RESEARCH ARTICLE / *Araştırma Makalesi*

An Important but Overlooked Public Health Problem: Pregnancy-Related Low Back Pain

Önemli Fakat Gözden Kaçan Bir Halk Sağlığı Sorunu: Gebelik ile İlgili Bel Ağrısı

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Geliş Tarihi / Received : **17.03.2021** Kabul Tarihi / Accepte: **26.05.2021**

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(Sakarya Tıp Dergisi / *Sakarya Med J* 2021, 11(4):865-872) DOI: 10.31832/smj.898585

Abstract

Objective	Different prevalence rates and trigger factors associated with pregnancy-related low back pain (PRLBP) have been reported. Therefore, the main aim of this study was to identify the PRLBP frequency in the city of Kahramanmaraş. Secondary aim was to detect the factors associated with PRLBP.
Materials and Methods	This descriptive cross-sectional study conducted on pregnant women in the city of Kahramanmaraş. Data were obtained between August 2019 and October 2019 using a questionnaire form that was prepared by the researchers considering the literature data.
Results	A total of 727 participants were enrolled and the frequency of PRLBP was 59.69% (n=434). The median VAS score of pregnant women with PRLBP was 5 (1-10) and highest score was detected in the third trimester. Higher gestational week (p<0.001), living in an urban area (p<0.001), higher level of education (p=0.001) and presence of low back pain before pregnancy (p<0.001) were found to be associated with PRLBP in this study. No significant association was detected between doing exercise during pregnancy and PRLBP (p=0.069).
Conclusion	A considerable proportion of pregnant women in Kahramanmaraş city center reported the presence of PRLBP. Future research should focus on developing strategies to prevent PRLBP, an important public health problem.
Keywords	pregnancy-related low back pain; frequency; risk factors

Öz

Amaç	*Gebelik ile ilgili bel ağrısı (GİBA) ilişkili farklı prevalans değerleri ve tetikleyici faktörler bildirilmiştir. Bu nedenle, bu çalışmanın temel amacı Kahramanmaraş il merkezindeki GİBA sıklığını belirlemekti. İkincil amaç, GİBA ile ilişkili faktörleri tespit etmekti.*
Gereç ve Yöntemle	*Kesitsel tipte tanımlayıcı araştırma, Kahramanmaraş il merkezinde gebeler üzerinde yapılmıştır. Veriler, araştırmacılar tarafından literatür verileri dikkate alınarak hazırlanan anket formu kullanılarak Ağustos 2019 ile Ekim 2019 tarihleri arasında elde edilmiştir.*
Bulgular	*Toplam 727 katılımcı kaydedildi ve GİBA sıklığı %59,69 (n=434) idi. GİBA mevcut gebelerin medyan VAS skoru 5 (1-10) idi ve en yüksek skor üçüncü trimesterde tespit edildi. Daha yüksek gebelik haftası (p<0,001), kentsel alanda yaşama (p<0,001), daha yüksek eğitim düzeyi (p=0,001) ve gebelik öncesi bel ağrısı varlığı (p<0,001) GİBA ile ilişkili bulundu. Gebelik sırasında egzersiz yapmak ile GİBA arasında anlamlı bir ilişki saptanmadı (p=0,069).*
Sonuç	*Kahramanmaraş il merkezinde gebe kadınların önemli bir kısmı GİBA varlığını bildirdi. Gelecekteki araştırmalar, önemli bir halk sağlığı sorunu olan GİBA'yı önlemek için stratejiler geliştirmeye odaklanmalıdır.*
Anahtar Kelimeler	*gebeliğe bağlı bel ağrısı; sıklık; risk faktörleri*

INTRODUCTION

Low back pain (LBP) is a major public health problem that affects daily life activities, productivity and absenteeism, health care costs and psychological status.[1,2] Pregnancy is consideredto beone of the main predisposing factors of LBP. The results of various studies have shown the prevalence of LBP during pregnancy to be >50%.[3-5] The fact that pregnancy-related low back pain (PRLBP) is considered a natural consequence of pregnancy and the expectation that it will disappear spontaneously after delivery cause this disorder to be overlooked by both pregnant women and physicians.[6,7] PRLBP has a negative effect on daily life activities in one-third of pregnant women, causes absenteeism, and may trigger chronic LBP which continues after delivery.[8,9] In studies conducted on middle-aged women with chronic LBP, 10-25% of the participants reported that the first episode of this pain started during pregnancy.[10-12]

