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Solving an incomplete puzzle: risk factors of low back pain during pregnancy

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ABSTRACT

Objectives: Low back pain during pregnancy is a common disorder with an obscure etiopathogenesis. This study sought to investigate the association of low back pain by assessing various epidemiologic and clinical risk factors including weight changes, the presence of striae gravidarum, and intraperitoneal adhesions.

Material and methods: A total of 250 pregnant women between 37 and 40 gestational weeks who were scheduled for cesarean section were included in this multicenter prospective trial. Sociodemographic parameters and physical examination findings were noted and assessed as potential risk factors that may play a role in the development of low back pain.

Results: The mean age of the study population was 29.98 ± 5.23 years and low back pain was identified in 120 (48%) patients. According to the logistic regression results, an increase in BMI (%) during pregnancy (odds ratio: 1.240; 95% CI: 1.061–1.448; p = 0.007) is correlated with the presence of low back pain. Separately, receiver operating characteristic curve analysis suggested that an increase in BMI (%) during pregnancy has a sensitivity of 77.5% and a specificity of 60% for the prediction of low back pain, and the cutoff point was found to be 15.5%.

Conclusions: Our results imply that an increase in BMI (%) was correlated with low back pain during pregnancy. Weight gain should be personalized for each pregnancy and the increase in BMI (%) during gestation should be reduced. Measures should be taken to assure appropriate weight control to prevent low back pain during pregnancy.

Key words: pregnancy, low back pain, body weight, body mass index

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INTRODUCTION

Low back pain during pregnancy has remained an incomplete puzzle in maternal medicine for some time. Pregnancy is one of the most sensitive periods during which women will suffer from low back pain in their life, with low back pain being approximately four times more common in pregnant women than those who are not at the same age [1]. Globally, 45–50% of pregnant women may suffer from low back pain during gestation [2, 3]. Given this high rate, this clinical entity constitutes a significant health problem that remarkably deteriorates the quality of life of women and restricts their capacity to perform a job or to carry out their normal daily activities [4]. In one study, more than 80% of pregnant women with low back pain reported having difficulties with standing and walking and 68% of pregnant women with low back pain experienced pain during sexual intercourse [4]. However, since low back pain is perceived as a temporary and mild condition by the patients and their health care providers initially, it is often ignored rather than considered to be a significant disorder. On the other hand, it may be treated simply and effectively following early diagnosis with the awareness of risk factors.

Many studies hoping to understand risk factors for low back pain during and after pregnancy have been carried out to date, especially in recent years. However, the etiologic risk factors remain unclear. Low back pain in previous pregnancies is the most well-documented risk factor for such during subsequent pregnancies; however, the exact findings conflict among different studies and are simply seen as suggesting that low back pain in previous pregnancies

pairs with low back pain in the current pregnancy without a causative relationship and known pain mechanism [2, 3, 5, 6]. Maternal age, maternal weight, ethnicity, the number of previous pregnancies, and any prior abortions are some reported etiologic factors but, again, the results all conflict to some extent in previous studies [2, 3, 7, 8]. In one recent study, it was also postulated that the presence and severity of low back pain were correlated with the presence and severity of striae gravidarum in pregnant women [9].

Many authors have claimed that the main mechanisms in the development of low back pain during pregnancy are related to the profound effect of pregnancy on the musculoskeletal system, which involves shifting the center of gravity, leading to lumbar spine hyperlordosis and anterior tilting of the pelvis [2, 10]. Some authors believe that the mechanical changes that may lead to low back pain during pregnancy are thought to be changes in body mass index (BMI) [2, 10]. However, studies on the effects of weight gain and considering changes in BMI during pregnancy are limited in number. Moreover, the existing studies are not comprehensive and do not consider the impacts of the wide range of reported or suspected mechanical risk factors on the lumbar spine and muscles, such as intraperitoneal adhesions that may form after prior surgeries. As low back pain during pregnancy is often a health problem disabling pregnant women in daily life, the risk factors for lumbar pain during pregnancy constitute an important research priority. Thus, to add to the current body of literature, in the present study, we sought to investigate various epidemiologic and clinical risk factors including weight changes, the presence of striae gravidarum, and intraperitoneal adhesions.

MATERIAL AND METHODS

This randomized, multicenter prospective trial was implemented in the obstetrics and gynecology departments of two tertiary care centers between the University Of Health Sciences Antalya Training and Research Hospital and the Akdeniz University School of Medicine Hospital. Approval from the local institutional review board was obtained before the study (26.06.2019/597). The study was conducted in compliance with the principles of the Helsinki Declaration.

