Original Article

Anxiety and Feelings toward Their Baby among Pregnant Women with Uterine Leiomyomas

Miki Senoo[a]*, and Mikiya Nakatsuka[b]

[a]Graduate School of Health Sciences, [b]Department of Obstetrics and Gynecology, Graduate School of Health Sciences, Okayama University, Okayama 700-8558, Japan

Pregnant women with uterine leiomyomas may experience anxiety toward their pregnancies and unfavorable feelings toward their infants. From March to July 2010, we distributed anonymous self-recorded questionnaires to 200 pregnant women who visited Okayama Central Hospital for an antenatal check-up after informed consent was provided, and 132 women (23 pregnant women with uterine leiomyomas) were included in our study. Among the multiparous women in their first trimester, the women with uterine leiomyomas had a higher rate of anxiety than those without uterine leiomyomas. 'Avoidance' scores on the Feeling Toward the Baby Scale were significantly higher in the leiomyoma group. The conflict index scores tended to be higher in the leiomyoma group. A multivariate analysis revealed no factors associated with trait-anxiety scores, whereas high state-anxiety scores were correlated with low age; however, there was no correlation between these scores and uterine leiomyomas. Although no factors were associated with State-Trait Anxiety Inventory (STAI) and approach scores toward the baby, avoidance and conflict index scores were associated with the existence of uterine leiomyomas. In pregnant women with uterine leiomyomas, efforts should be made to reduce anxiety in the first trimester, and support should be provided to help these women develop positive feelings toward their babies.

Key words: pregnancy, uterine leiomyomas, anxiety, feelings toward the baby, pregnancy loss

U terine leiomyomas are estrogen-dependent benign tumors that have the highest incidence among all gynecologic tumors. They affect 20-50% of women of reproductive age [1]. With the recent rise in the age of conception and childbirth among women, complications of uterine leiomyomas are experienced by an increasing number of pregnant women and occur in 1.4-8.6% of pregnancies [1-3]. Reported complications of uterine leiomyomas in pregnancy include threatened abortion (17.1%) [4], preterm labor (16.3%) [4], premature rupture of the membranes (PROM) (7.3%) [4], miscarriage (26%) [5], and preterm delivery (14%) [5]. Other reported complications of uterine leiomyomas in pregnancy include fetal growth restriction, fetal malpresentation, placental abruption, and pain [6-8]. Prolonged labor due to poor head engagement and weak labor and abnormal hemorrhage (such as atonic hemorrhage) at the time of delivery have also been reported in women with uterine leiomyomas, as have postpartum uterine subinvolution and hemorrhage [8, 9].

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During pregnancy, most women develop a psychological and social awareness of motherhood; they form a bond of affection with the baby, and they make preparations to welcome the baby into the family. As a result of the physical, psychological, and social changes that occur during pregnancy, pregnant women have been found to experience ambivalence, with both positive and negative feelings toward the baby. Anxiety during pregnancy has been found to impede affection toward the baby [10] as well as the mother's positive childcare behavior toward the infant.

Pregnant women with uterine leiomyomas can certainly experience the joy of being pregnant; however, concurrently, they may be naturally anxious about various matters when one or more uterine leiomyomas are first diagnosed during the pregnancy. Such anxiety can affect the development of the woman's affection toward the baby. However, to the best of our knowledge, no studies have investigated anxiety and feelings toward the baby among pregnant women with uterine leiomyomas.

Here we explored the state of anxiety and feelings toward the baby among pregnant women with uterine leiomyomas, and we examined how these relate to the women's background factors.

Subjects and Methods

Between March and July 2010, we distributed an anonymous self-completed questionnaire including the State-Trait Anxiety Inventory (STAI, Japanese version) and Feeling Toward the Baby Scale to 200 pregnant women who were undergoing routine antenatal checkups at the Department of Obstetrics in Okayama Central Hospital, Okayama, Japan. All of the women provided written informed consent to complete the questionnaire, and 139 responses were obtained (69.5% response rate). Of these 139 women, we excluded those with complications including medical problems, mental disorders, fetal growth restriction, placenta previa, and pregnancy-induced hypertension; therefore, 132 (66.0%) women were included. On the questionnaire, the presence of anxiety was queried, and the degree of anxiety was measured using the STAI (Japanese version) [11]. The STAI is a psychological inventory based on a four-point Likert scale, and it consists of 40 questions answered on a self-reported basis. The STAI mea-

sures 2 types of anxiety: state anxiety, i.e., anxiety about an event, and trait anxiety, i.e., the anxiety level as a personal characteristic. Higher scores are positively correlated with higher levels of anxiety. 'State anxiety' can be defined as feeling fear, nervousness, and discomfort along with the arousal of the autonomic nervous system induced by different situations that are perceived as dangerous. State anxiety refers to how a person is feeling at the time of a perceived threat, and it is considered temporary. 'Trait anxiety' can be defined as feelings of stress, worry, and discomfort that one experiences on a day-to-day basis as a personality trait. This is usually perceived as how people feel across typical situations that everyone experiences on a daily basis.

The pregnant subjects' feelings toward their babies were also evaluated using the Feeling Toward the Baby Scale developed by Hanazawa [12]. This scale is comprised of 28 items (approach items and avoidance items), scored with four points from "this applies very well" to "this does not apply at all." The 'approach' feelings are positive feelings toward the baby, and 'avoidance' feelings are negative feelings toward the baby. The Scale's conflict index (the conflict index = avoidance score × 100/approach score) indicates an ambivalent feeling; for example, "I think that my baby is adorable, but on the other hand the baby is troublesome."

