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Factors related with low back pain and pelvic pain at the early stage of pregnancy in Japanese women

Yuko Uemura[1,2]*, Toshiyuki Yasui[3], Kimiyo Horike[4], Kazuhisa Maeda[4], Hirokazu Uemura[5], Mari Haku[6], Reiko Sakae[1] and Keiko Matsumura[1]

[1]Department of Nursing, Kagawa Prefectural College of Health Sciences, Kagawa, Japan.
[2]Tokushima University Graduate School, Tokushima, Japan.
[3]Department of Reproductive and Menopausal Medicine, Institute of Biomedical Sciences, Tokushima University Graduate School, Tokushima, Japan.
[4]Shikoku Medical Center for Children and Adults, Kagawa, Japan.
[5]Department of Preventive Medicine, Institute of Biomedical Sciences, Tokushima University Graduate School, Tokushima, Japan.
[6]Department of Midwifery, Institute of Biomedical Sciences, Tokushima University Graduate School, Tokushima, Japan.

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The aim of this study was to clarify the proportion of women with low back and/or pelvic pain (LBPP) and LBPP-related factors at the early stage of pregnancy and to clarify the differences between LBPP-related factors in primiparous women and multiparous women in Japan. 157 pregnant women were recruited. Information about the presence of LBPP, degree of pain by using a visual analog scale (VAS), location of pain, past history of LBPP and background characteristics were collected. Physical status was assessed by the pregnancy mobility index (PMI). The Ethics Committee of Tokushima University Hospital approved the study. The proportion of women who complained of LBPP was 65.6%. PMI score in women with LBPP was significantly higher than that in women without LBPP ($p<0.001$). The proportions of women with a past history of LBPP before pregnancy and with a past history of LBPP in the previous pregnancy were significantly higher in women with LBPP ($p<0.001$ and $p=0.002$, respectively). In women with LBPP, the score of VAS in multiparous women was significantly higher than that in primiparous women ($p=0.019$). Early management for women with a past history of LBPP before pregnancy and with a past history of LBPP in the previous pregnancy is important. Management for lumbar pain according to parity is needed for health guidance at the early stage of pregnancy.

Key words: Pregnancy, first trimester, low back pain, pelvic pain, parity.

INTRODUCTION

Low back and/or pelvic pain (LBPP) during and after pregnancy is a common complication of pregnancy and puerperium. Mogren and Pohjanen (2005) reported that the overall prevalence of LBPP was 71.7% and that the mean gestational age at the start of LBPP was 22.1 weeks. It has been reported that the proportions of pregnant women with LBPP were approximately 50% in the first trimester (Gutke et al., 2008), 40 to 70% in the second trimester (Olsson et al., 2012) and 70 to 80% in the third trimester (Kovacs et al., 2012). Also, 70% of postpartum women complained of LBPP immediately after delivery and 40% of women complained of LBPP

3 to 4 months after delivery (Ostgaard, 1992). Pain in the pelvic girdle and lumbar region that occurs at the early stage of pregnancy has been suggested to be a predictor for persistent pain after delivery (Gutke et al., 2008). For pregnant women, prevention of LBPP is an important issue since LBPP is not only the most frequent complaint during pregnancy but also persists for a long period of time.

Several factors related to LBPP have been demonstrated. The association of LBPP with age has been controversial. It has been reported that the age of women without lumbopelvic pain was significantly higher than that of women with lumbopelvic pain in the second trimester (Olsson et al., 2009). On the other hand, it has been reported that older pregnant women are more likely to have pain in the lower back, pelvis and buttock regions in the third trimester (Brown et al., 2013).

