

Risks and Predictors of Readmission for a Mental Disorder During the Postpartum Period

Trine Munk-Olsen, PhD; Thomas Munk Laursen, PhD; Tamar Mendelson, PhD; Carsten B. Pedersen, MSc; Ole Mors, MD, PhD; Preben Bo Mortensen, MD, DMSc

Context: It has been suggested that the risk of inpatient psychiatric readmissions is elevated during the postpartum period. To our knowledge, no prior study has compared mothers and nonmothers to determine whether the risk of readmission differs between these 2 groups of women.

Objectives: To compare mothers and nonmothers to assess whether childbirth increases the risk for psychiatric readmission and to identify predictors of psychiatric readmission during the postpartum period.

Design: A population-based cohort study merging data from the Danish Civil Registration System and the Danish Psychiatric Central Register.

Setting: The population of Denmark.

Participants: Two partly overlapping study populations included a total of 28 124 women, 10 218 of whom were mothers, who were followed up from January 1, 1973, through June 30, 2005.

Main Outcome Measure: Readmission rates to psychiatric hospitals during the 12 months after childbirth (first live-born child).

Results: The period of highest risk of psychiatric readmission in new mothers was 10 to 19 days post partum (relative risk [RR], 2.71; 95% confidence interval [CI], 1.68-4.37), and the period of lowest risk was during pregnancy (0.54; 0.43-0.69). Childbirth was associated with an increased risk of readmission during the first postpartum month, after which risk for readmission was higher among nonmothers (RR, 1.53; 95% CI, 1.31-1.80). A previous diagnosis of bipolar affective disorder was the strongest predictor of readmissions 10 to 19 days post partum (RR, 37.22; 95% CI, 13.58-102.04). In all, 26.9% of mothers with this diagnosis were readmitted within the first postpartum year.

Conclusions: Mothers with mental disorders have lower readmission rates compared with women with mental disorders who do not have children. However, the first month after childbirth is associated with increased risk of psychiatric readmission, and women with a history of bipolar affective disorder are at particular risk of postpartum psychiatric readmissions.

Arch Gen Psychiatry. 2009;66(2):189-195

Author Affiliations: National Centre for Register-Based Research, University of Aarhus, Aarhus, Denmark (Drs Munk-Olsen, Laursen, Mortensen and Mr Pedersen); Department of Mental Health, Johns Hopkins Bloomberg School of Public Health, Baltimore, Maryland (Dr Mendelson); and Centre for Psychiatric Research, Psychiatric Hospital in Aarhus, Aarhus University Hospital, Risskov, Denmark (Dr Mors).

WOMEN WITH POSTPARTUM mental disorders constitute the following 2 groups: those for whom postpartum mental disorder represents a first psychiatric episode and those who have a history of mental disorder and experience a recurrence or relapse during the postpartum period. The prevalence of incident admissions among new mothers is 0.1% at up to 4 months post partum.¹ In comparison, data suggest that the risk of admission owing to recurrence of a mental disorder during the postpartum period may be more pronounced.² For instance, it has been suggested that episodes of puerperal psychosis follow 25.9% of de-

liveries among women with bipolar I disorder or schizoaffective disorder of the bipolar type.³ The risk of recurrence during the postpartum period is particularly elevated for women who experience their first mental disorder during pregnancy⁴ or who have a history of bipolar affective disorder^{5,6} or unipolar affective disorder.⁷ Whether the increase in readmissions post partum is a result of a generally elevated recurrence rate among women with a history of mental disorder^{8,9} or is a risk specifically associated with childbirth has not yet been investigated.^{7,10,11}

In a previous study,¹ we demonstrated that the incidence of psychiatric admissions differs in mothers and nonmothers. However, to our knowledge, no study has

investigated the risk of readmission for women with pre-existing mental disorders by comparing mothers with non-mothers. Therefore, the aims of our study were to investigate whether childbirth increases the risk of perinatal psychiatric readmission in a population of women with preexisting mental illness and to identify predictors of psychiatric readmission during the postpartum period.

METHODS

BACKGROUND POPULATION

This study used data from the Danish Civil Registration System (CRS).¹² Each Danish citizen is assigned a CRS number, which serves as a personal identifier in all national registers, enabling accurate linkage within and between registers (eg, linking parents with children). The CRS register includes many types of information, including sex, date of birth, and data on family members and partners. Data in the register, such as the date of death and migration status, are continuously updated. Women born in Denmark between January 1, 1955, and July 1, 1990, who were alive on their 15th birthday and who had at least 1 psychiatric admission during the study period from January 1, 1973, through June 30, 2005, constituted the study population.

ASSESSMENT OF MENTAL DISORDERS IN COHORT MEMBERS

The CRS data on the study population were linked with the Danish Psychiatric Central Register,¹³ which was computerized in 1969. The Danish Psychiatric Central Register contains data on all admissions to Danish psychiatric inpatient facilities and currently includes data on approximately 600 000 persons and 1.6 million admissions. There are no private psychiatric inpatient facilities in Denmark, ensuring that all admissions are represented in the register. From 1969 to 1993, the diagnostic system used was the Danish adaptation of the *International Classification of Diseases, Eighth Revision (ICD-8)*,¹⁴ and from 1994, the *International Statistical Classification of Diseases, 10th Revision (ICD-10)*.¹⁵ Only inpatient stays were included in the present study.

