Original Article

Trajectory of Antenatal Depression and Its Association with Parity: A Longitudinal Study Among Japanese Pregnant Women

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Objective : Objective: Antenatal depression is a common mental health concern that can negatively affect maternal and child outcomes. This study aimed to examine the trajectory of antenatal depressive tendencies across early, mid, and late pregnancy, and explore their association with parity among Japanese pregnant women.

Methods: A longitudinal web-based questionnaire survey was conducted from October 2022 to September 2023 at 10 obstetric facilities in southern Kanto, Japan. A total of 2,500 pregnant women were invited, and 337 who completed all three surveys were included in the final analysis. The Edinburgh Postnatal Depression Scale (EPDS) was used to assess depressive tendencies, with a cutoff score of ≥9. Differences between primiparous and multiparous women were analyzed using descriptive statistics and chi-square tests.

Results: The mean EPDS scores were 5.15 in early pregnancy, 4.76 in mid-pregnancy, and 4.63 in late pregnancy, showing a gradual decline over time. The proportion of participants with depressive tendencies also decreased: 21.4% in early pregnancy, 18.4% in mid-pregnancy, and 14.8% in late pregnancy. Although primiparous women showed slightly higher EPDS scores and rates of depressive tendencies across all trimesters, no statistically significant associations with parity were found.

Conclusions: Depressive tendencies peaked in early pregnancy and declined over time. While slightly higher in primiparous women, parity was not significantly associated. Continuous screening throughout pregnancy is recommended.

Keywords : Antenatal depression, parity, Edinburgh Postnatal Depression Scale, Japanese women

I. Introduction

Antenatal depression, a subtype of perinatal depression, refers to depressive symptoms that occur during pregnancy[1)]. It is a significant

mental health concern with adverse effects not only on the mother's physical and psychological well-being but also on fetal development, child outcomes, and overall family functioning[2)3)]. Historically, clinical attention focused primarily on postpartum depression (PPD), which typically manifests within the first 4–6 weeks after childbirth. However, recent evidence highlights antenatal depression as a major risk factor for PPD[4)], underscoring the need for early screening and intervention during pregnancy.

The diagnosis of major depressive disorder, including antenatal depression, follows the DSM-5 criteria, which require the presence of at least four out of nine symptoms-including either a depressed mood or loss of interest or pleasure-developing during pregnancy or within four weeks postpartum[5)].

The global prevalence of perinatal depression ranges from 8% to 26%, depending on regional and ethnic factors[1)6)]. In Japan, a meta-analysis by Tokumitsu et al. reported prevalence rates of 14.0% in the second trimester, 16.3% in the third trimester, and 14.3% one month postpartum[7)].

Pregnancy is a period of profound physiological and psychosocial transformation. Hormonal fluctuations, physical discomfort, altered body image, and anticipation of motherhood contribute to increased emotional vulnerability. These psychological fluctuations may differ depending on personal factors such as parity and previous childbirth experience[8)].

Numerous studies have found that primiparous women are more likely to experience postpartum depression than multiparous women[9)]. In Japan as well, several studies have confirmed this trend[10)11)]. However, fewer studies have explored how parity influences antenatal depression across different stages of pregnancy.

It is hypothesized that childbirth and prior parenting experiences may shape psychological adaptation during subsequent pregnancies. Therefore, understanding the trajectory of antenatal depression by parity can inform the development of tailored mental health interventions and support systems for pregnant women.

This longitudinal study aimed to examine differences in depressive symptoms between primiparous and multiparous Japanese women across the early, middle, and late stages of pregnancy.

II. Methods

1. Study Design

This study was a longitudinal observational design utilizing an anonymous, self-administered web-based questionnaire survey.

2. Study period

The survey was conducted from late October 2022 to late September 2023.

3. Study Sites, Participants, and Survey Time Points

1) Study Sites

Ten obstetric medical institutions located in the southern Kanto region of Japan

participated in the study upon agreement.

2） Participants

A total of 2,500 Japanese pregnant women aged 18 years or older, who were receiving prenatal care at the participating institutions, were recruited. Those who consented to participate were prospectively followed.

