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Hidden association between the presence and severity of striae gravidarum and low back pain in pregnancy

Demet Kokanalı*, Ali Turhan Çağlar

Zekai Tahir Burak Woman's Health Education and Research Hospital, Ankara, Turkey

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ABSTRACT

Objective(s): To investigate the association between striae gravidarum and low back pain in pregnancy.
Study Design: 200 healthy pregnant women with first, uncomplicated and singleton pregnancy at a gestation age of 36–37 weeks were evaluated for striae gravidarum Davey score. Back pain was assessed by Visual Analogue Scale and functional disability by the Turkish version of Oswestry Disability Index.
Results: 118 (59%) had low back pain. The Davey score was higher in women with low back pain (6.6 ± 2.2 vs. 4.4 ± 2.1; $p < 0.001$). Davey score and total Oswestry Disability Index score were positively correlated with Visual Analogue Scale in women with low back pain ($r = 0.570$, $p < 0.001$ and $r = 0.329$, $p < 0.001$, respectively). There were also significant positive correlations between Davey scores and Oswestry Disability Index scores of each different situation (pain intensity, personal care and lifting, walking, sitting, standing, sleeping, sexual life, social life and travelling).
Conclusion: Presence and severity of low back pain is correlated with the presence and severity of striae gravidarum in pregnant women. Therefore, the presence of low back pain can be predicted by simple striae gravidarum evaluation and follow-up. So, necessary precautions can be recommended to prevent pain and functional limitations that can occur during pregnancy.

Introduction

Low back pain (LBP) is a very common disorder in pregnancy and tends to increase as the pregnancy advances. Because of different definitions and diagnostic criteria, its real prevalence is unknown. But, it has been reported that it affects 20%–90% of pregnant women and is often over 50% [1,2]. LBP is accepted as a natural course of pregnancy and expected to disappear spontaneously after delivery, however it lowers the quality of a woman's life and increases health costs and work loss [3]. Therefore, any support preventing this pain and reducing its impact is important. Although some risk factors, such as smoking, body mass index (BMI) and work load, have been shown to be associated with LBP, there is no clear consensus about its etiology [1,2,4,5].

Striae gravidarum (SG) is a common skin problem that affects 55–90% of pregnant women. SG occurs as atrophic linear scars on the abdomen, breasts, buttocks, hips, and thighs, especially after the 24th week of gestation [6,7]. These skin lesions can disrupt a woman's quality of life by leading serious cosmetic problems [8]. Here again, the exact etiology is unknown, but several risk factors including young age, large fetus, increased weight gain and high BMI that might be effective in its formation have been reported [6,8,9]. In appropriate genetic susceptibility, it has been suggested that hormonal and mechanical factors may play a role in SG formation. Hormonal changes specific to pregnancy cause weakening in the connective tissue. And as the pregnancy progresses, the resulting mechanical stretching can also cause SG due to this weakening [6,8]. Similarly, as a result of weakening of the connective tissue, the stability in the spine is deteriorated and complaints such as pain can occur when the mechanical load related to pregnancy increases on the spine [10]. So, there may be an association between presence of SG and LBP during pregnancy.

In the current study, we aimed to investigate whether there is really an association between the presence and severity of SG and LBP in pregnancy.

Material and methods

This cross-sectional study was approved by the local ethical committee (protocol number 51/2018) and informed consent was obtained from each participant and conducted in accordance with the principles of the Declaration of Helsinki. Participants for this study were recruited from pregnant women who were consecutively

* Corresponding author at: Güzeltepe mah Halide Nusret Zorlutuna sok, No: 6/4, Cankaya, Ankara.
E-mail address: demetkokanali@gmail.com (D. Kokanalı).

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admitted to prenatal care unit of Zekai Tahir Burak Woman's Health Education And Research Hospital between April to June 2018. Healthy pregnant women with first, uncomplicated and singleton pregnancy at a gestation age of 36–37 weeks were included. Women with multiple pregnancies, detected uterine contractions, rupture of membranes, cervical dilatation, any systemic disease (such as gestational diabetes, preeclampsia, etc), neurological disease, any drug use except iron and vitamins supplements during pregnancy and preventive topical treatment use for SG were excluded.