Members of the cohort were categorized as having a mental disorder if they had been admitted to a psychiatric hospital. Diagnoses were grouped as follows: bipolar affective disorders (*ICD-8* codes 296.19, 296.39, and 298.19 and *ICD-10* codes F30, F31, F34.0, and F38.0), schizophrenialike disorders (*ICD-8* codes 295.xx, 297.xx, 298.39, and 301.83 and *ICD-10* codes F20, F21, F22, F23, F24, F25, F28, and F29), unipolar depressive disorders (*ICD-8* codes 296.09, 296.29, 296.99, 298.09, 300.1x, and 300.49 and *ICD-10* codes F32, F33, F34.1, F38.8, and F39), personality disorders (*ICD-8* code 301 [but not 301.83] and *ICD-10* codes F60 and F61), substance use disorders (*ICD-8* codes 291, 294.30, 294.38, 303, 304, and 980.09 and *ICD-10* code F1), adjustment disorders (*ICD-8* codes 308.4 and 307 and *ICD-10* code F43), eating disorders (*ICD-8* code 306.5 and *ICD-10* code F5), and other disorders (remaining diagnoses). Analyses were performed for all mental disorder diagnoses combined and for these categorized disorders.

READMISSIONS

Readmission to a psychiatric hospital was defined to include all psychiatric readmissions regardless of whether the same diagnosis had been given previously. Readmissions included patients who had a recurrence (a new psychiatric episode after a

period of remission) or a relapse (worsening of symptoms without a remission period). Two admissions with less than a 14-day interval were treated as a single admission.

GROUP 1

To investigate whether childbirth is a risk factor for readmission in new mothers with mental disorders predating childbirth, we selected all women who had been admitted once to a psychiatric hospital (group 1; n=28 124). The outcome of interest in analyses using group 1 was the second admission to a psychiatric hospital (first readmission). To allow comparison of mothers with nonmothers, which is essential in assessing whether childbirth is a risk factor for readmission, we tracked readmissions for mothers and nonmothers, treating childbirth as a time-dependent variable. We followed up women from the date of discharge after the first admission to a psychiatric hospital, from the 15th birthday, or from January 1, 1973, whichever came last, until 12 months post partum, the date of the first readmission, the date of death, the birth of a second child, the birth of a child outside Denmark, the death of a child, or July 31, 2005, whichever came first. Information on diagnosis, age, and length of hospital stay at first admission was collected at the time of the first admission (time-independent covariates). The following variables were time-dependent covariates in the analyses: age (1-year groups), calendar period (1-year groups), and the birth of the child (no children, pregnant, and 0-9, 10-19, 20-29, 30-59, 60-179, and 180-360 days post partum).

The study was designed as a cohort study, and data were analyzed in a survival analysis using log-linear Poisson regression¹⁶ with the use of commercially available software (SAS GENMOD, version 9.1 procedures; SAS Institute Inc, Cary, North Carolina). This method approximates a Cox regression.^{16,17} All relative risks (RRs) were adjusted for calendar period (1-year groups), age at a previous admission, and time since the previous admission.¹⁸

GROUP 2

Group 2 was created to assess predictors of readmissions to a psychiatric hospital during the postpartum period. Mothers with 1 or more psychiatric admissions that predated the birth of their first live-born child were selected (n=10 218). In analyses using group 2, the outcome of interest was psychiatric readmission after childbirth, regardless of the number of previous admissions. The study cohort was followed up beginning on the day of childbirth (first live-born child, singletons only), on the 15th birthday, or on January 1, 1973, whichever came last. This period ended 12 months post partum, on the date of the first readmission, on the birth of a second child, on the birth of a child outside Denmark, on the death of the first child, or on July 31, 2005, whichever came first. Using this time frame enables us to estimate the number of previous admissions and, consequently, whether the number of previous admissions predicts readmission post partum.

The outcome of interest was readmission 0 to 12 months after childbirth. The following set of time-independent covariates was assessed as of the date of childbirth: the number of previous admissions, diagnoses and time since the last admission, and admission of a first-degree relative or the father of the child to a psychiatric hospital before childbirth. The calendar period (1-year groups) was treated as a time-dependent variable. Data were analyzed in a manner similar to the data for group 1.

The study was approved by the Danish Data Protection Agency, Copenhagen, Denmark.

RESULTS

GROUP 1

During the 1973-2005 study period, a total of 28 124 women had 1 previous admission for a mental disorder and were at risk of a first readmission. During the follow-up period, 6828 of those women gave birth, and a total of 314 women with 1 psychiatric admission before childbirth were readmitted to a psychiatric hospital within the first 12 months after giving birth to their first live-born child (first readmission). In comparison, 21 296 women did not give birth, and 10 455 of those had their first readmission during the study period.

