

ORIGINAL

Relationship between maternal mental status and social supports during pregnancy and until one month after childbirth in a local city

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Abstract: The aim of this study was to clarify the relationship between maternal mental status and social supports during pregnancy and until one month after childbirth in order to evaluate the actual situation in a local city. A survey was conducted on 78 pregnant women who completed the CES-D (depression score), STAI (anxiety score) and Social Support Scale. Data were collected four times: during the second trimester, the third trimester, postpartum hospitalization, and 1 month after childbirth. The CES-D and STAI scores were initially high during pregnancy and decreased during the postpartum period. The Social Support Scale score, however, was initially low during pregnancy and increased during the postpartum period. The CES-D and STAI scores were significantly and negatively correlated with The Social Support Scale score during all four time periods. Participants ≥ 35 years of age scored lower on The Social Support Scale than did participants < 35 years of age in the second trimester, third trimester, and 1 month after childbirth. These findings should assist with the implementation of a comprehensive support center and may be useful for a local city in Japan. *J. Med. Invest.* 68 : 265-270, August, 2021

Keywords: maternal mental status, social supports, in a local city, a prospective cohort study

INTRODUCTION

In Japan which is a declining birthrate and an aging population, a problem of the perinatal mental health such as postpartum depression occurs. According to the investigation of the perinatal mental health, the prevalence of postpartum depression is 10%–15% (1), and the prevalence is higher than other perinatal disorders. Using the Edinburgh Postnatal Depression Scale (EPDS) as a measure, a systematic review of the literature found that the prevalence of postpartum depression is averaged around 17.7%, with a low of 3% in Singapore and a high of 38% in Chile (2).

On the other hand, antenatal depression is notable health problem as well as postpartum depression. Psychological stress and anxiety in pregnancy are associated with delayed motor development, mental development (3), and emotional problems in children (4). In prior studies on the working pregnant women, primiparous working women have high levels of mental health (5), about 70 % of the working pregnant women have an impatience (6). Thus, the mental health during pregnancy has an influence not only on mother but also on children.

A recent study reported the risk factors of postpartum depression are prenatal depression, prenatal stress, marital relationship and life stress (7). In Japan, there are reports that the postpartum women aged < 20 years and aged ≥ 35 years have high EPDS score (8). According to the study of older primiparas, they have high prevalence of shoulder stiffness, back pain and wrist pain (9) and the high level of fatigue (10) at one month after childbirth.

Moreover, one of the important risk factors for postpartum

depression is the lack of social support (11, 12). Young parents found it easy to receive postpartum support because they often lived near their parents in the local city, a 2011 survey reported (13). And therefore, the local city was the good environment to receive support easily in childcare. In this present decrease in the number of births, pregnant women who do not have an experience to play with children in a home and an area is increasing. Moreover, there are few friend and place in a trouble for pregnant women.

In reference to the Finnish neuvola model, we will install “The comprehensive support centers for Maternal with Child Health” where a pregnant woman can feel free to consult in the whole country across interfamily support. This study examines the relationship between mental health status and social support during pregnancy and through the first month postpartum in order to evaluate the actual situation in the local city. This study’s findings should assist with the plans in providing a comprehensive support center for maternal and child health in a local city.

METHODS

Survey

This was a prospective cohort study conducted between July 2018 and March 2020 in an emergency hospital staffed with midwives and postpartum mental health supports in. Participants were women > 20 years of age, without severe pregnancy complications and no mental disorders. Their children were determined to be physically normal, and there had been no severe postpartum health problems or unusual problems with the delivery.

Data were collected four times: during the second trimester, the third trimester, postpartum hospitalization, and 1 month after childbirth. During the second trimester, we asked the women to participate in the study and obtained a signed consent. During each of the four periods, we have distributed a

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self-administered questionnaire which the women completed and mailed back.

Instruments

In addition to the three scales discussed below, we asked the mothers about their age, number of previous births, type of delivery, occupation, whether they work at night, and whether they visited their parents' home. We asked about their primary support person, and we inquired about their satisfaction for this person using a 5-point Likert scale, from 1 (very satisfied) to 5 (very dissatisfied).

CES-D

The CES-D (the Center for Epidemiologic Studies Depression) scale was developed by Radloff (14), and it was then translated into Japanese by Shima *et al.* (15). It consists of 20 items and uses a 4-point Likert scale. We asked respondents to choose one of the following responses for each question as it applied to their physical or mental conditions: 0 (rarely or none of the time, <1 day/week); 1 (some or a little of the time, 1–2 days/week); 2 (occasionally or a moderate amount of time, 3–4 days/week); and 3 (most or all of the time, 5–7 days/week). Scores ranged from 0 to 60, with higher scores indicating greater levels of depression. The cut-off point was 16 points. The reliability of this scale has been examined.

