It is illegal to post this copyrighted PDF on any website. Suicide Attempts Among Pregnant and Postpartum Women in Japan: A Nationwide Retrospective Cohort Study

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ABSTRACT

Objective: To describe the demographic and clinical characteristics of pregnant and postpartum women in Japan with psychoneurological disorders who attempt suicide.

Method: A nationwide retrospective cohort study was conducted using the Diagnosis Procedure Combination database, a national database on acutecare inpatients in Japan. All pregnant and postpartum women who had psychoneurological disorders (*ICD-10* codes: O993, F530, F531) and were admitted to participating hospitals from January 2016 to March 2018 were identified. Among eligible patients, the prevalence of suicide attempts, risk factors for suicidal behaviors, maternal outcomes, and other characteristics were investigated.

Results: Among the 3,286 eligible patients (3,026 pregnant women and 260 postpartum women), 22 pregnant women and 16 postpartum women had attempted suicide. The prevalence of suicide attempts was significantly higher among postpartum women (6.2%) than among pregnant women (0.7%; P < .001). Postpartum patients were more likely to be aged 30 years or older and to have depression. Wrist cutting was the main method of suicide attempt among pregnant patients, whereas hanging was the main method among postpartum patients. Three postpartum patients died during hospitalization.

Conclusions: Postpartum patients were more likely to be in critical condition and to use fatal suicide attempt methods compared with pregnant women.

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*Corresponding author: Daisuke Shigemi, MD, Department of Clinical Epidemiology and Health Economics, School of Public Health, The University of Tokyo, 7-3-1 Hongo, Bunkyoku, Tokyo 113-0033, Japan (dshigemi@m.u-tokyo.ac.jp). The reduction of maternal mortality is a priority in Japan and in many other nations. Assessments of common causes of pregnancy-related mortality such as hemorrhage, hypertension, infection, peripartum cardiomyopathy, and venous thromboembolism indicate that maternal mortality has decreased dramatically over the past 20 years.^{1,2} A previous report³ showed that, in Japan, a total of 213 women died during pregnancy or within a year after delivery from 2010 to 2014 and that the most frequent causes of maternal death were obstetric hemorrhage (23%), brain disease (16%), amniotic fluid embolism (12%), cardiovascular disease (8%), and pulmonary disease (8%).

Despite the improvements in maternal mortality, relatively little attention has been paid to maternal deaths resulting from suicide. Recently, suicide has been revealed as a leading cause of death among pregnant and postpartum women in developed countries, including Japan.⁴⁻⁷ The Japan Society of Obstetrics and Gynecology has reported a very high rate of maternal and late-maternal death by suicide in the 23 wards of Tokyo (8.7 per 100,000 births), and, from 2005 to 2014, there were 23 suicides during pregnancy and 40 among women less than a year postpartum.⁷ The fact that there are many suicides among pregnant and postpartum women in Japan was not recognized until 2017 because research on suicide among these women has been hindered by methodological restrictions, including limited data sources that include pregnancy and childbirth status for patients with suicidal behavior. Additionally, the lack of recognition of deaths from self-harm may be a result of the exclusion of accidental or incidental deaths during pregnancy or in the first year postpartum from national mortality statistics on pregnancy-related mortality.

In May 2017, in a Japanese-language notice, the Japan Society of Obstetrics and Gynecology announced that physicians should record any relationship between death and pregnancy or delivery status when women die during pregnancy or within a year postpartum (www.jsog. or.jp/modules/news_m/index.php?content_id=206). In addition, since 2016, method of suicide attempt has been recorded in the Diagnosis Procedure Combination (DPC) database, a national database on acutecare inpatients, for patients hospitalized in psychiatric wards.

Screening positive for depression or anxiety has been reported to be related to later suicidal ideation among postpartum women.⁸ Postpartum depression is a common emotional problem, affecting approximately 10%–15% (with a reported range of 0%–60%) of women who have delivered, according to a recent worldwide meta-analysis.⁹ A Japanese multicenter study¹⁰ reported that 12.1% of pregnant women and 11.7% of postpartum women experienced the onset of some type of mental disorder, such as a major depressive episode, depressive disorder not otherwise specified, a manic episode, generalized anxiety disorder, panic disorder, social/specific phobia, or obsessive-compulsive disorder. Another study¹¹ reported a prevalence of depressive symptoms (defined as having an Edinburgh Postnatal Depression Scale score > 9) of 14.0% in Japan. It is illegal to post this copyrighted PDF on any website

Clinical Points

- Suicide is the leading cause of death among perinatal women in Japan, but few studies have investigated suicide attempts in this group.
- In comparison with pregnant patients, women with postpartum psychoneurological disorders had more distinct and serious psychopathology and used more lethal measures for suicide attempts.
- These findings emphasize that the postpartum period is an important time to monitor and support women to prevent suicide attempts using violent measures.