Despite the high prevalence rates, the pathophysiology of PRLBP has not been fully understood and the etiology is stil unclear. The most emphasized mechanisms are biomechanical changes secondary to weight gain and enlargement of the uterus, variations in blood levels of hormones including relaxin, estrogen and progesterone, and changes in vascular components.[13,14] In studies evaluating risk factors for the development of PRLBP, no single major causal factor has been detected, but various factors that may be associated with PRLBP have been identified. Some of the risk factors focused on area previous history of LBP, increase in body mass index (BMI), multiparity, fetal weight, psychological factors, physical activity and work intensity.[4,8,15,16]

There are differences in the frequency data provided from various regions in the literature.[5,17-19] Therefore, the aim of this study was to identify the PRLBP frequency in the city of Kahramanmaraş in the Eastern Mediterranean Region of Turkey. A secondary aim of the study was to detect the factors associated with PRLBP.

MATERİALS and METHODS

Study design and participants

This descriptive type cross-sectional study included pregnant women in thecity of Kahramanmaraş. Family Health Centers (FHC) provide primary health care services in Turkey and antenatal care for pregnant women. There are two districts in Kahramanmaraş (Onikişubat and Dulkadiroğlu) and a total of 61 FHC are located in these two districts. Based on the population of the districts, 5 FHCs were randomly selected from Onikişubat district and 3 FHCs from Dulkadiroğlu district. Pregnant women followed up at the 8 specified FHCs were evaluated. In 2018, the number of live births was 4143 in Dulkadiroğlu district, and 7817 in Onikişubat district. In consideration of these data, it was estimated before the study that there would be approximately 12,000 pregnancies in 2019 in the city of Kahramanmaraş. In a study conducted in a different region of Turkey, the prevalence of PRLBP was found to be 53.9%.5 Therefore, to calculate the sample size, it was assumed that the prevalence of PRLBP would be 53.9% and sample size was calculated with the Epi Info program to be 975 at a 95% confidence interval with a 3% margin of error.

Study participation was on a voluntary basis. Before the study, information was given about the questionnaire and it was explained that it would take about 20-30 minutes to complete. Pregnant women who felt well enough to answer questions and wished to participate were included in the study. Exclusion criteria were defined as not wishing to participate, a history of spinal fracture or surgery, inflammatory rheumatological disease such as spondyloarthropathies, spinal tumor, spinal deformity such as scoliosis, or adiagnosis of multiple sclerosis. After implementation of the inclusion and exclusion criteria, a total of 727 pregnant women were evaluated in this study. As the inclusion and exclusion criteria were strictly adhered to and volunteering was not compromised, the targeted sample size was not reached. Data collection was terminated because approval was obtained from the Ethics Committee for a 3-month study periodand it was deemed sufficient to rea-

ch 74.5% of the target sample size.

Data collection

With reference to previous similar frequency studies of PRLBP, a questionnaire was prepared taking these studies and the cultural structure of our region in to consideration.[5,17,20] The questionnaire was completed by 20 pregnant women before it was finalized. Any questions that the participants had difficulty in understanding oran swering were evaluated by there searchers (AE, BFK and RAO) and necessary corrections were made. Thus, a final form of the questionnaire was created. Data were obtained using the face-to-face interview method in a 3-month period between August 2019 and October 2019.

The questionnaire consisted of three main sections: socio-demographic factors, obstetric factors and daily habits. The socio-demographic factors include age, BMI, education status, employement status, spouse employment status and residential area. Obstetric factors include gestational week-trimester, number of parity-gravidity, history of caesarean delivery, weight before pregnancy and measurement of weight gain during pregnancy. Daily habits include smoking status, regular exercise habit before pregnancy, and regular exercise during pregnancy. The history of LPB before pregnancy, the presence of PRLBP and these verity of pain if PRLBP is present were also questioned. A 10cm visual analogue scale (VAS) was used to detect these verity of PRLBP (0=no pain and 10=highest pain level). PRLBP was defined as recurrent or continuous pain in the lumbar region or pelvis lasting more than 1 week during the current pregnancy.[20]