STAI

The STAI has been defined as a scale that divides anxiety into state and trait anxiety based on the state-trait anxiety theory of Spielberger *et al.* (16). The STAI is comprised of 20 state anxiety items, which evaluate present feelings, and 20 trait anxiety items examining everyday feelings. We only used the state anxiety questions to inquire about present feelings in this study. The state anxiety uses a 4-point Likert scale ranging from 1 (does not apply at all) to 4 (applies very well). Scores range from 20 to 80, with higher scores indicating higher levels of state anxiety. The cut-off point is 42 points. The reliability of this scale has been examined.

Social Support Scale

The Social Support Scale was developed by Zimet *et al.* (17-19), and it was translated to Japanese by Iwasa *et al.* (20). The scale consists of 12 items; each of which is comprised of three factors as follows: "support by the important person," "support by the family," and "support by a friend." It is scored using a 7-point Likert scale ranging from 1 (we do not think so at all) to 7 (we think so very much) points. Scores range from 12 to 84, with higher scores indicating higher levels of social support. The Cronbach alpha for this study was 0.921 in the second trimester, 0.945 in the third trimester, 0.951 during the postpartum hospitalization, and 0.950 1 month after childbirth.

Data analysis

The demographic data of the participants was evaluated using descriptive statistics. Changes in the three scales' scores over time were determined using the Friedman test. Meanwhile, the Bonferroni method was used for subsequent multiple comparisons. We analyzed the correlation among the three scales' scores using Spearman's rank correlation coefficient test. We analyzed the association between demographic information and the three scales' scores using the t-test and the Mann-Whitney U test. Statistical analyses were conducted using SPSS Statistics version 25 (IBM Corp.).

Ethical consideration

We informed the participants both verbally and in writing about the purpose of the study and that participation was vol-

untary. We stated that there was no penalty or disadvantage for refusing to participate, that confidentiality would be maintained, that withdrawal from the study was possible even after giving their consent, and that the data obtained would not be used for any other purpose apart from the study. We then used a questionnaire with an ID number for data collection for each four times the questionnaire was filled out. However, no individual was specifically identified, and the privacy of the participants was protected. This study was approved by the Ethics Committee of Tokushima University Hospital (approval no. 3165).

RESULTS

In total, 139 participants have agreed to participate in the study; however, 61 were excluded either due to peripartum maternal or infant abnormalities or failure to answer all questions on the four separate questionnaires, which narrowed down the participants into 78 (56.1%). The average age of the participants was 34.9 ± 4.7 years, and 48.7% were determined to be primiparous. The proportion of participants who were ≥ 35 years of age was 56.4%. Among primiparous women, the proportion of participants who were ≥ 35 years of age was 52.6% (20/38). Of all the participants, 82.1% held jobs and the most common support person was their husband on all four of the questionnaires (Table 1).

Table 1. Demographic data of the participants N = 78

		number (proportion)
age (years)	age (Mean \pm SD)	34.9 \pm 4.7
number of previous births	primiparous women	38 (48.7)
	multiparous women	40 (51.3)
age	aged < 35	34 (43.6)
	aged ≥ 35	44 (56.4)
age (in primiparous women's group) (n = 38)	aged < 35	18/38 (47.4)
	aged ≥ 35	20/38 (52.6)
type of delivery	Vaginal	64 (82.1)
	Cesarean section	14 (17.9)
work	don't work	14 (17.9)
	a working women	64 (82.1)
whether they work at night	Yes	6 (7.7)
	No	58 (74.4)
	don't work	14 (17.9)
whether they visited their parents' home	Yes	29 (37.2)
	No	49 (62.8)

Changes over time of the CES-D, STAI, and Social Support Scale

The CES-D score was 8.0, 9.0, 7.0, and 4.0 in the second trimester, third trimester, during postpartum hospitalization, and 1 month after childbirth, respectively. A significant difference was observed between the second trimester and 1 month after childbirth, between the third trimester and 1 month after childbirth, and between the postpartum hospitalization and 1 month after childbirth ($P < 0.001$).