In addition, suicide attempts are a significant predictor of subsequent completed suicide.¹² Therefore, epidemiologic analysis of mental disorders and suicide attempts among pregnant and postpartum women can be useful for taking countermeasures against suicide among these groups of women. Although a previous study in the United States¹³ reported that the cumulative incidence of suicide attempts during pregnancy was 4 per 10,000 pregnancies, little is known about the prevalence and epidemiology of suicidal behavior among perinatal women in Japan. The aim of the present study was to describe the demographic and clinical characteristics associated with suicide attempts among pregnant and postpartum women in Japan who have psychoneurological disorders.

METHODS

For this retrospective cohort study, we used the DPC database, a national database on acute-care inpatients in Japan. Several studies^{14,15} have been conducted using the DPC database in the field of obstetrics and gynecology. Briefly, approximately 1,200 hospitals, including all 82 academic hospitals in Japan, participate in the database and provide data for about 8,000,000 admissions annually, which represents approximately 50% of all acute-care inpatients in Japan. The database contains discharge abstracts and administrative reimbursement data for inpatient episodes, as well as unique hospital identifiers; dates of admission and discharge; patient details (age, sex, body height and weight); smoking status; type of admission (planned or emergency); use of ambulance; primary and secondary diagnoses; preexisting comorbidities at admission and complications after admission; medical procedures, including types of surgery; medications and devices used; in-hospital mortality; pregnancy status (pregnant or not); gestational age at admission; and delivery during hospitalization. Since 2016, method of suicide attempt has been included in the database for patients admitted to psychiatric wards. Diagnoses, comorbidities, and complications are recorded using International Classification of Diseases, Tenth Revision (ICD-10) codes and text data in Japanese. The database contains no laboratory data or imaging findings. Attending physicians are encouraged to record diagnoses accurately by linking data entries with reimbursements for health

Figure 1. Flow Diagram Showing the Stratification and Selection of Patients



care costs. A previous study showed that the validity of the diagnostic records in the DPC database is generally high and that the sensitivity and specificity of the primary diagnoses are 50%–80% and 96%, respectively. The specificity and sensitivity of the procedures have been found to exceed 90%.¹⁶

We identified all patients aged \geq 13 years treated in a participating hospital from January 2016 to March 2018 who had been diagnosed with any psychoneurological disorder during pregnancy, including epilepsy, psychosis, depression, and other types of central nervous system disorders (*ICD-10*: O993); postpartum depression (*ICD-10*: F530); and postpartum psychosis (*ICD-10*: F531). We used these diagnosis codes to detect pregnant and postpartum patients with high specificity. We excluded patients with meningitis or brain tumors and those with missing data. Among this cohort, we further detected psychotic disorders (*ICD-10*: F20–F25, F28–F29, F32.3), anxiety disorders (*ICD-10*: F40, F41), personality disorders (*ICD-10*: F60), and mental retardation (*ICD-10*: F70–F73, F79, F84).

We categorized age as \leq 19, 20–29, 30–39, and \geq 40 years. The database also provides important clinical scores, including Japan Coma Scale (JCS) scores. The JCS correlates well with the Glasgow Coma Scale score, with a consciousness score of 100 points on the JCS being equivalent to a score of 6–9 on the Glasgow Coma Scale.¹⁷ We used JCS score as a confounder because we estimated patients' severity based on whether alert consciousness was present. We categorized JCS score into 2 groups: alert (JCS=0) and disturbance of consciousness (JCS=1–300). In terms of addiction, we identified patients who had an alcohol use disorder (*ICD-10*: F101–F104) and any substance abuse (*ICD-10*: F112, F122, F140, F152, F157, F160, F182, T401, T407–T409, T436, T509).

