	A C P	1 2 6 4	B	Dispatch: 4.9.08	Journal: ACP	CE: Krishna Sarma
	Journal Name	Manuscript No.		Author Received:	No. of pages: 10	PE: Vijay

Acta Psychiatr Scand 2008: 1–10
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DOI: 10.1111/j.1600-0447.2008.01264.x

ACTA PSYCHIATRICA SCANDINAVICA

Prevalence, onset and comorbidity of postpartum anxiety and depressive disorders

Reck C, Struben K, Backenstrass M, Stefenelli U, Reinig K, Fuchs T, Sohn C, Mundt C. Prevalence, onset and comorbidity of postpartum anxiety and depressive disorders.

Objective: The study presents data on the 3-month prevalences of postpartum anxiety disorders (PAD) and postpartum depressive disorders (PDD) and their comorbidity in a German community sample. Associations with sociodemographic variables and previous history of psychopathology were analysed.
Method: Data were gathered in a longitudinal study over the first 3 months postpartum. In a two-stage screening procedure, a population-based representative sample of 1024 postpartum women was assessed for symptoms of anxiety and depression using DSM-IV-based screening instruments.
Results: The estimated rates of DSM-IV disorders were 11.1% for PAD and 6.1% for PDD. Comorbidity was found in 2.1%. The rate for PAD with postpartum onset was 2.2% and for PDD 4.6%. Young mothers and mothers with a low education level had a heightened risk of developing depression following delivery.
Conclusion: Because of the clinical relevance of PAD, controlled studies and specialized programmes for prevention and treatment are urgently required.

C. Reck[1], K. Struben[1], M. Backenstrass[1], U. Stefenelli[2], K. Reinig[1], T. Fuchs[1], C. Sohn[3], C. Mundt[1]

[1]Department of General Psychiatry, University of Heidelberg, Heidelberg, [2]Institute of Statistics, Wurzburg and [3]Gynaecological Clinic, University of Heidelberg, Heidelberg, Germany

Key words: postpartum period; anxiety disorders; depression; epidemiology; women's health

Corinna Reck, Klinik für Allgemeine Psychiatrie, Zentrum für Psychosoziale Medizin, Vossstr. 2, 69115 Heidelberg, Germany.
E-mail: corinna_reck@med.uni-heidelberg.de

Accepted for publication August 15, 2008

Significant outcomes

- The prevalence of postpartum anxiety disorders was 11.1% and the prevalence of postpartum depressive disorders was 6.1%.
- 18.4% of participants with an anxiety disorder ($n = 114$) were also diagnosed as having a depressive disorder and 33.9% of the women suffering from depression ($n = 62$) as having an anxiety disorder.
- Concerning self-report measures, considerably higher rates of anxiety and depressive disorders were found.

Limitations

- The' total' prevalence may be underestimated based on our predominantly middle class sample.
- Participants were more highly educated than non-participants.
- While women were requested to report the onset and history of depression and anxiety prior to delivery, the present assessments were exclusively conducted in the postpartum period and are thus subject to retrospective reporting bias.

Introduction

Postpartum anxiety disorders (PAD) and postpartum depressive disorders (PDD) are the most frequent maternal psychiatric disorders following delivery. The impact of the mother's postpartum depression on early interaction experiences and the long-term development of the child are well-established (1–4). In contrast to the well-studied epidemiology and consequences of postpartum depression on child development, empirical results concerning postpartum anxiety disorders are scarce (5). Matthey et al. (6) found that 16.2% of mothers were diagnosed with a pure anxiety disorder (phobias, panic, acute adjustment disorder with anxiety) 6 weeks postpartum. Furthermore, 82%

of diagnosed phobias were found to have occurred for the very first time in the postpartum period. Miller et al. (7) were able to show in a recent study employing a self-report measure that 10% of women suffered symptoms of anxiety and stress 6 weeks to 6 months postpartum. Applying Diagnostic and Statistical Manual of Mental Disorders (DSM-IV) criteria 8 weeks postpartum, Wenzel et al. (8) revealed a prevalence rate of 8.2% for generalized anxiety disorder.

According to epidemiological studies carried out mainly in the English-speaking world, approximately 10% of pregnant women develop a postpartum depression (9–12). The prevalence rates of postpartum depression have been shown to vary for women from different cultures, according to the assessment method used to obtain diagnoses and the length of postpartum period under evaluation. Socially disadvantaged populations tend to have notably higher postpartum depression prevalence rates than wealthy western industrial nations (13, 14).

