

Perinatal self-report of thoughts of self-harm, depressive symptoms, and personality traits: Prospective study of Japanese community women

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Aim: The aim of this study was to identify women with thoughts of self-harm preceded by suicidal ideation, during the perinatal period, on cluster analysis and to clarify their psychological correlates.

Methods: A secondary analysis was conducted using the data from a longitudinal study involving 18 obstetric clinics between 2011 and 2012 in Kumamoto Prefecture (Japan). Self-administered questionnaires including demographic data, Edinburgh Postnatal Depression Scale, Temperament and Character Inventory, and the Postnatal Bonding Questionnaire were distributed during the third trimester of pregnancy (wave 1), at 5 days (wave 2), and 1 month postpartum (wave 3).

Results: On cluster analysis using the data of participants who answered all observational points, the participants were

divided into two groups: cluster 1, normal (n = 201); and cluster 2, thoughts of self-harm (n = 42). Low self-directedness, low cooperativeness, higher anxiety, depression, and lack of affection and anger and rejection towards the baby were associated with cluster 2.

Conclusions: The finding that low self-directedness and low cooperativeness were related to the cluster 2 group suggests that immature personality traits may work as a predisposing factor mediating between anxiety, depression and thoughts of self-harm.

Keywords: cluster analysis, depression, maternal bonding disorder, perinatal period, suicidal ideation.

<http://onlinelibrary.wiley.com/doi/10.1111/pcn.12917/full>

Complete suicide in women after childbirth is a serious issue.¹ The mother's suicide would have a huge negative effect on the child's emotional development as well as on family functioning. Khalifeh *et al.* (2016) reported that 74 (4%) of 1485 suicide deaths of women aged 20–35 years were perinatal suicide.² They used 1997–2012 data from the UK National Confidential Inquiry into Suicides and Homicides by People with Mental Health, which has targeted people who have had contact with psychiatric services in the previous year. A Swedish study also noted a maternal suicide ratio of 3.7 per 100 000 live births based on the register data in psychiatric facilities since 1980–2007.³ Appleby *et al.* (1998), using the data of the Danish Psychiatric Case Register and the Danish registers of birth and causes of death for 1973–1993, found that 107 women (6.8%) who were admitted to psychiatric hospitals in the first year after birth committed suicide.⁴ The standardized mortality ratio (SMR) of suicide ≤ 1 year after delivery is higher than that of suicide ≤ 2 years after delivery (SMR ≤ 1 year, 7216; SMR ≤ 2 years, 4859) indicating that suicides are most likely to occur in the first year after childbirth.⁴ A recent study in Japan indicated that among women who had given birth in Tokyo, 8.5 out of 100 000 women committed suicide in the first year after childbirth.⁵ A large scale longitudinal epidemiological study may be necessary in order to identify risk factors for completed suicide after childbirth.

In addition, completed and attempted suicides are usually preceded by suicidal ideation. Approximately 90% of unplanned and 60% of planned first attempts occurred ≤ 1 year after the onset of suicidal ideation.⁴ Therefore, it may be feasible to extrapolate data obtained from those with suicidal ideation to those who are likely to attempt or complete suicide.

Item 10 of the Edinburgh Postnatal Depression Scale (EPDS),⁷ which asks the participant woman whether in the previous week the 'thought of harming myself had occurred to me (thought of self-harm)', is widely used as a measurement indicating 'suicidal ideation'.^{1,8–20} This is because the EPDS is one of the gold standard measures to assess perinatal depression in both research and clinical areas. A moderate agreement between EPDS 10 item with the Clinical Interview Schedule (CIS-R) assessing 'suicide ideation' had a moderate agreement, giving a kappa statistic of 0.42 according to Howard *et al.* (2011),¹³ therefore the authors concluded that the EPDS measure is clinically applicable for indicating suicidal ideation.¹³ Thoughts of self-harm cover 'non-suicidal self-harm' and 'suicidal self-harm' ideations,¹³ but the prevalence of the former is assumed to be very low. In contrast, thoughts of self-harm preceded by suicidal ideation are closer to suicide attempts than suicidal ideation, therefore thoughts of self-harm measured on the EPDS may be of more clinical importance.