Our statistical analyses of the mothers' questionnaire results were performed using SPSS ver. 22.0 software (IBM, Armonk, NY, USA). Primipara versus multipara status, the presence of uterine leiomyomas, and the presence of several other background factors were compared using t-tests and Mann-Whitney U-tests; the proportion of the presence of each factor was determined using the chi-square test, and the presence of uterine leiomyomas was compared according to primaparous and multiparous pregnancies using a one-way analysis of variance (ANOVA), the Kruskal-Wallis test, and the multiple comparison test. The study was performed with the approval of the Ethics Committee of the Graduate School of Health Sciences, Okayama University.

Results

Subjects. The gestational age at the time of the questionnaire completion among 132 pregnancies was

28.5 ± 7.7 (mean $\pm$ SD) weeks (Table 1). Uterine leiomyomas had been diagnosed in 23 of the 132 pregnant women (17.4%). The uterine leiomyoma group was significantly older than the group without uterine leiomyomas (n = 109); however, there was no significant between-group (*i.e.*, uterine leiomyoma group vs. without uterine leiomyomas group) difference with regard to the proportion of women with a history of miscarriage and/or stillbirth, rate of fertility treatment, or threatened abortion and/or preterm labor.

The rate of complications during pregnancy was higher in the primiparous pregnancies compared to multiparous pregnancies, with a significantly higher rate of preterm labor.

Background factors and perceived anxiety.
The results of our analyses of the patients' background factors and their anxiety about pregnancy are summarized in Table 2. The highlights are as follows.

1. Uterine leiomyomas

There was no significant difference in the proportion of women with anxiety about pregnancy based on the presence of uterine leiomyomas.

2. Parity

There was no significant between-group difference in the proportion of women with anxiety about pregnancy based on primipara (n = 69) or multipara (n = 63) status.

3. Age

Among the 25–29–year-old women (n = 38), the proportion of pregnant women with anxiety about pregnancy tended to be higher in the group without uterine leiomyomas compared to the uterine leiomyoma group ($p = 0.095$).

4. History of miscarriage and/or stillbirth

There was no significant between-group difference in the proportion of pregnant women with anxiety about pregnancy among the women with a history of miscarriage and/or stillbirth (n = 26) and those without a history of miscarriage and/or stillbirth (n = 106).

5. Fertility treatment

There was no significant between-group difference in the proportion of pregnant women with anxiety about pregnancy among the subjects with a history of fertility treatment (n = 25) and those without such a history (n = 107).

Among the 69 primipara women only, there was no significant between-group difference in the proportion of pregnant women with anxiety about pregnancy based on the presence of uterine leiomyomas. Among the women without a history of fertility treatment, the subjects without uterine leiomyomas had a higher rate of anxiety about pregnancy than the uterine leiomyoma group (39.6% vs 0%) although it did not reach to a significant difference.

Table 1   Patient background

	Overall (n = 132)	Uterine leiomyomas		P-value	Parity		P-value
		Without (n = 109)	With (n = 23)		Primipara (n = 69)	Multipara (n = 63)	
Age	32.0 ± 4.4 32 [20–43]	31.4 ± 4.2 32 [20–41]	34.6 ± 4.4 34 [23–43]	<0.01	30.7 ± 4.6 30 [20–43]	33.3 ± 3.8 33 [25–42]	<0.01
Marital age	28.1 ± 4.1 28 [19–43]	27.5 ± 3.7 27 [19–41]	31.0 ± 4.8 29.5 [24–43]	<0.01	28.6 ± 4.5 28 [20–43]	27.6 ± 3.5 27 [19–39]	n.s.
With miscarriage and/or stillbirth	26 (19.7%)	20 (18.3%)	6 (26.1%)	n.s.	14 (20.3%)	12 (19.0%)	n.s.
With uterine leiomyomas	23 (17.4%)	–	–		11 (15.9%)	12 (19.0%)	n.s.
Family							
Nuclear family	115 (87.1%)	95 (87.2%)	20 (87.0%)	n.s.	63 (91.3%)	52 (82.5%)	n.s.
Extended family	17 (12.9%)	14 (12.8%)	3 (13.0%)	n.s.	6 (8.7%)	11 (17.5%)	n.s.
2 generations	14 (10.6%)	11 (10.1%)	3 (13.0%)	n.s.	5 (7.2%)	9 (14.3%)	n.s.
3 generations	3 (2.3%)	3 (2.8%)	0 (0%)	n.s.	1 (1.4%)	2 (3.2%)	n.s.
Employed	58 (43.9%)	49 (45.0%)	9 (39.1%)	n.s.	33 (47.8%)	25 (39.7%)	n.s.
Full-time	42 (31.8%)	36 (33.0%)	6 (26.1%)	n.s.	24 (34.8%)	18 (28.6%)	n.s.
Part-time/casual	12 (9.1%)	10 (9.2%)	2 (8.7%)	n.s.	7 (10.1%)	5 (7.9%)	n.s.
Other	4 (3.0%)	3 (2.8%)	1 (4.3%)	n.s.	2 (2.9%)	2 (3.2%)	n.s.
Pregnancy through fertility treatment	25 (18.9%)	18 (16.5%)	7 (30.4%)	n.s.	16 (13.2%)	9 (14.3%)	n.s.
Threatened abortion/ preterm labor	11 (8.3%)	10 (9.2%)	1 (4.3%)	n.s.	9 (13.0%)	2 (3.2%)	<0.05

Data are mean $\pm$ SD, median [range], n.s.: not significant.