Very few studies have employed DSM-IV-criteria in diagnosing postpartum depression and anxiety disorders. There are only two studies (6, 8) reporting comorbidity rates of anxiety and depressive disorders with postpartum onset according to DSM-IV criteria. In his two study samples, Matthey et al. (6) documented rates of comorbid depression and anxiety of 4.2% and 2.1%. Wenzel et al. (8) found rates of 1.4% for comorbid generalized anxiety disorder and 0.7% for depression. In summary, it should be underscored that only very scarce data concerning the comorbidity of postpartum depression and anxiety disorders are available. Despite the high health risks for both mother and child associated with postpartum disorders, valid data on the epidemiology of PDD remain scarce in Germany (15, 16) and findings with respect to PAD are completely lacking (17).

Aims of the study

The aims of the study were: i) to determine the 'total' prevalence of PAD and PDD according to DSM-IV-criteria (including PAD and PDD with onset prior to delivery), ii) rates of PAD and PDD with onset in the 3-month postpartum period (including recurrent and first time onset of PAD and PDD), iii) the comorbidity of PAD and PDD during the first 3 months following delivery. Secondary parameters were analysed in accordance with the primary target parameters: iv) the impact of previous disorder history on the prevalences of PAD and PDD, and v) correlations of sociodemographic variables with prevalence rates of PAD and PDD.

Material and methods

Study sample

The study was carried out in south Germany in two middle-sized towns and their surroundings. The total sample in this study consisted of female inpatients of six maternity hospitals in Heidelberg and Darmstadt who gave birth between December 2003 and February 2005. The sample was mainly middle class. Exclusion criteria for participation in the study included poor command of the spoken and written German language. A total of 1464 German-speaking mothers were asked to participate in the study, of which 1024 (70%) consented. The participation rate of 70% is acceptable and comparable with rates reported in other studies (6, 15).

Measures

All participants completed a demographic information sheet covering sociodemographic data such as age, number of children and education level (Table 1).

Screening for anxiety disorders was performed using two different screening instruments. The *Anxiety-SCID-Screening* (18) was used as a telephone screening and the *Anxiety Screening Questionnaire* (ASQ-15) (19) in the context of a questionnaire survey.

The Anxiety-SCID-Screening is taken from the structured clinical interview for DSM-IV, axis I disorders (SCID-I) (18). It contains five screening questions covering the diagnostic categories: panic disorder, agoraphobia, social phobia, specific phobia and generalized anxiety disorder. A 'critical score' resulted from positive screening in one of the five anxiety disorder categories.

Table 1. Sociodemographic characteristics of the participants and comparison of participants with SCID (n = 333 with screening positive + n = 171 with screening negative) vs. participants without SCID (n = 520 with screening negative)

Sociodemographic characteristics	Participants (n = 1024)	Without SCID	With SCID	*U*-Test (SCID/no SCID)
Mean age (years)	33 ± 5	33 ± 5	33 ± 5	P = 0.73, z = 0.35
Age range (years)	15–45	15–45	18–45	
Educational level (%)				
Lower level secondary school leaving certificate	6	6	7	P = 0.18, z = −0.38
Higher level secondary school leaving certificate	30	28	31	
Vocational A levels	4	5	4	
A levels	14	12	16	
University degree	46	49	43	
Mean number of children	2 ± 0.7	2 ± 0.8	2 ± 0.7	P = 0.73, z = −0.35

SCID, structured clinical interview for DSM-IV.

The ASQ-15 is a self-report instrument which comprises 15 items and serves as a syndromatic screening tool for current anxiety and generalized anxiety disorders. Women with critical screening scores in one of the diagnostic categories, panic disorder, agoraphobia, social phobia, specific phobia or generalized anxiety disorder, were subsequently interviewed using the SCID and DSM-IV criteria. The ASQ has been validated in terms of its concordance with DSM-IV diagnosis. The sensitivity of the ASQ-15 ranges according to diagnosis group from 0.88 to 0.95 and its specificity from 0.51 to 0.96.

Screening for depression was carried out using the *Patient Health Questionnaire-Depression* (-D) (20) and the *Edinburgh Postnatal Depression Scale* (EPDS) (21, 22). A German version of the short form of the -D translated by Loewe et al. (23) was used to screen for major and minor depression according to DSM-IV criteria (24). The -D comprises nine items. Responses are to be made with reference to the past 14 days. Each of the items in the depression module represents one of the nine DSM-IV criteria for major depression. 'Critical scores' for minor and major depression are based on DSM-IV criteria (25).