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What remains to be explored is whether there is a specific group/groups of women who score high in item 10 of the EPDS. Thus, our first question is whether a specific patient group with a thought of self-harm is seen on cluster analysis using the EPDS item 10. Various statistical analysis methods such as bimodality, finite mixture modelling, cluster analysis, and latent class analysis have been developed to classify patients and others.²¹ Of these methods, a cluster analysis, which can determine how many homogeneous groups of cases can be distinguished within a given sample,²¹ has been applied in several psychiatric studies.^{22,23} Another point of importance is the necessity of viewing 'perinatal depression' as continuous throughout the perinatal period rather than viewing point prevalence of a thought of self-harm separately in the antenatal/and postnatal periods, which many previous studies have focused on.²⁴⁻²⁶

Our second question is whether there is an association between personality and the cluster of perinatal women with thoughts of self-harm. A variety of factors have been reported as being correlated with perinatal suicide ideation and/or thought of self-harm: (i) individual and psychological risk factors such as younger age, being unmarried, nulliparous, personal/family history of psychiatric disorders or suicide attempts, negative attitude towards the pregnancy, anxiety about birth and depression; (ii) socioeconomic risk factors such as conflict with family and lack of social support and exposure to domestic violence; and (iii) environmental factors including gender inequalities and social discrimination or war.^{27,28} Predisposing variables determined before the pregnancy such as history of suicide attempts and psychiatric disorders, and depression during the perinatal period have been identified as the major contributing factors on multivariate analysis.²⁴ Nevertheless, surprisingly little research has been done on the personality traits of perinatal women who have reported thoughts of self-harm. In contrast, the association of personality traits and suicidality has been studied in other populations with suicidal ideation and completed suicide. Completed suicide is associated with many psychological factors, which can be categorized into impulsivity/aggression, depression, anxiety, hopelessness, and self-consciousness/social disengagement.²⁹

A very important approach to personality and personality disorder research is the use of the Temperament and Character Inventory (TCI).³⁰ Cloninger *et al.* (1993) claimed that personality can be divided into temperament and character domains.³¹ Temperament has four dimensions: Novelty Seeking (NS), Harm Avoidance (HA), Reward Dependence (RD), and Persistence (PS); whereas character has three dimensions: Self-directedness (SD), Cooperativeness (CO), and Self-transcendence (ST). Temperament dimensions are moderately heritable, manifest early in life, and 'involve preconceptual biases in perceptual memory and habit formation'.³¹ NS reflects impulsivity versus rigidity, HA reflects anxiousness versus risk-taking, RD reflects approval-seeking versus aloofness, and PS reflects overreaching versus underachieving. In contrast, character matures in adulthood and, via insight into self-concepts, enhances personal and social effectiveness. SD is the concept of self as an autonomous individual. CO is the concept of self as an integral part of humanity. Finally, ST is the concept of self as an integral part of the universe as a whole. Suicide attempters have been found to score higher in HA, and lower in SD and CO.³²⁻³⁴ In patients with borderline personality disorder, the low attachment subdimension of RD predicted attempted suicide.³⁵ A study of a general population showed a link between suicide attempts and schizotypal pattern of character, that is, low SD and CO, and high ST.³⁶ In this study, we expected that perinatal suicidal ideation would be correlated with higher NS, HA, and ST, and lower SD and CO.

The aim of this study was to identify a group/groups of women during the perinatal period with thoughts of self-harm on cluster analysis and to clarify their psychological and clinical correlates including personality traits. To the best of our knowledge, this is the first investigation on this topic using a longitudinal research design in Japan.

Methods

Study design

This study is a secondary analysis using data from a longitudinal study conducted between 2011 and 2012 in Kumamoto Prefecture.³⁷⁻⁴⁰

Participants and procedure

Kumamoto Prefecture is located in the center of Kyushu Island, in the southern part of Japan, and consists of urban, suburban, and rural areas. Of the 55 obstetric facilities in Kumamoto Prefecture that were asked to participate in this study by the local government, a total of 18 (33%) antenatal institutes responded: one university hospital, 12 public and private hospitals, and five private clinics. Inclusion criteria were (i) women who were ≥ 28 gestational weeks; and (ii) who attended either of the facilities in November 2011. Pregnant women who were teenagers or unable to communicate in Japanese, who had severe mental illness, or who had severe pregnancy complications, were excluded. Self-administered questionnaires were directly distributed at the time of regular checkup by medical staff working in each setting during the third trimester of pregnancy (wave 1), and at 5 days (wave 2) and 1 month postpartum (wave 3).