We recruited a total of 250 term pregnant women who were not in active labor and who were admitted for elective cesarean section. Pregnant women over 37 weeks of gestation were accepted as being term. As intraperitoneal adhesions could only be evaluated during cesarean section, only pregnant women who were scheduled for this procedure were included in the present study. These pregnant women were evaluated in terms of low back pain, striae gravidarum, and the presence of intraperitoneal adhesions. Sociodemographic parameters and physical examination findings were noted and assessed as possible risk factors that might play a role in the development of low back pain.

Low back pain was defined per the consensus approach regarding the standardization of back pain definitions for use in prevalence studies [11]. According to this system, pregnant women were questioned regarding the presence of back pain in the preceding four weeks and whether the pain had interfered with their performance of daily activities or altered their course of life for at least one day. Pregnant women with positive replies to both questions were accepted as positive for low back pain [11]. Data were collected using patient evaluation sheets.

The Davey scoring system was employed to classify the striae gravidarum [12]. The abdomen was divided into four quadrants, using the midline and a line drawn horizontally through the umbilicus as reference points. Each quadrant was assigned a score, with clear skin awarded zero points, moderate (1–3) striae awarded one point, and many (≥ 4) striae awarded two points. The sum of the scores of all four quadrants was calculated to obtain the total striae score for each participant [12].

Exclusion criteria included the presence of systemic diseases, urgent delivery, detection of uterine contractions at initial admission, premature rupture of membranes, cervical dilatation, chronic hypertension, and failure to communicate.

Statistical analysis

Continuous variables were described by means and standard deviations or medians and quantiles and categorical variables were described by frequencies and percentages. The distribution of continuous variables was examined by using visual (e.g., histograms and probability plots) and analytical (Kolmogorov–Smirnov and Shapiro–Wilk tests) methods. The relationships between continuous variables and back pain were compared using an independent-samples t-test or the Mann–Whitney U test according to the distribution of the variables. The relationship between categorical variables was compared with the chi-squared test. Independent variables with p-values of less than 0.05 in the univariate analysis were included in the logistic regression analysis. Also, cutoff values were determined during receiver operating characteristic curve analysis by using Youden's index. A p-value of less than 0.05 was defined as statistically significant.

RESULTS

Table 1 presents an overview of the demographic and clinical characteristics of our study population. The mean age of the study population was 29.98 ± 5.23 years and low back pain was identified in 120 (48%) patients. The median numbers of gravidity and parity were three and one,

Table 1. Demographic and clinical characteristics of the study population		
Characteristics	**Parameters**	**Values**
Age (years)	Mean ± Sd	29.98 ± 5.23
Gravidity	Median 25th–75th percentiles	3 2–3.25
Parity	Median 25th–75th percentiles	1 1-2
Gestational period (days)	Median 25th–75th percentiles	271 266–273
Previous history of surgery	Absent Present	46 (18.4) 204 (91.6)
	1 2 3	138 (55.2) 45 (18.0) 21 (8.4)
Fetal Gender	Female Male	129 (51.6) 121 (48.4)
Height (cm)	Median 25th–75th percentiles	163 159–167
Prepregnancy body weight	Median 25th–75th percentiles	62 56–73.25
Prepregnancy BMI	Median 25th–75th percentiles	23.24 21.48–28.42
Body weight at labor (kg)	Median 25th–75th percentiles	74.5 69–85
BMI at labor (kg/m^2)	Median 25th–75th percentiles	28.38 25.46–33.28
Weight gain during pregnancy (kg)	Median 25th–75th percentiles	12 8–15
BMI increase during pregnancy	Median 25th–75th percentiles	4.23 3.01–5.76
BMI increase during pregnancy (%)	Median 25th–75th percentiles	17 12–22
Uterine fundus height (cm)	Median 25th–75th percentiles	34 33–36
Birth weight (g)	Median 25th–75th percentiles	3335 3110–3590
Working status during pregnancy	Always sitting down Often sitting down Half time sitting down Often standing up Always standing up	17 (6.8) 129 (51.6) 57 (22.8) 32 (12.8) 15 (6.0)
Diabetes	Absent Present	234 (93.6) 16 (16.4)
Polyhydramnios	Absent Present	237 (94.8) 13 (5.2)
Striae gravidarum score	Median 25th–75th percentiles	3 0–8
Striae gravidarum	Absent Mild Severe	80 (32.0) 40 (16.0) 130 (52.0)
Intraperitoneal adhesion	Absent Film Severe	87 (34.8) 113 (45.2) 50 (20.0)
Low back pain	Absent Present	130 (52.0) 120 (48.0)

Percentages are given in parenthesis 'Values' column. BMI — body-mass index; kg — kilogram; cm — centimeter; g — gram

respectively. The median weight gain during pregnancy was 12 kg (25th–75th percentiles: 8–15 kg) and the median BMI increase during pregnancy was 4.23 kg/m^2 (25th––75th percentiles: 3.01–5.76 kg/m^2). The median increase in the percentage (%) of BMI from prepregnancy to labor was 17% (25th–75th percentiles: 12–22). Striae gravidarum was detected in 170 (68.0%) and intraperitoneal adhesions were observed in 163 (65.2%) of participants, respectively.