The EPDS is an internationally well-established and validated 10-item instrument for the screening of postpartal depression (21, 22). This self-rating scale assesses mental state during the previous 7 days. According to the German EPDS validation study conducted by Bergant et al. (22), a cut-off value of 10 or more indicates the presence of a minor and 13 or more the presence of a major depressive disorder. In this study, women obtained a 'critical score' given an EPDS score of 10 or more.

Participants who reached a 'critical score' in one of the four described screening instruments were additionally interviewed in a second stage using the SCID-I (18). The SCID is a semistructured, economical, efficient and reliable instrument for the measurement and diagnosis of selected axis I mental syndromes and disorders according to the criteria of the DSM-IV (25).

As the diagnosis of generalized anxiety disorder requires a minimum symptom duration of 6 months, it is impossible for a *de novo* onset of generalized anxiety disorder to occur in the postpartum period. For this reason, women meeting the criteria for generalized anxiety disorder in the 3-month postpartum period with a minimum symptom duration of 2 weeks within the last 4 weeks were diagnosed as having acute adjustment disorder with anxiety (AADA) (6). Additional 'postpartum onset' was diagnosed when the disorder emerged within the first 12 weeks following delivery. The full mood and anxiety module including the assessment of previous history of psychiatric disorders was applied. Obtained results for obsessive–compulsive disorders (OCD) are not presented in this study because of the fact that common anxiety screening tools do not cover OCD symptoms. Therefore, an additional and specific OCD screening instrument would have been required in the screening stage and this in turn would have exceeded the scope of our study.

The research assistants who administered the screening instruments and conducted the DSM-IV-interview had received training to ensure reliability. Continuous checks were made throughout the study for the purpose of ensuring that reliability was maintained.

Procedure

Contact was initially made with the mothers 1 day after delivery in the respective maternity hospitals ($n = 1464$, see Fig. 1). The women were informed about the Mother–Child Project and were provided with informational material and the first set of questionnaires (including a written consent form)

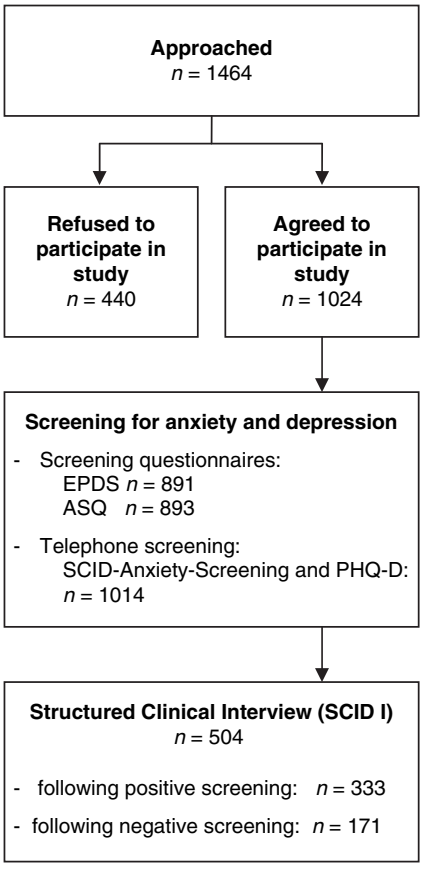

Fig. 1. Flowchart depicting sample recruitment, screening and procedures.

given their interest in study participation. Study research assistants noted the telephone number and child's date of birth of those women who consented to being re-contacted by telephone 14 days postpartum. As agreed, women were contacted by telephone 14 days postpartum and asked to decide whether they wanted to take part in the study (n = 1024). In the case of a positive decision, the -D and Anxiety-SCID-Screening were conducted with the mothers for the first time. Two weeks postpartum, the women were additionally asked to complete the questionnaire set that had been distributed in the maternity hospital and which included a written consent form, the EPDS and the ASQ-15. These were to be returned by post using the stamped addressed envelope provided. Mothers were further sent a questionnaire set which included the EPDS and the ASQ-15 and which was to be completed and returned 6 weeks postpartum. A stamped addressed envelope was again enclosed. EPDS measurement occasions were selected according to the following considerations: '2 weeks postpartum' was selected with the aim of avoiding a temporal overlap and potential confounding with the occurrence of maternal blues. 'Six weeks postpartum' was selected in line with the definition of postpartum depression, according to which symptom onset occurs 4–8 weeks after delivery (21, 25).