Table 1 shows the risk of psychiatric readmission, which varied significantly with the time since birth. Because of differences in the rates of mental disorders in mothers and nonmothers demonstrated in our previous work,¹ women who had given birth 6 to 11 months previously were chosen as the reference group in the analyses. The period of the highest risk of readmission was 10 to 19 days post partum (RR, 2.71; 95% confidence interval [CI], 1.68-4.37), and the period of lowest risk was during pregnancy (0.54; 0.43-0.69) (Table 1). Childbirth was associated with an increased risk of readmission during the first postpartum month, after which the risk of readmission was higher among nonmothers (RR, 1.53; 95% CI, 1.31-1.80) (Table 1). In addition to our group 1, we also investigated separate samples of women who had 2, 3, or 4 previous admissions to assess the risk of readmission among those groups. A similar risk pattern was observed: we found a decreased risk of admission during pregnancy, an increased risk shortly after childbirth, and an overall elevated risk of readmission among nonmothers.

GROUP 2

A total of 10 218 first-time mothers with 1 or more psychiatric admissions predating childbirth were at risk of readmission, and 487 of those mothers were readmitted 0 to 12 months after the birth of their first live-born child. Additional analyses were conducted to identify predictors of readmissions post partum. Given previous work indicating that bipolar affective disorder may be specifically linked to postpartum recurrence,⁶ diagnosis-specific analyses were conducted. Mothers were divided into the following 3 diagnostic groups: bipolar affective disorders, schizophrenialike disorders, and the remaining disorders. This categorization was made according to the new mothers' diagnoses at the last admission before childbirth. About three-quarters of all the mothers were readmitted post partum with the same diagnosis they had been given before childbirth (results not shown).

Table 2 displays predictors of postpartum readmission across the 3 diagnostic groups. The temporal trend between readmissions and time since childbirth was especially dominant in women with previous diagnoses of bipolar affective disorders, with the highest risk of readmission 10 to 19 days post partum (RR, 37.22; 95% CI, 13.58-102.04) compared with mothers with the same diagnoses who gave birth 6 to 11 months earlier (the ref-

Table 1. Relative Risks of First Readmission in Relation to Childbearing Among Danish Women^a

Variable	No. of Cases	Rate per 1000 Person-Years	RR (95% CI) ^b
No children	10 455	84.89	1.53 (1.31-1.80)
Pregnant	115	22.08	0.54 (0.43-0.69)
Time since birth, d			
0-9	16	85.72	2.29 (1.37-3.83)
10-19	19	101.98	2.71 (1.68-4.37)
20-29	12	64.30	1.67 (0.93-3.01)
30-59	32	56.79	1.35 (0.93-1.98)
60-179	84	36.49	0.78 (0.59-1.01)
180-360	151	43.25	1 [Reference]

Abbreviations: CI, confidence interval; RR, relative risk.

^aIncludes women born between January 1, 1955, and July 1, 1990. From January 1, 1973, through June 30, 2005, a total of 314 mothers were readmitted for the first time within 12 months after the birth of their first child, based on group 1 (described in the "Group 1" subsection of the "Methods" section).

^bEstimates of RRs were adjusted for age at first admission, calendar period, diagnosis at first admission, and length of first admission.

erence group). During the same period of 10 to 19 days post partum, the RRs (95% CIs) of readmission for schizophrenialike and other disorders were 4.58 (2.48-8.48) and 2.98 (1.89-4.71), respectively.

Time since previous admissions predicted postpartum readmissions for mothers with schizophrenialike and other disorders, and the risk was highest if the mother's previous admission occurred during pregnancy. The number of previous admissions also predicted postpartum readmissions for mothers with schizophrenialike disorders and other disorders, as did mental disorder in the father of the child (Table 2). A family history of mental disorder did not predict postpartum readmission in any of the 3 diagnostic groups.

For mothers previously diagnosed as having bipolar affective disorders, the cumulative incidence of admission 0 to 3 months post partum was 22% (**Figure**). Cumulative incidence is a measure of the percentage of individuals in the population who were admitted at a given time; it provides an estimate of the probability that a woman will experience a psychiatric episode within the given follow-up period. During the first postpartum year, more than one-quarter (26.9%) of all women diagnosed as having bipolar affective disorders predating childbirth were admitted within the first 12 months post partum. In comparison, the cumulative incidence in women with schizophrenialike disorders was 15.7%.

