.

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CONFLICT OF INTEREST

The authors have no conflicts of interest to declare.

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SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section.

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