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Feeling better? – Identification, interventions, and remission among women with early postpartum depressive symptoms in Sweden: a nested cohort study

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Research Article

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Abstract

Background. Postpartum depression affects around 12% of mothers in developed countries, with consequences for the whole family. Many women with depressive symptoms remain undetected and untreated. The aim of this study was to investigate to what extent women with depressive symptoms at 6 weeks postpartum are identified by the healthcare system, the interventions they received, and remission rates at 6 months postpartum.

Methods. Postpartum women scoring 12–30 on the Edinburgh Postnatal Depression Scale (EPDS) at 6 weeks after delivery (n = 697) were identified from the longitudinal cohort study "Biology, Affect, Stress, Imaging and Cognition" (BASIC) in Uppsala, Sweden. A total of 593 women were included. Background and remission information at 6 months was collected from the BASIC dataset. Medical records were examined to identify interventions received.

Results. Most women (n = 349, 58.7%) were not identified by the healthcare system as having depressive symptoms and 89% lacked any record of interventions. Remission rates at 6 months postpartum were 69% in this group. Among women identified by the healthcare system, 90% received interventions and about 50% were in remission at 6 months postpartum. The EPDS reduction during the study period was largest in the group identified by the child health services (CHS, −5.15) compared to the non-identified (−4.24, $p < 0.001$).

Conclusions. Despite screening guidelines, many women with depressive symptoms had no documentation of screening or interventions by the healthcare system. Furthermore, a significant proportion did not achieve remission despite interventions. Being identified by CHS was associated with the largest reduction of symptoms. Research is needed to understand gaps in the healthcare processes, to better identify peripartum depression.

Introduction

Postpartum depression (PPD) is one of the most common postpartum complications; a meta-analysis from 2022 estimated a prevalence of 12% in developed countries [1]. PPD may have negative implications for the mother–infant interaction [2] and may impact child development [3–6]. Despite several available treatment options, PPD is widely underdiagnosed and undertreated, with one systematic review estimating around one third of women with PPD were identified in clinical settings and only 16% received treatment [7, 8]. Furthermore, research has shown differences in identification of PPD depending on the context. In 2011, Kozhimannil [9] demonstrated significant racial–ethnic disparities in postnatal depression-related mental healthcare, indicating suboptimal treatment for low-income women. Additionally, a Swedish study revealed that women born outside of Sweden and those reporting poor self-rated health faced an elevated risk of not being offered screening for PPD [10]. The American College of Obstetricians and Gynaecologists recommends screening all pregnant women for symptoms of depression at least once during pregnancy. Similarly, the National Institute for Health and Care Excellence in the United Kingdom recommends screening all newly delivered mothers and WHO recently published a report for screening in the postpartum period [11–13]. Internationally, screening practices vary despite a recent meta-analysis reporting good quality evidence of improved outcomes with screening in high-income country settings [14]. Indeed, systematic psychosocial interventions may reduce the prevalence of PPD [15, 16]. Furthermore, long-term symptoms seem to be common; remission rates of postpartum depressive symptoms have been reported to be 30%–50% during the first year after delivery [17, 18].

Routine check-ups and care pathways to detect and treat PPD have been established in Sweden. Recommendations until 2023 state that, during early pregnancy, the midwife should inquire about

current or past history of mental illness at routine pregnancy visits. Postpartum, the standard procedure involves screening for depression using the Edinburgh Postnatal Depression Scale (EPDS) [19, 20]. Guidelines specify that an overall assessment for depressive symptoms should be conducted, including administration of the EPDS questionnaire and relevant follow-up questions during the 6–8 weeks postnatal appointment with the child health services (CHS), as a basis for further assessment [21, 22]. The recommendations emphasize that EPDS scores cannot serve as a substitute for a clinical assessment. Elevated scores at a single assessment point do not necessarily imply the presence of depression. High scores may arise due to common but transient factors such as feeling overwhelmed, sleep deprivation, or temporary challenging circumstances. The EPDS outcome and/or eventual follow-up visits or calls should be documented in the medical records [23]. CHS is free of charge and 99% of all children 0–5 years attend regular check-ups by specialized CHS nurses [24]. If the screening is positive, documentation as well as related actions should be registered in the mother's medical records. The recommendations also include action guidelines for interventions [25]. The benefits of using EPDS for screening have been underlined by several researchers [14, 26], but there is still a lack of follow-up studies on women screening positive, regarding received interventions. Furthermore, few studies have investigated remission rates in women with depressive symptoms postpartum within the framework of organized screening or by outcome. In particular, the remission rates by participation status in screening programs are not well studied.

The aim of this study was to investigate to what extent women identified within a population-based longitudinal study as experiencing significant postpartum depressive symptoms, were actually detected by the CHS or other parts of the healthcare system, and to describe what interventions they received. A secondary aim was to determine the remission rates at 6 months postpartum, in relation to being identified or not by the healthcare system.

Methods

Setting

This descriptive study is a sub-study within the Biology, Affect, Stress, Imaging and Cognition (BASIC) project. BASIC is a population-based prospective study on maternal psychological well-being, conducted at the Department of Obstetrics & Gynaecology at Uppsala University Hospital between 2009 and 2019 [27]. Women in the BASIC study were recruited when invited to the Uppsala University Hospital for routine ultrasound examination at pregnancy weeks 16–18, which 97% of all women in this region attend. For participants who gave informed consent, Internet-based surveys with the EPDS tool were sent at baseline, pregnancy week 32, and postpartum at 6 weeks, 6 months, and 12 months to assess depressive symptoms. Data from over 6,400 pregnancies were prospectively collected [21, 28]. Each of the 10 items on the EPDS produces a score from 0 to 3, with total scores ranging from 0 to 30. A validated cutoff value of 12 or more was used [29], also in line with the Swedish guidelines recommending using this cutoff when screening for depressive symptoms postpartum [22].