Telephone screening (Anxiety-SCID-Screening and -D) was conducted with participating women on six measurement occasions: 2, 4, 6, 8, 10 and 12 weeks after delivery (see Fig. 2, n = 1014, 10 women were not obtainable, but sent back the questionnaires, therefore they have been included in the sample). Temporal deviations of plus 4 days for the first telephone screening and plus or minus 4 days for the remaining telephone screenings were tolerated for organizational reasons (e.g. poor obtainability of the participants). The SCID was additionally performed given the occurrence of clinically relevant symptoms ('critical score') in the course of screening at any one of the six measurement occasions.

The fortnightly telephone screenings with the -D (20) and the Anxiety-SCID-Screening were conducted in addition to the EPDS (21, 22) (n = 891) and ASQ-15 (19) (n = 893) questionnaire surveys at 2 and 6 weeks postpartum in light of our goal to promptly assess the occurrence of depressive symptoms or anxiety. This procedure enabled the direct arrangement of an appointment for the performance of a more extensive clinical interview (SCID-I) (18) in the case of critical screening scores. The SCID was conducted within the 12-week period of study (n = 333, additionally n = 171 mothers without positive screening completed a SCID as control for false-negative screening results). Anyhow, if a SCID diagnosis was made (PAD or PDD), the screening procedure was continued up to 12 weeks postpartum just like for mothers without a critical screening scores. This was done to cover for cases in which an additional disorder would occur (diagnosis of depression after a diagnosis of anxiety disorder or the other way round; with these mothers a second SCID would have been conducted, but in our study all cases of comorbitiy were diagnosed contemporaneously).

The study protocol was approved by the independent ethics committee of the University Medical Faculty, Heidelberg. Patient confidentiality was in no way breached. Written informed consent was obtained 2 weeks postpartum following a detailed explanation of study procedures.

Statistical analyses

Prevalence rates were calculated using simple percentages. For the evaluation of confidence intervals, a global and two-sided decision error first type of $\alpha = 0.05$ was selected for five major confirmative comparisons, i.e. postpartum preva-

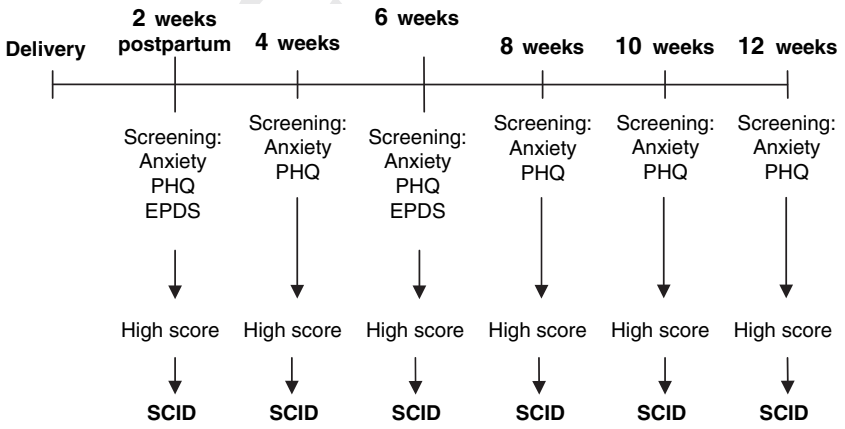

Fig. 2. Flowchart of screening occasions for postpartum anxiety and depressive symptoms. Mothers with a positive screening completed a SCID. Afterwards the screening procedure was continued just like for mothers without a critical screening score. A second SCID would have been undertaken in case of mothers with positive screening results for depressive disorders additionally developing anxiety disorders and the other way round, but this did not occur during our study.

lence (first parameter) and onset rates (second) of anxiety, prevalence (third) and onset of depression (fourth) and their comorbidity (fifth parameter)[1].

Odds ratios with confidence intervals were calculated as risk measures to determine the impact of previous anxiety and depression on disorders in the postpartum period and disorders with postpartum onset. The effect of covariates such as age, education or number of children was also estimated using odds ratios with one (e.g. age) group as reference level (26). An interaction effect of the parameters age and education was analysed using a logistic regression model. To compare participants and refusers, participants and drop-outs as well as participants with and without SCID with respect to sociodemographic characteristics, Mann–Whitney tests were conducted. These statistical analyses were performed using SPSS 11.5 and R in version 12.2.1 (26).