Eligible women were recruited for the study by medical staff with an informed consent sheet. When a woman agreed, she was asked to complete the questionnaire at home and to send it to one of the researchers (T.K.) using a postage paid envelope.

Measurements

Demographic information

Demographic information including antenatal institutions, age, birth parity (primiparous vs multiparous), pregnancy complications such as pregnancy hypertension, placenta previa, anomaly of the fetus, and birth outcomes that included planned cesarean section, emergency cesarean section, and delivery complications were obtained from medical charts. Marital status was assessed from the questionnaire at wave 1. In addition, negative response towards the current pregnancy was assessed on a 5-point scale (1, very pleased; to 5, very displeased).

Thought of self-harm and dysphoric symptoms

Item 10 of the EPDS,⁷ 'the thought of harming myself has occurred to me (thought of self-harm)', implies the participant's intention of suicide ideation. Hence, we used this item from the Japanese version of the EPDS.⁴¹ It was rated with a 4-point scale: never, 0; hardly ever, 1; sometimes, 2; yes, quite often, 3. We distributed the EPDS at waves 1, 2, and 3.

Depressive symptoms

We used the three subscales of the EPDS as measures of depressive symptoms. The EPDS has been shown to have a three-factor structure consisting of Anhedonia (2 items), Anxiety (3 items), and Depression subscales (3 items).⁴² We distributed the EPDS at waves 1, 2, and 3.

Personality

We used the Japanese version of the 130-item TCI.^{30,43} Five additional Persistence items were added to the original 125 items to increase the internal reliability of the scale.⁴⁴ In the TCI, personality and character dimensions were assessed. Temperament had four dimensions: NS, HA, RD, and PS. Character had three dimensions: SD, CO, and ST. The original TCI used dichotomous (true or false) scales, but in order to obtain better internal consistency in Japanese populations, Kijima *et al.* (1996) recommended a modification to a 4-point scale (0-3).⁴³ The reliability and factor validity of the Japanese version of the TCI were reported by Kijima *et al.* (2000),⁴⁴ and Takeuchi *et al.* (2011).⁴⁵ We administered the TCI at wave 1.

Table 1. Change in EPDS item 10 score over the course of the perinatal period (*n* = 243)

Item 10	Wave 1 <i>n</i> (%)	Wave 2 <i>n</i> (%)	Wave 3 <i>n</i> (%)
Never (0)	220 (87.0)	236 (93.3)	233 (92.1)
Hardly ever (1)	15 (5.9)	10 (4.0)	11 (4.3)
Sometimes (2)	12 (4.8)	3 (1.2)	5 (2.0)
Quite often (3)	2 (0.8)	1 (0.4)	0
Missing	4	3	4
Mean ± SD	0.18 ± 0.54	0.08 ± 0.34	0.08 ± 0.34

Wave 1, pregnancy; wave 2, 5 days after childbirth; wave 3, 1 month after childbirth. EPDS, Edinburgh Postnatal Depression Scale.

Table 2. Distribution of EPDS item 10 scores vs cluster and wave

	Cluster 1 (<i>n</i> = 201) <i>n</i> (%)	Cluster 2 (<i>n</i> = 42) <i>n</i> (%)
Wave 1		
Never (0)	201 (93.9)	13 (6.1)
Hardly ever (1)	0 (0.0)	15 (100)
Sometimes (2)	0 (0.0)	12 (100)
Quite often (3)	0 (0.0)	2 (100)
Wave 2		
Never (0)	201 (87.4)	29 (12.6)
Hardly ever (1)	0 (0.0)	9 (100)
Sometimes (2)	0 (0.0)	3 (100)
Quite often (3)	0 (0.0)	1 (100)
Wave 3		
Never (0)	201 (88.5)	26 (11.5)
Hardly ever (1)	0 (0.0)	11 (100)
Sometimes (2)	0 (0.0)	5 (100)
Quite often (3)	0	0

Wave 1, pregnancy; wave 2, 5 days after childbirth; wave 3, 1 month after childbirth. EPDS, Edinburgh Postnatal Depression scale.