Data and procedures

Background data were collected from the BASIC study and all participants' medical records were scrutinized to identify interventions received. Data were extracted from medical records by the first author (K.G.), a medical student, and four research assistants from March 1, 2020 to December 15, 2021, following a standardized protocol designed for the purpose of the study. The medical records refer to those used in the public healthcare system, as well as by private practitioners (some psychologists and gynecologists) sharing the same medical record system. The use of the same journal system is extensive in the Uppsala region. A small share of private practitioners use other systems and notes, meaning those records would not be available for data extraction. Nevertheless, there is often a note in the public healthcare provider's record if a woman has had contact with a private practitioner (without the same medical record system); in those cases, the participant was listed as receiving this type of intervention/treatment in this study. The timeline of routine maternal healthcare and data collection about participants from pregnancy week 17 to 12 months postpartum is illustrated in Figure 1. Information collected on interventions included history of psychiatric diagnoses, medical treatment, received counseling or psychological treatment, and referrals to psychiatric health services. Types of treatments noted were: antidepressant use during the period from delivery until 6 months postpartum; counseling and psychotherapy, including physical visits with any kind of therapy with maternal healthcare psychologists, social workers, counseling by CHS nurse, as well as by psychologists, psychiatrists, and/or psychiatric nurses. Data on referral source to psychiatric care were collected. Information on offer of referral that was declined was collected. Data also included information concerning comorbidities and relevant healthcare appointments. Other interventions and health-related variables deemed to potentially impact remission and residual symptoms of depressive symptoms were collected, including reports on delivery experience, breastfeeding problems and breastfeeding support received, contraception use, and any antibiotic-treated infections. Information on background and pregnancy characteristics was collected from the BASIC project [27]. Using data from the BASIC study's follow-up, participating women were identified as in remission (EPDS score ≤ 11, $n = 334$) or not (EPDS score = 12–30, $n = 228$) at 6 months postpartum. Remission rates were defined as the percentage of women who had an EPDS score of 11 or less at 6 months postpartum. EPDS scores for 135 women were missing at the 6-month follow-up. Of these 135 participants, a clinical evaluation was performed, based on healthcare professionals' assessments in medical records and were categorized accordingly. Sensitivity analyses were carried out without participants with missing EPDS scores at 6 months postpartum.

Participants, inclusion, and exclusion criteria

Women reporting EPDS ≥12 in the BASIC cohort at 6 weeks postpartum ($n = 697$) were initially included in the study (see Figure 2). Medical records were scanned based on a pre-designed structured protocol. Participants who lacked records after moving from the region during the study period ($n = 14$) and a woman with censored medical records ($n = 1$) were excluded from the study sample. The same applied for ongoing psychiatric treatment ($n = 89$) at 6 weeks postpartum, due to national guidelines stating that women with ongoing psychiatric treatment are not included in the screening with EPDS by the CHS [22]. The remaining participants ($n = 593$) were grouped based on whether they had been identified as having depressive symptoms or not, and if they were

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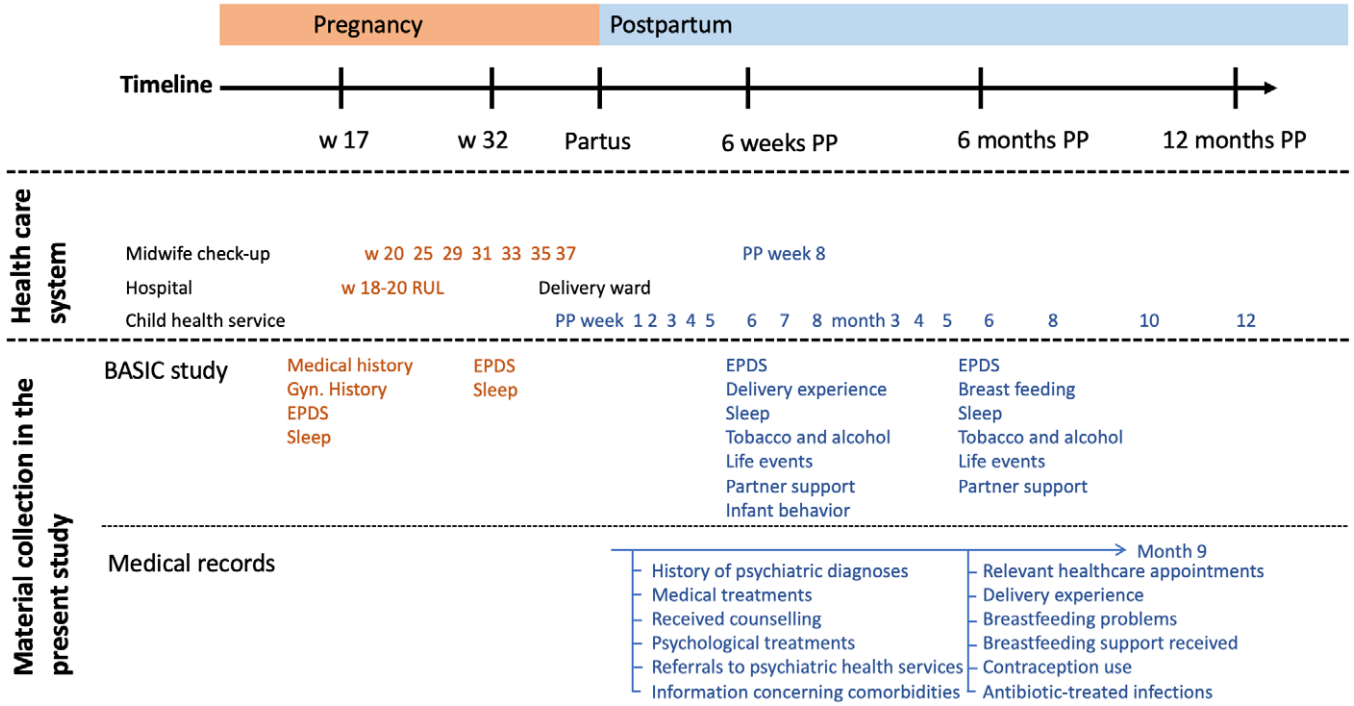