The results of the analysis of the relationships between the presence of low back pain and demographic and clinical features are shown in Table 2. According to univariate analysis, gravidity (p = 0.011), previous history of surgery (p = 0.006), weight gain during pregnancy (p < 0.001), BMI at labor (p = 0.02), BMI increase during pregnancy (p < 0.001), BMI (%) increase during pregnancy (p = 0.001), standing up during work time (p = 0.002), striae gravidarum score (p = 0.014), and the presence of intraperitoneal adhesions (p = 0.002) were correlated with the presence of low back pain.

Separately, according to logistic regression results, BMI (%) increase during pregnancy (odds ratio: 1.240; 95% confidence interval: 1.061–1.448; p = 0.007) was correlated with the presence of low back pain. Receiver operating characteristic curve analysis revealed that the BMI (%) increase during pregnancy had a sensitivity of 77.5% and a specificity of 60% for the prediction of low back pain, while the cutoff point was 15.5%.

DISCUSSION

The present study is a preliminary study of weight gain factors affecting low back pain. As part of this research, prepregnancy body weight and BMI, body weight and BMI at labor, weight gain, and BMI increase and BMI (%) increase during the course of pregnancy were analyzed. Also, to our knowledge, this study is the first to evaluate the effect of striae gravidarum and intraperitoneal adhesions in the same cohort. Our results indicated that weight gain changes during pregnancy, the presence and intensity of striae gravidarum, and intraperitoneal adhesions are more frequent in pregnant women with low back pain. According to logistic regression analysis, our results support that BMI (%) increase during pregnancy is significantly correlated with the presence of low back pain.

We found that each one-unit increase in BMI (%) increases the occurrence of low back pain by 24%. The associated weight gain may lead to an overload of the lumbar vertebra, pelvic girdle, and lower extremities and a shift in the center of gravity anteriorly as a result of these events. Thus, increased lordosis is a compensatory action to counteract this change in the center of gravity. However, increased lordosis causes low back pain due to the amplification of load on the pelvic girdle. Increased maternal weight, the laxity

Table 2. The relationship of demographic and clinical characteristics with the occurrence of low back pain

Characteristics	Parameters	Low Back Pain		P-value
		Absent	Present	
Age [years]	Mean ± SD	30.38 ± 5.36	29.55 ± 5.07	0.212
Gravidity	Median IQR	3 2	3 1	0.011
Parity	Median IQR	1 1	2 1	0.301
Gestation [day]	Median IQR	270 5,5	272 7	0.862
Previous history of surgery	0 1 2 3	20 (43.5) 66 (47.8) 26 (57.8) 18 (85.7)	26 (56.5) 72 (52.2) 19 (42.2) 3 (14.3)	0.006
Fetal Gender	Female Male	67 (51.9) 63 (52.1)	62 (48.1) 58 (47.9)	0.984
Height	Median IQR	163 7	162 9	0.518
Prepregnancy body weight	Median IQR	62,5 22	62 16	0.338
Prepregnancy BMI	Median IQR	23.25 8.08	23.24 6.89	0.830
Body weight at labor [kg]	Median IQR	73 20	75 12	0.212
BMI at labor	Median IQR	27.23 8.76	29.26 6.68	0.02
Weight gain during pregnancy [kg]	Median IQR	10 6	14 6	< 0.001
BMI increase during pregnancy	Median IQR	3.50 2.2	5.07 2.47	< 0.001
BMI increase during pregnancy [%]	Median IQR	13 9	20 11	0.001
Uterine fundus height [cm]	Median IQR	33 3	34 3	0.071
Birth weight [g]	Median IQR	3370 541	3325 400	0.658
Working position during pregnancy	Always sitting down Often sitting down Half time sitting down Often standing up Always standing up	11 (64.7) 74 (57.4) 30 (52.6) 12 (37.5) 3 (20.0)	6 (35.3) 55 (42.6) 27 (47.4) 20 (62.5) 12 (80.0)	0.022
Standing up during work time	Less or equal than half time More than half time	115 (56.7) 15 (31.9)	88 (43.3) 32 (68.1)	0.002
Diabetes mellitus	Absent Present	120 (51.3) 10 (62.5)	114 (48.7) 6 (37.5)	0.385
Polyhydramnios	Absent Present	126 (53.2) 4 (30.8)	111 (46.8) 9 (69.2)	0.116
Striae gravidarum score	Median IQR	2 7	4 7	0.014
Striae gravidarum	Absent Mild Severe	53 (66.3) 15 (37.5) 62 (47.7)	27(33.8) 25 (62.5) 68 (52.3)	0.004
	Absent Mild/Severe	53 (66.3) 77 (45.3)	27 (33.8) 93 (54.7)	0.002
Intraperitoneal adhesion	Absent Film Severe	49 (56.3) 65 (57.5) 16 (32.0)	38 (43.7) 48 (42.5) 34 (68.0)	0.007
	Absent Film/Severe	114 (57) 16 (32)	86 (43) 34 (68)	0.002