6. Pregnancy term

There was no significant difference in the proportion of pregnant women with anxiety about pregnancy based on the presence of uterine leiomyomas among the women in their first, second, or third trimesters.

From the perspective of multipara status only, in the first trimester of pregnancy, the women with uterine leiomyomas tended to have a higher rate of anxiety than those without uterine leiomyomas ($p = 0.083$); however, no difference was observed during the second and third trimesters.

7. Threatened abortion and/or preterm labor

There was no significant difference in the proportion of pregnant women with anxiety about pregnancy according to the presence or absence of uterine leiomyomas among the women with threatened abortion and/or preterm labor and those without these complications.

Background factors and the scores of the STAI. The results of our analyses of the associations between the subjects' background factors and their scores on the STAI are presented in Table 3.

1. Uterine leiomyomas

There was no significant difference in the state anxiety or trait anxiety scores on the STAI according to the presence or absence of uterine leiomyomas. Moreover, there was no significant difference in the proportion of pregnant women with high scores (state

Table 2 Perceived anxiety in pregnant women with and without uterine leiomyomas

	Overall Uterine leiomyomas		P-value	Primipara Uterine leiomyomas		P-value	Multipara Uterine leiomyomas		P-value
	Without (n = 109)	With (n = 23)		Without (n = 58)	With (n = 11)		Without (n = 51)	With (n = 12)	
Overall	35 (32.1%)	7 (30.4%)	n.s.	25 (43.1%)	3 (27.3%)	n.s.	10 (19.6%)	4 (33.3%)	n.s.
Age									
>24 years (n = 6)	33.3% (2/6)	0% (0/0)	n.s.	33.3% (2/6)	0% (0/0)	n.s.	0% (0/0)	0% (0/0)	n.s.
25–29 years (n = 38)	35.3% (12/34)	0% (0/4)	n.s. (0.095)	50.0% (11/22)	0% (0/4)	n.s.	8.3% (1/12)	0% (0/0)	n.s.
30–34 years (n = 45)	30.6% (11/36)	55.6% (5/9)	n.s.	40.0% (6/15)	50.0% (2/4)	n.s.	23.8% (5/21)	60% (3/5)	n.s.
35–39 years (n = 38)	28.1% (9/32)	33.3% (2/6)	n.s.	35.7% (5/14)	50% (1/2)	n.s.	22.2% (4/18)	25.0% (1/4)	n.s.
40–44 years (n = 5)	100% (1/1)	0% (0/4)	<0.05	100% (1/1)	0% (0/1)	n.s.	0 (0%)	0% (0/3)	n.s.
History of miscarriage and/or stillbirth									
Without (n = 106)	28.1% (25/89)	23.5% (4/17)	n.s.	42.2% (19/45)	30.0% (3/10)	n.s.	13.6% (6/44)	14.3% (1/7)	n.s.
With (n = 26)	50.0% (10/20)	50.0% (3/6)	n.s.	46.2% (6/13)	0% (0/1)	n.s.	57.1% (4/7)	60.0% (3/5)	n.s.
History of fertility treatment									
Without (n = 107)	29.7% (27/91)	25.0% (4/16)	n.s.	39.6% (19/48)	0% (0/5)	n.s.	18.6% (8/43)	36.4% (4/11)	n.s.
With (n = 25)	44.4% (8/18)	42.9% (3/7)	n.s.	60.0% (6/10)	50.0% (3/6)	n.s.	25.0% (2/8)	0% (0/1)	n.s.
Pregnancy term									
1st trimester (n = 10)	28.6% (2/7)	66.7% (2/3)	n.s.	50.0% (2/4)	0% (0/0)	n.s.	0% (0/3)	66.7% (2/3)	n.s. (0.083)
2nd trimester (n = 44)	38.9% (14/36)	25.0% (2/8)	n.s.	52.6% (10/19)	66.7% (2/3)	n.s.	23.5% (4/17)	0% (0/5)	n.s.
3rd trimester (n = 74)	27.4% (17/62)	25.0% (3/12)	n.s.	37.5% (12/32)	12.5% (1/8)	n.s.	16.7% (5/30)	50.0% (2/4)	n.s.
Threatened abortion and/or preterm labor									
Without (n = 121)	28.3% (28/99)	27.3% (6/22)	n.s.	38.0% (19/50)	20.0% (2/10)	n.s.	18.4% (9/49)	33.3% (4/12)	n.s.
With (n = 11)	70.0% (7/10)	100% (1/1)	n.s.	75.0% (6/8)	100% (1/1)	n.s.	50.0% (1/2)	0% (0/0)	n.s.

Data are mean ± SD, median [range], n.s.: not significant.

Table 3 Evaluation of anxiety using the STAI

	Overall Uterine leiomyomas		P-value	Primipara Uterine leiomyomas		P-value	Multipara Uterine leiomyomas		P-value
	Without (n = 109)	With (n = 23)		Without (n = 58)	With (n = 11)		Without (n = 51)	With (n = 12)	
State anxiety	39 [21–69]	36 [26–71]	n.s.	38 [25–69]	35 [26–62]	n.s.	39.5 [21–57]	37 [26–71]	n.s.
Proportion of pregnant women with high scores	43 (39.4%)	6 (26.1%)	n.s.	25 (43.1%)	4 (36.4%)	n.s.	18 (35.3%)	2 (16.7%)	n.s.
Trait anxiety	40 [22–65]	37 [25–64]	n.s.	40 [22–64]	35 [25–61]	n.s.	40 [23–65]	39 [26–64]	n.s.
Proportion of pregnant women with high scores	34 (31.2%)	7 (30.4%)	n.s.	21 (36.2%)	3 (27.3%)	n.s.	13 (25.5%)	4 (33.3%)	n.s.