It has been reported that increase in parity was associated with increased risk for lumbar pain and that risk for lumbar pain in multiparous women was higher than that in primiparous women (Mota et al., 2015). A past history of lumbar and pelvic pain related or unrelated to previous pregnancy (Kovacs et al., 2012), low educational level (Chang et al., 2011), and high body mass index (BMI) and overweight (Mogren and Pohjanen, 2005) have been reported to be as factors related to LBPP. It has also been reported that a longer period of previous regular physical activity decreased the risk of LBPP during pregnancy and that a physically demanding occupation was associated with increased risk of LBPP during pregnancy (Mogren, 2005). Ostgaard et al. (1992) reported that persistent postpartum back pain was associated with the presence of back pain before pregnancy, the presence of back pain during pregnancy, physically heavy work and multipregnancy. Mogren (2006) reported that women with persistent LBPP at 6 months after delivery had significantly earlier onset of pain during pregnancy, higher maternal age and higher BMI, suggesting that the level and timing of onset of pain during pregnancy were strong predictors of persistent LBPP after delivery (Mogren, 2006). The aim of this study was to clarify the proportion of women with LBPP and LBPP-related factors at the early stage of pregnancy and to clarify the differences between LBPP-related factors in primiparous women and multiparous women in Japan.

MATERIALS AND METHODS

Study setting and date collection

This study was conducted from March in 2015 to January in 2016 in a birth center in Kagawa Prefecture in Japan. Number of delivery was approximately 500 per year in the hospital that was examined, and sample size was 184 by using permissible errors (5%), reliability (95%) and a ratio of a population (25%). The sample size was determined to be 215, considering the number of uncollected sample. 157 pregnant women were recruited at the first trimester in the birth center. Participants were informed of the purposes and procedure of the study.

The study protocol was reviewed and approved by the Ethics Review Board of Tokushima University Hospital (Approval No. 2201).

Questionnaire

A self-administered questionnaire was designed consisting of three parts that took about 20 min to complete. With respect to location of pain, the reference was cited (Al-Sayegh et al., 2012). VAS score was used, which was widely used as objective assessment for degree of pain. Ten women were tested using self-administered questionnaire for assessment of validity in advance and studied using revised self-administered questionnaire. The first part of the questionnaire consisted of questions regarding baseline characteristics such as age, marital status, education and week of pregnancy. The second part of the questionnaire consisted of questions regarding the presence of LBPP, location of pain and 10 cm visual analog scale (VAS) with the end-points of no pain (0 cm) and worst thinkable pain (10 cm). The third part consisted of questions on factors related to low back pain including employment, smoking, and menstruation before pregnancy and history of low back pain. Physical status was evaluated using the pregnancy mobility index (PMI) (Van et al., 2006). In the question for PMI, daily activities were categorized into three scales: (1) daily mobility in the house, (2) ability to perform normal household activities, and (3) mobility outdoors. Every item has a score option from 0 to 3 (‘no problem in performing the task’, ‘some effort in performing the task’ and ‘not possible to perform the task or only possible with the aid of others’), which was transformed to a 0 to 72 scale. A higher score indicates limitation of the activity in daily life.

Data analyses

Differences in background characteristics, physical factors, LBPP-related factors, and PMI were evaluated by the χ^2 test or Mann-Whitney U test in all subjects and in women with LBPP. Odds rations (OR) and their corresponding to 95% confidence interval (CI) were calculated by using logistic regression analyses. All p values are two-tailed and those less than 0.05 were considered to be statistically significant. Statistical analyses for data evaluation were carried out using SPSS version 22 for Windows (IBM Crop., Aromonk, NY).

RESULTS

Baseline characteristics of the subjects are shown in Table 1. Mean age ± standard deviation (SD) of the subjects was 32.2 ± 5.1 years. The proportion of women whose age was more than 35 years was 31.8%. The mean week of pregnancy was 14.8 weeks, ranging from 9 to 20 weeks. The subjects included 38.9% primiparous

*Corresponding author. E-mail: uemura@chs.pref.kagawa.jp. Tel: +81-87-870-1212.

Table 1. Background characteristics of the subjects.