Table 3. Demographic variables and EPDS item 10 scores vs cluster

	Cluster 1 (<i>n</i> = 201) Mean ± SD or <i>n</i> (%)	Cluster 2 (<i>n</i> = 42) Mean ± SD or <i>n</i> (%)	<i>t</i> - value	<i>P</i> - value
Demographic and obstetric features				
Age (years)	30.2 ± 3.3	29.9 ± 0.9	0.3	
Married	196/199 (98)	40/41 (98)	0.53	
Parity	0.55 ± 0.04	0.38 ± 0.08	2.0	*
Negative response towards the current pregnancy complications	1.24 ± 0.04	1.45 ± 0.11	1.8	*
Pregnancy complications	0.38 ± 0.12	0.25 ± 0.04	1.0	
EPDS				
Wave 1				
Anhedonia	0.03 ± 0.02	0.10 ± 0.07	1.0	
Anxiety	2.07 ± 0.15	4.50 ± 0.40	6.7	***
Depression	0.56 ± 0.07	2.62 ± 0.37	5.7	***
Wave 2				
Anhedonia	0.06 ± 0.04	0.10 ± 0.10	0.3	
Anxiety	1.44 ± 0.13	3.62 ± 0.39	5.3	***
Depression	0.61 ± 0.08	1.83 ± 0.02	4.1	***
Wave 3				
Anhedonia	0.00 ± 0.00	0.10 ± 0.10	1.0	
Anxiety	1.04 ± 0.11	2.43 ± 0.36	3.7	***
Depression	1.57 ± 0.25	1.57 ± 0.25	4.6	***
The postpartum bonding questionnaire				
Wave 2				
LA	1.71 ± 0.22	2.31 ± 0.52	1.1	
RF	0.33 ± 0.07	0.93 ± 0.27	2.1	*
AR	8.37 ± 0.44	11.49 ± 1.14	2.8	**
Wave 3, mean ± SD				
LA	1.45 (0.21)	3.05 (0.59)	2.5	*
RF	0.26 (0.06)	1.29 (0.31)	3.2	**
AR	9.15 (0.47)	13.04 (1.15)	3.4	**
Personality, mean ± SD				
NS	24.3 (0.4)	26.5 (1.0)	2.1	*
HA	33.0 (0.5)	35.6 (1.0)	2.2	*
RD	29.2 (0.3)	28.1 (0.7)	1.5	
PS	16.4 (0.2)	16.3 (0.4)	0.3	
SD	44.9 (0.6)	39.3 (1.5)	3.8	***
CO	50.3 (0.4)	45.9 (1.1)	4.2	***
ST	17.1 (0.4)	19.4 (1.1)	2.1	*

**P* < 0.05;

***P* < 0.01;

****P* < 0.001.

Wave 1, pregnancy; wave 2, 5 days after childbirth; wave 3, 1 month after childbirth. AR, anger and restrictedness; CO, cooperativeness; EPDS, Edinburgh Postnatal Depression Scale; HA, harm avoidance; LA, lack of affection; NS, novelty seeking; PS, persistence; RD, reward dependence; RF, rejection and fear; SD, self-directedness; ST, self-transcendence.

Postnatal maternal bonding towards the infant

We used the Japanese version of the Postnatal Bonding Questionnaire (PBQ)⁴⁶ for assessing parental attitudes and emotions towards their baby.⁴⁵ It consists of 25 items with a 6-point scale (0–5). Higher scores indicate more negative attitudes towards the baby. Previously we reported a three-factor structure of the Japanese version of the PBQ:³⁹ Lack of Affection (LA), Rejection and Fear (RF), and Anger and Restrictedness (AR). LA reflects parents' lack of affection and intimacy towards their baby (six items). RF reflects parental rejection and internal fear of their baby (five items). AR reflects parental annoyance with or anger towards their baby and their feeling that they were 'trapped' by parenting (13 items). We distributed the PBQ to participants at waves 2 and 3.

Statistical analysis

Little's test for missing completely at random (MCAR) showed that MCAR could not be rejected ($\chi^2 = 33882.495$, d.f. = 41717, *P* = 1.00). Nevertheless, we imputed missing values by the means of the multiple imputation method⁴⁸

We used the scores of item 10 of the EPDS at the three observation periods in a two-step cluster analysis.⁴⁹ Unlike other widely used clustering methods such as k-mean clustering and the agglomerative hierarchical method, the two-step clustering can handle mixed types of continuous and categorical data and determine the number of clusters with a predetermined algorithm. Clusters thus derived were compared in terms of other correlates. Because of multiple comparisons (five demographic, nine EPDS, six PBI, and seven TCI variables), the α level was set at $P < 0.001$ rather than at the conventional significance level of $P < 0.05$.