Data are mean ± SD, median [range], n.s.: not significant.

anxiety: $\geq$ 42 points, trait anxiety: $\geq$ 45 points), who are at high mental risk.

2. Parity

We also observed no significant difference in the STAI state anxiety or trait anxiety scores based on the presence of uterine leiomyomas from the perspective of primipara only and multipara only.

3. Age

There were no significant differences in STAI state anxiety scores or trait anxiety scores based on the presence or absence of uterine leiomyomas in any age group.

4. History of miscarriage and/or stillbirth

No significant difference was revealed in state anxiety scores based on the presence of uterine leiomyomas among the women with a history of miscarriage and/or stillbirth or among those without a history of either.

However, for the trait anxiety scores, among the women with a history of miscarriage and/or stillbirth, the uterine leiomyoma group [median (range), 45 (37–64)] tended to have higher scores than the group without uterine leiomyomas [36 (23–64)] ($p = 0.064$), whereas among women without a history of miscarriage and/or stillbirth, no significant difference was observed.

5. Fertility treatment

Based on the presence of uterine leiomyomas in the group with a history of fertility treatment and in the group without a history of fertility treatment, there was no significant difference in STAI state anxiety or trait anxiety scores.

6. Pregnancy term

There was no significant difference in state anxiety or trait anxiety scores based on the presence of uterine leiomyomas in any pregnancy term.

7. Threatened abortion and/or preterm labor

No significant differences in state anxiety or trait anxiety scores based on the presence of uterine leiomyomas were observed in the group with threatened abortion and/or preterm labor and the group without these complications.

Background factors and feelings toward the baby scale.

The results of the analyses of the relationships between the subjects' background factors and their reported feelings toward their babies are presented in Table 4.

1. Uterine leiomyomas

Overall, there was no significant difference in approach scores based on the presence of uterine leiomyomas. However, the uterine leiomyoma group had significantly higher avoidance scores than the group without (10 [1–35] vs. 6 [0–20], respectively; $p < 0.05$). In addition, for the conflict index, the uterine leiomyoma group tended to have higher scores than the group without uterine leiomyomas (36.1 ± 29.3 vs. 24.2 ± 16.6, respectively; $p = 0.092$).

2. Parity

For approach scores, when analyzed in the primipara-only and multipara-only groups, there was no significant difference according to the presence or absence of uterine leiomyomas. For avoidance scores, in the primipara-only group, the women with uterine leiomyomas tended to have higher scores than those without ($p = 0.093$), whereas in the multipara-only group there was no significant difference based on the presence of uterine leiomyomas. For the conflict index, when analyzed in the primipara-only and multipara-only groups, there was no significant difference based on the presence of uterine leiomyomas.

3. Age

Regarding the approach scores, there was no significant difference according to the presence or absence of uterine leiomyomas in any of the age groups.

Regarding the avoidance scores and conflict index, there was no significant difference based on the presence of uterine leiomyomas in any age group. For the primipara-only subjects, among the 30–34–year-old women, the uterine leiomyoma group (avoidance scores: 11 [9–12], conflict index: 40.2 ± 9.5) tended to have higher scores (avoidance scores: $p = 0.060$, conflict index: $p = 0.054$) than the group without uterine leiomyomas (avoidance scores: 6 [0–15], conflict index: 22.6 ± 13.0].). When analyzed in the multipara-only women, there was no significant difference based on the presence or absence of uterine leiomyomas in any age group.

4. History of miscarriage and/or stillbirth

For the approach scores, there was no significant difference according to the presence or absence of uterine leiomyomas in the group with a history of miscarriage and/or stillbirth, or in the group without a history of miscarriage and stillbirth.

For the avoidance scores, there was no significant difference according to the presence or absence of