Socio-demographic characteristics of women were recorded. Gestational age was based on last menstrual period confirmed or adjusted by first trimester ultrasonographic evaluation. Estimated fetal weights were calculated on the basis of all biometric parameters measured by transabdominal ultrasonography.

Presence and severity of SG were assessed according to Davey score (DS) [11]. To calculate the DS, the abdomen was divided into four quadrants using the midline and a line drawn horizontally through the umbilicus. For each quadrant, women received 0 points if there were no SG, 1 point if there were moderate (1–3) number of SG and 2 points if there were many (≥ 4) SGs. Points of each quadrants were then summed to get the total score. The total score was between 0 and 8 points. Zero point was defined as no SG, 1–2 points were as mild SG and 3–8 points were as severe SG.

For each pregnant women, presence of LBP was addressed with two questions recommended by a modified Delphi study aimed to identify standardized definitions of LBP: 'In the past 4 weeks, have you had pain in your low back? (A small diagram showing the low back area were accompanied to this question)' and 'If yes, was the pain bad enough to limit your usual activities or change your daily routine for more than 1 day?' [12]. If a woman answered these two questions positively, she was accepted as having LBP during pregnancy. Pain intensity was then rated by pregnant women themselves on a 10-cm visual analogue scale (VAS), with 0 denoting "no pain" and 10 "unbearable pain" [13].

Finally, functional disability was measured by the Turkish version of Oswestry Disability Index (ODI) [14]. ODI measures the extent to which a patient's functional level is limited by LBP in different situations (eg pain intensity, personal care and lifting, walking, sitting, standing, sleeping, sexual life, social life and travelling) [15]. Each section is scored from 0 to 5, 5 representing the greatest disability. The ODI forms were filled in by pregnant women themselves.

Data analyses were performed using SPSS for Windows, version 22.0 (SPSS Inc., Chicago, IL, USA). The normality of continuous variables and the homogeneity of variances were tested by Kolmogorov-Smirnov tests and by Levene tests, respectively. Continuous variables were presented as mean ± standard deviation (SD). Categorical variables were presented as numbers (percentages). The mean differences between the groups were compared by Student's t-tests. Chi-square tests were used to compare the categorical variables. Univariate correlations were performed using Pearson's or Spearman's correlation coefficient where appropriate. Receiver-operating characteristic (ROC) curves were constructed to calculate the sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV) and accuracy for different DS in disciminating pregnant women with LBP. The best cut-off point for DS was calculated by maximum Youden index (sensitivity + specificity - 1). $p < 0.05$ was considered statistically significant.

Results

Two hundred and sixty nine pregnant women were included in this study. After excluding candidates due to criteria, there were 208 women eligible for the study. Eight women did not complete the given questionnaire forms and were therefore excluded. The final study population consisted of 200 women. Of these, 118 (59%) were classified as pregnant women with LBP and 82 (41%) were as pregnant women without LBP. All the women were Causian.

Demographic characteristics of the two compared groups (pregnant women with and without LBP) were listed in Table 1. The groups were similar in terms of age (23.7 ± 2.9 vs. 24.0 ± 2.7 years, p = 0.463), gestational age (36.6 ± 0.3 vs. 36.5 ± 0.3 weeks, p = 0.211), BMI (29.9 ± 3.4 vs. 30.2 ± 2.5 kg/m^2, p = 0.531), weight gain during pregnancy (9.9 ± 1.4 vs. 9.6 ± 1.5, p = 0.155), frequency of women who were housewives (68.6% vs 64.6%, p = 0.553) and estimated fetal weight (2819.7 ± 125.1 vs. 2807.9 ± 131.3 g, p = 0.523).

The calculated DSs and SG severity of the groups were shown in Table 2. Compared to the pregnant women without LBP, DS was significantly higher in women with LBP (6.6 ± 2.2 vs. 4.4 ± 2.1, p < 0.001). In addition, the women with severe SG were more common among women with LBP, while no and mild SG were more common in women without LBP (p = 0.039).