The state anxiety score (STAI) was 38.5, 37.5, 35.0, and 31.0 in the second trimester, third trimester, during postpartum hospitalization, and 1 month after childbirth, respectively. The average score in the second trimester was deemed to be the highest, and all scores gradually decreased throughout the remainder of the study period. Each of the initial three study periods was significantly different from the period 1 month after childbirth ($P < 0.001$).

The Social Support Scale score was 72.5, 72.5, 76.0, and 76.5 in the second trimester, third trimester, during postpartum hospitalization, and 1 month after childbirth, respectively. A significant difference was determined between the second trimester and the postpartum hospitalization, between the third trimester and the postpartum hospitalization, between the second trimester and 1 month after childbirth, and between the third trimester and 1 month after childbirth ($P < 0.001$).

The score for support by the important person on the Social Support Scale was 25.5, 24.0, 27.0, and 27.0 in the second trimester, third trimester, during postpartum hospitalization, and 1 month after childbirth, respectively. There was a significant difference between the second trimester and the postpartum hospitalization, between the third trimester and the postpartum hospitalization, and between the third trimester and 1 month after childbirth ($P < 0.001$). The score for support by the family was 25.0, 25.0, 26.0, and 27.0 in the second trimester, third trimester, during postpartum hospitalization, and 1 month after childbirth, respectively. Significant difference was also observed between the second trimester and the postpartum hospitalization and between the third trimester and the postpartum hospitalization ($P < 0.001$). The score for support by a friend was 23.0, 23.0, 24.0, and 24.0 in the second trimester, third trimester, during postpartum hospitalization, and 1 month after childbirth, respectively. There was a significant difference between the second trimester and the postpartum hospitalization, between the third trimester and the postpartum hospitalization, between the second trimester and 1 month after childbirth, and between the third trimester and 1 month after childbirth ($P < 0.001$) (Table 2).

Correlation among the three scales

The CES-D score was significantly and negatively correlated

with the Social Support Scale score in the second trimester, third trimester, during postpartum hospitalization, and 1 month after childbirth ($r = -.30$ to $-.48$, $P < 0.01$). Also, the STAI score was significantly and negatively correlated with the Social Support Scale score in all four times ($r = -.28$ to $-.46$, $P < 0.01$). However, the STAI score was not significantly correlated with the score of support by the family in the postpartum hospitalization period (Table 3).

Association between demographic data and the scales' scores
Age

Participants aged < 35 years have been determined to have significantly higher Social Support Scale scores than those aged ≥ 35 years in the second trimester ($P = 0.017$). Those < 35 years had a significantly higher Social Support Scale score in the third trimester ($P = 0.041$). Finally, participants aged < 35 years had a significantly higher Social Support Scale score 1 month after childbirth ($P = 0.044$).

We divided 38 primiparous women into two groups. One was aged < 35 , the other was aged ≥ 35 . We investigated the association with the scale score. There was no significant difference between two groups in all for four times.

Night work

We divided a working woman into two groups. One was the participants who worked in the night, the other was the participants who did not work in the night in the second trimester. One group had a significantly lower CES-D and STAI score than the other ($P = 0.034$ and 0.040 , respectively). One group had a significantly higher Social Support Scale score than the other ($P = 0.024$) (Table 4).

Table 2. Changes over time of the CES-D, STAI, and Social Support Scale

N = 78

	the CES-D		the state anxiety (STAI)		the Social Support Scale		for support by the important person on the Social Support Scale		for support by the family on the Social Support Scale		for support by a friend on the Social Support Scale	
second trimester	8.0 (4.0, 13.0)	a	38.5 (32.0, 46.0)	a	72.5 (66.0, 80.0)	a	25.5 (23.0, 27.0)	bc	25.0 (23.0, 28.0)	b	23.0 (20.0, 25.0)	a
third trimester	9.0 (5.0, 12.0)	a	37.5 (34.0, 45.0)	a	72.5 (65.0, 79.0)	a	24.0 (23.0, 28.0)	c	25.0 (22.0, 28.0)	b	23.0 (20.0, 25.0)	a
postpartum hospitalization	7.0 (4.0, 10.0)	a	35.0 (30.0, 41.0)	a	76.0 (69.0, 82.0)	b	27.0 (24.0, 28.0)	a	26.0 (24.0, 28.0)	a	24.0 (21.0, 27.0)	b
1 month after childbirth	4.0 (1.0, 8.0)	b	31.0 (24.0, 39.0)	b	76.5 (67.0, 82.0)	b	27.0 (24.0, 28.0)	ab	27.0 (23.0, 28.0)	ab	24.0 (21.0, 28.0)	b

Changes in the three scales' score over time were determined using the Friedman test. Meanwhile, the Bonferroni method was used for subsequent multiple comparisons. Values were presented as Median (25th, 75th percentile). Different letters indicated significant differences at $P < 0.05$ between sites.