Groups of women derived from the cluster analysis were compared in terms of the women's demographic and obstetric features (age, husband's age, marital status, number of children, parity, negative response towards the current pregnancy), depressive symptoms (anhedonia, anxiety, and depression subscales of the EPDS), maternal postnatal bonding disorder (LA, RF, and AR subscale of the PBQ), and personality traits (subscales of the TCI).

All statistical analysis was conducted using SPSS 20.0 (IBM, Chicago, Illinois, USA) and Amos 20.0 (IBM, Chicago, Illinois, USA).

Ethics

The present study was approved by the Ethics Committee of Kumamoto University Graduate School of Life Sciences (No. 458) and the Institutional Review Board of each institution participating in the study.

Results

Of the 1451 eligible women invited to participate in this study, a total of 248 (17%) returned all the questionnaires for all three time points. Because the total response rate was low (17%), we compared medical information between participating women ($n = 248$) and non-participating women ($n = 1203$). The participants were less likely to report pregnancy complications ($n = 22$; 8%) than the others ($n = 179$; 14%), whereas the number of emergency cesarean sections ($n = 26$; 10%) and delivery complications ($n = 73$; 29%) were higher for the participants (Table S1).

We excluded five cases from the subsequent analyses because of twin babies. Therefore, the remaining 243 cases were used in further analysis.

Mean scores for item 10 of the EPDS were very low over the course of the perinatal period: 0.18 ± 0.54 , 0.08 ± 0.34 , and 0.08 ± 0.34 for waves 1, 2, and 3, respectively. The rate of women who reported a score of 2 or 3 for item 10 was 5.6%, 1.6%, and 2.0% for waves 1, 2, and 3, respectively (Table 1).

Two-step cluster analysis produced two clusters. Cluster 1 consisted of 201 women (82.7%) and cluster 2 consisted of 42 women (17.3%). Missing values came from 10 women. All of the women who belonged to cluster 1 reported 'never' for item 10 on every occasion of assessment (Table 2). In contrast, many of the women belonging to cluster 2 reported 'sometimes' or 'quite often'. On visual scrutiny of the cases in cluster 2, 19 women scored ≥ 1 point only during pregnancy; 13 women, only after childbirth; and the remaining 10, before and after childbirth. All of the women who reported 'sometimes' or 'quite often' during pregnancy ($n = 14$) scored ≥ 1 point at either wave 2 or wave 3 or both.

When comparing these two clusters, women belonging to cluster 2 were characterized by high anxiety and depression at waves 1, 2, and 3 (Table 3). They were also characterized by low SD and CO. Two subscales of the PBQ, RF and AR, although barely reaching the significance level ($P < 0.001$), tended to be linked to cluster 2. The women in cluster 2 scored higher in these variables.

Discussion

This study has conducted a cluster analysis of item 10 of the EPDS to differentiate women who with thoughts of self-harm from those

without those thoughts, using longitudinal data. Second, we examined the association between the cluster of women with thoughts of self-harm and personality traits. This cluster analysis divided the participants into two groups: cluster 1, normal ($n = 201$); and cluster 2, thoughts of self-harm ($n = 42$; 17%). Low SD, CO, and higher anxiety and depression were associated with cluster 2. In addition, women belonging to cluster 2 tended to express a higher LA and RF during the postnatal period.

To the best of our knowledge, this study is the first to use the power of the EPDS item 10 to identify mothers with thoughts of self-harm. In total, one out of six perinatal women were in the thoughts of self-harm group (cluster 2). All of the participants who belonged to cluster 2 expressed thoughts of self-harm at either one or all of the observational points (waves 1, 2, and 3). This supports the idea that the EPDS assesses both depression and thoughts of self-harm. As aforementioned, some authors state that the meaning of the EPDS item 10 differs from exact 'suicidal ideation' because it is more indicative of 'thoughts of self-harm'. Other studies have used the EPDS and other scales such as the Clinical Interview Schedule,⁵⁰ the Patient Safety Questionnaire-9,⁵¹ and the Suicide Behaviors Questionnaire-Revised.⁵² These questionnaires directly ask participants about suicidal ideation or behaviors such as 'I felt like life was not worth living', 'I hoped to die', and 'I committed a suicide attempt'. Although the content validity of the EPDS awaits further consideration, because the EPDS has been widely used for screening perinatal depression not only in Japan but also in many other countries, the results suggest to us the higher feasibility of the EPDS item 10 in the clinical settings. In addition, Howard *et al.* (2011) noted that EPDS item 10 may lead to underreporting of actual suicidal ideations,¹³ but it is also possible that self-reporting may be more accurate than clinical interview.