Age (year)	-	32.2 ± 5.1
Week of pregnancy (weeks)	-	14.8 ± 1.6
Height (cm)	-	157.0 ± 5.3
Weight (kg)	-	53.4 ± 9.8
Body mass index (kg/m^2)	-	21.6 ± 3.9
Marital status	Married	150 (95.5)
	Not married	7 (4.5)
Working	Yes	109 (69.4)
	No	48 (30.6)
Smoking	Current	2 (1.3)
	Previous	35 (22.3)
	Never	120 (76.4)
Parity	Primiparous	61 (38.9)
	Multiparous	96 (61.1)
Education level	High school	43 (27.4)
	Junior college or professional school	72 (45.9)
	College and/or graduate school	42 (26.7)
Presence of LBPP before pregnancy	Yes	81 (51.6)
	No	76 (48.4)
Past history of treatment for LBPP	Yes	37 (23.6)
	No	120 (76.4)
Past history of orthopedic diseases	Yes	32 (20.4)
	No	125 (79.6)
Past history of LBPP in the previous pregnancy (n=96)	Yes	67 (69.8)
	No	29 (30.2)

LBPP: Low back and/or pelvic pain. The values of age, duration of pregnancy, height, weight and BMI are presented as means ± standard deviation.

women and 61.1% multiparous women. The proportion of working women was 69.4% and the proportion of primiparous working women was significantly higher than that of multiparous working women (p=0.013). The proportion of women with a past history of LBPP before pregnancy was 51.6% and the proportion of women with a past history of LBPP in the previous pregnancy was 69.8%. As shown in Table 2, the proportion of women who complained of LBPP was 65.6%. The mean ± standard deviation (SD) of VAS score was 2.6 ± 2.4, ranging from 0 to 8.6. The proportion of women whose VAS scores were more than 7 was 6.4%. The proportion of women whose frequency of LBPP was once or twice per week was 45.7%. Only 40.8% of women coped with LBPP. The proportion of women who coped with pain in working women was lower than the proportion of women who did cope with pain in non-working women (p=0.019). The region in which women complained most frequently of pain was the lower back followed by the buttocks.

The subjects were classified into two groups: women with LBPP and women without LBPP as shown in Figure 1. As shown in Table 3, PMI score in women with LBPP was significantly higher than that in women without LBPP (p<0.001). The proportion of working women in women without LBPP was significantly higher than that in women with LBPP (p=0.032). The proportions of women with a past history of LBPP before pregnancy and with a past history of LBPP in the previous pregnancy were significantly higher in women with LBPP (p<0.001 and p=0.002, respectively). The presence of LBPP before

Table 2. Characteristics of LBPP in the subjects.

VAS score	-	2.6 ± 2.5
Frequency of LBPP	1-2 days/week	47 (45.7)
	3-6 days/week	26 (25.2)
	7 days/week	30 (29.1)
Coping with LBPP	Yes	42 (40.8)
	No	61 (59.2)
Location of LBPP (Multiple answers)	Back	71 (45.2)
	Left hip	27 (17.2)
	Right hip	26 (16.6)
	Around the pubis	17 (10.8)
PMI score	-	7.0 ± 7.6

LBPP: Low back and/or pelvic pain; PMI: pregnancy mobility index. The values of VAS score and PMI are presented as means ± standard deviation.

pregnancy was an increased risk for LBPP (OR 5.33, 95%CI 2.18-13.06).

There was no significant difference between the proportions of primiparous women with LBPP (62.2%) and multiparous women with LBPP (67.7%). In order to clarify the characteristics of women with LBPP according to parity, the women were classified into two groups: primiparous women with LBPP and multiparous women with LBPP (Figure 1). In women with LBPP, the proportions of primiparous women and multiparous women were 36.9 and 63.1%, respectively. As shown in Table 4, mean VAS scores were 3.3 in primiparous women and 4.2 in multiparous women and VAS score in multiparous women was significantly higher than that in primiparous women (p=0.019). In primiparous women with LBPP, the proportion of working women was higher than that of working multiparous women (p=0.013). In multiparous women with LBPP, the proportion of women who coped with LBPP was higher than that in primiparous women (p=0.047). The region of pain that primiparous women most frequently complained of was around the pubic bone (p=0.043), and the region of pain that multiparous women most frequently complained of was the lower back (p=0.04).