Results

Differences between refusers and participants

Participants had a mean age of 33 years (SD = 5, n = 899) (Table 1). Analyses comparing participants and those refusing to participate showed that participants were on average 3 years older [age of refusers: 30 ± 7 (n = 383) years, $P < 0.001$, $z = -6.52$, Mann–Whitney test, two-sided] and that they were more highly educated [64% of participants (n = 845) with higher education vs. 44% (n = 374) of non-participants, $P < 0.001$, $z = -10.55$, Mann–Whitney test, two-sided]. There were, however, no differences with respect to the number of children [an average of two in both groups (n = 905 and 385 respectively), $P < 0.15$, $z = -0.15$, Mann–Whitney test, two-sided].

Prevalences

Prevalence of postpartum scid-anxiety disorders. Table 2 presents the number of patients meeting criteria for the diagnosis of an anxiety disorder. Prevalence rates include only those women who received a positive SCID diagnosis (anxiety or depression) at the second stage of measurement. Because of the small number of cases in each diagnostic category, we combined the clinically relevant subgroups i) 'panic disorder/agoraphobia' which included panic disorder, panic disorder with agoraphobia and agoraphobia, ii) 'AADA' and iii) 'specific and social phobias' to form single categories.

The rate of anxiety disorders across the entire group of women during the first three postpartum months was 11.1% (n = 114). The rate of anxiety disorders with postpartum onset was 2.2% (n = 23), 82.6% (n = 19) of which had a first onset of anxiety disorders (1.9%, 95% CI 1.1–2.9, n = 19 of 1024). With regard to the subgroup of specific and social phobias, we found a prevalence of 8.1% (95% CI 6.5–10.0) (n = 83) and a rate of 0.3 % (95% CI 0.1–0.9) (n = 3) for postpartum onset.

Regarding the subgroup 'panic disorder/agoraphobia', a prevalence rate of 1.8% (n = 18) was found and 0.4% (n = 4) for 'panic disorder/agoraphobia' with postpartum onset. A prevalence rate of 2.3% (n = 24) was found for AADA and 1.5% (n = 15) for AADA with postpartum onset.

Prevalence of postpartum SCID -depressive disorders. The 'total' prevalence of depressive disorders (including PDD with onset prior to delivery) (Table 2) in the entire group of women during the first 3 months postpartum was 6.1% (n = 62). The rate of depressive disorders with postpartum onset was 4.6% (n = 47). Regarding major depression, a prevalence rate of 2.9% (n = 30) was found. A rate of 2.3% (n = 24) was observed for major depression with postpartum onset, 46% of which had a first onset and no previous history of depressive disorders (1.1%, 95% CI 0.5–1.9, n = 11 of 1024). The prevalence rate of minor depression was 2.9% (n = 30) and 2.2% (n = 23) for minor depression with postpartum onset – all of which lacked a history of depression. For dysthymia, a rate of 0.5% (n = 5) was revealed.

10.4% of the women reported a positive history of depressive disorders (n = 107). Ninety-one of these had a history of depression without current symptoms (85.0%, 95% CI 76.9–91.2) and the remaining 16 also had a depression at the time of measurement (15.0%, 95% CI 8.8–23.1). All 16 recurrent sufferers had a major depression.

Comorbidities of SCID-postpartum depressive and anxiety disorders

An analysis of the frequency of comorbid occurrence of PAD und PDD revealed a comorbidity rate of 2.1% (n = 21). 18.4% of

[1]As a total of five estimators were regarded as primary, the global α was adjusted according to Bonferroni's method resulting in a comparison-wise level of decision error of $\alpha = 0.01$ (26). Two-sided $1 - \alpha/5 = 0.99 = 99$ % confidences were thus calculated for these five primary coefficients. All other coefficients and tests are provided with 95% confidence intervals for descriptive purposes only. All two-sided confidence intervals were calculated for the single proportion.

Table 2. Prevalences and confidence intervals of depressive and anxiety disorders (total prevalence, prevalence of disorder with postpartum onset and prevalence of previous disorder in patient history)

	Anxiety disorders	Depressive disorders
	Anxiety disorder	Depression SCID (minor or major depression, dysthymia)
Total prevalence	**11.1 (8.7–13.6)***	**6.1 (4.3–8.2)***
Postpartum onset	**2.2 (1.2–3.7)***	**4.6 (3.1–6.6)***
Previous occurrence of disorder	3.5 (2.5–4.8)	10.4 (8.6–12.5)
	Panic disorder, agoraphobia, panic and agoraphobia	Major depression SCID
Total prevalence	1.8 (1.0–2.5)	2.9 (2.0–4.2)
Postpartum onset	0.4 (0.1–1.0)	2.3 (1.5–3.5)
Previous occurrence of disorder	2.2 (1.4–3.1)	6.3 (4.8–7.9)
	Specific and social phobia	Minor depression SCID
Total prevalence	8.1 (6.5–10.0)	2.9 (2.0–4.2)
Postpartum onset	0.3 (0.1–0.9)	2.2 (1.4–3.4)
Previous occurrence of disorder	1.3 (0.7–2.2)	3.4 (2.4–4.7)
	Acute adjustment disorder with anxiety[1]	Dysthymia
Prevalence	2.3 (1.5–3.5)	0.5 (0.2–1.1)
Postpartum onset	1.5 (0.8–2.4)	–
Previous occurrence of disorder	0.1 (0.0–0.5)	0.1 (0.0–0.5)