Table 3. Correlation among the three scales

N = 78

		the Social Support Scale score	the scores for support by the important person on the Social Support Scale	the scores for support by the family	the scores for support by a friend
second trimester	the CES-D score	-0.31**	-0.31**	-0.27*	-0.30**
	the score of the state anxiety score (STAI)	-0.36**	-0.36**	-0.26*	-0.40**
third trimester	the CES-D score	-0.31**	-0.35**	-0.31**	-0.25*
	the score of the state anxiety score (STAI)	-0.45**	-0.47**	-0.39**	-0.39**
postpartum hospitalization	the CES-D score	-0.30**	-0.36**	-0.24*	-0.26*
	the score of the state anxiety score (STAI)	-0.28*	-0.26*	-0.21	-0.28*
1 month after childbirth	the CES-D score	-0.48**	-0.51**	-0.41**	-0.44**
	the score of the state anxiety score (STAI)	-0.46**	-0.47**	-0.45**	-0.41**

We analyzed the correlation among the three scales' using Spearman's rank correlation coefficient test. ** $P < 0.01$, * $P < 0.05$.

Table 4. Association between demographic data and the scales' scores

		the CES-D score	P value	the score of the state anxiety score(STAI)	P value	the Social Support Scale score	P value	the scores for support by the important person on the Social Support Scale	P value	the scores for support by the family	P value	the scores for support by a friend	P value
second trimester	number of previous births	primiparous women	8.0 (4.0, 14.0)	0.912	38.9 (8.8)	0.740	73.0 (68.0, 80.0)	0.224	26.0 (23.0, 28.0)	0.248	26.0 (24.0, 28.0)	23.0 (20.0, 25.0)	0.695
		multiparous women	8.0 (4.5, 13.0)		39.6 (10.5)		72.0 (65.5, 79.5)		24.0 (22.5, 27.0)		24.5 (23.0, 27.5)	22.5 (20.0, 25.0)	
	age	aged < 35	6.0 (4.0, 14.0)	0.385	37.9 (8.9)	0.287	75.5 (71.0, 81.0)	0.017	27.0 (24.0, 28.0)	0.066	26.5 (24.0, 28.0)	24.0 (22.0, 25.0)	0.068
		aged ≥ 35	8.0 (5.0, 13.0)		40.3 (10.1)		69.0 (65.5, 79.0)		24.0 (23.0, 27.0)		24.0 (23.0, 27.5)	22.0 (19.0, 24.5)	
		aged (in primiparous women's group)	8.6 (6.2)	0.565	37.5 (7.5)	0.359	75.7 (7.4)	0.109	27.0 (24.0, 28.0)	0.246	27.0 (25.0, 28.0)	25.7 (3.3)	0.100
third trimester	work	aged ≥ 35	9.8 (6.4)		40.2 (9.8)		71.7 (7.4)		25.0 (23.0, 27.0)		24.5 (23.0, 28.0)	21.8 (3.7)	
		don't work	7.5 (4.0, 13.0)	0.739	41.1 (11.0)	0.425	68.5 (61.0, 78.0)	0.155	23.0 (21.0, 27.0)	0.084	24.0 (21.0, 26.0)	22.0 (19.0, 24.0)	0.281
		a working women	8.0 (4.5, 13.0)		38.4 (9.4)		73.0 (66.5, 80.0)		26.0 (23.5, 27.5)		25.5 (23.0, 28.0)	23.0 (20.0, 25.0)	
		Yes	3.5 (3.0, 6.0)	0.084	31.0 (24.0, 36.0)	0.040	81.0 (80.0, 83.0)	0.024	28.0 (27.0, 28.0)	0.043	28.0 (28.0, 28.0)	25.5 (24.0, 27.0)	0.021
		No	8.0 (5.0, 14.0)		39.0 (34.0, 45.0)		72.0 (66.0, 79.0)		25.5 (23.0, 27.0)		25.0 (23.0, 28.0)	23.0 (20.0, 25.0)	
postpartum hospitalization	number of previous births	primiparous women	7.5 (4.0, 13.0)	0.652	38.2 (8.5)	0.618	73.5 (68.0, 79.0)	0.284	25.0 (23.0, 28.0)	0.221	26.0 (24.0, 28.0)	24.0 (21.0, 26.0)	0.289