Figure 1. Timeline illustrating the data collection and the routine check-ups in maternal healthcare in Sweden from pregnancy week 17 to 12 months postpartum. Abbreviations: w = week; PP = postpartum; RUL = routine ultrasound; EPDS = Edinburgh Postnatal Depression Scale.

identified by the CHS or by any other healthcare service. The groups formed where: NI ("not identified"), CHS ("identified by CHS"), and IO ("identified by other"). The NI group members lacked documentation in their medical records on assessment, presence of depressive symptoms during the study period, or interventions offered by the healthcare system. Some participants entered the study on ongoing antidepressant treatment, but if the treatment was not commented on in the medical records, altered or evaluated during the study period, those cases were not deemed to be getting any new intervention and fell into the NI group. Documentation concerning depressive symptoms and/or interventions from any healthcare professional outside of CHS led to inclusion in the IO group. If a woman had any documentation concerning depressive symptoms (mentioning depressive symptoms and/or commenting on EPDS screening suggesting ongoing symptoms) and/or had registered interventions (typically referrals or a plan to follow-up) from the CHS nurse in their medical records, she was assigned to the CHS group. When there was documentation or evidence of interventions from both CHS and other healthcare units, the individual was included in the CHS group.

Data analysis

Comparisons of groups regarding background variables, medical history, and pregnancy/delivery variables were performed using χ^2 tests, independent *t*-tests, or Kruskal–Wallis tests, depending on the types of data. Analyses were performed with IBM SPSS version 27 and *p*-values of less than 0.05 were considered significant.

Results

Out of the 593 women included, 349 (58.7%) were not identified by the healthcare system as having depressive symptoms, 54 (9.6%) were identified by other healthcare units than CHS, and 190 (32.5%) were identified by the CHS as having depressive symptoms (see Figure 3).

Characteristics by identification group

Table 1 presents maternal characteristics in the three study groups. In the postpartum period, the IO and CHS groups had a lower frequency of full breastfeeding at 6 weeks postpartum and more often reported higher partner support, compared with the NI group. Women in the IO group had a shorter mean gestational length and higher rates of premature birth. Women in the CHS group more often had diabetes or underwent instrumental delivery, compared with the other two groups.

Identification of depressive symptoms and interventions received

Figure 3 shows the flowchart of participants. The NI group encompasses 349 cases (58.7%). Of those, 38 (10.9%) sought care on their own and therefore received treatment (with a remission rate at around 50%), whereas the remaining 311 did not receive any referral (89.1%). Of the 311 participants, 301 participants did not receive any treatment, and of those 301, 31% were still having depressive symptoms at 6 months postpartum. The IO group consisted of 54 women, of whom 52 received different treatment combinations, with remission rates between 42% and 64%. The CHS group consisted of 190 women (32.5%). Twelve (6.3%) had documentation of EPDS screening by CHS, but no significant depressive symptoms were detected. Of the 178 women with depressive symptoms who were detected by CHS, 153 (86.7%) were referred to mental health services.

EPDS scores at 6 weeks postpartum were self-reported in the BASIC study and were found to differ between study groups. In the

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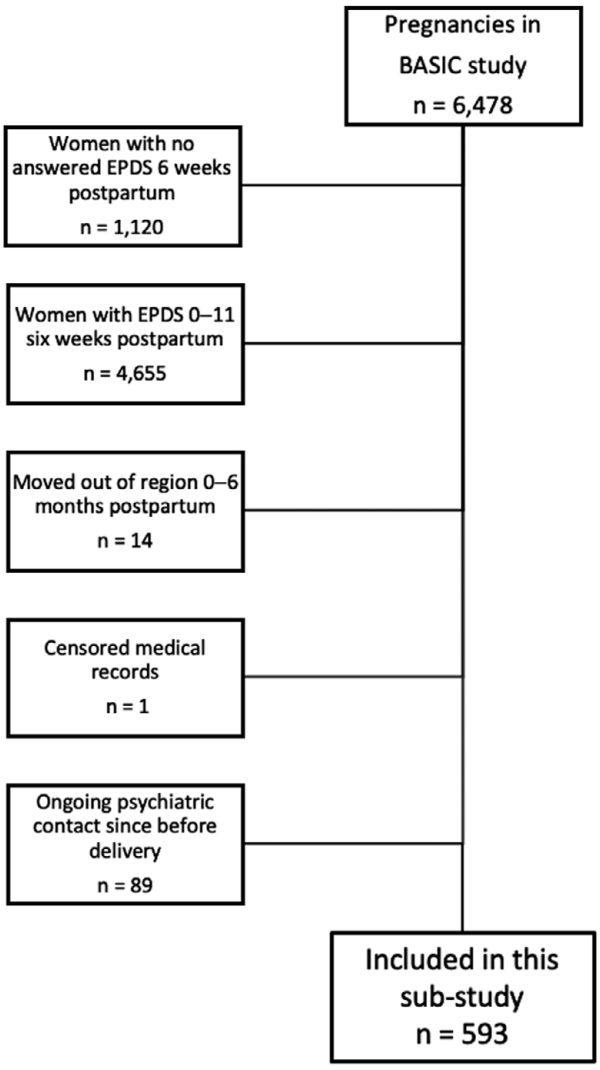

Figure 2. Flowchart over included and excluded individuals from the study.

NI group, the mean EPDS score was lower than in the IO group or the CHS group ($p < 0.001$) (see Figure 4).