Exclusion criteria included:

- Use of systemic corticosteroids
- Multiple pregnancies
- Any condition deemed unsuitable for participation by attending physicians

3） Survey Time Points

To reflect typical psychological changes during pregnancy, data were collected at the following three stages:

- First trimester (up to approximately 13 weeks gestation)
- Second trimester (between 24 and 28 weeks gestation)
- Third trimester (between 34 and 35 weeks gestation)

4. Survey Procedures and Measures

1） Procedures

At the initial prenatal visit, eligible participants were provided with a recruitment letter containing a QR code linking to the online questionnaire. Those who met the exclusion criteria were not approached.

For the second and third surveys, reminder emails with a unique URL were sent to participants using the email addresses collected at the initial survey.

2） Measures

（1）Demographic and Perinatal Information

Demographic variables included age, height, pre-pregnancy weight, marital status, Parity status, educational level, household income, and smoking and alcohol consumption.

Data were collected through a combination of multiple-choice and open-ended questions.

（2）Depressive Tendencies

Depressive symptoms were measured using the Japanese version of the Edinburgh Postnatal Depression Scale (EPDS)[12], originally developed by Cox et al[13]. The Japanese translation by Okano et al[12] has demonstrated good reliability and validity among postpartum women.

The EPDS consists of 10 self-report items rated on a 4-point scale (0–3), yielding a total score of 0–30. A cutoff score of 9 or more (≥9) is commonly used in Japan to screen for depressive tendencies during the perinatal period[14)15)]. In this study, we applied the 9-point cutoff throughout pregnancy, consistent with its clinical relevance and predictive validity for postpartum depression.

5. Analytical Methods

All analyses were performed using IBM SPSS Statistics, Version 29 (IBM Corp., Armonk, NY, USA). The significance level was set at $p < 0.05$ for all two-tailed tests.

First, descriptive statistics were calculated for demographic and obstetric characteristics. The normality of EPDS scores was assessed using the Shapiro-Wilk test.

Internal consistency of the EPDS was assessed by calculating Cronbach's alpha for each time point.

Finally, chi-square tests were used to examine differences in depressive tendencies (EPDS ≥ 9) between primiparous and multiparous women at each stage of pregnancy.

III. Ethical Considerations

This study complies with the Ethical Guidelines for Life Science and Medical Research Involving Human Subjects and has been approved by the Tsukuba University Medical Ethics Committee (No. 1797).

IV. Results

1. Participant Overview

1） Survey Participation

A total of 2,500 research request forms with QR codes were distributed across 10 cooperating obstetric medical facilities in the southern Kanto region. Of these, 743 pregnant women responded in the first trimester (response rate: 29.7%), 677 in the second trimester (91.1%), and 522 in the third trimester (77.1%).

After excluding participants who did not complete all three survey waves, those whose pregnancies were no longer ongoing (n=5: 2 in the second trimester and 3 in the third trimester), and those with missing data on critical demographic variables (e.g., age, weight, height) or EPDS scores (n=2), a final sample of 337 participants was included in the analysis.

2） Participant Demographics (Table 1)

The mean age of participants was 32.3 years (SD = 4.33), and the mean BMI was 20.8 (SD = 2.30). Based on BMI classification, 257 participants (76.3%) were of normal weight, 58 (17.2%) were underweight, and 22 (6.5%) were classified as obese.

Regarding smoking history, 283 participants (84.0%) reported no history of smoking, while 54 (16.0%) reported past smoking. As for alcohol use, 160 participants (47.5%) had never consumed alcohol, while 177 (52.5%) had a history of alcohol consumption.

Most participants were married (n = 335; 99.4%), while 2 (0.6%) were unmarried. Regarding parity, 169 participants (50.1%) were primiparous and 168 participants (49.9%) were multiparous. Regarding educational attainment, 212 participants (63.1%) had obtained a university degree or higher, and 124 (36.9%) had less than university-level education. Household income

Table 1 Demographic characteristics of the population

Variable	Total（n = 337）			
	n	（%）	Mean	SD
Age	337		32.3	（±4.33）
Height	337		158.9	（±5.42）
Pre-pregnancy weight	337		52.5	（±7.35）
BMI	337		20.8	（±2.30）
Normal	257	76.3		
Underweight	58	17.2		
Overweight	22	6.5		
Smoking history	337			
No	283	84.0		
Yes	54	16.0		
Alcohol consumption history	337			
No	160	47.5		
Yse	177	52.5		
Marital status	337			
Married	335	99.4		
Unmarried	2	0 .6		
Parity Status				
Primiparous	168	50.0		
Multiparous	168	50.0		
Educational background	337			
University degree or higher	212	63.1		
Less than university	125	36.9		
Household income	337			
<6 million JPY	103	30.6		
≥6 million JPY	234	69.4		

was ≥6 million JPY in 230 participants (69.9%) and <6 million JPY in 99 participants (30.1%).