Table 4　Uterine leiomyomas and feelings toward the baby

	Overall Uterine leiomyomas		P-value	Primipara Uterine leiomyomas		P-value	Multipara Uterine leiomyomas		P-value
	Without (n = 109)	With (n = 23)		Without (n = 58)	With (n = 11)		Without (n = 51)	With (n = 12)	
Overall									
Approach scores	29 [11–40]	28 [22–38]	n.s.	28 [11–39]	28.5 [23–34]	n.s.	29 [16–40]	26 [22–38]	n.s
Avoidance scores	6 [0–20]	10 [1–35]	<0.05	6 [0–20]	10.5 [2–35]	n.s. (0.093)	6 [0–18]	6 [1–23]	n.s
Conflict index	24.2 ± 16.6	36.1 ± 29.3	n.s. (0.092)	25.2 ± 18.7	42.2 ± 31.6	n.s.	23.1 ± 13.5	30.6 ± 25.8	n.s
Age									
>24 years (n = 6)	(n = 6)	(n = 0)		(n = 6)	(n = 0)		(n = 0)	(n = 0)	
Approach scores	31.5 [14–37]	–	–	31.5 [14–37]	–	–	–	–	–
Avoidance scores	9 [7–13]	–	–	9 [7–13]	–	–	–	–	–
Conflict index	39.1 ± 24.6	–	–	39.1 ± 24.6	–	–	–	–	–
25–29 years (n = 38)	(n = 34)	(n = 4)		(n = 22)	(n = 4)		(n = 12)	(n = 0)	
Approach scores	29 [15–39]	28.5 [28–34]	n.s.	30 [15–39]	28.5 [28–34]	n.s.	25 [16–35]	–	–
Avoidance scores	6 [0–20]	7.5 [2–13]	n.s.	6 [0–20]	7.5 [2–13]	n.s.	5.5 [1–18]	–	–
Conflict index	23.3 ± 15.3	25.2 ± 14.1	n.s.	22.8 ± 16.1	25.2 ± 14.1	n.s.	24.1 ± 13.9	–	–
30–34 years (n = 45)	(n = 36)	(n = 9)		(n = 15)	(n = 4)		(n = 21)	(n = 5)	
Approach scores	28.5 [11–40]	26.5 [22–31]	n.s.	27.5 [11–37]	28 [23–31]	n.s.	30 [17–40]	25 [22–29]	n.s.
Avoidance scores	6 [0–17]	10 [2–12]	n.s.	6 [0–15]	11 [9–12]	n.s. (0.060)	6 [0–17]	4 [2–12]	n.s.
Conflict index	23.8 ± 13.7	30.1 ± 14.6	n.s.	22.6 ± 13.0	40.2 ± 9.5	n.s. (0.054)	24.8 ± 14.2	24.1 ± 13.8	n.s.
35–39 years (n = 38)	(n = 32)	(n = 6)		(n = 14)	(n = 2)		(n = 18)	(n = 4)	
Approach scores	30 [18–40]	30.5 [22–38]	n.s.	27.5 [18–35]	30.5 [27–34]	n.s.	32 [19–40]	29.5 [22–38]	n.s.
Avoidance scores	5 [1–18]	15.5 [2–35]	n.s.	5 [1–18]	24 [13–35]	n.s.	6 [1–14]	12 [2–23]	n.s.
Conflict index	23.2 ± 17.4	56.7 ± 43.1	n.s.	26.4 ± 21.8	83.9 ± 45.7	n.s.	20.5 ± 11.9	43.0 ± 34.5	n.s.
40–44 years (n = 5)	(n = 1)	(n = 4)		(n = 1)	(n = 1)		(n = 0)	(n = 3)	
Approach scores	27	30 [26–38]	–	27	30	–	–	32 [26–38]	–
Avoidance scores	3	10 [1–15]	–	3	10	–	–	8 [1–15]	–
Conflict index	11.1	25.6 ± 15.6	–	11.1	33.3	–	–	21.7 ± 17.8	–
History of miscarriage and stillbirth									
Without (n = 106)	(n = 89)	(n = 17)		(n = 45)	(n = 10)		(n = 44)	(n = 7)	
Approach scores	29 [11–40]	28 [22–38]	n.s	28 [11–37]	28 [23–34]	n.s.	29 [16–40]	25 [22–38]	n.s.
Avoidance scores	6 [0–20]	9 [1–35]	n.s.	7 [0–20]	11 [2–35]	<0.05	6 [0–18]	5 [1–23]	n.s.
Conflict index	25.0 ± 15.9	38.3 ± 33.1	n.s.	26.3 ± 17.5	43.2 ± 33.1	n.s.	23.6 ± 13.8	30.9 ± 31.5	n.s.
With (n = 26)	(n = 20)	(n = 6)		(n = 13)	(n = 1)		(n = 7)	(n = 5)	
Approach scores	29 [14–39]	29.5 [22–38]	n.s.	31 [14–39]	30	–	24 [17–38]	29 [22–38]	n.s.
Avoidance scores	5 [1–13]	10.5 [2–18]	n.s.	5 [1–13]	10	–	5 [1–7]	11 [2–18]	n.s.
Conflict index	20.9 ± 19.1	30.6 ± 15.1	n.s.	21.6 ± 21.9	33.3	–	19.3 ± 10.2	30.1 ± 16.5	n.s.
Fertility treatment									
Without (n = 107)	(n = 91)	(n = 16)		(n = 48)	(n = 5)		(n = 43)	(n = 11)	
Approach scores	29 [11–40]	28 [22–38]	n.s.	28 [11–39]	29 [23–34]	n.s.	30 [16–40]	25.5 [22–38]	n.s.
Avoidance scores	6 [0–20]	6 [1–23]	n.s.	6 [0–20]	10 [2–13]	n.s.	6 [0–18]	5 [1–23]	n.s.
Conflict index	24.0 ± 15.9	29.9 ± 23.7	n.s.	24.7 ± 17.8	30.3 ± 15.4	n.s.	23.1 ± 13.2	29.7 ± 26.9	n.s.
With (n = 25)	(n = 18)	(n = 7)		(n = 10)	(n = 6)		(n = 8)	(n = 1)	
Approach scores	27 [18–39]	29.5 [27–38]	n.s.	28 [18–35]	28 [27–34]	n.s.	26 [29–34]	38	–
Avoidance scores	6 [1–18]	12 [9–35]	n.s. (0.088)	6 [1–18]	11 [9–35]	n.s.	5.5 [2–13]	15	–
Conflict index	25.6 ± 20.0	51.7 ± 35.5	n.s.	27.4 ± 22.3	54.2 ± 38.4	n.s.	22.5 ± 14.9	39.5	–

Data are median [range], mean ± SD, n.s.: not significant.　　　　　　　　　　　　　　　　　Continued to next page

uterine leiomyomas in the group with a history of miscarriage and/or stillbirth, or in the group without a history of miscarriage and stillbirth. Among the primipara-only women, in the group without a history of miscarriage and/or stillbirth, the uterine leiomyoma group had significantly higher avoidance scores than the group without uterine leiomyomas (11 [2–35] vs. 7 [0–20], respectively; $p < 0.05$). However, in the group with a history of miscarriage and/or stillbirth, there was no significant difference in avoidance scores based on the presence of uterine leiomyomas. In addition, among the multipara women, there

was no significant difference in avoidance scores based on the presence of uterine leiomyomas.