Remission rates

Figure 5 shows the remission rates in the study groups. A significantly higher proportion of women in the NI group had gone into remission at 6 months postpartum, compared with the CHS group and the IO group ($n = 235$, 67.3% vs. $n = 54$, 52.1% and $n = 99$, 51.9%, $p < 0.001$; χ^2). In the group of women with ongoing psychiatric contact ($n = 89$), the remission rate was 49.4% at 6 months postpartum. The rates were nearly the same when analyses were made after exclusion of participants without EPDS scores at 6 months postpartum.

EPDS differences during the study period

Differences in EPDS score between 6 weeks and 6 months in the study groups are shown in Figure 6. The largest change was in the CHS group, where the reduction in score was 5.15 during the study period, significantly larger than the NI group (4.24, $p < 0.001$, *t*-test). No difference between the two identified groups (IO and CHS groups) was found ($p = 0.35$).

Discussion

Using a novel approach in a uniquely large cohort, this study combined self-reported data from a population-based study at two timepoints (6 weeks and 6 months postpartum) with parallel evaluation of medical records from delivery to 9 months postpartum, to determine rates of detection and interventions for depressive symptoms in the early postpartum period. This method gives a detailed insight and description of the pathways that women with depressive symptoms after delivery are following; from identification, interventions received to frequency of remission of symptoms several months later. Of all women self-reporting EPDS scores ≥12 at 6 weeks postpartum, less than half were identified by the healthcare system as possibly depressed at 2 months postpartum. Of those identified, most received interventions, such as referrals, psychotherapy, or medication. As expected, most cases were identified by the CHS in line with national screening guidelines, and the interventions and treatments received were in line with existing recommendations [19, 20].

It is of note that a significant proportion of women in this study were not identified as having depressive symptoms, despite reporting high EPDS scores in the BASIC-study setting. Studies from the United States and Australia, respectively, showed screening rates of depressive symptoms with EPDS in early postpartum period of 85% in 2015–2017 and 70% in 2000–2017 [30, 31], whereas our Swedish study from 2021 showed an EPDS screening rate of 70% [10]. Differing rates could reflect variations in documentation routines and/or actual differences in screening rates. Unclear documentation screening guidelines could be one reason for the relatively low identification rates in the present study. For example, if documentation of positive EPDS screening was (incorrectly) performed in the child's medical records (instead of the mother's records), it would not be identified in our study. Time restrictions at CHS visits might lead to lack of screening or documentation, while some mothers could be reluctant to take time for themselves during child healthcare visits, and therefore not fully disclose severity of depressive symptoms. Another contributing factor might be that the women who were not identified had higher EPDS scores in the study setting than at CHS visits. This could be due to early remission in some women with high EPDS scores at 6 weeks postpartum, when the questionnaire was answered in the study, explaining the lack of notes on a positive CHS screening 2 weeks later. An additional explanation could be that women report their symptoms differently in a web questionnaire filled out at home as opposed to a clinical setting. Indeed, similar differences between screening settings have shown that mental health issues are underreported in identified compared to anonymously collected data [32, 33]. The remission rate at 6 months postpartum was 67% in the non-identified group, compared with 52% in the identified groups, possibly indicating that the women identified also had more severe problems than those not identified. Another explanation for low identification rates could be that some women scored highly in the EPDS during the CHS visit, but after the overall discussion and assessment (e.g., ongoing sleep deprivation or an especially demanding baby), the nurse concluded that there was a low risk for clinical depression and thus chose not to document in the medical records. This is in line with the relatively low specificity of the EPDS [28], but not entirely in line with guidelines stating that

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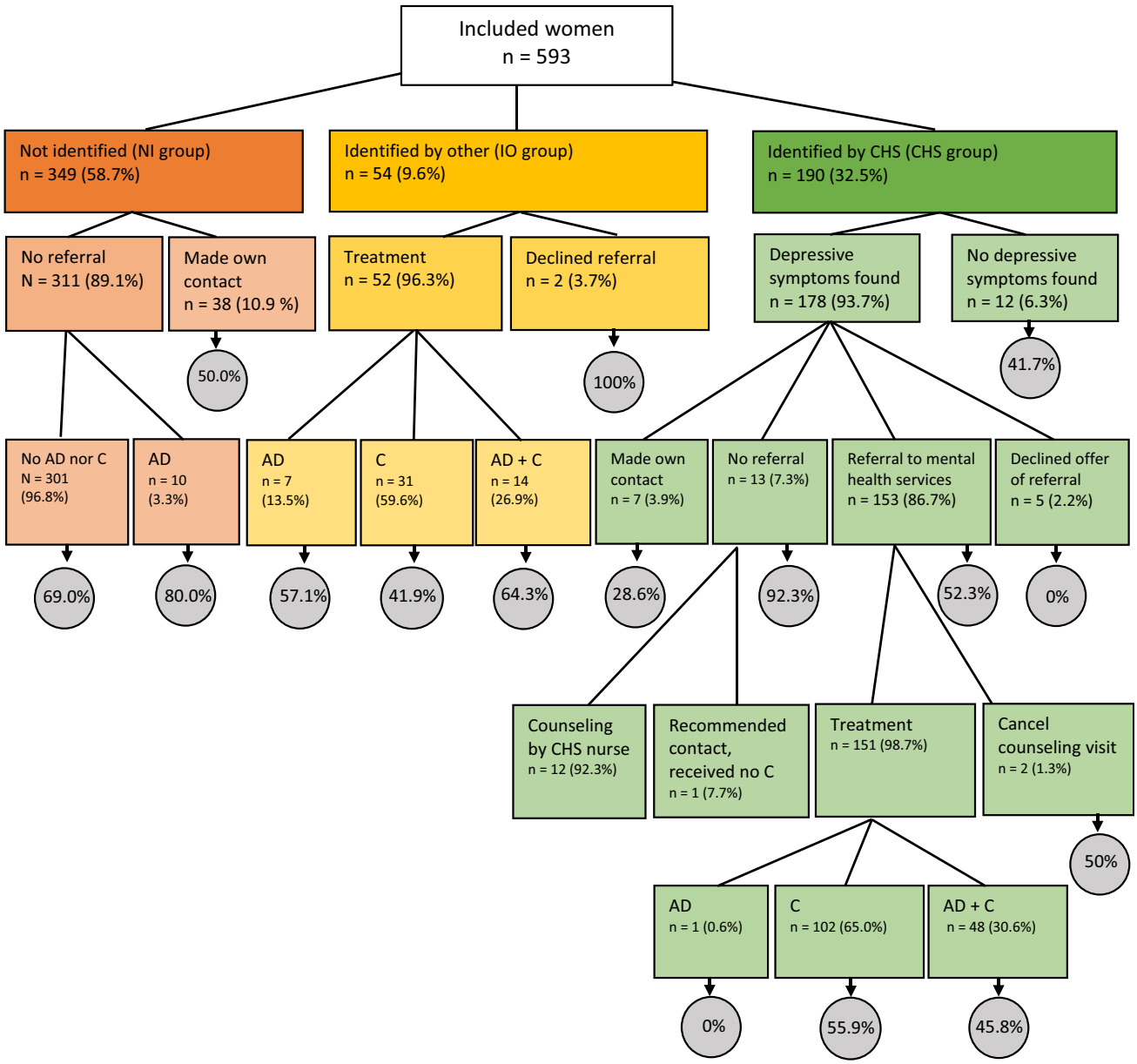