DISCUSSION

In the present study, we found that the prevalence of LBPP in women at the early stage of pregnancy was 65.6%, that pregnant women with LBPP had a past history of LBPP before pregnancy and a past history of LBPP in the previous pregnancy, and that LBPP-related factors were different in primiparous women with LBPP and multiparous women with LBPP.

Previous studies demonstrated that the prevalence of lumbar pain was approximately 50% at the first trimester (Gutke et al., 2008; Robinson et al., 2010) and that the prevalence of pelvic and low back pain was 59 to 66% in Japan (Shinkawa et al., 2009). The prevalence (65.6%) in the present study is consistent with those previous studies. The region of pain shown in the present study is also consistent with a previous study (Brown et al., 2013). On the other hand, it has been reported that 14.6% of pregnant women at the first trimester experienced pain in which the value of VAS was more than 7 (Brown et al., 2013). The proportion of such women in the present study (6.4%) was lower than that in the previous study. Also, the frequency of LBPP was shown to be once or twice per week. The relative low intensity and frequency of LBPP might have been the reason why 60% of the pregnant women did not have to cope with LBPP. However, it has been reported that pelvic girdle pain and lumbar pain at the early stage of pregnancy persist in the puerperium period (Gutke et al., 2008). Therefore, health guidance for LBPP at the early stage of pregnancy is important even if the intensity and frequency are low.

In the present study, high proportions of women with a past history of LBPP before pregnancy and with a past history of LBPP in the previous pregnancy were found in women with LBPP. These factors were shown in previous studies to be risk factors of lumbar pain during pregnancy (Ostgaard et al., 1992; Mogren and Pohjanen, 2005; Mohseni-Bandpei et al., 2009; Bjelland et al., 2011; Al-Sayegh et al., 2012). It has been reported that the proportion of women with chronic lower back pain increased from 20 to 30 years of age to 50 to 60 years of age (Meucci et al., 2015), suggesting that the occurrence of lumbar pain increases with advance of age. An increase in the number of women in Japan who have

Table 3. Comparison of characteristics of women with and without LBPP.

Parameter		Women with LBPP (n=103)	Women without LBPP (n=54)	*P*
Age (years)	-	31.8 ± 4.8	33.0 ± 5.4	0.143
Duration of pregnancy (weeks)	-	14.9 ± 1.5	14.6 ± 1.4	0.429
Height (cm)	-	156.7 ± 5.3	157.8 ± 5.1	0.206
Weight (kg)	-	53.5 ± 8.7	53.1 ± 11.7	0.357
Body mass index (kg/m^2)	-	21.8 ± 3.7	21.3 ± 4.1	0.218
Marital status	Married	98 (95.1)	52 (96.3)	0.546
	Not married	5 (4.9)	2 (3.7)	
Working	Yes	66 (64.1)	43 (79.6)	0.032
	No	37 (35.9)	11 (20.4)	
Smoking	Current	1 (1.0)	1 (1.8)	0.436
	Previous	26 (25.2)	9 (16.7)	
	Never	76 (73.8)	44 (81.5)	
Educational level	High school	30 (29.1)	13 (24.1)	0.719
	Junior college or professional school	45 (43.7)	27 (50.0)	
	College and/or graduate school	28 (27.2)	14 (25.9)	
Parity	Primiparous	38 (36.9)	23 (42.6)	0.299
	Multiparous	65 (63.1)	31 (57.4)	
Presence of LBPP before pregnancy	Yes	65 (63.1)	16 (29.6)	<0.001
	No	38 (36.9)	38 (70.4)	
Past history of treatment for LBPP	Yes	26 (25.2)	11 (20.4)	0.317
	No	77 (74.8)	43 (79.6)	
Past history of orthopedic diseases	Yes	24 (23.3)	8 (14.8)	0.148
	No	79 (76.7)	46 (85.2)	
Past history of LBPP in the previous pregnancy (n=96)	Yes	52 (80.0)	15 (48.4)	0.002
	No	13 (20.0)	16 (51.6)	
PMI	-	9.1 ± 8.1	3.2 ± 4.5	<0.001

LBPP: Low back and/or pelvic pain; PMI: pregnancy mobility index. The values of age, duration of pregnancy, height, weight, body mass index and PMI are presented as means ± standard deviation.