Target parameters are printed in bold, n = 1024 (n = 504 with SCID, n = 520 without SCID due to negative screening results).

participants with an anxiety disorder (n = 114) were also diagnosed with a depressive disorder and 33.9% of the women suffering from depression (n = 62) also had an anxiety disorder. One hundred and fifty-five women had an anxiety disorder or a depression or both (15.1%, 95% CI 13.0–17.5).

Impact of previous SCID-depressive and anxiety disorders

11.1% (95% CI 3.1–26.1, n = 4 of 36) of the women who had previously suffered from an anxiety disorder developed an anxiety disorder with postpartum onset. 12.1% (95% CI 6.6–19.9, n = 13 of 107) of women reporting a previous depressive episode developed a depression with postpartum onset. Using odds ratios, an increased risk for depressive and anxiety disorders with postpartum onset was found for those mothers with a history of depressive or anxiety disorders (Table 3).

Screening results

With regard to the screening of anxiety symptoms, 28.6% (95% CI 25.9–32.5) of the 1024 women showed symptoms of anxiety in the Anxiety-SCID-Screening carried out at weeks 4–12. Eight hundred and ninety-three women completed an ASQ-15 at weeks 2 or 6, 32.5% of which proved critical (95% CI 29.4–35.7). In total, anxiety symptoms were revealed for 42.9% (95% CI 39.8–46.0) of participating women using either the SCID-Screening or the ASQ-15.

An analysis of available data rates based on depression screening measures revealed that the data of 1014 women were available for the -D and of 891 for the EPDS. According to the -D (weeks 2–12), 9% (95% CI 7.3–10.9) of participating women screened positive for a major or minor depressive disorder. The rate of women with depressive symptoms according to EPDS (week 2 or 6) was 23.6% (95% CI 20.8–26.5). Altogether, critical depression scores

Table 3. Risk of developing a disorder with postpartum onset given previous history of disorder assessed using the SCID, n = 1024 (n = 504 with SCID, n = 520 without SCID due to negative screening results)

Previous occurrence of disorder	Postpartum onset (recurrent and first time onset)	Odds ratio (95% CI)	Evaluation of relative risk
Anxiety	Anxiety	6.35 (1.49–20.68)	Increased
	Depression	3.62 (1.05–10.08)	Increased
Depression	Anxiety	2.45 (0.69–7.02)	Unchanged
	Depression	3.58 (1.68–7.27)	Increased
Depression or anxiety	Anxiety	3.80 (1.37–9.78)	Increased
	Depression	3.86 (1.91–7.54)	Increased

emerged for 25% (95% CI 22.4–27.8) of the women according to either the -D or EPDS.

20.4% (95% CI 17.7–23.2) of women in this study reached the cut-off for a minor depression (>9) 2 weeks postpartum and 15.8% (95% CI 12.8–19.1) 6 weeks postpartum. 9.9% (95% CI 8.0–12.1) of the women had a major depression (>12) 2 weeks postpartum and 8.7% (95% CI 6.5–11.4) 6 weeks postpartum.

Regarding the number of positively screened women in the -D and EPDS, as well as in the Anxiety-SCID-Screening and the ASQ-15, prevalence rates proved persistent across measurement occassions without eminent deviations at the upper and lower ends.

Sociodemographic correlates

Sociodemographic correlate analyses were conducted based on total prevalences. There was no effect of number of children (one vs. more than one) on anxiety or depression disorders (in both cases odds ratio = 1.0, 95% CI 0.6–1.7), nor of child's gender (in both cases odds ratio = 1.0, 95% CI 0.6–1.6). The risk of suffering from anxiety disorders following delivery was not affected by the mother's age or education.