In pregnant women with LBP, association of VAS score and several clinical parameters were demonstrated in Table 3. There were no significant correlations between VAS score and the woman's age, gestational age, BMI, weight gain during pregnancy and estimated fetal weight. In contrast, DS and total ODI score were positively correlated with VAS score (r = 0.570, p < 0.001 and

Table 1
Demographic characteristics of pregnant women with and without low back pain.

	Low back pain (n = 118)	No low back pain (n = 82)	P
Age (year)	23.7 ± 2.9	24.0 ± 2.7	0.463
Gestational age (week)	36.6 ± 0.3	36.5 ± 0.3	0.211
BMI (kg/m^2)	29.9 ± 3.4	30.2 ± 2.5	0.531
Weight gain during pregnancy (kg)	9.9 ± 1.4	9.6 ± 1.5	0.155
Housewife	81 (68.6)	53 (64.6)	0.553
Estimated fetal weight (gr)	2819.7 ± 125.1	2807.9 ± 131.3	0.523

Variables were presented as mean ± standard deviation and number (%).
BMI: Body mass index;
p < 0.05 was considered statistically significant.

Table 2
Davey scores and SG severity of pregnant women with and without low back pain.

	Low back pain (n = 100)	No low back pain (n = 100)	P
Davey score	6.6 ± 2.2	4.4 ± 2.1	<0.001
SG severity	2 (1.7)	5 (6.1)	0.039
No SG	7 (5.9)	11 (13.4)	
Mild SG	109 (92.4)	66 (80.5)	
Severe SG			

Variables were presented as mean ± standard deviation and number (%).
SG: Striae gravidarum.
p < 0.05 was considered statistically significant.

Table 3
The association of pain intensity measured by VAS score in pregnant women with low back pain and clinical parameters.

	r	P
Age	−0.054	0.563
Gestational age	0.110	0.234
BMI	0.021	0.821
Weight gain during pregnancy	0.052	0.574
Estimated fetal weight	0.036	0.698
Davey score	0.570	<0.001
Total ODI score	0.329	<0.001

r: Pearson's correlation coefficient.
BMI: Body Mass Index; ODI: Oswestry Disability Index.
p< 0.05 was considered statistically significant.

r = 0.329, $p < 0.001$, respectively). Moreover, as presented in Table 4, there were significant positive correlations between DSs and ODI scores for each different situation in pregnant women with LBP.

ROC curve for DS in discriminating women with LBP was shown in Fig. 1. The curve constructed for calculated DS was above the 45° line, indicating that there was a significant relationship between this variable and LBP [Area under curve (AUC) = 0.72; Standard error (SE) = 0.033; 95% confidence interval (CI) = 0.709-0.836; $p < 0.001$]. According to the highest Youden index, the best cut-off value for discrimination of pregnant women with LBP was 6.5 with a sensitivity of 57.6%, a specificity of 85.4%, a PPV of 85.0%, a NPV of 58.3% and an accuracy of 69.0% (Table 5).

Comment

LBP is one of the most common musculoskeletal complaints of women in pregnancy. In our study, we determined the prevalence of pregnant women with LBP as 59%. This high rate, which is in accordance with the prevalance reported in literature [1,2,15], suggests that LBP is an important health problem for pregnant women which affects women's lives to a significant extent. Eighty percent of pregnant women suffering from LBP indicate that it affects their daily routines and 10% of them report that they can not work because of this pain [2]. In general, delays in the management occur because it is perceived as a temporary condition experienced by pregnant women and is ignored by the health care providers [16]. Cosequently, it may lead to more severe social and health problems such as taking sick leave from work or quitting their jobs, chronic pain and sexual disorders [3,17,18]. However, early diagnosis and simple treatments have quite successful outcomes [2,19]. Therefore, it may be important to identify the markers that appear at the time of gestation, which may lead to anticipation of LBP.