LBPP before pregnancy is expected since the age of birth has recently been increasing in Japan (Ministry of Health, Labour and Welfare, 2015). Health guidance for prevention of lumbar pain at the early stage of pregnancy is important since lumbar pain in women with a past history of LBPP before pregnancy may become worse throughout pregnancy.

Previous studies showed that the proportion of women who were working was not significantly different between women with lumbar pain and women without lumbar pain (Gutke et al., 2008; Olsson et al., 2009; Mohseni-Bandpei et al., 2009). It has been reported that women without LBPP were more likely to work than women with LBPP in the late stage of pregnancy (Kovac et al., 2012). In the early stage of pregnancy, the proportion of working women in women without LBPP was we shown to be higher than that in women with LBPP. However, a causal relationship between LBPP and working was not found. Given that physical and psychological factors related to jobs have also been reported to be predictors for lumbar

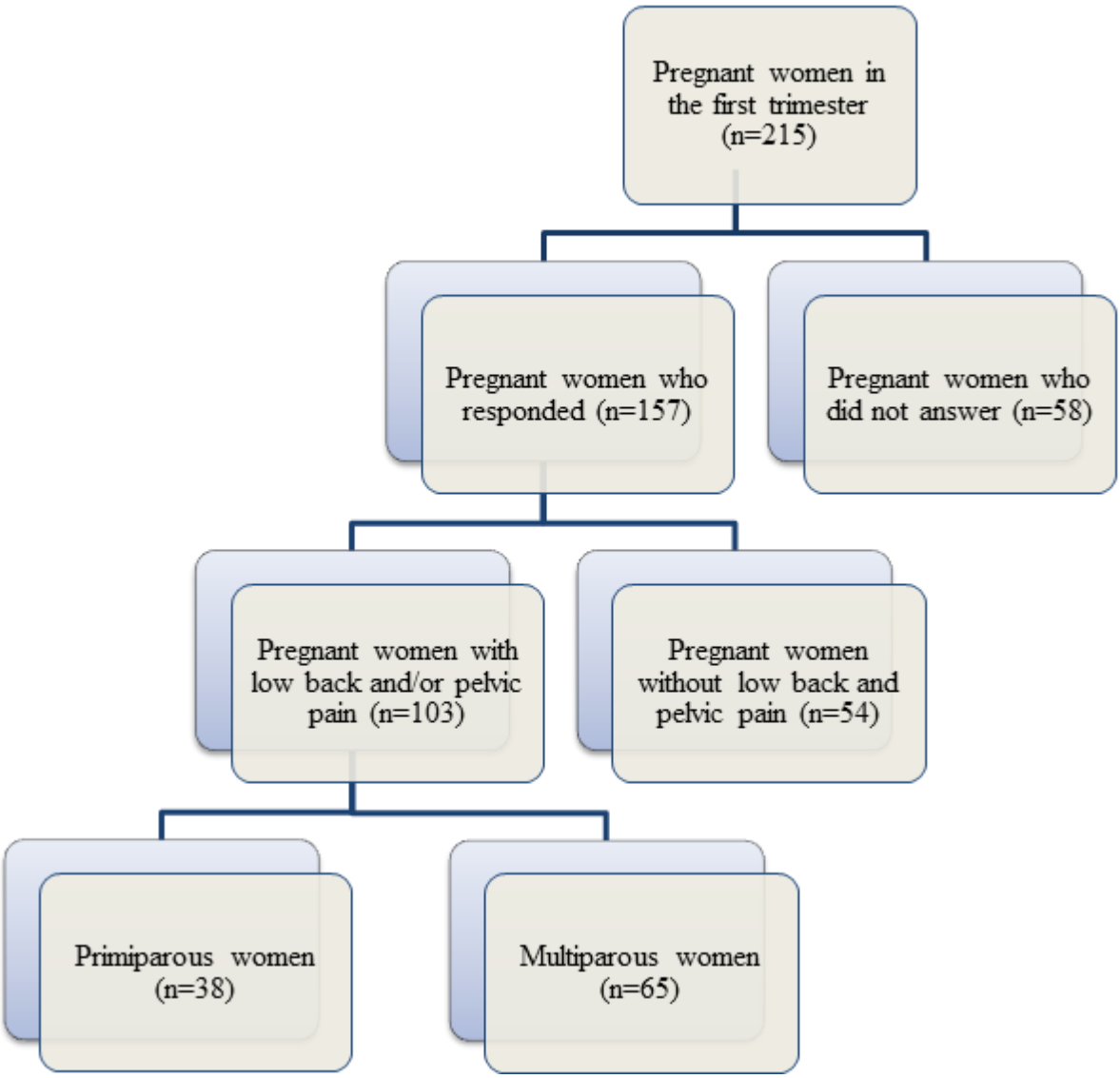

Figure 1. Classification of subjects.

pain (Wáng et al., 2016), a prospective longitudinal study is needed to determine the relationship between LBPP and working.

The mean PMI score (7.0) in the present study was higher than that (3.5 at 12 weeks of age) in a previous study (Bakker et al., 2013). Bakker et al. (2013) suggested that PMI score at the first trimester can predict PMI score at the third trimester since PMI score increases with advance of gestational weeks. Therefore, PMI at the early stage of pregnancy is important. Since PMI score in women with LBPP was high, activity in daily life was limited due to pain in women with LBPP. In addition, Bakker et al. (2013) reported that PMI score caused by lumbopelvic pain was significantly associated with psychological determinants during all stages of pregnancy (Bakker et al., 2013). Management for LBPP at the early stage of pregnancy may also be involved in prevention of the development of a poor psychological condition.