2. Depressive Tendencies and Association with Parity (Table2, 3)

The Cronbach's alpha coefficients for the EPDS in this study were 0.839 for the first trimester, 0.867 for the second trimester, and 0.854 for the third trimester, indicating good internal consistency at each time point.

Tests for normality showed that EPDS scores were not normally distributed at any stage of pregnancy.

In the first trimester, the mean EPDS score was 5.15 (SD = 4.52), with a median of 4 (range: 0–19). A total of 72 participants (21.4%) had EPDS scores ≥9, indicating depressive tendencies. In the second trimester, the mean score was 4.76 (SD = 4.67), with a median of 3 (range: 0–27); 62 participants (18.4%) had scores ≥9. In the third trimester, the mean score was 4.63 (SD = 4.49), with a median of 3 (range: 0–24); 50 participants (14.8%) had scores ≥9.

Among primiparous women, the mean EPDS score in the first trimester was 5.71 (SD = 4.53), with 40 women (23.7%) scoring ≥9. In the second trimester, the mean was 5.35 (SD = 5.06), with 35 women (20.7%) scoring ≥9. In the third trimester, the mean was 4.71 (SD = 4.18), and 23 women (13.6%) scored ≥9.

Among multiparous women, the mean EPDS score in the first trimester was 4.60 (SD = 4.46), with 32 women (19.0%) scoring ≥9. In the second trimester, the mean was 4.18 (SD = 4.19), and 27 women (16.1%) scored ≥9. In the third trimester, the mean was 4.57 (SD = 4.80), with 27 women (16.1%) scoring ≥9.

No statistically significant association was found between parity and depressive tendencies at any stage of pregnancy, based on chi-square test results.

Table. 2 Depressive Tendency During Each Trimester of Pregnancy

	Total (n =337)				
Trimester	n	(%)	Mean	SD	Median (Range)
First trimester			5.15	(±4.52)	4 (0-19)
EPDS ≤ 8	265	78.6			
EPDS ≥ 9	72	21.4			
Second trimester			4.76	(±4.67)	3 (0-27)
EPDS ≤ 8	275	81.6			
EPDS ≥ 9	62	18.4			
Third trimester			4.63	(±4.49)	3 (0-24)
EPDS ≤ 8	287	85.2			
EPDS ≥ 9	50	14.8			

Table. 3 Association Between Parity and Antenatal Depressive Tendency Across Pregnancy Trimesters

	Primipara (n =169)					Multipara (n =168)					p
Trimester	n	(%)	Mean	SD	Median (Range)	n	(%)	Mean	SD	Median (Range)	
First trimester	169		5.71	(±4.53)	5 (0-19)	168		4.60	(±4.46)	3 (0-19)	
EPDS ≤ 8	129	76.3				136	81.0				0.3
EPDS ≥ 9	40	23.7				32	19.0				
Second trimester			5.35	(±5.06)	4 (0-27)	168		4.18	(±4.19)	3 (0-20)	
EPDS ≤ 8	134	79.3				141	83.9				0.3
EPDS ≥ 9	35	20.7				27	16.1				
Third trimester			4.71	(±4.18)	4 (0-20)	168		4.57	(±4.80)	3 (0-24)	
EPDS ≤ 8	146	86.4				141	83.9				0.5
EPDS ≥ 9	23	13.6				27	16.1				

The association between parity (primipara vs. multipara) and depressive tendency (EPDS score ≥ 9) at each trimester was examined using the chi-square test.

V. Discussion

1. Demographic Characteristics of the Participants

This study recruited 2,500 pregnant women from 10 obstetric facilities in the southern Kanto region. The response rate was 29.7% in early pregnancy and 77.1% in the final survey, which is comparable to previous longitudinal studies[16].