Statistical analysis

Data were statistically evaluated using the Statistical Package for the SocialSciences soft ware (IBM SPSS Statisticsfor Windows, Version 20.0. IBM Corp., Chicago, IL, USA). Conformity of the data to normal distribution was assessed with the Shapiro-Wilk test and it was determined that the data were not normally distributed. Data were expressed as number (n) and percentage (%) and median (minimum - maximum) values. Two groups of continuous variables were compared using the Mann Whitney U-test and comparisons of three groups using the Kruskal-Wallis test.The Mann-Whitney U test was used to evaluate the significance of pair wise differences with Bonferroni correction (post-hoc test) to adjust for multiple comparisons. For post-hoc tests, the level of statistical significance was accepted as 0.017 (0.05/3). For the categorical variables, group comparisons were performed using the Chi-Square test. Spearman rho test was used for the correlation analyses.

Logistic regression analysis was carried out to predict the presence of PRLBP. Univariate logistic regression analysis was performed for each factor and those with avalue of $p<0.25$ were considered potential independent predictors.[5] Collinearity was checked and the clinically important factor was preferred of the factors for which collinearity was determined. Factors were included in the multivariable regression analysis using the enter method. The level of statistical significance was accepted as $p< 0.05$.

Ethical approval

Pregnant women were informed that participation was completely voluntary and the data obtained from the forms would only be used scientifically. Kahramanmaraş Sütçü İmam University Medical Ethics Committee approved the study (Decision date: 31-07-2019, Decision no: 4).

RESULTS

A total of 727 participants were enrolled, with median age of 27 years (range, 18-43 years) and median BMI of 26.76 (16.11–41.64). The frequency of PRLBP was 59.69% (n=434). The number of participants with first pregnancy was 211 (29.1%). Of the total study subjects, 17.9% (n=130) were in thefirst trimester, 48.3% (n=351) were in the second trimester and 33.8% (n=246) were in the third trimester. Residence in a rural area was stated by 96 (13.20%) subjects, and in an urban area by 631 (86.80%).

When the pregnant women with and without PRLBP were compared, there were significant differences in terms of BMI, residence area and education status. BMI was significantly higher in pregnant women with PRLBP (p=0.021). The rate of pregnant women living in an urban area was higher in the group with PRLBP (p<0.001). The rates of high school and university or above educational levels were higher in the PRLBP positive group (p=0.034). No significant difference was detected in terms of age, employment status and spouse employment status (p>0.05). The demographic and socioeconomic characteristics of the participants are presented in Table 1.

Table 1. Demographic and socioeconomic characteristics of the participants

Characteristics	Participants without PRLBP (n=293)	Participants with PRLBP (n=434)	p
Age*	27 (18 – 43)	27 (18 – 42)	0.720
BMI*	26.34 (16.11 – 41.53)	27.07 (17.30-41.64)	0.021
Education+			
Literate	7 (2.4)	9 (2.1)	
Primary school	58 (19.8)	61 (14.1)	
Middle school	84 (28.7)	99 (22.8)	0.034
High school	86 (29.4)	158 (36.4)	
University or Above	58 (19.8)	107 (24.7)	
Residence area+			
Rural	63 (21.5)	33 (7.6)	<0.001
Urban	230 (78.5)	401 (92.4)	
Employment Status+			
Unemployed	247 (84.3)	344 (79.3)	0.088
Employed	46 (15.7)	90 (20.7)	
Spouse Employment Status+			
Unemployed	18 (6.1)	19 (4.4)	0.288
Employed	275 (93.9)	415 (95.6)	

*Data are expressed as median (minimum – maximum), +: Data areexpressed as number (percentage)
PRLP: Pregnancy-related low back pain, n: number

The rates of LBP presence before the pregnancy, performing exercise before the pregnancy, and performing exercise during the pregnancy were significantly higher in the PRLBP positive group (p<0.001; p<0.001 and p=0.006, respectively). No significant difference was detected in terms of number of gravidity and parity, smoking status and history of caesarean section (p>0.05). The pregnancy history, personal habits and clinical characteristics of the study participants are shown in Table 2.