		multiparous women	9.0 (5.0, 12.0)		39.2 (9.8)		71.0 (63.0, 78.0)		24.0 (23.0, 27.0)		24.5 (23.0, 28.0)	23.0 (20.0, 24.0)	
	age	aged < 35	6.0 (4.0, 13.0)	0.214	36.8 (8.6)	0.108	75.5 (70.0, 81.0)	0.041	25.0 (24.0, 28.0)	0.030	26.0 (24.0, 28.0)	24.0 (21.0, 25.0)	0.220
		aged ≥ 35	9.0 (6.0, 12.0)		40.2 (9.4)		71.0 (63.5, 76.0)		24.0 (22.5, 26.0)		24.0 (23.0, 27.0)	23.0 (20.0, 24.5)	
		aged (in primiparous women's group)	6.0 (4.0, 13.0)	0.455	36.7 (7.7)	0.332	78.0 (70.0, 81.0)	0.236	26.0 (24.0, 28.0)	0.211	26.5 (24.0, 28.0)	24.0 (20.0, 26.0)	0.444
1 month after childbirth	number of previous births	primiparous women	8.5 (5.5, 12.5)	0.877	39.5 (9.2)	0.027	72.0 (66.5, 77.5)	0.703	24.5 (23.0, 26.5)	0.634	24.5 (23.5, 28.0)	23.0 (21.5, 25.5)	0.936
		multiparous women	7.0 (4.0, 12.0)		38.0 (9.5)		76.5 (71.0, 83.0)		26.5 (24.0, 28.0)		26.0 (25.0, 28.0)	24.5 (22.0, 27.0)	
	age	aged < 35	6.0 (3.0, 9.0)	0.084	33.7 (7.4)	0.124	79.0 (73.0, 83.0)	0.064	27.0 (24.0, 28.0)	0.153	27.0 (25.0, 28.0)	25.0 (23.0, 27.0)	0.167
		aged ≥ 35	8.0 (5.0, 11.5)		37.1 (9.0)		74.5 (66.5, 80.5)		25.5 (23.5, 28.0)		26.0 (23.5, 28.0)	23.0 (20.0, 27.5)	
		aged (in primiparous women's group)	6.0 (3.0, 10.0)	0.067	35.8 (8.7)	0.182	79.5 (72.0, 83.0)	0.253	27.0 (24.0, 28.0)	0.486	26.5 (26.0, 28.0)	25.5 (22.0, 27.0)	0.345
1 month after childbirth	type of delivery	aged ≥ 35	8.0 (5.0, 15.5)		40.0 (10.1)		73.5 (69.5, 81.5)		25.0 (24.0, 28.0)		26.0 (24.0, 27.0)	23.5 (21.0, 26.5)	
		Vaginal	7.0 (4.0, 10.5)	0.248	35.5 (8.3)	0.573	76.0 (69.0, 82.0)	0.690	26.5 (24.0, 28.0)	0.679	26.0 (24.0, 28.0)	24.0 (21.0, 27.0)	0.953
		Cesarean section	8.0 (7.0, 10.0)		37.0 (10.8)		76.0 (72.0, 84.0)		27.0 (24.0, 28.0)		27.0 (26.0, 28.0)	24.0 (20.0, 28.0)	
		primiparous women	3.5 (1.0, 9.0)	0.884	30.5 (23.0, 40.0)	0.671	78.0 (67.0, 84.0)	0.184	27.0 (24.0, 28.0)	0.457	27.0 (24.0, 28.0)	24.0 (21.0, 28.0)	0.373
		multiparous women	4.0 (1.0, 7.0)		31.0 (25.5, 38.0)		75.5 (67.5, 80.5)		26.0 (23.5, 28.0)		26.0 (23.5, 28.0)	24.0 (20.0, 26.5)	
1 month after childbirth	age	aged < 35	3.5 (0.0, 5.0)	0.241	31.0 (24.0, 41.0)	0.988	80.0 (70.0, 84.0)	0.044	27.0 (24.0, 28.0)	0.195	27.0 (24.0, 28.0)	24.0 (22.0, 28.0)	0.168
		aged ≥ 35	4.5 (1.0, 9.5)		30.5 (24.0, 37.5)		75.0 (65.0, 80.5)		26.0 (23.0, 28.0)		25.5 (24.0, 28.0)	24.0 (20.0, 27.0)	
		aged (in primiparous women's group)	3.0 (0.0, 7.0)	0.210	28.0 (23.0, 41.0)	0.629	80.0 (70.0, 84.0)	0.213	27.5 (24.0, 28.0)	0.502	28.0 (24.0, 28.0)	24.5 (22.0, 28.0)	0.289
		aged ≥ 35	5.0 (2.0, 10.5)		32.5 (24.0, 38.5)		77.5 (65.0, 81.5)		27.0 (24.0, 28.0)		27.0 (23.5, 28.0)	24.0 (20.0, 27.0)	
		whether they visited their parents' home	Yes	5.0 (1.0, 9.0)	0.466	28.0 (24.0, 38.0)	0.524	79.0 (70.0, 82.0)	0.256	27.0 (24.0, 28.0)	0.367	28.0 (24.0, 28.0)	24.0 (21.0, 28.0)
	No	3.0 (1.0, 7.0)		31.0 (24.0, 41.0)		76.0 (67.0, 81.0)		27.0 (23.0, 28.0)		26.0 (23.0, 28.0)	24.0 (21.0, 27.0)		