We conducted this cross-sectional, and self-administered questionnaire-based study with the aim of investigating whether an association existed between the presence and severity of SG and LBP in pregnant women. From the literature, it can be seen that relations exist between SG and some cases which include obstetric anal sphincter injuries, pelvic floor symptoms, intraperitoneal adhesions or uterine scar healing following caesarean deliveries [20,21]. To our knowledge, the association between SG and LBP in pregnancy examined in our study has not previously been investigated. We found that the presence of SG was more common and severity of SG was greater in pregnant women with LBP than in those without LBP. There was also a positive correlation between SG and LBP severity. Our results suggest that there may be similar pathway in the etiopathogenesis of both conditions.

The etiology of SG and LBP has not been fully elucidated, but some similar mechanical and hormonal factors have been noted for the pathogenesis of these two conditions [6,10]. Both SG and LBP develop especially after the 2nd trimester of pregnancy and increase in severity as the pregnancy progresses [6,10]. Mechanical factors such as increases in fetal growth, uterine size, abdominal diameter and weight gain can stretch and weaken abdominal skin and cause SG formation, and these mechanical overloads on the spine can also cause LBP [22,23].

The hormonal environment changes in a pregnant woman. This hormonal differentiation causes some changes in the structure of connective tissue. Estrogen levels increase steadily during pregnancy [24]. Its main role is to promote fetal growth and wellbeing, but it also decreases collagen synthesis and fibroblast proliferation [25,26]. Relaxin is another hormone that influences the connective tissue structure, with a ten-fold increase of Relaxin levels during pregnancy [3]. Its role is to inhibit myometrial contractility until late pregnancy and to facilitate cervical ripening at birth [27]. However, relaxin reduces the density and organisation of collagen bundles, leading to a significant local decrease in total collagen content [26]. These kind of changes in the structure of connective tissue due to hormonal factors reduce the ability of skin to withstand strain and lead to an increased risk of SG formation as the pregnancy progresses [6,26]. Additionally, increased estrogen and relaxin levels increase joint laxity by softening and weakening ligamentous collagen. This causes a decrease in stability of the spine and brings on a potential strain in

Table 4
The association of Davey score and functional disability measured by Oswestry Disability Index in pregnant women with low back pain.

	r	p
Pain intensity	0.581	<0.001
Personal care	0.506	<0.001
Lifting	0.501	<0.001
Walking	0.429	<0.001
Sitting	0.491	<0.001
Standing	0.512	<0.001
Sleeping	0.559	<0.001
Sexual life	0.558	<0.001
Social life	0.525	<0.001
Travelling	0.535	<0.001
Total ODI	0.564	<0.001

r: Spearman's correlation coefficient.
ODI: Oswestry Disability Index.
$p < 0.05$ was considered statistically significant.

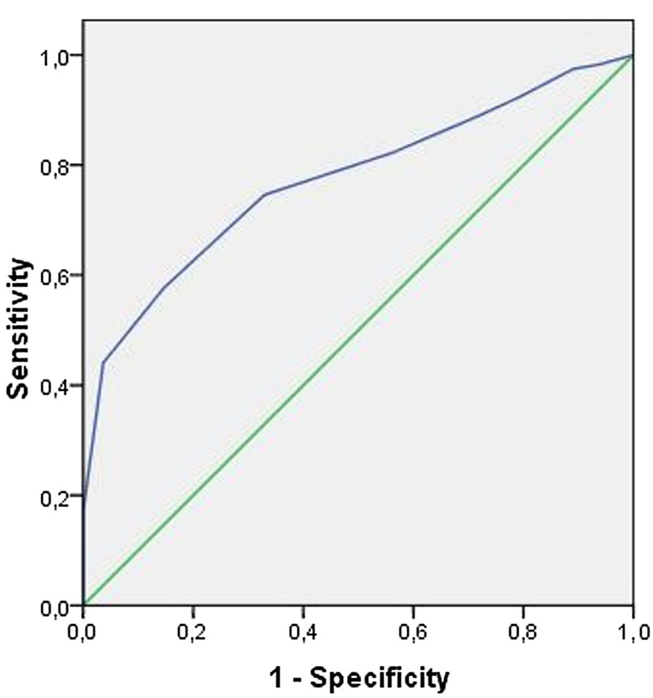

Fig. 1. Receiver-operating characteristic curve of Davey score and pregnant women with low back pain. Area under curve is 0.772 (95% confidence interval = 0.709-0.836; standard error = 0.033; $p < 0.001$).