Table 2. Pregnancy history, personal habits and clinical characteristics of participants without and with PRLBP

Characteristics	Participants without PRLBP (n=293)	Participants with PRLBP (n=434)	p
Gestational week*	20 (3 – 40)	24 (3 – 40)	**<0.001**
Trimester+			
First	72 (24.6)	58 (13.4)	
Second	146 (49.8)	205 (47.2)	**<0.001**
Third	75 (25.6)	171 (39.4)	
Number of Gravidity*	2 (1 -15)	2 (1 – 7)	0.837
Number of Parity*	1 (0 – 5)	1 (0 – 5)	0.810
Weight Gain*	3 (-7 – 22)	6 (-9 – 28)	**<0.001**
History of LBP Before Pregnancy+			
Yes	17 (5.8)	122 (28.1)	
No	276 (94.2)	312 (71.9)	**<0.001**
Exercise Status Before Pregnancy+			
Yes	45 (15.4)	114 (26.3)	
No	248 (84.6)	320 (73.7)	**<0.001**
Exercise Status During Pregnancy+			
Yes	68 (23.2)	142 (32.7)	
No	225 (76.8)	292 (67.3)	**0.006**
Smoking Status+			
Yes	8 (2.7)	18 (4.1)	
No	285 (97.3)	416 (95.9)	0.313
History of Cesarean+			
Yes	118 (40.3)	166 (38.2)	
No	175 (59.7)	268 (61.8)	0.583

* Data are expressed as median (minimum – maximum), +: Data are expressed as number (percentage)
PRLP: Pregnancy-related low back pain, LBP: Low back pain, n: number

The median VAS score of pregnant women with PRLBP was 5 (1-10), with a significant difference determined according to the trimester (p<0.001). The median VAS scores

in the first, second and third trimester groups were 5 (2-10), 5 (1-10) and 6 (1-10), respectively. According to the pair wise comparisons, the source of significance was the third trimester group. No significant correlation was detected between VAS score and age, BMI, weight gain during pregnancy, and number of gravidity and parity in the PR-LBP positive group (p>0.05).

Factors affecting the presence of PRLBP were evaluated using logistic regression analysis. Gestational week was found to be associated with the presence of PRLBP (OR=1.057, 95% CI:1.037-1.078). Higher values increased the risk of PRLBP. Livingin an urban area was associated with the presence of PRLBP (OR=3.504, 95% CI:2.148–5.718). Educational status was associated with PRLBP (OR=1.325, 95% CI:1.129-1.155). A higher level of education was linked to an increased risk of PRLBP. The study subject swith LBP before pregnancy had a 7.563-fold higher probability of developing PRLBP (95% CI:4.313–13.259). No significant association was detected between doing exercise during pregnanc yand PRLBP (p=0.069) (Table 3).

Table 3. Multivariate analysis of factors associated with PRLBP

Factors	B	Exp (B)	Lower – Upper (95% CI)	p
Gestational week	0.056	1.057	1.037 – 1.078	<0.001
Livingin a urban residence area	1.254	3.504	2.148 – 5.718	<0.001
Eductional status	0.281	1.325	1.129 – 1.555	0.001
LBP presence before pregnancy	2.023	7.563	4.313 – 13.259	<0.001
Doing exercise during pregnancy	0.350	1.418	0.973 – 2.068	0.069

PRLP: Pregnancy-related low back pain, LBP: Low back pain

DISCUSSION

From the results of this study, the frequency of PRLBP in the city of Kahramanmaraş was calculated as 59.69%. Gestational week, living in an urban area, educational status, and a history of LBP before pregnancy were found to be associated with the presence of PRLBP.

In two previous studies conducted in different regions of Turkey, PRLBP prevalence was found to be 53.9% and 54.1%, consistent with the current study data.[5,21] There are different prevalence data in the literature such as 34%, 39.5% and 72%.[19,20,22] which can be attributed to variations in methodology, definitions of LBP/pelvic pain, definition of point prevalence, and sample size.

In the current study, a significant association was found between gestational weekand PRLBP. The highest VAS score was detected in the third trimester of pregnancy, suggesting that the gestational week is not only associated with the presence of PRLBP but also with these verity of pain. Previous studies have reported a link between increasing gestational weekand PRLBP.[23,24] This result is not surprising given the physiology of pregnancy. The spine becomes overloaded as a result of the weight gain during pregnancy.[3] Another reason is the softening of the lumbosacral ligaments and joints, triggered by high concentrations of progesterone and relaxation hormones.[24]