COMMENT

READMISSIONS

Results from our study indicated that, among women with a history of mental disorders, risk of readmissions differed between mothers and nonmothers. Nonmothers had higher readmission rates than did mothers overall. However, the first postpartum month was associated with an increased risk of readmission in new mothers with mental disorders predating childbirth, and the risk of

Table 2. Risk Factors for Readmission in Relation to Childbearing Among Danish Mothers With Previous Psychiatric Admission(s) Before the Birth of Their First Child^a

Variable	Bipolar Affective Disorders			Schizophrenialike Disorders			Other Disorders		
	No. of Cases	Rate per 1000 Person-years	RR (95% CI) ^b	No. of Cases	Rate per 1000 Person-years	RR (95% CI) ^b	No. of Cases	Rate per 1000 Person-years	RR (95% CI) ^b
Time since birth, d									
0-9	13	2293.89	21.53 (7.51-61.68)	18	738.78	5.67 (3.23-9.96)	27	115.67	3.62 (2.38-5.51)
10-19	18	3544.46	37.22 (13.58-102.04)	14	586.28	4.58 (2.48-8.48)	22	94.82	2.98 (1.89-4.71)
20-29	6	1250.96	15.18 (4.58-50.30)	9	382.95	3.05 (1.47-6.33)	10	43.26	1.37 (0.72-2.61)
30-59	5	361.22	4.62 (1.32-16.12)	17	245.41	2.00 (1.13-3.55)	38	55.11	1.76 (1.22-2.55)
60-179	9	173.61	2.40 (0.80-7.17)	41	154.49	1.36 (0.87-2.11)	81	29.98	0.99 (0.74-1.31)
180-360	5	67.73	1 [Reference]	39	104.92	1 [Reference]	115	29.44	1 [Reference]
No. of previous admissions									
1	13	206.09	1 [Reference]	35	98.90	1 [Reference]	129	21.47	1 [Reference]
2-4	23	329.98	0.90 (0.42-1.95)	57	170.62	1.17 (0.76-1.82)	111	62.63	2.32 (1.78-3.02)
5-7	14	997.28	2.40 (0.93-6.20)	24	413.28	1.96 (1.13-3.43)	34	217.76	5.31 (3.53-7.98)
≥8	6	728.89	0.87 (0.27-2.82)	22	686.28	1.59 (0.84-3.00)	19	335.33	6.13 (3.56-10.57)
Time since previous admission, mo									
0-9, during pregnancy	12	1312.84	2.24 (0.73-6.89)	44	756.80	6.83 (3.58-13.04)	80	167.78	5.61 (3.81-8.26)
10-23	18	760.31	2.12 (0.83-5.43)	45	263.79	3.34 (1.83-6.10)	82	56.36	2.50 (1.73-3.61)
24-60	16	294.18	1.21 (0.50-2.93)	33	125.38	1.89 (1.03-3.48)	74	29.25	1.49 (1.04-2.14)
≥60	10	147.39	1 [Reference]	16	55.91	1 [Reference]	57	16.14	1 [Reference]
Family members									
Records of mental disorders in family members	21	394.18	1.22 (0.65-2.30)	56	222.75	1.31 (0.91-1.88)	109	39.21	1.04 (0.82-1.32)
No records of mental disorders in family members	35	343.90	1 [Reference]	82	155.68	1 [Reference]	184	35.29	1 [Reference]
Father of child									
Records of mental disorder in father of child	6	372.91	0.48 (0.17-1.35)	44	412.56	1.80 (1.21-2.68)	62	107.35	1.76 (1.30-2.40)
No records of mental disorder in father of child	50	359.82	1 [Reference]	94	139.99	1 [Reference]	231	31.14	1 [Reference]

Abbreviations: CI, confidence interval; RR, relative risk.

^aIncludes women born between January 1, 1955, and July 1, 1990. From January 1, 1973, through June 30, 2005, a total of 487 mothers were readmitted within 12 months after the birth of their first child, based on group 2 (described in the "Group 2" subsection of the "Methods" section).

^bFor the 3 diagnostic categories, estimates of RRs were adjusted for age, calendar year, all variables included in the table, and the specific diagnostic categories.