Table 5
Cut-off points for Davey scores in discriminating pregnant women with low back pain.

	Cut off point	Sensitivity (%)	Specificity (%)	PPV (%)	NPV (%)	Accuracy (%)
Davey score	5.5	74.6	67.1	–	–	–
	6.5	57.6	85.4	85.0	58.3	69.0
	7.5	44.1	96.3	–	–	–

PPV: positive predictive value; NPV: Negative predictive value.

the low back area and lead to LBP. Namely, as the pregnancy progresses, this joint laxity allows for progressive forward pelvic rotation and lumbar spine hyperlordosis, which in turn brings more load to the pelvis and low back. Also, axial loading of the spine may contribute to LBP by causing compression of intervertebral discs [10].

In our study, we found that there is a mild and positive relationship between the VAS scores indicating LBP severity and total ODI scores measuring functional disability. This means that more pain will cause more functional limitations in the life of the pregnant woman. There was also moderate positive associations between DSs and LBP intensity and each ODI item scores. These associations suggested that the presence and severity of SG could be used as a marker for LBP and functional disabilities that women may experience during pregnancy. We think that these findings will be a guide for future studies.

We also found that DS at 36 week of gestation was significantly greater in pregnant women with LBP compared to the healty ones and there was a statistically significant AUC of DS in ROC analyses between the pregnancies with and without LBP (0.690; CI 0.574–0.806, p = 0.003). Morover, a cut off score of 5.5 has a sensitivity of 75.0%, a specificity of 63.0%, a PPV of 67.0%, a NPV of 71.6% and an accuracy of 62.0% for discriminating pregnant women with LBP. Our results indicate that DS might be beneficial in determining pregnant women who are likely to have LBP. Even though, we did not primarily aim to evaluate DSs to distinguish and predict the pregnancies complicated by LBP, we believe that our findings may lead to future studies aiming to show predictive power or clinical validity of DS in pregnant women with LBP.

There are some strengths and limitations in this current study. First of all, our study is the first trial that is evaluating the association between SG and LBP in pregnant women. This is the main strength of the current study. However, because of this privilige, no comparison of results among studies or calculation of an adequate sample size could be conducted. On the other hand, the woman's age, geastational age, BMI, weight gain during pregnancy, estimated fetal weight of all pregnant women are similar which may reduce the bias of the effect of these confounders on the LBP and SG when comparing the groups. Finally, we used questionnaires for data collection and all participants filled out the questionnaires on their own, which indicated the objective nature of the data. However, our study is a cross-sectional study without any follow up. This was a limitation. In addition, there is no data regarding the genetic susceptibility, psychological condition, working conditions of the employees that may be important for LBP or SG formation and study population lacks ethnic diversity. Ideally, to use the term pain, it should be confirmed by physical examination or some provocation tests, but they are not available in our study. This may decrease the reliability of our results. And finally, SG has been evaluated only in the abdominal area, excluding any striae in other regions such as breast and thighs.

So we can conclude that LBP is a common complaint in pregnancy. It is an important health problem that can adversely affect the quality of life and functional capacity of a pregnant woman. Interestingly, the presence and severity of this condition is correlated with the presence and severity of SG, depending on the possible similar mechanical and hormonal factors. Therefore, the presence of LBP can be predicted by simple SG evaluation and follow-up. So, necessary precautions such as simple exercises or lifestyle changes can be suggested to prevent pain and functional limitations that can occur during pregnancy. We believe that these opinions can be confirmed with new, more participatory, prospective studies and we think that many studies in the future should be presented to the literature in this topic.

Declaration of interest statement

None.

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None.

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