We analyzed the association between demographic information and the three scales' scores using the t-test and Mann-Whitney U test. Values were presented as Mean(SD) or Median(25th, 75th percentile).

DISCUSSION

We investigated the changes in mental status and social support among women from the second trimester of pregnancy through 1 month after childbirth. During this period, the CES-D and STAI scores were initially high during pregnancy and decreased during the postpartum period. The Social Support Scale score, however, was initially low during pregnancy and increased during the postpartum period.

The CES-D and STAI scores were significantly and negatively correlated with The Social Support Scale score in the second trimester, third trimester, during postpartum hospitalization, and 1 month after childbirth. Lastly, participants ≥ 35 years of age scored lower on The Social Support Scale than did participants < 35 years of age in the second trimester, third trimester, and 1 month after childbirth.

Changes in CES-D, STAI, and Social Support Scale scores over time and their correlation

The CES-D score was highest in the third trimester, and then, it gradually decreased and was significantly lower 1 month after childbirth than at any other time. In their longitudinal study, Takehara *et al.*, using the EPDS, found the proportion of primiparous women who were depressed peaked 2 weeks after childbirth and decreased 3 months after childbirth (21). In this current study, because the CES-D measures depression in both mind and body, we found a depressive state to be low from the early postpartum period to 1 month after childbirth. During the early postpartum period, women experienced fatigue and stress due to lack of sleep and rest due to pacifying a baby during the physical recovery process. We found a depressed state to be higher during the postpartum hospitalization period than 1 month after childbirth, highlighting the need for rest in the postpartum period.

The STAI score was highest in the second trimester and then gradually decreased and was significantly lower 1 month after childbirth than at any other time. Prior reports had noted that the STAI score was higher during pregnancy than during the postpartum period (22) and pregnant women had multiple anxieties about their delivery and the health of their fetuses (23). We speculate that the pre-pregnancy anxieties decreased following birth as women began to feel joy in childcare resulting in a lower STAI score.

The Social Support Scale scores were low during pregnancy and increased during the postpartum period. The Social Support Scale used in this study measures emotional support. Because this study's participants rarely felt the need of support, and could provide self-care during pregnancy, they did not feel that they received support from an important person, family, or friend during pregnancy. However, after birth, the participants began to feel the need for and received the support of family and friends around childcare issues, leading to the increased Social Support Scale scores in the postpartum period.

Prior studies of both domestic and foreign populations have found the Social Support Scale score to be negatively correlated with a postpartum depression symptom score during the postpartum period (24-26). Also, in this current study, the CES-D score was significantly and negatively correlated with the Social Support Scale score in all four time periods as was the STAI score. The result showed that understanding social support is important for prediction of postpartum depression.

Association between demographics and scale scores

Participants ≥ 35 years of age had lower Social Support Scale scores than those < 35 years of age. Recently in Japan, the proportion of older primiparas, ≥ 35 years of age, has been

increasing (27), and there are reports that they are able to use their life experiences in childcare (28, 29). However, Maehara *et al.* reported that older primiparas are much less satisfied with their social support than younger primiparas (30). Hence, older primiparas demonstrate higher stress scores (31). In this current study, there was no significant difference between older and younger primiparas on the Social Support Scale score which we believe to be due to the low number of participants.