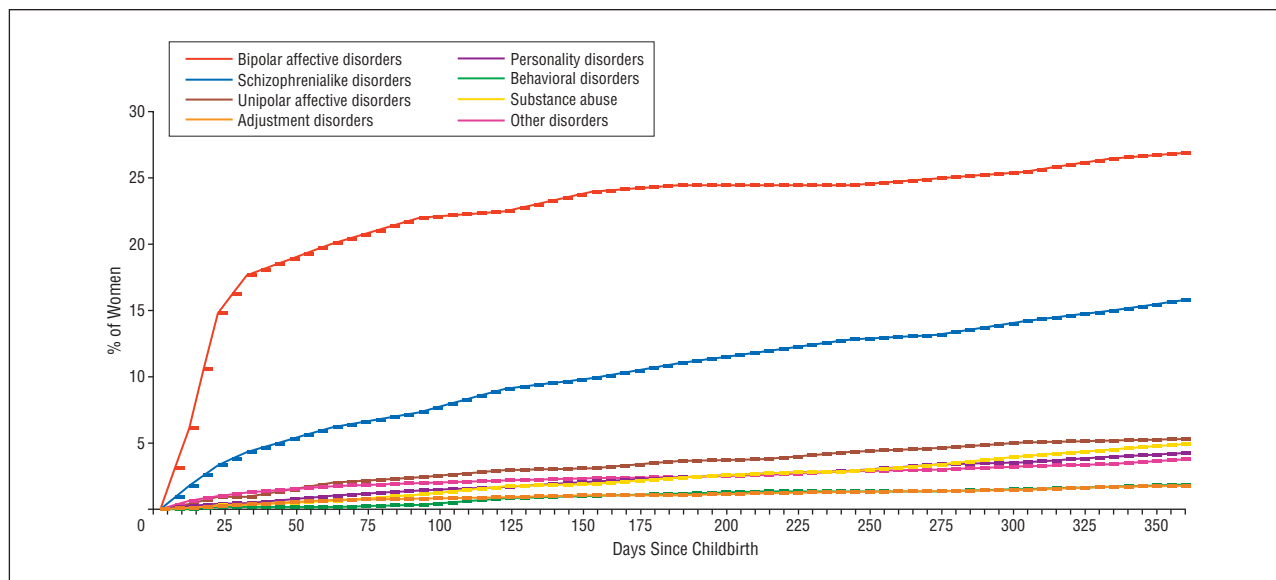


Figure. Cumulative incidences of readmission (the percentage of individuals in the population who were readmitted at a given point) by time since birth among Danish mothers born between January 1, 1955, and July 1, 1990, with previous psychiatric admissions before the birth of the first child. From January 1, 1973, through June 30, 2005, a total of 487 mothers were readmitted within 12 months after the birth of their first child (results are based on group 2, described in the "Group 2" subsection of the "Methods" section).

readmission was greatest 10 to 19 days post partum. The particularly high risk of readmission 10 to 19 days post partum is similar to the highest risk of first-time admissions shown in a previous report from our group.¹

Dates of readmission were used in the current analyses. It is likely that the mothers in our sample experienced increasing levels of symptoms before the date of readmission (ie, during pregnancy or during the first postpartum days). This, however, cannot be investigated in a study like ours because psychiatric symptoms per se are not recorded in the registers. However, Heron and colleagues^{19,20} recently reported that there is no latency period in the onset of bipolar affective puerperal psychoses, with 22% to 40% of women experiencing symptoms on the first postpartum day. This indicates that most women with postpartum psychosis experience symptoms very early in the postpartum period and perhaps a number of days or weeks before the date of admission.²⁰

Readmissions during the postpartum period may result in part from mothers being admitted for assessment of parenting skills or because the stress of coping with an infant exacerbates an existing illness.^{21,22} In addition, the increased risk of readmission post partum may reflect close monitoring of women with affective disorders by their physicians, with attempts to prevent worsening of the disorder via hospitalization at the early signs of symptoms in the new mother. These possibilities cannot be assessed in our cohort.

CHILDBIRTH AND RISK OF BIPOLAR AFFECTIVE DISORDER

Risk for postpartum readmission has been found to vary among different diagnostic groups.⁵ In the current study, risk of readmission 10 to 19 days post partum was 37.22 if the mother had been diagnosed as having bipolar affective disorder before childbirth (Table 2). This risk was more than 8 times greater than the risk of readmission in new mothers with schizophrenialike disorders predating the birth of the child. Recently, Harlow and colleagues⁴ also studied risk of readmission in first-time mothers during the postpartum period using registry data. In contrast to our results, the authors reported that risk of readmission was most pronounced in mothers with psychotic episodes compared with mothers with bipolar affective disorders. However, caution is required when interpreting those results because women with unipolar depression were included in the bipolar episode group, as noted recently by Jones et al.²² This grouping of diagnoses most likely results in an underestimation of the risk of readmission in mothers with bipolar affective disorder.²²

The cumulative incidences of readmission and RRs of readmission were highly increased in mothers with bipolar affective disorders predating childbirth. This provides strong support for a link between childbirth and bipolar affective disorders consistent with results from previous studies.⁶ Among the mothers in our sample with a history of bipolar affective disorder, the cumulative incidence of admission 0 to 3 months post partum was 22% (Figure). Our percentages are similar to those of Jones and Craddock,³ who found that 26% of patients with bipolar disorder experience postpartum recurrence, but

lower than the estimate of 30% to 50% reported in a review by Chaudron and Pies.⁶ Variations in the reported rates of recurrence are most likely due to differences in severity of the studied episodes, which ranged from severe disorders necessitating readmissions to milder episodes of mood disorders.

We found a very clear and limited high-risk period for readmissions in the first few weeks after delivery in women with bipolar affective disorders (Table 2). The increased postpartum psychiatric readmission rate could imply that women with bipolar disorders are more vulnerable to puerperal triggering³ and that childbirth itself rather than changes in medication treatment is associated with the high postpartum risk of bipolar episodes.²³ Given that a number of medications used to treat bipolar affective disorder are associated with teratogenicity,²⁴ our findings could reflect the effect of discontinuing medication therapy during pregnancy among women with bipolar disorder, although this is highly unlikely based on the results of these studies.^{3,23}

The risk of fetal malformations associated with maternal drug use depends on the properties of the drug and the period of fetal exposure.²⁴ Fear of the potential teratogenic risk of drug treatment during pregnancy still appears to have a strong restraining effect on physicians and patients. In their recent study on reproductive decisions, Viguera et al²⁵ reported that 45% of women with bipolar affective disorder had been advised not to become pregnant.