Assessed outcomes included miscarriage, emergency cesarean section, preterm birth (at < 37 weeks' gestation), abruptio placentae, intrauterine fetal death, stillbirth, blood transfusion, length of hospital stay, and maternal death

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Table 1. Baseline Patient Characteristics

	Patients With Psychoneurological Disorders (n = 3,286)			
	Pregnant	Postpartum		
	Patients	Patients	Р	
Characteristic	(n=3,026), n (%)	(n=260), n (%)	Value	
Age, y			.02	
13–19	66 (2.2)	3 (1.2)		
20–29	1,011 (33.4)	66 (25.4)		
30–39	1,705 (56.3)	156 (60.0)		
≥40	244 (8.1)	35 (13.5)		
Gestational age, wk				
<14	181 (6.0)			
15–27	263 (8.7)			
28–36	625 (20.7)			
≥37	1,898 (62.7)			
Missing data	59 (1.9)			
Disturbance of consciousness at	36 (1.2)	23 (8.8)	<.001	
admission (JCS score = $1-300$)	,			
Smoking (current or past)	492 (16.3)	19 (7.3)	<.001	
Use of ambulance	233 (7.4)	46 17.7)	<.001	
Teaching hospital	2,414 (79.8)	182 (70.0)	<.001	
ICU admission	21 (0.7)	3 (1.2)	.43	
Obstetric comorbidities at admission	_ ((, , ,	- ()		
Premature rupture of membranes	128 (4.2)			
Threatened preterm labor	452 (14.9)			
Twin pregnancy	63 (2.1)			
Previa	44 (1.5)			
Abruptio placentae	8 (0.3)			
Gestational diabetes mellitus	239 (7.9)	3 (1.2)	< .001	
Overt diabetes mellitus	7 (0.2)	0	.99	
Hypertensive disorder of pregnancy	196 (6.5)	2 (0.8)	< .001	
Fclampsia	4 (0.1)	0	.99	
Psychoneurological comorbidities	. (011)	C C		
on admission				
Depression	734 (24.3)	189 (72.7)	<.001	
Psychosis	697 (23.0)	43 (16.5)	.016	
Schizophrenia	267 (8.8)	19 (7.3)	.49	
Panic disorder	184 (6.1)	4 (1.5)	.001	
Anxiety disorder	202 (6.7)	11 (4.2)	.15	
Bipolar disorder	67 (2 2)	7 (2 7)	66	
Fnilensy	1 193 (39 4)	15 (5.8)	< 001	
Mental retardation	0	0	1.001	
Personality disorder	11 (0 4)	1 (0 4)	99	
Alcohol use disorder	4 (0.1)	0	.99	
Any substance abuse	2 (0.1)	õ	.99	
Suicide attempts	22 (0.7)	16 (6.2)	<.001	
Abbraviations ICIL intensive				
Appreviations: $ICO = Intensive care unit, JCS = Japan Coma Scale.$				

during hospitalization. We selected these outcomes because they are critical and important outcomes among pregnant and postpartum women. The database did not include information on long-term outcomes after discharge.

To assess outcomes among the eligible patients, we present the categorical variables as numbers and percentages; these data were compared using Fisher exact test. Continuous variables are shown as means and standard deviations or medians and interquartile ranges; these data were compared using Student *t* test or the Mann-Whitney *U* test.

All statistical analyses were performed using Stata software, Version 15.0 (2007; StataCorp LP; College Station, Texas). All tests were 2-tailed, and the threshold for significance was P < .05.

This study was approved by the Institutional Review Board of The University of Tokyo, which waived the requirement for informed patient consent because of the anonymous nature of the data. During the study period, there were 1,235 eligible hospitalized patients with any psychoneurological disorder in 2016, 1,659 in 2017, and 392 in 2018 (January–March only). The eligible 3,286 patients during these 27 months comprised 3,026 pregnant women and 260 postpartum women. Of these patients, 22 pregnant women and 16 postpartum women were admitted to hospitals because of suicide attempts (Figure 1).

Table 1 shows the characteristics of all eligible patients. The proportions of patients aged ≥ 40 years, with disturbance of consciousness at admission, with use of ambulance, and with depression were significantly higher among postpartum women than among pregnant women. In contrast, higher proportions of pregnant women than postpartum women smoked, were admitted to a teaching hospital, had psychosis, had panic disorder, and had epilepsy. Regarding addiction, only 4 women had an alcohol use disorder, and only 2 had any substance abuse. The prevalence of hospital admissions for suicide attempts was significantly higher among postpartum women than among pregnant women (6.2% vs 0.7%, P<.001) and was also significantly higher among patients with depression than among those without depression (2.4% vs 0.7%, P<.001).