Pregnant women living in urban areas had a higher risk of experiencing PRLBP compared to those living in rural areas. The results of a study by Mohseni-Bandpei et al. were similar, while Sencan et al. and Sibbritt, Ladanyi & Adams did not find any association between place of residence and PRLBP. Although conflicting results have been reported instudies, there may be several reasons for the PRLBP trend in the urban population detected in the current study. This can be attributed to the daily life differences between urban and rural populations, as women in the rural population lead a physically active life despite being pregnant, where as there is a higher tendency for

a sedentary lifestyle in the urban population. Ergonomic problems as a result of the high prevalence of desk work by urban dwellersd can increase the prevalence of PRLBP. A high ereducation level was found to be associated with PRLBP. Shijagurumayum Acharya et al. found similar results in univariate analyses. It was seen that the participants with a level of education higher than secondary school were more likely to have PRLBP. However, the literature data do not generally support this finding. Sencan et al, Mohseni-Bandpei et al. and Sibbritt, Ladanyi&Adams did not detect any association between education level and PRLBP. In a systematic review of LBP, the authors stated that alow education level was a risk factor for LBP.[25] The reason for this is that people with low education levels may be more prone to risky behaviors in terms of LBP development. That the opposite result was determined in the current study could be due to the educated population living in the urban area, as mentioned above, and risk factors caused by urban life may have triggered PRLBP. Another explanation may be that the more highly educated group perceived PRLBP as a problem, while those with alow level of educationdid not state it as a problem, assuming that it was a natural process brought on by pregnancy.

Further more, an association was found between LBP presence before pregnancy and PRLBP in the current study. This result was consistent with the data in the literature.[4,5,17]. In the analyses, this was the most important factor with the highest oddsratio. Various etiological and predisposing factors trigger pain in participants with pre-pregnancy LBP. It is attempted to over come the pain with various compensatory mechanisms. Biomechanical and hormonal changes brought about by pregnancy can negatively affect this compensatory process and pain can be induced by the recurrence or exacerbation of the pre-existing disorder.

In this study, exercise during pregnancy was not observed to be associated with PRLBP. Although there are various studies showing the positive effects of exercise programs during pregnancy on PRLBP,[26,27] similar to the current study results, this could not be confirmed in some epidemiological studies.[17,18] In controlled clinical studies, researchers have recommended suitable exercise programs for pregnant women at appropriate frequency and intensity. Although pregnant women are encouraged to exercise, they may not be prescribed by a health care professional experienced in exercises that are safeand therapeutic for groups with special needs, such as pregnant women. There fore, pregnant women may not be practicing the correct exercises at the proper intensity and frequency, which could affect the results of the studies.

According to the univariate comparisons, age and employment status were not significantly different between pregnant women with and without PRLBP. The link between ageand PRLBP is still a controversial issue. There are studies in literature both supporting and not supporting this association.[12,15] The current study results suggest that genetic factors and the degree of loading of the spinal column in daily life may be more important factors than age and employment status. There were significant differences in BMI and weight gain in favor of the group with PRLBP. This was an expected result as a higher BMI causes overload on the spinal column and lumbar region. No significant difference was detected in numbers of gravidity and parity between the groups, but there is no consistency in the literature on this point. There are studies that have defined it as a risk factor and there are others that have not.[12,28,29] This may be due to differences in study designs, statistical methods, sample size, orregional structure.

This study had some limitations, primarily that it was a descriptive cross-sectional study and the pregnant women were not followed up. Further more, there was no evaluation of psychological status, disability level, quality of life, marriageage, income status, and onset of PRLBP. As there was no follow-up, there could not be any interpretation of the postpartum period. There was no physical examination of PRLBP. The questionnaire was based on self-reporting, so had the inherent limitations of self-reported

data. However, self-reported data are clinically important because they are individual reports that participants present to health care professionals. As a result of the strict implementation of inclusion and exclusion criteria, the target sample size was not reached. The main strength of this study was the collection of data from the field to represent the city of Kahramanmaraş, with 8 FHCs determined from two different districts according to the population. Therefore, the study group can be considered to represent pregnant women in the city of Kahramanmaraş.

The results of this study demonstrated that the frequency of PRLBP is 59.69% in the city of Kahramanmaraş. Gestational week, living in an urban area, higher educational level, and LBP before pregnancy were found to be associated with PRLBP according to the multivariate analysis. Future research should focus on evaluating the impact of strategies to prevent this important public health problem of PRLBP. Therefore, there is a need for follow-up studies with large sample sizes including pre-pregnancy and post-pregnancy periods. In addition, physical examination findings should be added in future studies.