PREGNANCY

A decreased risk of readmission was observed in pregnant women compared with new mothers and nonmothers (Table 1). This is consistent with other studies suggesting that pregnancy is a time of emotional well-being, providing possible protection from mental disorders.^{1,5} However, although some women may experience affective well-being during pregnancy, research suggests that pregnancy is not uniformly protective with respect to the risk of relapse of major depression and bipolar disorder.^{26,27} Recently, O'Keane and Marsh²⁸ reported that half of the women in their study had an onset of depression during pregnancy. High levels of depressive symptoms in pregnancy were also reported by Evans et al.²⁹

Divergent findings regarding whether pregnancy protects against mental disorders most likely signify a difference in disorder severity and/or treatment settings assessed. We assessed readmission using data on inpatient psychiatric admissions, whereas the study by Evans et al,²⁹ for example, used information on self-reported depressive symptoms. However, most women experiencing these symptoms will likely not seek or receive treatment for unipolar depression.

In contrast to the current study, Viguera et al²⁷ recently reported that the overall risk of at least 1 recurrence in pregnant women with bipolar disorder was 71%. Thus, pregnancy appeared not to have a protective effect against new or worsening of illness in patients with bipolar disorder. Future studies of women with bipolar affective disorder should explore reasons for the divergent findings regarding pregnancy's association with the risk of recurrence.

PREDICTORS OF POSTPARTUM READMISSION

The multivariate analysis in Table 2 indicated that a family history of mental disorders did not predict the mother's risk of readmission post partum. A previous study by our group on incident postpartum admissions³⁰ found that a family history of mental disorders in general and a family history of bipolar disorder in particular increased the risk of severe postpartum episodes in mothers with no pre-existing mental disorders. In the present study, however, all women in the analysis had already demonstrated a vulnerability to severe mental illness because they all had had previous admissions to psychiatric hospitals before childbirth. A history of mental disorder in the father predicted postpartum recurrence among mothers with a history of schizophrenialike and other disorders. Thus, the mental health of the partner is more predictive of postpartum readmission than is family history of mental disorders among women with a history of certain psychiatric disorders.

Results from this study suggest that pregnancy is associated with the decreased risk of psychiatric readmissions. However, clinicians should be aware that, for the small group of women with a history of schizophrenialike and other disorders, admission during pregnancy predicted admission after childbirth.

Differences in predictors for postpartum readmission in women with bipolar affective disorder vs schizophrenialike and other disorders are shown in Table 2. The variations among diagnostic groups that we found might be due to a specific impact of childbirth in vulnerable women with bipolar disorder. The dramatic hormonal and physiological changes of childbirth may trigger a severe episode resulting in a readmission in this group of patients. By contrast, the pattern of readmissions in schizophrenialike and other disorders may be more consistent with difficulties in adaptation to new parenthood rather than a direct effect of childbirth itself. However, additional studies are needed to determine whether this is the case. Future studies should assess data on readmission patterns in general and should include more cases than the current study to ensure sufficient statistical power in the analyses.

CLINICAL IMPLICATIONS

Women who have psychotic disorders are less likely to have children than other women of childbearing age, with low fertility rates mainly observed in women with schizophrenia.³¹ Women who have mental disorders are justifiably concerned about recurrence during the postpartum period. Our study provides evidence that the postpartum period represents a high-risk period for readmissions, particularly among women with bipolar affective disorder. Women with bipolar affective disorder who are planning to conceive should be informed about the risk for relapse or recurrence after childbirth, and medication prophylaxis during the immediate postpartum period should be considered.²⁴ In addition, because discontinuation of medication therapy during pregnancy increases the risk of recurrence significantly,^{23,27} women with bipolar disorder should be monitored closely during pregnancy and post partum. Because treatment can be managed most effectively if pregnancy is planned, clinicians should discuss

the issue of pregnancy and its management with every patient who has mental disorders and childbearing potential.²⁴ Obstetricians and psychiatrists should collaborate to optimize treatment for mothers with mental disorders.⁴ Antenatal care should, at a minimum, include monitoring for recurrence during pregnancy and post partum and plans for rapid intervention if indicated³² because the delay in identifying episodes of mental disorders can be serious and costly.²⁰

LIMITATIONS

No data on pharmacological treatment were available for this study; hence, it was not possible to determine whether postpartum admissions resulted from medication changes or discontinuation during pregnancy or post partum. Another limitation of the current findings is that we could not distinguish whether postpartum readmissions were primarily due to worsening of symptoms (relapse) or to new onset of a psychiatric episode after a period of remission (recurrence).

Our results are based on clinical diagnoses from the Danish Psychiatric Central Register¹³ determined at the admission before childbirth rather than based on research diagnoses. However, clinical diagnoses have shown high agreement with research diagnoses in validation studies.^{33,34} Bipolar disorder is frequently misdiagnosed because symptoms may be confused with unipolar depression or with schizoaffective, schizophrenia, or personality disorder,³⁵ and the delay in receiving an accurate diagnosis of bipolar disorder may take years.^{35,36} Diagnostic instability may affect the results in the present study. If bipolar affective disorder is underdiagnosed in women in favor of, for example, schizophrenia, this would inflate the risk of other diagnostic groups and suggest that the estimated risk of readmission because of bipolar affective disorder may be conservative as a result.