Figure 3. Flowchart of identification and intervention pathways. Abbreviations: AD = antidepressants; C = counseling or psychotherapy; CHS = child health services; IO = identified by other; NI = not identified. The percentages in the boxes are calculated based on the number in the box one level up. The percentages in gray circles refer to remission rates at 6 months postpartum.

a high EPDS score should be followed up with a new EPDS screening 4–6 months postpartum. However, even though the recommendation is that all matters concerning the mother should be documented in her medical record, there might be varying practices, for example, documentation in the child's journal instead. Those factors may partly explain why so few of the women in this study cohort are identified as defined by the CHS.

Of the identified women (CHS and IO groups), most received interventions, which is in line with national guidelines and international praxis [34]. The intervention rate of 90.5% of identified women in our study is higher than previously described. A similar study from North America in 2010 reported that only 25% of identified women received adequate treatment [35]. The difference could partly be explained by the time period, as PPD screening and treatment guidelines have changed since the start of the study period; as screening was added to the national guidelines in 2010 [36]. Furthermore, our study population represents mostly women with high socioeconomic status [27]. In Sweden, the maternal healthcare system employs many psychologists, which is quite unique internationally and could also partly explain the high rates of treatment. Also, Sweden has another health insurance system compared to other countries which may lead to higher utilization of health services. However, in our study, more than half of the *total* study population (both identified and non-identified women) had no records of a healthcare intervention for PPD, indicating that PPD might still be undertreated, with only 40% of all possibly depressed women receiving interventions in our study group [7, 8]. Despite that we would not expect all women with high EPDS scores in the BASIC study to receive interventions, only 41.3% were identified as having depressive symptoms and, therefore, less than

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Table 1. Characteristics of the study participants by study group

	Not identified (*N* = 349) *n* (%), mean ± SD, or median (IQR)	Identified by other (*N* = 54) *n* (%), mean ± SD, or median (IQR)	Identified by CHS (*N* = 190) *n* (%), mean ± SD, or median (IQR)	*P*-value	Missing *N* (%)
BACKGROUND					
Year of delivery				0.912	0 (0.0)
Median	2014	2013	2014		
Age at partus				0.56	0 (0.0)
Years ± SD	31.2 ± 4.6	31.2 ± 5.4	31.6 ± 4.8		
Birth country				0.08	49 (8.3)
In Scandinavia	290 (92.4)	45 (90.0)	155 (86.1)		
Other	24 (7.6)	5 (10.0)	25 (13.9)		
Level of education				0.07	57 (9.6)
University	208 (67.3)	33 (68.8)	138 (77.1)		
Other	101 (32.7)	15 (31.2)	41 (22.9)		
Occupation at pregnancy week 17				0.28	55 (9.3)
Working or studying full- or part time	272 (87.7)	41 (83.7)	148 (82.7)		
Parental leave, sick leave, unemployed	38 (12.3)	8 (16.3)	31 (17.3)		
BMI				0.28	61 (10.3)
Mean ± SD (kg/m^2)	24.9 ± 5.3	25.4 ± 4.9	24.6 ± 5.2		
Smoking ever				0.96	46 (7.8)
No	204 (64.6)	32 (64.0)	119 (65.7)		
Yes	112 (35.4)	18 (36.0)	62 (34.3)		
Parity (prior to index pregnancy)				0.61	35 (5.9)
Nullipara	164 (49.4)	23 (45.1)	100 (57.1)		
Primipara	125 (37.7)	23 (45.1)	54 (30.9)		
Multipara (≥2)	43 (13.0)	5 (9.8)	21 (12.0)		
PREGNANCY AND DELIVERY					
Twins	4 (1.1)	2 (3.7)	2 (1.1)	0.29	0
Pregnancy complications					
Gestational diabetes	2 (0.6)	0 (0.0)	8 (4.8)	0.004	67 (11.3)
Gestational hypertension	25 (7.2)	6 (11.1)	14 (7.4)	0.59	0
Preeclampsia	5 (1.6)	3 (6.3)	2 (1.2)	0.07	67 (11.3)
EPDS score at pregnancy week 17				0.08	58 (9.8)
Median (IQR)	8 (7)	9 (9)	9 (7.5)		
EPDS score at pregnancy week 32				0.09	62 (10.5)
Median (IQR)	9 (7)	11 (8)	9.5 (6.5)		
Gestational length				0.02	35 (5.9)
Mean ± SD (days)	278.1 ± 12.1	273.7 ± 13.9	277.5 ± 13.0		
Premature delivery				0.01	62 (10.5)
No	300 (95.2)	41 (85.4)	161 (95.8)		
Yes	15 (4.8)	7 (14.6)	7 (4.2)		
Delivery mode				0.02	0 (0.0)
Spontaneous delivery	249 (71.3)	32 (59.3)	128 (67.4)		
Elective cesarean	32 (9.2)	7 (13.0)	16 (8.4)		
Emergency cesarean	36 (10.3)	7 (13.0)	19 (10.0)		
Cesarean	4 (1.1)	4 (7.4)	2 (1.1)		