The characteristics of primiparous and multiparous pregnant women with LBPP might be different. A previous study showed that multiparty was a risk factor for LBPP during pregnancy (Mogren and Pohjanen, 2005). Since a past history of lower back pain in the previous pregnancy has been suggested to be a risk factor for LBPP (Mogren and Pohjanen, 2005; Mohseni-Bandpei et al., 2009), the risk of LBPP in multiparous women may be higher than that in primiparous women. The fact that 80% of multiparous women with LBPP in the present study had a past history of LBPP in their previous pregnancy suggests

Table 4. Comparison of primiparous and multiparous women with LBPP.

Parameter		Primiparous (n=38)	Multiparous (n=65)	*P*
Age (year)		30.5 ± 5.0)	32.6 ± 4.5	0.028
pregnancy duration (weeks)		14.7 ± 1.2	14.9 ± 1.8	0.428
Height (cm)		155.6 ± 5.0	157.3 ± 5.4	0.110
Weight (kg)		52.5 ± 10.4	54.1 ± 7.7	0.140
Body mass index (kg/m^2)		21.7 ± 4.2	21.9 ± 3.4	0.335
Marital status	Married	34 (89.5)	64 (98.5)	0.061
	Not married	4 (10.5)	1 (1.5)	
Working	Yes	30 (78.9)	36 (55.4)	0.013
	No	8 (21.1)	29 (44.6)	
Smoking	Current	0 (0.0)	1 (1.5)	0.543
	Previous	8 (21.1)	18 (27.7)	
	Never	30 (78.9)	46 (70.8)	
Educational level	High school	8 (21.1)	22 (33.8)	0.291
	Junior college or professional school	20 (52.6)	25 (38.5)	
	College or Graduate school	10 (26.3)	18 (27.7)	
Presence of LBPP before pregnancy	Yes	28 (73.7)	37 (56.9)	0.067
	No	10 (26.3)	28 (43.1)	
Past history of treatment for LBPP	Yes	12 (31.6)	14 (21.5)	0.184
	No	26 (68.4)	51 (78.5)	
Past history of orthopedic diseases	Yes	11 (28.9)	13 (20.0)	0.212
	No	27 (71.1)	52 (80.0)	
Past history of LBPP in the previous pregnancy	Yes	-	52 (80.0)	
	No	-	13 (20.0)	
Coping with LBPP	Yes	11 (28.9)	31 (47.7)	0.047
	No	27 (71.1)	34 (52.3)	
Location of LBPP				
Back	Yes	22 (57.9)	49 (75.4)	0.040
	No	16 (42.1)	16 (24.6)	
Left hip	Yes	12 (31.6)	15 (23.1)	0.250
	No	26 (68.4)	50 (76.9)	
Right hip	Yes	11 (28.9)	15 (23.1)	0.348
	No	27 (71.1)	50 (76.9)	
Around the pubis	Yes	10 (26.3)	7 (10.8)	0.043
	No	28 (73.7)	58 (89.2)	
VAS score	-	3.3 ± 1.6	4.2 ± 2.1	0.019
PMI score	-	6.8 ± 5.5	10.3 ± 9.2	0.100