Low SD and CO was associated with cluster 2 although NS, HA, and ST were only weakly significant. The findings were similar to those of previous studies that focused on suicidal ideation in a general population.³²⁻³⁴ An individual with low SD and CO is characterized as an immature personality, and is described as 'weak, fragile, and blaming' or 'self-absorbed, intolerant, critical, and unhelpful' according to Cloninger (1994).³⁰

Considering that anxiety and depression are major risk factors of suicidal ideation, this immature personality trait involves an individual vulnerability that can be a predisposing factor connecting depression and suicidal ideation/attempt. In addition, a recent study showed that self-aggression associated with high HA and low SD contributed to suicidal ideation among inpatients who were admitted to a psychiatric ward due to a previous suicide attempt.³³ Thus, these interactions may be of pivotal importance in the occurrence of suicidal ideation in the perinatal period.

Another finding of this study was the link between suicidal ideation and bonding disorders (LA and AR). Anxiety, depressive symptoms, and bonding disorders are comorbid.^{38,53,54} The present participants belonging to cluster 2 had higher anxiety and depression. Therefore, this implies that depression may mediate bonding disorders and suicidal ideation, but future studies examining the etiological mechanism between bonding failure, depressive symptoms, and suicidal ideation may be required.

Several limitations should be stated. First, although the data of this secondary analysis were taken from a community-based survey of multiple medical facilities in Japan, the response rate was very low (17%). The present participants reported less pregnancy complications compared with others who did not return all questionnaires, indicating that some women who might have had a severe dysphoric mood due to pregnancy complication might not have participated. Given the selection bias in the present study, it is possible that the number of mothers belonging to the cluster of perinatal suicidal ideation, and the degree of correlation between perinatal suicidal ideation and pregnancy complications, antenatal and postnatal dysphoric moods may be underestimated.

Second, a self-reported item such as the EPDS item 10 used in this study may cause underreporting of actual suicidal ideation, and

fail to identify some participants who refrain from reporting their suicidal ideations. Using other instruments with multiple questions for assessing suicidal ideation and structured interviews may be more appropriate to capture these participants. We should be aware, however, that asking about suicidal ideation is a sensitive topic, and therefore reporting bias always accompanies all of these instruments. Third, cluster analysis has advantages and disadvantages. The advantages of this method include the use of multivariate analysis, permitting the use of multiple indicators, and the availability of an explicit method to determine the number of clusters to retain. Disadvantages include the uncertainty of stopping rules to identify the number of clusters. This may depend on subjective judgement. Hence, future studies should make use of other methods of grouping qualitatively different groups.

In conclusion, this secondary analysis differentiated the participants into two groups by cluster analysis: cluster 1, normal ($n = 201$); and cluster 2, suicidal ideation ($n = 41$). Low SD, CO, higher anxiety, and depression were associated with suicidal ideation, suggesting that immature personality traits may function as predisposing factors and interact with anxiety, depression, and suicidal ideation during the perinatal period.

Acknowledgments

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors. We thank the support given by the following hospitals and clinics: Fukuda Hospital, Suenaga Ob/Gyn Clinic, Jikei Hospital, Kumamoto City Hospital, Kumamoto University Hospital, Kurokawa Gynecologic and Obstetric Clinic, Tashiro Gynecologic and Obstetric Clinic, Amakusa Central General Hospital, Arao Municipal Hospital, Shimokawa Gynecologic and Obstetric Clinic, Kamiamakusa General Hospital, Kataoka Ladies Clinic, Honda Ladies Clinic, Aikoh Obstetrics, Gynecology, and Dermatology Clinic, Yamaguchi Maternity Clinic, Matsubase Ladies Clinic, Kikuyou Ladies Clinic, and Asahino General Hospital. We thank all participating mothers and the staff of the antenatal clinics they attended.

Disclosure statement

The authors have no conflicts of interest to declare.

Author contributions

K.S., T.T., and T.K. designed and conducted the study. M.T. and T.K. performed analysis and M.T., S.T., and T.K. wrote this manuscript. All authors read and approved the final manuscript.

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Supporting information

Additional Supporting Information may be found in the online version of this article at the publisher's web-site:

Table S1 Comparisons between participants who returned all questionnaires (W1–3) and others who did not return.