Regarding the conflict index, there was no significant difference according to the presence or absence of uterine leiomyomas in the women with a history of miscarriage and/or stillbirth, or in the group without such a history.

5. Fertility treatment

Regarding the approach scores, there was no significant difference based on the presence of uterine leiomyomas in the group with a history of fertility treatment or in the group without such a history.

Table 4 continued

	Overall Uterine leiomyomas		P-value	Primipara Uterine leiomyomas		P-value	Multipara Uterine leiomyomas		P-value
	Without (n = 109)	With (n = 23)		Without (n = 58)	With (n = 11)		Without (n = 51)	With (n = 12)	
Trimester									
1st trimester (n = 10)	(n = 7)	(n = 3)		(n = 4)	(n = 0)		(n = 3)	(n = 3)	
Approach scores	33 [17–37]	29 [26–35]	n.s.	33 [21–37]	–	–	25 [17–33]	29 [26–35]	n.s.
Avoidance scores	6.5 [0–9]	11 [1–18]	<0.05	6.5 [0–9]	–	–	4 [1–7]	11 [1–18]	n.s.
Conflict index	17.9 ± 13.6	31.1 ± 20.0	n.s.	20.1 ± 15.3	–	–	13.5 ± 7.7	31.1 ± 20.0	n.s.
2nd trimester (n = 44)	(n = 36)	(n = 8)		(n = 19)	(n = 3)		(n = 17)	(n = 5)	
Approach scores	29 [11–39]	28 [22–38]	n.s.	27 [11–37]	28 [27–31]	n.s.	29 [17–39]	31 [22–38]	n.s.
Avoidance scores	6 [0–20]	11 [4–35]	n.s.	5.5 [0–20]	11 [9–35]	n.s.	6 [2–14]	10.5 [4–23]	n.s.
Conflict index	23.0 ± 14.1	52.5 ± 40.1	n.s.	24.8 ± 16.2	66.0 ± 45.2	n.s.	21.6 ± 11.3	42.3 ± 32.2	n.s.
3rd trimester (n = 74)	(n = 62)	(n = 12)		(n = 32)	(n = 8)		(n = 30)	(n = 4)	
Approach scores	28 [13–40]	28 [22–34]	n.s.	28 [13–39]	29 [23–34]	n.s.	29 [16–40]	23.5 [22–28]	n.s.
Avoidance scores	6 [0–18]	9 [2–13]	n.s.	7 [1–18]	10 [2–13]	n.s.	6 [0–18]	2.5 [2–12]	n.s.
Conflict index	25.6 ± 18.2	27.1 ± 15.7	n.s.	26.5 ± 20.8	32.1 ± 14.3	n.s.	24.6 ± 14.5	18.4 ± 14.3	n.s.
Threatened abortion and/or preterm labor									
Without (n = 121)	(n = 99)	(n = 22)		(n = 50)	(n = 10)		(n = 49)	(n = 12)	
Approach scores	29 [11–40]	28 [22–38]	n.s.	28 [11–39]	29 [23–34]	n.s.	29 [16–40]	27 [22–38]	n.s.
Avoidance scores	6 [0–20]	10 [1–35]	<0.05	5.5 [0–20]	10 [2–35]	n.s. (0.096)	6 [0–18]	8.5 [1–23]	n.s.
Conflict index	23.6 ± 16.0	36.9 ± 30.5	n.s. (0.088)	23.6 ± 18.2	42.6 ± 33.3	n.s.	23.7 ± 13.4	31.8 ± 26.7	n.s.
With (n = 11)	(n = 10)	(n = 1)		(n = 8)	(n = 1)		(n = 2)	(n = 0)	
Approach scores	34 [23–39]	28	–	34 [23–37]	28	–	31.5 [24–39]	–	–
Avoidance scores	7 [2–18]	11	–	9 [5–18]	11	–	2.5 [2–3]	–	–
Conflict index	28.2 ± 20.8	39.3	–	33.9 ± 20.2	39.3	–	8.0 ± 0.3	–	–
Anxiety experienced by pregnant women									
Without (n = 90)	(n = 74)	(n = 16)		(n = 33)	(n = 8)		(n = 41)	(n = 8)	
Approach scores	29 [11–40]	28 [22–38]	n.s.	28 [11–37]	29.5 [23–34]	n.s.	29 [16–40]	24 [22–38]	n.s.
Avoidance scores	6 [0–18]	9 [1–23]	n.s.	6 [0–15]	9.5 [2–13]	<0.05	6 [1–18]	4 [1–23]	n.s.
Conflict index	23.8 ± 16.0	30.0 ± 22.5	n.s.	23.0 ± 18.8	31.7 ± 13.4	n.s.	24.4 ± 13.2	28.0 ± 29.6	n.s.
With (n = 42)	(n = 35)	(n = 7)		(n = 25)	(n = 3)		(n = 10)	(n = 4)	
Approach scores	29.5 [18–39]	28 [25–35]	n.s.	29 [18–39]	27.5 [27–28]	n.s.	31 [19–39]	28.5 [25–35]	n.s.
Avoidance scores	6 [0–20]	11.5 [2–35]	n.s.	7 [1–20]	23 [11–35]	n.s.	3 [0–14]	11.5 [2–18]	n.s.
Conflict index	25.1 ± 17.7	51.5 ± 37.4	n.s.	28.0 ± 18.2	84.5 ± 45.2	n.s.	17.2 ± 13.0	35.1 ± 16.3	n.s. (0.078)

Data are median [range], mean ± SD, n.s.: not significant.