LBPP: Low back and/or pelvic pain; VAS: visual analog scale; PMI: pregnancy mobility index. The values of age, duration of pregnancy, height, weight, body mass index, VAS and PMI are presented as means ± standard deviation.

that multiparous women generally have LBPP. However, the proportion of multiparous women with LBPP was not significantly different from the proportion of primiparous women with LBPP being in line with the results of previous studies (Mohseni-Bandpei et al., 2009; Mota et al., 2015). Mogren and Pohjanen (2005) reported that mean gestational age at the onset of LBPP was 22.1 weeks. The reason for no significant difference between proportions of multiparous and primiparous women with LBPP in the present study might be that the subjects were in the early stage of pregnancy.

The proportion of working women was shown to be high in primiparous women with LBPP. Previous studies showed that occurrence of lumbar pain were not associated with working status (Olsson et al., 2009; Mohseni-Bandpei et al., 2009). To the best of our knowledge, there has been no report regarding the association of LBPP with working status according to parity. It was found that VAS level in multiparous women with LBPP was higher than that in primiparous women with LBPP. Since subjective and personal experiences in the past contribute to the feeling of pain, a high VAS level may be associated with a past history of LBPP in the previous pregnancy in multiparous women. It is important to obtain information regarding a past history of LBPP in the previous pregnancy.

Multiparous women with LBPP were likely to cope with pain, while primiparous women with LBPP did not cope with pain sufficiently. Given that a past history of LBPP in the previous pregnancy is a risk factor for LBPP, coping with LBPP is important for primiparous women, and active management for LBPP is needed. Primiparous women with LBPP were likely to have pain around the pubic bone, while multiparous women with LBPP were likely to have pain at the lower back. It has been reported that the areas of pain for which the VAS score was more than 7 were the lower back (12.4%) and pelvis (9.8%) in the first trimester. However, to the best of our knowledge, a difference in location of pain according to parity has not been demonstrated.

A significant relationship between LBPP and age was also not found in our study. In previous studies, both younger age (Olsson et al., 2009; Mohseni-Bandpei et al., 2009; Bjelland et al., 2011; Kovacs et al., 2012) and older age (Gutke et al., 2008) were shown to be risk factors for LBPP. Wu et al. (2004) reported that both youngest age and oldest age were higher risks for lower back pain. Increase in abdominal girth and change in posture do not occur at the early stage of pregnancy. This might be the reason for no significant association of LBPP with age being found in the present study.

This study has several limitations. First, the proportions of primiparous women and multiparous women were not similar, though the difference was not significant. Further study with a large sample size may be needed. Second, this study is of a cross-sectional nature. Prospective studies including subjects in middle and late gestational stages and puerperium may be required to clarify the characteristics of LBPP in each stage.

In conclusion, 65% of women complained of LBPP at the early stage of pregnancy and daily life of women with LBPP was limited. Early management for women with a past history of LBPP before pregnancy and with a past history of LBPP in the previous pregnancy is important. Management for lumbar pain according to parity is needed for health guidance at the early stage of pregnancy.

Conflict of Interests

The authors have not declared any conflict of interests.

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