There was no significant difference between women who worked and those who did not on any of the scale scores. However, women who worked at night had significantly lower CES-D and STAI scores than women who did not work at night in the second trimester. Women who worked at night had a significantly higher Social Support Scale score than women who did not work at night. In a previous study, the mental stress level was high in women who did shift work including night work (32), and in a survey which included biochemical data, pregnant women working at night had evidence of increased psychologic stress (33). In this current study, women doing night work had low CES-D and STAI scores, as well as little evidence of depression and anxiety. In the local city, many women were employed in the medical and welfare services sector. They were able to use the informal social services of the family to supplement a shortage of night care centers, and family help was necessary to allow them to keep working.

Mental health support

In the local city, there are few formal social services to a pregnant woman and a problem about the mental health support of the pregnant woman. The support of the family is still essential to a pregnant woman in a local city. Therefore, we think that it is important to examine a support method so that "The comprehensive support centers for Maternal with Child Health" becomes the useful support resources of the pregnant woman living in the local city.

STUDY LIMITATIONS

This survey was a prospective cohort study during the period of the second trimester of pregnancy until 1 month after childbirth. There is the potential for significant bias of the results as we only examined women who were relatively stable in mind and body during their postpartum hospitalization and 1 month after childbirth. In the future, we plan to evaluate postpartum women with significant physical and emotional limitations postpartum.

CONCLUSIONS

We found that depressive symptoms and anxiety were elevated during pregnancy and decreased following birth, while the feeling of having social supports was low during pregnancy and increased during the postpartum period. These findings should assist with the implementation of a comprehensive support center and may be useful for in a local city in Japan.