Compared with nonmothers, new mothers are more often in contact with health professionals, which might increase the probability of detection of mental disorders. Pregnant women with mental health difficulties may sometimes be admitted to obstetric rather than to psychiatric wards or may have an increased frequency of outpatient psychiatric contacts. However, those forms of intervention are more likely to occur in milder cases of psychiatric disturbance, whereas this study assessed severe mental disorders requiring inpatient admission. It is likely that our focus on severe forms of mental disorder decreased the probability of detection bias due to obstetric visits by pregnant women.

CONCLUSIONS

This study is, to our knowledge, the first to compare psychiatric readmission rates of mothers with mental disorders and nonmothers with mental disorders. The use of population-based registers enabled us to distinguish between first-time psychiatric admissions and readmissions. Our findings indicate that mothers with mental disorders have lower readmission rates compared with women with mental disorders who do not have chil-

dren. However, in the group of new mothers, the first month after childbirth is associated with increased risk of psychiatric readmission. Our findings suggest that pregnancy is associated with a decreased risk of readmission, consistent with results from our previous study¹ on the risk of first-time admission during pregnancy and postpartum. However, results also indicate that pregnancy was not uniformly protective with respect to risk of readmission. Numerous previous admissions predicted prenatal and postpartum readmissions, although the magnitude of their effect varied by the diagnostic classification of the mother. The strongest predictor of postpartum readmission was psychiatric admission before childbirth with a diagnosis of bipolar affective disorder. During the first postpartum year, 26.9% of women with a history of bipolar affective disorder before childbirth were readmitted. Our findings highlight the need for careful clinical monitoring and provision of relevant psychoeducation to women with a history of bipolar disorder who are pregnant or considering pregnancy.

Submitted for Publication: May 8, 2008; final revision received and accepted August 13, 2008.

Correspondence: Trine Munk-Olsen, PhD, National Centre for Register-Based Research, University of Aarhus, Taasingegade 1, DK-8000 Aarhus C, Denmark (tmo@ncrr.dk).

Author Contributions: Drs Munk-Olsen and Laursen had full access to all the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis. All of the authors contributed to the conception and design of the study and gave their approval for the manuscript to be published.

Financial Disclosure: None reported.

Funding/Support: This study was supported by the Stanley Medical Research Institute and the Danish Medical Research Council (reference No. 271-07-0738).

Role of the Sponsors: This study was approved by the Danish Data Protection Agency. The sponsors had no role in the design of the study, in analysis and interpretation of the data, or in the writing of the manuscript.