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Table 1. *Continued*

	Not identified (*N* = 349) *n* (%), mean ± SD, or median (IQR)	Identified by other (*N* = 54) *n* (%), mean ± SD, or median (IQR)	Identified by CHS (*N* = 190) *n* (%), mean ± SD, or median (IQR)	*P*-value	Missing *N* (%)
Vacuum extraction	28 (8.0)	4 (7.4)	25 (13.2)		
Obstetric laceration				0.99	31 (5.2)
None	183 (54.5)	27 (54.0)	93 (52.8)		
Grade I	94 (28.0)	14 (28.0)	50 (28.4)		
Grade II	51 (15.2)	8 (16.0)	28 (15.9)		
Grade III	6 (1.8)	1 (2.0)	4 (2.3)		
Grade IV	2 (0.6)	0 (0.0)	1 (0.6)		
Delivery experience				0.08	100 (16.9)
Positive	252 (85.4)	32 (72.7)	124 (80.5)		
Negative	43 (14.6)	12 (27.3)	30 (19.5)		
Birthweight				0.90	36 (6.1)
Mean (grams ± SD)	3,603 ± 589	3,507 ± 700	3,518 ± 576		
Child gender				0.41	36 (6.1)
Girl	163 (49.1)	23 (46.0)	75 (42.9)		
Boy	169 (50.9)	27 (54.0)	100 (57.1)		
Newborn admission to neonatal unit				0.43	59 (9.9)
No	279 (87.7)	40 (83.3)	141 (83.9)		
Yes	39 (12.3)	8 (16.7)	27 (16.1)		
POSTPARTUM					
Breastfeeding at 6 weeks PP				0.005	2 (0.3)
Fully	231 (66.6)	27 (50.0)	107 (56.3)		
Partially	83 (23.9)	15 (27.8)	47 (24.7)		
No	33 (9.5)	12 (22.2)	36 (18.9)		
Partner support at 6 weeks PP				0.014	6 (1.0)
Yes, much help	163 (47.4)	29 (54.7)	111 (58.4)		
Yes, some help	162 (47.1)	17 (32.1)	69 (36.3)		
No	19 (5.5)	7 (13.2)	10 (5.3)		
Sleep at 6 weeks PP				0.41	1 (0.2)
Less than 4 h/night	47 (13.5)	7 (13.0)	21 (11.1)		
4–6 h/night	215 (61.6)	38 (70.4)	113 (59.8)		
More than 6 h/night	87 (24.9)	9 (16.7)	55 (29.1)		
Sleep at 6 months PP				0.25	97 (16.4)
Less than 4 h/night	12 (4.1)	3 (7.1)	9 (5.6)		
4–6 h/night	140 (47.6)	15 (35.7)	61 (38.1)		
More than 6 h/night	142 (48.3)	24 (57.1)	90 (56.3)		

Note: IQR = interquartile range; PP = postpartum; SD = standard deviation. Premature delivery was defined as delivery before gestational week 37 + 0. Tests used were independent *t*-tests, Kruskal–Willis tests, and χ^2 tests.

40% received interventions. We suspect that the limitations of the EPDS instrument, such as low specificity, cannot fully account for the nearly 60% of women with high self-reported EPDS scores who are lacking any documentation about depressive symptoms in the medical records. The low EPDS specificity would account for the 12 women (Figure 3), who, after identification and relevant discussion, were not found to be suffering from significant depressive symptoms. On the other hand, about 11% of the non-identified women (Figure 3) took the initiative to contact primary healthcare or mental health services on their own accord for their depressive symptoms. Additionally, among the women who were not identified and did not get a referral, 30% were still reporting a high EPDS score at 6 months postpartum. Therefore, we believe that a significant proportion of the non-identified women would have needed

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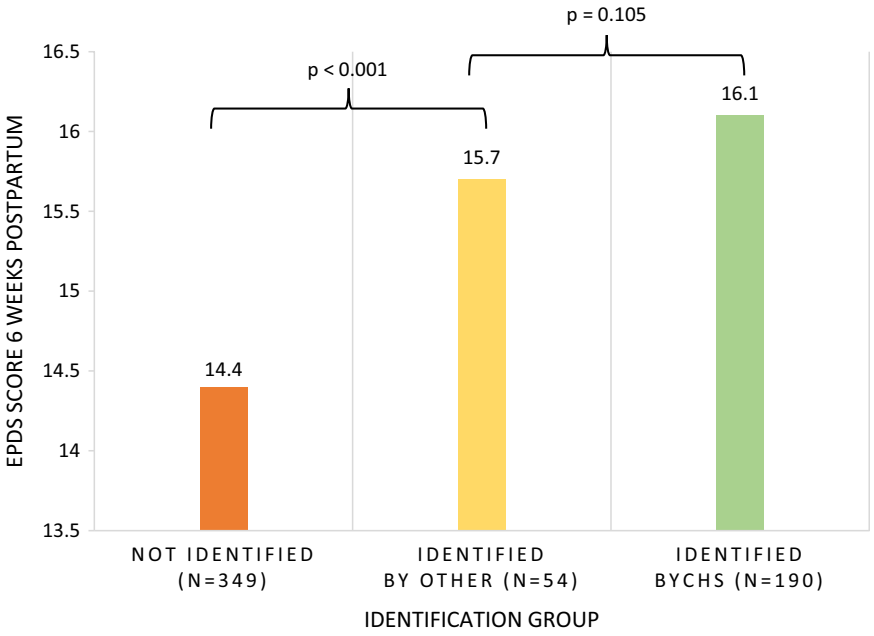