Two major factors were discovered which significantly impacted the risk of developing a postpartum depression: age and education of the mother. While young mothers (< 25 years) had a heightened risk of developing depression following the birth of their child (odds ratio = 3.7, 95% CI 1.8–7.5), mothers above 35 years had a decreased risk (odds ratio = 0.5, 95% CI: 0.3–1.0). Ages ranged between 15 and 45 years. There were no exclusion criteria relating to the age of the mother. Furthermore, mothers with a low education level (lower secondary school leaving certificate) had an increased risk of developing depression (odds ratio = 2.3, 95% CI 1–5) whereas mothers with a university degree were less at risk (odds ratio = 0.5, 95% CI 0.3–0.9).

Using the EPDS and a cut-off score of 13 or more, we were able to confirm the influence of age on the development of depressive symptoms (chi-squared test, $P < 0.01$, $df = 2$, $\chi^2 = 11.55$). Younger women (below the age of 25) were significantly more likely to obtain an EPDS score or 13 or more. The influence of education was, however, not confirmed (chi-squared test, $P = 0.13$, $df = 4$, $\chi^2 = 7.19$).

Drop-out analyses

By week 12, the attrition rate was 9.9%. With respect to screening measures (EPDS, ASQ-15) and sociodemographic variables (age, education, number of children), no differences were found between drop-outs ($n = 101$) after week 12 and those continuing in the study ($n = 923$) (Mann–Whitney test, two-sided, $P > 0.05$ in each case, $-1.09 < z < -0.04$).

Representativeness of the SCID-sample

SCID results were obtained for 504 subjects. Of these 504 women, 171 subjects had negative screening results (PHQ, EPDS, ASQ-15 and SCID-Screening) and were randomly selected to take part in the clinical interview with the aim of controlling for possible estimation errors in terms of 'false negatives' – i.e. participants fulfilling criteria for depression or anxiety who were not identified in the screening process. Seven individuals were tested positive by the SCID despite having been screened negative for depression (seven false negatives of 766 screened negative = 0.9%, 95% CI 0.4–1.9) corresponding to a false-negative rate of 0.9%. Four individuals obtained a positive anxiety SCID result despite having been screened negative for anxiety (four false negatives of 585 negatively screened anxiety cases = 0.7%, 95% CI 0.2–1.7). Furthermore, SCID subjects ($n = 504$) did not differ from non-SCID subjects ($n = 520$) in demographical parameters (age, education and number of children) (Mann–Whitney test, $P > 0.5$ in each case, $-0.38 < z < 0.35$) (Table 1).

Discussion

These findings provide new insights concerning the prevalences of postpartum anxiety disorders and depression as well as their comorbidity in Germany and how these prevalences compare with those found in studies of different countries. The Heidelberg Postpartum Study aimed to examine the prevalences of PAD and PDD as well as their comorbidity based on DSM-IV-criteria within the first 3 months following birth. The influence of previous disorder histories and sociodemographic correlates on the risk of developing a PAD or PDD was further evaluated. This study represents the first investigation of the prevalence of postpartum anxiety disorders in a German community sample of women. The results further provide new data on the comorbidity of PDD and PAD.

The prevalence of PAD (acute adjustment disorder with anxiety, all phobias and panic disorder) in this study was 11.1%, with the specific phobias constituting 8.1%. This rate corresponds with the findings of other studies (5, 7, 8).

Regarding women with a disorder-onset following delivery (including recurrent and first time onset of PAD), a rate of 2.2% was observed. Concerning self-report measures (ASQ-15) completed at weeks 2 or 6, a considerably higher rate of anxiety symptoms (32.5%) was found. In line with the findings for depressive disorders, rates of anxiety disorders closely correspond to those reported for the general population.

The prevalence of PDD (minor and major depression) in the German predominantly middle class sample was 6.1%. Taking into consideration studies which have used DSM-IV-criteria, the rate found in this study is comparable with some reported results (21, 22, 27). With respect to those women with a disorder-onset after delivery, this study revealed a PDD rate of 4.6%, which is in line with rates obtained in other studies (15, 23).

Concerning the frequency of depression in Germany, it is remarkable that the prevalence found in this study is comparable with the rate of 5.6% reported for a subgroup of women between the ages of 14 and 35 years (28).