Authorship Contributions
Concept/Design: AE, BFK
Analysis/Interpretation: AE, RAO
Data Acquisition: AE, BFK, RAO
Writting: AE, BFK, RAO
All authors reviewed the article and approved it for submission.

Conflict of Interest

The authors declare that they have no conflict of interest.

Funding

The authors declared that this study has received no financial support.

Kaynaklar

1. *Coste J, Delecoeuillerie G, Cohen de Lara A, Le Parc JM, Paolaggi JB. Clinical course and prognostic factors in acute low back pain: an inception cohort study in primary care practice. British Medical Journal 1994;308(6928):577-580. DOI: 10.1136/bmj.308.6928.577.*
2. *Maher C, Underwood M, Buchbinder R. Non-specific low back pain. Lancet 2017;389(10070):736-747. DOI: 10.1016/S0140-6736(16)30970-9.*
3. *Ostgaard HC, Andersson GB, Karlsson K. Prevalence of back pain in pregnancy. Spine (Phila Pa 1976) 1991;16(5):549-552. DOI: 10.1097/00007632-199105000-00011.*
4. *Wang SM, Dezinno P, Maranets I, Berman MR, Caldwell-Andrews AA, Kain ZN. Low back pain during pregnancy: prevalence, risk factors, and outcomes. Obstetrics and Gynecology 2004;104(1):65-70. DOI: 10.1097/01.AOG.0000129403.54061.0e.*
5. *Sencan S, Ozcan-Eksi EE, Cuce I, Guzel S, Erdem B. Pregnancy-related low back pain in women in Turkey: Prevalence and risk factors. Annals of Physical and Rehabilitation Medicine 2018;61(1):33-37. DOI: 10.1016/j.rehab.2017.09.005.*
6. *Sydsjö G, Sydsjö A. Newly delivered women's evaluation of personal health status and attitudes towards sickness absence and social benefits. Acta Obstetricia et Gynecologica Scandinavica 2002;81(2):104-111. DOI: 10.1080/j.1600-0412.2002.810203.x.*
7. *Gutke A, Boissonnault J, Brook G, Stuge B. The Severity and Impact of Pelvic Girdle Pain and Low-Back Pain in Pregnancy: A Multinational Study. Journal of Women's Health 2018;27(4):510-517. DOI: 10.1089/jwh.2017.6342.*
8. *Fast A, Weiss L, Ducommun EJ, Medina E, Butler JG. Low-back pain in pregnancy. Abdominal muscles, sit-up performance, and back pain. Spine (Phila Pa 1976) 1990;15(1):28-30. DOI: 10.1097/00007632-199001000-00008.*
9. *Borg-Stein J, Dugan SA, Gruber J. Musculoskeletal aspects of pregnancy. American Journal of Physical Medicine & Rehabilitation 2005;84(3):180-192. DOI: 10.1097/01.phm.0000156970.96219.48*
10. *Svensson HO, Andersson GB, Johansson S, Wilhelmsson C, Vedin A. A retrospective study of low-back pain in 38- to 64-year-old women. Frequency of occurrence and impact on medical services. Spine (Phila Pa 1976) 1988;13(5):548-552. DOI: 10.1097/00007632-198805000-00019.*
11. *Svensson HO, Andersson GB, Hagstad A, Jansson PO. The relationship of low-back pain to pregnancy and gynecologic factors. Spine (Phila Pa 1976) 1990;15(5):371-375. DOI: 10.1097/00007632-199005000-00006.*
12. *Kristiansson P, Svärdsudd K, von Schoultz B. Back pain during pregnancy: a prospective study. Spine (Phila Pa 1976) 1996;21(6):702-709. DOI: 10.1097/00007632-199603150-00008.*
13. *Sneag DB, Bendo JA. Pregnancy-related low back pain. Orthopedics 2007;30(10):839-845. DOI: 10.3928/01477447-20071001-14.*
14. *Peterson CK, Mühlemann D, Humphreys BK. Outcomes of pregnant patients with low back pain undergoing chiropractic treatment: a prospective cohort study with short term, medium term and 1 year follow-up. Chiropractic and Manual Therapies 2014;22(1):15. DOI:10.1186/2045-709X-22-15.*