Percentages are given in parenthesis in 'Low Back Pain' column. BMI — body-mass index; kg — kilogram; cm — centimeter; g — gram; IQR — interquartile range

of ligaments that stabilize the vertebral and sacroiliac ligaments, direct compression of lumbosacral nerve roots by the uterus and fetus, the tension of spinal antigravity muscles due to an insufficiency of anterior abdominal muscles, and muscular fatigue may lead to low back pain [13, 14]. The increase in BMI may be reflected as a remarkably increased mechanical load on the pelvic and lumbar joints leading to increased low back pain. Thus, the pain usually starts in the 18th week of gestation and attains peak intensity between the 24th and 36th weeks [7]. This shows the effect of weight gain and compensatory mechanisms on low back pain during the progress of pregnancy through the trimesters. Even though low back pain during pregnancy disappears in 93% of cases within three months, 7% of patients experience persistent and severe pain after delivery [7]. Excessive weight gain during pregnancy is also correlated with low back pain after pregnancy [15]). It was reported that pregnant women with a gestational weight gain of 15 kg or more are 2.3 times more likely to experience low back pain relative to women with less than 10 kg of gestational weight gain [15]. This situation alongside our findings leads us to stress the importance of reducing the weight back to prepregnancy levels after delivery to decrease lumbosacral pain.

The Institute of Medicine recommends a total weight gain not exceed 12.5 to 18 kg for underweight women, 11.5 to 16 kg for normal-weight women, 7 to 11.5 kg for overweight women, and 5 to 9 kg for obese women during pregnancy [16]. These recommendations aim to prevent adverse maternal and fetal health conditions. Such that inadequate gestational weight gain was asoociated with small for geatational age newborns whereas excessive gestational weight gain was associated with large for gestational age newborns [17]. In the case of low back pain during pregnancy, according to our results, weight gain should not be standardized for women with the same prepregnancy body weights. The increase in BMI (%) has more impact on the occurrence of low back pain when compared with gestational weight gain. Moreover, according to our results, to decrease the occurrence of low back pain, weight gain should be personalized for each pregnant depending on her prepregnancy body weight and height. Thus, certain weight gain (or increase in BMI) for pregnant women having lower prepregnancy BMI values is correlated with greater low back pain when compared with a similar amount of weight gain in pregnant women with higher prepregnancy BMI values. This may be explained by the weaker adaptation and because the strengthening of capacities of the musculoskeletal system to handle the body weight increase over a very short time like pregnancy may vary from woman to woman [10]. According to our results, these capacities may be lower in pregnant women with lower prepregnancy BMI values such that the same amount of body load increase more severely affects pregnant women with weaker and taller bodies. This hypothesis should be investigated in further biomechanical studies in pregnant women.

In addition, we found that a 15.5% increase in prepregnancy BMI has a sensitivity of 77.5% and specificity of 60% for the occurrence of low back pain. That means that, with a 15.5% increase in prepregnancy BMI, the probability of low back pain in a woman is 77.5%. However, if there is no increase in BMI of 15.5% or greater, the probability of the absence of low back pain is just 60%. Our results suggest the presence of other etiologic factors like exercises during pregnancy probably interfere with body weight and compensatory musculoskeletal etiopathogenesis. As compensatory mechanisms demonstrated by the musculoskeletal system play a role in the development of low back pain, muscle-strengthening exercises should not be neglected during pregnancy. Thus, pregnant women should be encouraged to engage in regular exercise as it was shown that regular exercise adherence is associated with positive long-term effects on BMI [18].

The results of our study may not fit with all pregnant women globally of different ethnicities because genetics, working status and nutrition habits may change geographically, however, our study is unique in terms of analyzing various epidemiologic and clinical risk factors including weight changes, the presence of striae gravidarum, and intraperitoneal adhesions in pregnant women for low back pain.

CONCLUSIONS

To conclude, low back pain during pregnancy is a common disorder, but its etiopathogenesis is not well-understood at this time. Our results imply that an increase in BMI (%) is correlated with low back pain during pregnancy. Weight gain should be personalized for each pregnancy depending on the BMI. The increase in BMI (%) should be minimalized. Finally, weight control should be achieved with a multidisciplinary approach that includes proper nutrition and exercise to prevent low back pain during pregnancy.

Conflict of interests

No potential conflict of interest was reported by the authors.

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