For the avoidance scores, in the group with a history of fertility treatment, the uterine leiomyoma group tended to have higher scores than the group without uterine leiomyomas ($p = 0.088$). However, in the group without a history of fertility treatment, there was no significant difference according to the presence or absence of uterine leiomyomas.

For the conflict index, there was no significant difference based on the presence or absence of uterine leiomyomas in the group with a history of fertility treatment, or in the group without such a history.

6. Pregnancy term

Regarding the approach scores, there was no significant difference according to the presence or absence of uterine leiomyomas during any trimester.

In the first-trimester group, the women with uterine leiomyomas had significantly higher avoidance scores than the group without uterine leiomyomas (11 [1–18] vs. 6.5 [0–9], respectively; $p < 0.05$). However,

no similarly significant differences in avoidance scores were observed in the second or third trimesters.

For the conflict index, there was no significant difference according to the presence or absence of uterine leiomyomas during any trimester.

7. Threatened abortion and/or preterm labor

Regarding approach scores, there was no significant difference according to the presence or absence of uterine leiomyomas among the women with threatened abortion and/or preterm labor and those without these complications.

For the avoidance scores, among the women without pregnancy complications, the uterine leiomyoma group had significantly higher scores than the group without uterine leiomyomas (10 [1–35]) vs. 6 [0–20]; $p < 0.05$). However, there was no similarly significant difference observed among women with threatened abortion and/or preterm labor. Among the primipara-only women, among those without a threatened abor-

tion and/or preterm labor, the women with uterine leiomyomas tended to have higher scores than those without uterine leiomyomas (10 [2–35] vs. 5.5 [0–20], respectively; $p = 0.096$); however, among the primipara women with threatened abortion and/or preterm labor, there was no significant difference based on the presence of uterine leiomyomas.

Regarding the conflict index, in the group of women without a threatened abortion and/or preterm labor, the uterine leiomyoma group tended to have higher scores than the group without uterine leiomyomas (36.9 ± 30.5 vs. 23.6 ± 16.0, respectively $p = 0.088$). On the other hand, among the women with a threatened abortion and/or preterm labor, there was no significant difference based on the presence or absence of uterine leiomyomas.

8. Anxiety experienced by pregnant women

There was no significant difference in approach scores based on the presence of uterine leiomyomas among the women with anxiety or among the women without anxiety.

Regarding the avoidance scores, among both the women with anxiety and those without anxiety, there was no significant difference based on the presence of uterine leiomyomas. Among the primipara-only subjects, in the group without anxiety, the uterine leiomyoma group had significantly higher scores than the group without uterine leiomyomas (9.5 [2–13] vs. 6 [0–15], respectively; $p < 0.05$). In the group with anxiety, however, there was no significant difference based on the presence of uterine leiomyomas.

There was no significant difference in the conflict index based on the presence of uterine leiomyomas among the women with anxiety or those without anxiety. In the multipara-only group, among the women with anxiety, the uterine leiomyoma group tended to have higher scores than the group without uterine leiomyomas (35.1 ± 16.3 vs. 17.2 ± 13.0, respectively; $p = 0.078$).

Multiple regression analysis: factors associated with STAI scores and feelings toward the baby scale.   We analyzed each STAI score in relation to age, presence of uterine leiomyomas, primiparity, history of miscarriage and stillbirth, history of fertility treatment, and pregnancy term by multiple regression analysis; no relationships were observed between trait-anxiety scores and any of these factors. However, in state-anxiety scores, we found that the

lower the woman's age was the higher the score for state-anxiety (state anxiety $= 54.958 - 0.495 \times$ age). In addition, when examined based on the presence of uterine leiomyomas, age was correlated with state-anxiety scores (state anxiety $= 57.496 - 0.580 \times$ age). However, in the uterine leiomyoma group, no correlation was observed for any factor. For trait anxiety, there was no correlation with any factor, even when examined based on the presence of uterine leiomyomas.

In our multiple regression analysis of each score on the scale of feelings toward the baby with regard to age, presence of uterine leiomyomas, primiparity, history of miscarriage and stillbirth, history of fertility treatment, week of pregnancy, complication with threatened abortion and/or preterm labor, and anxiety experienced by the pregnant woman, no correlation was observed between approach scores and any factor when examined overall or based on the presence of uterine leiomyomas.

The analysis showed that the presence of uterine leiomyomas was correlated with high avoidance scores (avoidance score $= 6.634 + 3.700 \times$ presence of uterine leiomyomas).

Our findings also revealed that the presence of uterine leiomyomas was correlated with high conflict index scores (conflict index $= 24.228 + 11.891 \times$ presence of uterine leiomyomas).

Discussion

Our analysis of the questionnaire results of 132 pregnant women revealed that during the first trimester, there tended to be a high proportion of multiparous women with uterine leiomyomas who experienced anxiety. In the first trimester, fetal movements and an enlarged abdomen due to the presence of the fetus are not yet experienced. In fact, as noted in the Free Comments section of the questionnaire, pregnant women with uterine leiomyomas reported anxiety regarding whether they would give birth safely as a result of their experience with miscarriage or hospitalization for threatened abortion. In multipara women, the experience of a threatened abortion and/ or preterm labor or a history of miscarriage or stillbirth may cause anxiety.