15. *Ostgaard HC, Andersson GB. Previous back pain and risk of developing back pain in a future pregnancy. Spine (Phila Pa 1976) 1991;16(4):432-436. DOI: 10.1097/00007632-199104000-00008.*
16. *Mogren I. Perceived health, sick leave, psychosocial situation, and sexual life in women with low-back pain and pelvic pain during pregnancy. Acta Obstetricia et Gynecologica Scandinavica 2006;85(6):647-656. DOI: 10.1080/00016340600607297.*
17. *Mohseni-Bandpei MA, Fakhri M, Ahmad-Shirvani M, Bagheri-Nessami M, Khalilian AR, Shayesteh-Azar M, et al. Low back pain in 1,100 Iranian pregnant women: prevalence and risk factors. The Spine Journal 2009;(10):795-801. DOI: 10.1016/j.spinee.2009.05.012.*
18. *Pierce H, Homer CS, Dahlen HG, King J. Pregnancy-related lumbopelvic pain: listening to Australian women. Nursing Research and Practice 2012;2012:387428. DOI:10.1155/2012/387428.*
19. *Shijagurumayum Acharya R, Tveter AT, Grotle M, Eberhard-Gran M, Stuge B. Prevalence and severity of low back- and pelvic girdle pain in pregnant Nepalese women. Biomed Central Pregnancy and Childbirth 2019;19(1):247. DOI: 10.1186/s12884-019-2398-0.*
20. *Mogren IM, Pohjanen AI. Low back pain and pelvic pain during pregnancy: prevalence and risk factors. Spine (Phila Pa 1976) 2005;30(8):983-91. DOI: 10.1097/01.brs.0000158957.42198.8e.*
21. *Mazicioglu M, Tucer B, Ozturk A, Serin IS, Koc H, Yurdakos K, Bayrak B. Low back pain prevalence in Turkish pregnant women. Journal of Back and Musculoskeletal Rehabilitation 2006;19(2-3):89-96.*
22. *Sibbritt D, Ladanyi S, Adams J. Healthcare practitioner utilisation for back pain, neck pain and/or pelvic pain during pregnancy: an analysis of 1835 pregnant women in Australia. International Journal of Clinical Practice 2016;70(10):825-831. DOI: 10.1111/ijcp.12870.*
23. *Kovacs FM, Garcia E, Royuela A, González L, Abraira V; Spanish Back Pain Research Network. Prevalence and factors associated with low back pain and pelvic girdle pain during pregnancy: a multicenter study conducted in the Spanish National Health Service. Spine (Phila Pa 1976) 2012;37(17):1516-1533. DOI: 10.1097/BRS.0b013e31824dcb74.*
24. *Ramachandra P, Maiya AG, Kumar P, Kamath A. Prevalence of musculoskeletal dysfunctions among Indian pregnant women. Journal of Pregnancy 2015;2015:437105. DOI: 10.1155/2015/437105.*
25. *Batista AADS, Henschke N, Oliveira VC. Prevalence of low back pain in different educational levels: a systematic review. Fisioterapia em Movimento 2017;30:351-361.*
26. *Garshasbi A, Faghih Zadeh S. The effect of exercise on the intensity of low back pain in pregnant women.International Journal of Gynaecology and Obstetrics 2005;88(3):271-275. DOI: 10.1016/j.ijgo.2004.12.001.*
27. *Sklempe Kokic I, Ivanisevic M, Uremovic M, Kokic T, Pisot R, Simunic B. Effect of therapeutic exercises on pregnancy-related low back pain and pelvic girdle pain: Secondary analysis of a randomized controlled trial.Journal of Rehabilitation Medicine 2017;49(3):251-257. DOI: 10.2340/16501977-2196.*
28. *Larsen EC, Wilken-Jensen C, Hansen A, Jensen DV, Johansen S, Minck H, Wormslev M, Davidsen M, Hansen TM. Symptom-giving pelvic girdle relaxation in pregnancy. I: Prevalence and risk factors. Acta Obstetricia et Gynecologica Scandinavica 1999;78(2):105-110.*
29. *Robinson HS, Veierød MB, Mengshoel AM, Vøllestad NK. Pelvic girdle pain--associations between risk factors in early pregnancy and disability or pain intensity in late pregnancy: a prospective cohort study. BMC Musculoskelet Disord 2010;13;11:91. DOI: 10.1186/1471-2474-11-91.*