The mean age of participants was 32.3 years (SD = 4.33), which aligns with national averages for childbirth in Japan—30.9 years for first births and 32.9 years for second births[18]. This distribution reflects the participant composition, where approximately half were primiparous and half were multiparous.

Although Japan's total fertility rate is 1.26[17], meaning many women experience only one childbirth, nearly half of the study participants were multiparous. This may be attributed to the inclusion of low-risk obstetric facilities and the longitudinal design, which may discourage participation among first-time mothers due to anxiety about pregnancy and childbirth. In contrast, multiparous women, having previous experience, may have been more inclined to participate. Similar trends were also observed in large-scale cohort studies of perinatal mental health in Japan[18].

Regarding educational background, 63% of participants had a university degree or higher, exceeding the national average for women in their 30s (34.4-45.8%)[19][20]. This may reflect the regional characteristics of South Kanto, where higher education access and university enrollment rates are relatively high. Moreover, 69.9% of participants reported annual household incomes of ≥6 million JPY, exceeding the national average for households headed by individuals in their 30s (6.27 million JPY) [21]. These results are consistent with existing evidence showing a positive correlation between educational attainment and income.

2. Depressive Tendencies During Each Stage of Pregnancy

The Average EPDS scores in this study were consistent with previous findings among Japanese women, which report mean scores of 3.51–5.30 in early pregnancy, 3.25–4.12 in mid-pregnancy, and 3.02–5.06 in late pregnancy[22][23][24].

The proportion of participants with depressive tendencies (EPDS ≥ 9) was 21.4% in early pregnancy, 18.4% in mid-pregnancy, and 14.8% in late pregnancy, indicating a downward trend. These findings mirror those of previous studies, which report similar prevalence rates of 20%, 17.9%, and 15.2% across the respective trimesters[25]. However, other studies have shown an increase in depressive symptoms in late pregnancy, possibly due to anxiety related to childbirth[7]. Thus, the trajectory of antenatal depression remains inconclusive. The present findings support the pattern of higher depressive tendencies in early pregnancy.

3. Relationship Between Depressive

Tendencies and Parity

This study also examined the association between depressive tendencies and parity. Although EPDS scores and the proportion of depressive tendencies were consistently higher among primiparous women across all trimesters, chi-square tests revealed no statistically significant association between parity and depressive symptoms at any stage.

These findings suggest that while parity may influence emotional experiences, it does not serve as a decisive factor for antenatal depression. Depressive tendencies during pregnancy are likely shaped by multiple psychosocial variables such as pregnancy planning, partner support, past mental health history, and social support systems.

Previous studies have highlighted that primiparous women often experience increased anxiety and stress due to unfamiliarity with pregnancy and childbirth, whereas multiparous women may struggle with increased childcare and household responsibilities[9)26)]. These distinct stressors may contribute to depressive symptoms in both groups, potentially offsetting parity-related differences. The absence of significant findings may reflect the complexity of these interacting factors.

VI. Limitations of the Study

This study has several limitations. First, the number of participants classified as having depressive tendencies (EPDS ≥ 9) was relatively small in each group, which may have limited the statistical power to detect significant differences. Second, depressive symptoms were assessed solely using the EPDS, a self-reported screening tool. The absence of clinical diagnostic interviews or comparisons with other validated psychological instruments limits the interpretability and diagnostic accuracy of the findings.

Additionally, the study did not account for other psychosocial or medical factors known to influence antenatal depression. Future research should incorporate multivariate analyses that include variables such as social support, childcare burden, partner relationship quality, psychiatric history, and pregnancy intentionality. Moreover, stratified analyses by geographic region, age group, and level of social support would enhance the generalizability and applicability of the findings.

VII. Conclusion

This study elucidated the trajectory of antenatal depressive tendencies across early, mid, and late pregnancy, and explored their association with parity. EPDS scores were highest in early pregnancy and gradually declined as pregnancy progressed. Although primiparous women exhibited slightly higher EPDS scores and a greater proportion of depressive symptoms at all stages compared to multiparous women, no statistically significant association with parity was observed. These findings underscore the importance of early screening and ongoing mental health support for all pregnant women,

regardless of childbirth experience.

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Conflict of interest (COI)

No business enterprises, organisations, or groups related to COI were involved.

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