In the evaluation by the STAI, we observed that pregnant women with both uterine leiomyomas and a history of miscarriage or stillbirth tended to have high

scores for trait anxiety. Thus, the trait anxiety of pregnant women was correlated with a history of miscarriage and stillbirth. Trait anxiety indicates an individual's susceptibility to develop anxiety as an individual personality trait, in a similar response to various threatening situations. Persistent anxiety due to uterine leiomyomas may prevent the woman from moving on from an experience of miscarriage or stillbirth, and it can affect trait anxiety. The results of earlier studies involving pregnant women in general were inconsistent, with one report indicating that the experience of miscarriage or stillbirth is associated with anxiety and depression during pregnancy [13], whereas another study indicated that the experience of miscarriage or stillbirth does not affect the level of anxiety and depression during pregnancy [14]. However, on the basis of the present study's findings, we believe that in addition to a history of miscarriage or stillbirth, having uterine leiomyomas increases a woman's anxiety about the continuation of the pregnancy.

Obstetricians should make the effort to encourage pregnant women with uterine leiomyomas to express their anxiety by taking the time to talk to these women during routine antenatal check-ups, beginning in the first trimester. The women's anxiety should also be eased with the use of an ultrasound examination and fetal heart rate monitoring to demonstrate that the fetus is alive.

In pregnant women with uterine leiomyomas and a history of miscarriage or stillbirth, anxiety may be alleviated by accurately evaluating the impact of the uterine leiomyomas before pregnancy and, if required, planning a uterine myomectomy while informing the woman that this does not pose a problem. An accurate evaluation and, if required, tocolysis may reduce anxiety when uterine leiomyomas are diagnosed during early pregnancy. We believe that the provision of thorough medical treatment and hospitalization may alleviate anxiety among women with uterine leiomyomas.

Our multivariate analysis demonstrated that the STAI scores for state anxiety were correlated with age in pregnant women overall, as well as in the group without uterine leiomyomas. McMahon *et al*. [15] conducted a study involving pregnant women in general, and they reported that young pregnant women had high STAI scores. Camberis *et al*. [16] claimed that psychological maturity is an advantage of older mothers. Similarly, in the present study, we believe

that young, psychologically immature women were less able to cope with anxiety during pregnancy and thus experienced greater anxiety than other age groups. Our study's pregnant women with uterine leiomyomas were older and therefore may have had less anxiety about uterine leiomyomas because of their psychological maturity.

In the present patient series, regarding the pregnant women's feelings toward their babies, approach feelings were not associated with the presence of uterine leiomyomas. However, the women with uterine leiomyomas had significantly higher avoidance scores, and we observed that the primiparous women tended to have particularly high avoidance scores. In multiparous women with uterine leiomyomas, their prior experiences with pregnancy, delivery, and child care may have prevented an adverse effect on the development of affection toward the baby. In primiparous women, efforts should be made to alleviate their anxiety and promote their affection and concern toward the baby, by explaining the course of the mother-child state.

Our findings also revealed that avoidance scores were correlated with various factors including history of miscarriage and stillbirth, history of fertility treatment, week of pregnancy, complications during the current pregnancy, and anxiety experienced by the pregnant woman, whereas the conflict index scores were correlated with complications during the current pregnancy and anxiety experienced by the pregnant woman.

Among the pregnant women with a history of fertility treatment in the present study, we found that avoidance scores tended to be high. It has been reported that, for women who have undergone fertility treatment, anxiety about miscarriage can lead to more concern about pregnancy continuation than about the baby, and this anxiety can thus place the woman in a situation where it is difficult to develop affection toward the baby [17].

The mental stress and physical burden of fertility treatment should be thoroughly understood, and the risks of uterine leiomyomas should be adequately described. It is also important to not only provide support to ease anxiety about the progression of the pregnancy but also to enable pregnant women to develop affection for their unborn child and imagine life after delivery.

In the present study, the pregnant women with uterine leiomyomas in their first trimester had high avoidance scores. Pregnancy is a period during which women prepare mentally and socially to become a mother and to receive a child into their life, and it is reported that feelings of affection gradually grow during pregnancy [18]. The formation of maternal affection is reported to be promoted through concern for the baby [19, 20], for example, by viewing the appearance of the fetus by ultrasound before feeling fetal movements. In pregnant women with uterine leiomyomas, it is important to make a birth plan and imagine child-rearing to promote interest and concern for the baby.

The present study's multiparous women with uterine leiomyomas who experienced anxiety regarding the pregnancy tended to have high conflict index scores. It is important to create an environment in which pregnant women find it easy to express their anxiety. However, primiparous women with uterine leiomyomas had significantly higher avoidance scores even when they did not feel anxiety, and our findings indicated that it was difficult for them to develop affection toward their babies. We used the STAI to evaluate anxiety; further studies should be performed that include other indexes to evaluate anxiety. Additional investigations that examine in detail the awareness of anxiety, perception of the baby, and postpartum child care are needed. In pregnant women with uterine leiomyomas, it is also possible that factors other than anxiety are associated with feelings toward the baby; such relationships should be clarified.

The results of the multivariate analysis showed that, in terms of the avoidance scores and conflict index, our study is the first to reveal that the presence of uterine leiomyomas can have an adverse effect on feelings toward the baby. The provision of support for women with uterine leiomyomas may facilitate the development of affection toward their unborn children, and support postpartum child care. However, the sample size was small in the multivariate analysis and studies with larger numbers of subjects should be conducted to test our findings. Further examinations of related factors including the size, number, and location of uterine leiomyomas should be performed.

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