Table 2 shows the characteristics of patients who were admitted to hospitals because of suicide attempts. Most pregnant women in this group of patients were admitted during their second or third trimester of pregnancy. Pregnant women were relatively young (aged < 30 years), whereas postpartum women were more likely to be older (≥ 30 years). In terms of psychoneurological disorders, although depression was a numerically more likely complication among postpartum women than among pregnant women, there were no significant differences for any of the disorders. There was only 1 woman who had substance abuse. Method of suicide attempt partially differed between pregnant and postpartum patients: wrist cutting was the main method among pregnant patients, whereas hanging was the main method among postpartum patients. No postpartum patients with disturbance of consciousness at admission were discharged with normal consciousness. Three postpartum patients died during hospitalization. These patients were aged in their 20s or 30s, had depression (n=2) or psychosis (n=1), and were all transported to the hospital by ambulance because of hanging and presented with deep coma at admission. These patients died on their first, second, or eighth day of hospitalization.

Table 3 shows the obstetric and maternal outcomes among the 22 pregnant patients who were admitted to hospitals because of suicide attempts. There were no critical adverse obstetric events such as miscarriage, Table 2. Characteristics of Patients Admitted to Hospitals Because of Suicide Attempts

	Patients With		
	Suicide Attempts		
	(n=38)		
	Pregnant	Postpartum	
	Patients	Patients	Р
Characteristic	(n = 22), n (%)	(n = 16), n (%)	Value
Age v			64
13-19	1 (4 5)	0	.01
20-29	9 (40.9)	4 (25 0)	
30-30	11 (50.0)	11 (68 8)	
>10	1 (4 5)	1 (6 3)	
Costational age wk	1 (4.5)	1 (0.5)	
	2 (12 6)		•••
< 14 15 07	2 (12.0) 2 (12.6)	•••	
15-27	5 (15.0)		
28-30	5 (22.7) 10 (45 5)		
≥3/	10 (45.5)	•••	
Missing	1 (4.5)		
Disturbance of consciousness at	2 (9.1)	10 (62.5)	.001
admission (JCS score = $1-300$)			
Smoking (current or past)	4 (18.2)	4 (25.0)	.70
Use of ambulance	4 (18.2)	12 (75.0)	.001
Teaching hospital	17 (77.3)	16 (100)	.052
ICU admission	0	2 (12.5)	.17
Psychoneurological comorbidities			
at admission			
Depression	10 (45.5)	12 (75.0)	.10
Psychosis	13 (59.1)	4 (25.0)	.052
Schizophrenia	5 (22.7)	2 (12.5)	.68
Panic disorder	4 (18.2)	0	.12
Anxiety disorder	4 (18.2)	0	.12
Bipolar disorder	4 (18.2)	1 (6.3)	.37
Epilepsy	1 (4.5)	0	1.00
Mental retardation	0	0	
Personality disorder	0	0	
Alcohol use disorder	0	0	
Any substance abuse	1 (4 5)	Õ	38
Method of suicidal attempt	1 (1.5)	Ŭ	083
Hanging	4 (18 2)	5 (31 3)	.005
lumping	3 (13.6)	2 (12 5)	
Taking paison	1(45)	2 (12.3)	
Overdese	1 (4.3)	1 (0.5)	
Colf have weiger a share to al	4 (10.2)	4 (25.0)	
Sell-narm using a snarp tool	2 (9.1)	4 (25.0)	
(excluding wrist cutting)	0 (26 4)	0	
wrist cutting	8 (36.4)	0	07
Death during hospitalization	U	3 (18.8)	.07
Abbreviations: ICU = intensive care un	nit, JCS = Japan C	Coma Scale.	

stillbirth, or intrauterine fetal death. Four patients underwent emergency cesarean section. There were no maternal deaths.

DISCUSSION

In the current study, there were 3,286 hospitalizations among pregnant or postpartum women with psychoneurological disorders in Japan during 27 months. Most of these admitted patients were pregnant. There were 38 women (1.1% of the eligible hospitalizations) with suicide attempts. Pregnant patients who were admitted to hospitals because of a suicide attempt were more likely to be in the second or third trimester of pregnancy and were relatively young (aged < 30 years), whereas postpartum patients with suicide attempts were more likely to be older (aged \geq 30 years) and to have the complication of depression. There were no critical adverse obstetric events. The proportion of women with any drug or alcohol use disorders was very Table 3. Obstetric and Maternal Outcomes for PatientsAdmitted to Hospitals Because of Suicide Attempts

Outcome	Pregnant Patients With Suicide Attempts (n=22) ^a
Preterm birth	2 (9.1)
Miscarriage	0
Abruptio placentae	0
Intrauterine fetal death	0
Stillbirth	0
Emergency cesarean section	4 (18.2)
Blood transfusion	0
Length of hospital stay, n (interquartile range), d	8 (6–12)
Death during hospitalization	0
^a Data are presented as n (%) unless otherwise noted	4

low among women with suicide attempts. Among women who were admitted to hospitals because of suicide attempts, 3 patients died; all of the patients who died were postpartum.