REFERENCES

- Munk-Olsen T, Laursen TM, Pedersen CB, Mors O, Mortensen PB. New parents and mental disorders: a population-based register study. *JAMA*. 2006;296(21):2582-2589.
- Collaborating Centre for Mental Health. *Antenatal and Postnatal Mental Health: The NICE Guideline on Clinical Management and Service Guidance*. Leicester, British Psychological Society; London, England: Royal College of Psychiatrists; 2007.
- Jones I, Craddock N. Familiality of the puerperal trigger in bipolar disorder: results of a family study. *Am J Psychiatry*. 2001;158(6):913-917.
- Harlow BL, Vitonis AF, Sparen P, Cnattingius S, Joffe H, Hultman CM. Incidence of hospitalization for postpartum psychotic and bipolar episodes in women with and without prior pre-pregnancy or prenatal psychiatric hospitalizations. *Arch Gen Psychiatry*. 2007;64(1):42-48.
- Kendell RE, Chalmers JC, Platz C. Epidemiology of puerperal psychoses. *Br J Psychiatry*. 1987;150:662-673.
- Chaudron LH, Pies RW. The relationship between postpartum psychosis and bipolar disorder: a review. *J Clin Psychiatry*. 2003;64(11):1284-1292.
- Robertson E, Grace S, Wallington T, Stewart DE. Antenatal risk factors for postpartum depression: a synthesis of recent literature. *Gen Hosp Psychiatry*. 2004;26(4):289-295.
- Mortensen PB, Eaton WW. Predictors for readmission risk in schizophrenia. *Psychol Med*. 1994;24(1):223-232.
- Kessing LV, Andersen EW, Andersen PK. Predictors of recurrence in affective disorder: analyses accounting for individual heterogeneity. *J Affect Disord*. 2000;57(1-3):139-145.
- O'Hara MW, Swain AM. Rates and risk of postpartum depression: a meta-analysis. *Int Rev Psychiatry*. 1996;8(1):37-54.
- Beck CT. A meta-analysis of predictors of postpartum depression. *Nurs Res*. 1996;45(5):297-303.
- Pedersen CB, Gøtzsche H, Møller JØ, Mortensen PB. The Danish Civil Registration System: a cohort of 8 million people. *Dan Med Bull*. 2006;53(4):441-449.
- Munk-Jørgensen P, Mortensen P. The Danish Psychiatric Central Register. *Dan Med Bull*. 1997;44(1):82-84.
- World Health Organization. *Klassifikation af sygdomme: Udvidet dansk-latinsk udgave af verdenssundhedsorganisationens internationale klassifikation af sygdomme, Eighth Revision, 1965 [Classification of Diseases: Extended Danish-Latin Version of the World Health Organization International Classification of Diseases, Eighth Revision, 1965]*. Copenhagen: Danish National Board of Health; 1971.
- World Health Organization. *World Health Organization ICD-10: Psykiske lidelser og adfærdsmæssige forstyrrelser: Klassifikation og diagnostiske kriterier [World Health Organization International Statistical Classification of Diseases: Mental and Behavioural Disorders: Classification and Diagnostic Criteria]*. Copenhagen, Denmark: Munksgaard; 1994.
- Andersen PK, Borgen Ø, Gill RD, Keiding N. *Statistical Models Based on Counting Processes*. New York, NY: Springer-Verlag; 1993.
- Laird N, Olivier D. Covariance analysis of censored survival data using log-linear analysis techniques. *J Am Stat Assoc*. 1981;76(374):231-240.
- Clayton D, Hills M. *Statistical Models in Epidemiology*. New York, NY: Oxford University Press Inc; 2002:1-367.
- Heron J, Robertson BE, McGuinness M, Craddock N, Jones I. No "latent period" in the onset of bipolar affective puerperal psychosis. *Arch Womens Ment Health*. 2007;10(2):79-81.
- Heron J, McGuinness M, Blackmore ER, Craddock N, Jones I. Early postpartum symptoms in puerperal psychosis. *BJOG*. 2008;115(3):348-353.
- Brockington I. *Motherhood and Mental Health*. New York, NY: Oxford University Press Inc; 1996:1-612.
- Jones I, Heron J, Blackmore ER, Craddock N. Incidence of hospitalization for postpartum psychotic and bipolar episodes. *Arch Gen Psychiatry*. 2008;65(3):356.
- Viguera AC, Nonacs R, Cohen LS, Tondo L, Murray A, Baldessarini RJ. Risk of recurrence of bipolar disorder in pregnant and nonpregnant women after discontinuing lithium maintenance. *Am J Psychiatry*. 2000;157(2):179-184.
- Yonkers KA, Wisner KL, Stowe Z, Leibenluft E, Cohen L, Miller L, Mamber R, Viguera A, Suppes T, Altshuler L. Management of bipolar disorder during pregnancy and the postpartum period. *Am J Psychiatry*. 2004;161(4):608-620.
- Viguera AC, Cohen LS, Bouffard S, Whitfield TH, Baldessarini RJ. Reproductive decisions by women with bipolar disorder after pre-pregnancy psychiatric consultation. *Am J Psychiatry*. 2002;159(12):2102-2104.
- Cohen LS, Altshuler LL, Harlow BL, Nonacs R, Newport DJ, Viguera AC, Suri R, Burt VK, Hendrick V, Remnick AM, Loughhead A, Vitonis AF, Stowe ZN. Relapse of major depression during pregnancy in women who maintain or discontinue antidepressant treatment. *JAMA*. 2006;295(5):499-507.
- Viguera AC, Whitfield T, Baldessarini RJ, Newport DJ, Stowe Z, Remnick A, Zurick A, Cohen LS. Risk of recurrence in women with bipolar disorder during pregnancy: prospective study of mood stabilizer discontinuation. *Am J Psychiatry*. 2007;164(12):1817-1824.
- O'Keane V, Marsh MS. Depression during pregnancy. *BMJ*. 2007;334(7601):1003-1005.
- Evans J, Heron J, Francomb H, Oke S, Golding J. Cohort study of depressed mood during pregnancy and after childbirth. *BMJ*. 2001;323(7307):257-260.
- Munk-Olsen T, Laursen TM, Pedersen CB, Mors O, Mortensen PB. Family and partner psychopathology and the risk of postpartum mental disorders. *J Clin Psychiatry*. 2007;68(12):1947-1953.
- Howard LM. Fertility and pregnancy in women with psychotic disorders. *Eur J Obstet Gynecol Reprod Biol*. 2005;119(1):3-10.
- Wisner KL, Parry BL, Piontek CM. Clinical practice: postpartum depression. *N Engl J Med*. 2002;347(3):194-199.
- Kessing LV. Validity of diagnoses and other clinical register data in patients with affective disorder. *Eur Psychiatry*. 1998;13(8):385-444.
- Jakobsen KD, Frederiksen JN, Hansen T, Jansson LB, Parnas J, Werge T. Reliability of clinical ICD-10 schizophrenia diagnoses. *Nord J Psychiatry*. 2005;59(3):209-212.
- Bhugra D, Flick GR. Pathways to care for patients with bipolar disorder. *Bipolar Disord*. 2005;7(3):236-245.
- Freeman MP, Smith KW, Freeman SA, McElroy SL, Kmetz GE, Wright R, Keck PE Jr. The impact of reproductive events on the course of bipolar disorder in women. *J Clin Psychiatry*. 2002;63(4):284-287.