CONFLICT OF INTERESTS

No conflict of interests

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REFERENCES

1. Japan Association of Obstetricians and Gynecologists : Maternal Mental Health Manual (in Japanese). 2017
2. Hahn-Holbrook J, Cornwell-Hinrichs T, Anaya I : Economic and health predictors of national postpartum depression prevalence : a systematic review, meta-analysis, and meta-regression of 291 studies from 56 countries. *Front Psychiatry* 248 : 1-23, 2018
3. Huizink AC, Robles de Medina PG, Mulder EJ, Visser GH, Buitelaar JK : Stress during pregnancy is associated with development outcome in infancy. *J CHILD PSYCHOL PSYC* 44 : 810-818, 2003
4. O'Connor TG, Heron J, Golding J, Beveridge M, Glover V : Maternal antenatal anxiety and children's behavioural/emotional problems at 4 years: report from the Avon Longitudinal Study of Parents and Children. *Br J Psychiatry* 180 : 502-508, 2002
5. Anan A, Li Y, Tsuji M, Nagamatsu Y, Chou S, Toyofuku K, Nakatani J, Kawai K : Status of pregnant women's mental and physical stress and influences of work. *JJOMT* 65 : 201-210, 2017
6. Shinkawa H, Shimada M, Hayase M, Inui T : A survey of the variety, incidence rate, and frequency of minor symptoms currently experienced by expectant mothers (in Japanese). *JJpn Acad Midwif* 23 : 48-58, 2009
7. Beck CT : Predictors of postpartum depression : an update. *Nurs Res* 50 : 275-285, 2001
8. Harada N : Statistical analysis of risk factors for depression of mothers with a high score on Edinburgh postnatal depression scale (in Japanese). *J Health Sci* 5 : 1-12, 2008
9. Iwata H, Mori E, Maehara K, Sakajo A, Aoki K, Tamakoshi K : Shoulder stiffness, back pain, and wrist pain : Are older primiparas more vulnerable?. *Int J Nurs Pract* 24 : 1-7, 2018
10. Iwata H, Mori E, Sakajo A, Aoki K, Maehara K : Course of maternal fatigue and its associated factors during the first 6 months postpartum : a prospective cohort study. *Nurs Open* 5 : 186-196, 2018
11. O'Hara MW, Swain AM : Rates and risk of postpartum depression : A meta-analysis. *Int Rev Psychiatry* 8 : 37-54, 1996
12. Milgrom J, Gemmill AW, Bilszta JL, Hayes B, Barnett B, Brooks J, Ericksen J, Ellwood D, Buist A : Antenatal risk factors for postnatal depression : A large prospective study. *J Affect Disord* 108 : 145-157, 2008
13. Research on childcare environment in urban and rural areas (in Japanese). https://www8.cao.go.jp/shoushi/shoushika/research/cyousa23/kankyo/index_pdf.html
14. Radloff LS : The CES-D Scale : A self-report depression scale for research in the general population. *Appl Psychol Meas* 1 : 385-401, 1977
15. Shima S, Shikano T, Kitamura T, Asai M : New self-rating scale for depression (in Japanese). *Clin Psychiatry* 27 : 717-723, 1985
16. Hidano T, Fukuhara M, Iwawaki S, Soga S : State-trait anxiety inventory-form JYZ manual (in Japanese). *Zitumukyokuikyusuppann*, Tokyo, 2000
17. Dahlem NW, Zimet GD, Walker RR : The multidimensional scale of perceived social support : a confirmation study. *J Clin Psychol* 47 : 756-761, 1991
18. Zimet GD, Powell SS, Farley GK, Werkman S, Berkoff KA : Psychometric characteristics of the Multidimensional Scale of Perceived Social Support. *J Pers Assess* 55 : 610-617, 1990
19. Zimet GD, Dahlem NW, Zimet SG, Farley GK : The multidimensional scale of perceived social support. *J Pers Assess* 52 : 30-41, 1998
20. Iwasa H, Gondo Y, Masui Y, Inagaki H, Kawai T, Otuka R, Ogawa M, Takayama M, Imuda M, Suzuki T : Reliability and validity of the Japanese version of Multidimensional Scale of Perceived Social Support Scale among middle-aged and elderly people living in a Japanese community (in Japanese). *J Health welfare Stat* 54 : 26-33, 2007
21. Takehara K, Tachibana Y, Yoshida K, Mori R, Kudo T : Prevalence trends of pre-and postnatal depression in Japanese women : A population-based longitudinal study. *J Affect Disord* 225 : 389-394, 2018
22. Sato K : Severity of anxiety and related factors among women during gravid and puerperal period (in Japanese). *JJpn Acad Midwif* 20 : 74-84, 2006
23. Kabeyama K, Sayama M : Clinical midwifery handbook-support based on life and culture- (in Japanese). *Igaku-syoin*, Tokyo, 2006
24. Leahy-Warren P, McCarthy G, Corcoran P : First-time mothers: social support, maternal parental self-efficacy and postnatal depression. *J Clin Nurs* 21 : 388-397, 2011
25. Xie R-H, Yang J, Liao S, Xie H, Wajker M, Wen SW : Prenatal family support, postnatal family support and postpartum depression. *Aust N Z J Obstet Gynaecol* 50 : 340-345, 2010
26. Kinjo H, Kawasaki K, Takeo K, Yuga M, Maruyama Y, Imai KK : Depression symptoms and related factors on pregnant and postpartum women in Japan (in Japanese). *Saku UNIV J Nurs* 3 : 15-25, 2011
27. Kamiya K : Maternal and child health statistics of Japan (in Japanese). *Mothers' & Childrens' Health & Welfare Association*, Tokyo, 2012
28. Sakajo A, Mori E, Maehara K, Maekawa T, Ogawa H, Morita A, Aoki K, Iwata H : Older Japanese primiparas' experiences at the time of their post-delivery hospital stay. *Int J Nurs Pract* 20 : 1-19, 2014
29. Mori E, Iwata H, Sakajo A, Maehara K, Ozawa H, Maekawa T, Morita A, Saeki A : Postpartum experiences of older Japanese primiparas during the first mother after childbirth. *Int J Nurs Pract* 20 : 20-31, 2014
30. Maehara K, Mori E, Tsuchiya M, Sakjo A, Iwata H, Ozawa H, Aoki K, Morita A, Maekawa T, Mochizuki Y : Related factors for improving maternal role confidence among primiparas with low confidence from discharge to 1 month after childbirth : a comparison between older and younger ages (in Japanese). *JJpn Maternal Health* 56 : 264-272, 2015
31. Fujioka N, Kamezaki A, Kawamoto E, Shiomichi A, Tsuboi Y, Fujii Y : The change with time of some stress in the 5 days after delivery- Investigated and compared pregnancies over the age 35 with those under 35- (in Japanese). *JJpn Maternal Health* 55 : 78-85, 2014
32. Anan A, Li Y, Tsuji M, Nagamatsu Y, Chou S, Toyofuku K, Kawai K : Mental/Physical stress levels of female nurses' working rotational shifts. *JJOMT* 67 : 167-174, 2019
33. Yamauchi H : Effects of shift work on psychophysical health of pregnant women-Urinary Norepinephrine level and STAI-A-State score-. *Bull Kumamoto UNIV, Sch Health Sci* 6 : 63-72, 2010