Globally, wide ranges of prevalence rates have been reported for perinatal suicidal ideation and behavior. A 2005 review¹⁸ of 17 studies in high- and low-income countries found the prevalence of suicidal ideation among pregnant and postpartum women to range from 5% to 14%, with higher prevalence rates found in low-income countries.¹⁸ These findings are corroborated by more recent studies¹⁹⁻²¹ in low- and middle-income countries, with prevalence rates ranging from 6.3% to 18%. However, there are limited data on perinatal suicide attempts in developed countries. In the United States, the cumulative incidence of suicide attempts during pregnancy has been reported to be 4 per 10,000 pregnancies.¹³ The present study revealed that hospitalizations because of suicide attempts comprised 1.1% of total hospitalizations among patients with psychoneurological disorders who were pregnant or postpartum. Because the entire number of perinatal women with psychoneurological disorders is unknown and because the DPC database does not include all hospitalized patients in Japan, we were unable to show the apparent prevalence of suicidal behavior-related hospitalizations. However, to the best of our knowledge, this study is the first to show the prevalence of suicide attempts among perinatal women with psychoneurological disorders in Japan.

Previous studies^{22,23} have revealed that depressive disorder is a risk factor for antepartum suicidal ideation. Anxiety and panic disorder have also been recognized as risk factors for suicidal ideation during pregnancy.²³ In the current study, pregnant patients who attempted suicide had various psychoneurological comorbidities at admission, whereas postpartum patients who attempted suicide had only the complications of depression, psychosis, schizophrenia, and bipolar disorder. This result suggests that postpartum women who attempt suicide are more likely to suffer from serious psychoneurological disorders compared with pregnant women who attempt suicide.

In our study, method of suicide attempt differed between pregnant and postpartum patients: wrist cutting was the main method among pregnant women, whereas hanging was the main method among postpartum women. The

all hospitalizations of pregnant or postpartum women and

because suicide attempts sometimes result in death outside of

hospitals, our study does not show nationally representative

estimates of suicidal behavior among all pregnant and

postpartum women in Japan. These limitations may lead

to underestimation of the number of perinatal patients

who attempted suicide. Finally, the database used in this

study did not contain detailed data on the postpartum

period. Therefore, postpartum women were identified using

were pregnant or postpartum and had psychoneurological

disorders were admitted to hospitals in Japan because

In conclusion, our study showed that 38 women who

diagnosis codes (ICD-10: F530, F531).

It is illegal to post this copy results for method of suicide attempt and disturbance of consciousness at admission may indicate that postpartum patients who attempt suicide are more likely to be in critical condition than are pregnant patients who attempt suicide. This finding suggests that pregnant women tend to experience suicidal ideation and engage in minor self-harm, whereas postpartum women tend to make life-threatening suicide attempts. Previous studies^{24,25} have also reported that pregnant women are more likely to experience suicidal ideation compared with the general population but that pregnant women are less likely to commit suicide than are their non-pregnant counterparts.

The strengths of this study include the fact that it is the first study of perinatal suicide attempts to use a national inpatient database. Despite this strength, several limitations of the study should be acknowledged. First, our results do not represent suicidal behavior among all perinatal women in Japan because the database used in the current study was composed of clinical data from only some of the hospitals in the country. In addition, this study is not a registerbased study. Second, because we were unable to identify

tionalof suicide attempts from January 2016 to March 2018.ntionsPostpartum patients were more likely to have depression andlts dotended to be in critical condition, with fatal suicide attempt

tended to be in critical condition, with fatal suicide attempt methods. Because the current study investigated only specific patients who had psychoneurological disorders and because the study period was limited, further clinical studies are needed to determine the incidence of and risk factors for suicidal behaviors among all perinatal women in Japan.

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had no role in planning the research, analyzing the data, interpreting the results, or writing the report. **Additional information:** The datasets analyzed in the current study are not publicly available for ethical reasons because the data are patient-specific; however, the datasets are available from the corresponding author on reasonable request.

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