Figure 4. Edinburgh Postnatal Depression Scale scores at 6 weeks postpartum by the identification group. Comparisons of groups were performed using independent *t*-test, and the *p*-value is presented at the top of each column.

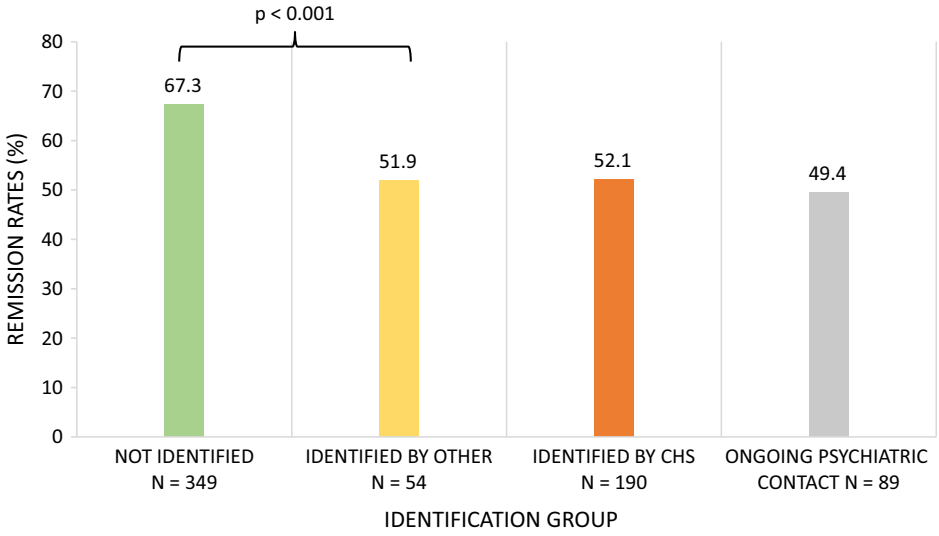

Figure 5. Remission rates (%) of depressive symptoms at 6 months postpartum in the study groups. The ongoing psychiatric contact group is presented, but was not compared to the other groups. Comparisons of groups were performed using χ^2 tests, and the *p*-value is presented at the top of the first two columns. There were no significant differences between the other three groups.

further assessment. Consequently, our findings might suggest that PPD is still inadequately addressed, indicating potential undertreatment. However, the intervention rate in our material is higher compared with a study by Cox et al. [7] from 2016, reporting a PPD treatment rate of 6.3%. The difference might be due to differences in accepted intervention types, where Cox's study may not include all types of interventions offered and accepted in the Swedish healthcare system.

Depression often presents with spontaneous remission after a few months [37, 38]. Though studies reporting on untreated PPD are scarce, a study from North Africa also showed a high remission rate (64%) among untreated women [39]. A high remission rate (67%), even without intervention, was also observed in our study. This finding should be interpreted with caution on account of possible indication bias; however, randomized studies are impossible to implement because of ethical reasons. Nevertheless, it is important to consider that due to the lower EPDS specificity [27], it could be expected that many in the identified group might not have fulfilled criteria for a major depressive episode. This could partly explain why as many as 67% reported absence of depressive symptoms even without intervention. Moreover, as previously mentioned, the higher remission rate among the not identified participants could imply less severe symptoms which partly could be explained by lower depressive symptom severity (i.e., lower

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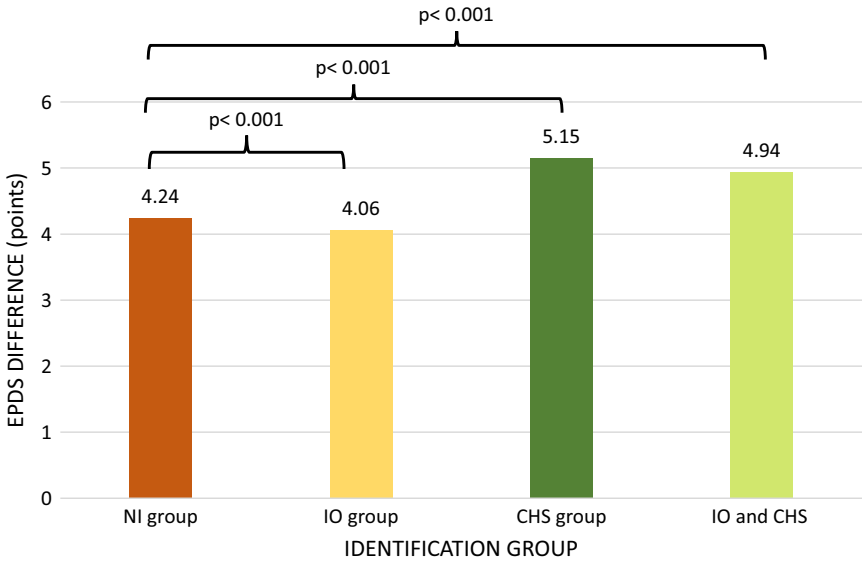

Figure 6. Illustration of differences in Edinburgh Postnatal Depression Scale scores between 6 weeks and 6 months postpartum. The brackets show the *p*-values when comparing groups with independent *t*-test. Abbreviations: NI = not identified; IO = identified by other; CHS = Identified by child health services.