Regarding clinical cases of EPDS-scores 6 weeks postpartum, 15.8% of the women had a cut-off value above 9 and 8.7% a cut-off value above 12. In conclusion, the prevalence results based on the EPDS are, when applying the same cut-off value at the same measurement occasion, very similar to those found in economically developed western nations. These are, however, lower than prevalences found in less economically developed countries such as India (29) or Turkey (13). Different results were obtained using different measures of depression. We found higher prevalences for self-reported symptoms (ASQ-15 and EPDS) than in the clinical interview (DSM-IV, SKID). It is possible that categorical diagnosis (DSM-IV) may fail to describe the acute clinical syndromes of postpartum depression and anxiety disorder. Dimensional models might be preferable. The findings of Ramchandani et al. (30) present one argument in support of the clinical relevance of dimensional models. Ramchandani et al. (30) showed that depression diagnosed using the EPDS (cut-off value above 12) also had a significant effect on the child's development. Using the same cut-off value and carrying out testing at the same measurement occasion, we obtained a prevalence rate of 8.7% for postpartum depression. If we are to understand Ramchandani et al.'s (30) results as an indication that subsyndromal postpartal depressive disorders can have a detrimental effect on childhood development, then according to our results, 8.7% of children are at risk of developmentally suffering under the depressive mood of their mothers.

Regarding the comorbidity rate of PAD and PDD, these findings are in accordance with other studies in postpartum research (6, 8). Concerning the impact of previous anxiety and depressive disorders on the onset of these disorders following delivery, the results show a heightened risk of developing postpartum anxiety disorders and depression in the case of a previous history (6, 11).

Younger mothers were found to be especially exposed to a heightened risk of postpartum depression. The increased risk associated with this particular group could be explained by the poor compatibility of pursuing a career and raising children with which women in Germany continue to be faced.

During the last few years, a number of studies have examined preventive programmes for postpartum depression (31–34). In contrast, only few studies exist focusing on appropriate preventive interventions for postpartum anxiety disorders (35, 36). The prevalence rates of postpartum anxiety disorders presented in this study indicate that the development of appropriate screening instruments for anxiety disorders in the perinatal period is vitally important to preventive medicine. The implementation of a screening instrument routinely applied for postpartum anxiety disorders seems necessary to initiate preventive measures for sufferers and facilitate an untroubled postpartum period and healthy development of their children.

The strength of this study is to be found in its longitudinal design with multiple fortnightly measurement occasions. This enabled an accurate determination of the onset of a postpartum disorder within the first 3 months following delivery. The study further applied both DSM-IV criteria and common screening tools such as the EPDS for the diagnosis of disorders; differences in prevalence rates resulting from the assessment method used were thus identifiable.

Several limitations of the study should also be considered. First, based on our predominantly middle class low-risk sample, the 'total' prevalence may be underestimated. The influence of education level on rates of refusal underscore the bias in the sample selection and the associated risk of prevalence-underestimation; participants were more highly educated than non-participants (64% vs. 44% higher education). While women were requested to report the onset and history of depression and anxiety prior to delivery, the present assessments were exclusively conducted in the postpartum period and are thus subject to retrospective reporting bias. It should also be noted that it was not possible for us to screen all women who gave birth in the number of women

screened positive in the respective maternity hospitals and that those women who did not give birth in a clinic were automatically excluded.

With regard to the repeated application of the screening tools over a relatively short period of time, it must be critically discussed whether this procedure might bias results. It is conceivable that the mothers under investigation felt that they were 'in safe hands' and supported by the regular contact to the investigator, and that this may have lead to a reduction in symptoms (strengthening effect) and in turn an underestimation of prevalence rates. On the other hand, the repetitive completion of questionnaires may have resulted in a loss of concentration (weakening effect). Nonetheless, given the lack of systematic changes using the PHQ and EPDS as well as the Anxiety-SCID-Screening and ASQ-15 across measurement occasions, the applied study procedure appears to be methodologically justified and for the most part insensitive to such disturbances. With respect to statistical analyses, the broad confidence intervals arising from the small sample sizes (e.g. comorbidity tables) should also be critically noted. Furthermore, many exploratory results carry the consequence of an α-inflation caused by multiple testing.

Controlled studies comparing the prevalence of postpartum anxiety disorders and their comorbidity with depressive disorders between postpartum and non-postpartum women are urgently required. Clinicians should be aware that anxiety and depression represent serious health care problems in the first few weeks postpartum and that appropriate preventive programmes are required which commence in the early postpartum period.

Acknowledgements

The authors thank the women who participated in the study and the staff with the maternity clinics in Heidelberg (St. Josef's Hospital, Saint Elisabeth's Hospital, Salem Hospital and the Gynaecological Clinic at the University of Heidelberg) and in Darmstadt (Alice-Hospital and Darmstadt Hospital). The authors also thank Eva Stehle, Dipl.-Biol. and Dipl.-Psych. Dawn Girlich for their help in manuscript preparation. The Postpartum Prevalence Study was supported by a grant from the Program of Research Support at the University Medical Faculty, Heidelberg (funding period: 2003–2004).

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