EPDS score) (see Figure 4). However, it is also essential to remember that risks to both mother and child increase when needed treatment is withheld, even though most reach remission eventually [40]. Personal communications from the women within the BASIC study have shown that some women with EPDS scores of 12 or above declined interventions, arguing to nurses that the score reflects sleep deprivation or an especially demanding baby. It could be speculated in these cases that nurses might not push for further diagnostics, when conversation with the mother may provide explanations for her high scores, and correctly classify them as not depressed. Notably, women identified as having depressive symptoms had a lower remission rate than women not identified (52% vs. 67%). This may indicate that the healthcare system does identify the group with more severe symptoms, as shown by the higher mean EPDS scores at 6 weeks postpartum (Figure 4). Those findings are supported by a systematic review including 149 studies from 84 countries, showing that more severe depression leads to higher treatment coverage [41]. Moreover, the remission rate is comparable to that in a review of longitudinal studies by Vliegen et al. [17], showing that in community samples, about 30% of women with PPD still experience depressive symptoms at 12 months postpartum, while the rate is about 50% in clinical samples. Another study presented different remission rates based on clinical presentation. About 50% of the women experienced mild depression with remission by 12 months postpartum, whereas about 40% reported gradual symptom improvement and 8% had consistently high scores [18]. Even though the study designs differ slightly, those results correspond well with those of our study; though we were able to provide a more detailed description of given interventions and the remission rates in different care pathways.

The EPDS has previously been shown to be able to detect changes in maternal depressive symptoms [42, 43]. In our study, the CHS group had the largest reduction of EPDS score, significantly more than the NI group, but not compared to the IO group. This could imply that being identified as having depressive symptoms leads to earlier reduction of symptoms, even though the remission rates is higher in the NI group. This underlines the importance of detection of depressive symptoms postpartum.

In summary, this study gives new insights in that the efforts made for the identification and treatment of women with PPD are not enough to provide remission for all. Even though more women achieved remission in the non-identified group, this is probably due to lower disease burden in this group. Some women in the non-identified group may still suffer considerably and could have achieved remission earlier if detected and timely treated. Furthermore, when comparing the EPDS drop from 6 weeks to 6 months postpartum, being identified by the CHS resulted in a more prominent reduction of EPDS score, which partly would be expected due to higher scoring at baseline. However, as many women continue having depression symptoms 6 months after delivery despite universal screening for PPD, the results of this study may pinpoint areas for improvement in care pathways. More research is needed to understand the possible gaps in the healthcare processes, to ensure better identification and treatment of this condition.

Strengths and limitations

A strength of this study is that it is based on the longitudinal BASIC cohort, one of the largest longitudinal studies in the field with a long follow-up period [27], combined with a detailed data collection, including medical record variables. A limitation is the uncertainty of documentation routines, where information sometimes could be registered in the child's journal, which would be missed in our study. To deal with this problem, we combined journal data with self-report data. Moreover, unclear documentation guidelines could result in the absence of recording high EPDS scores in the mother's journal, particularly when the nurse attributed the high score to other circumstances rather than depressive symptoms. In this study, we have used EPDS <12 as an indication of remission if the participant reported EPDS of 12 or higher in the earlier assessment. This represents a limitation, as the available data are insufficient for assessing genuine clinical remission. Instead, the focus is on the broader application of the

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instrument, with scores of 12 or higher indicative of a high probability of depression. A limitation of the BASIC study is the overrepresentation of women with high education and corresponding low-risk socioeconomical profile, inducing risk of healthy participation bias. However, depression rates are quite high even in groups of higher socioeconomic status, making this study setting relevant [44]. Moreover, assessments from self-report surveys were used, which may lead to some self-report bias [45]. Though, the questionnaires used are validated and frequently used in similar studies, and questionnaire data were combined with medical records data using a pre-specified protocol, thus minimizing recall bias. Another limitation of the study relates to the timing of start of antidepressant use; some women may have had antidepressant use during pregnancy continuing into the postpartum, while some may have started using postpartum; unfortunately, because journals were scanned from around the childbirth timepoint onward, the initiation timepoint is not clear for all. Women with antidepressant use but no recorded health service use or altered medication notification were categorized into the NI group as mentioned in the "Methods" section. We do not, however, believe that this greatly affects the interpretation of results.

This descriptive study indicates that there is room for improvement in the screening procedures for PPD, in order to further increase remission rates during the first months after delivery. In contrast, among identified women, intervention offer, and acceptance was high in this Swedish sample. Screening guidelines should include clear routines for documentation of screening-related variables in patient records, to facilitate improved care pathways and symptom monitoring. Women scoring below but close to EPDS cutoffs might need further evaluations and follow-ups on top of what is offered today. This could help differentiate those with a transient mood change from those at severe risk of a depressive episode and long-term symptoms. Preventive interventions have been shown to be effective and cost-efficient among high-risk individuals; these could be considered for those with sub-clinical depression symptoms. Further investigation of the reasons for low identification and the optimal healthcare setting with greatest potential for an open dialogue on new mothers' mental health is warranted.

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Author contribution. A.S. conceived the idea for the study, acquired funding, and gathered the BASIC study data. K.G. planned and performed the collection of data from medical records, and performed the statistical analyses. E.F. and S.I.I. contributed to the analysis plan and interpretation of the results, together with A.S., L.V., and K.G. K.G. and L.V. drafted the manuscript. All authors discussed the results and contributed to the final manuscript.

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Competing interest. The authors declare that they have no competing interests.

Ethical standard. The study was approved in 2009 by the Regional Ethical Review Board in Uppsala, Sweden (Dnr. 2009/171).

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