Original Article

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Association of Low Back Pain Beyond Mid-Pregnancy with Maternal Physical Activity Prior to Pregnancy: A Cross-Sectional Study

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Abstract:

Objective: 1) To compare the proportions of low back pain (LBP) in pregnant women with adequate and inadequate physical activity (APA and IPA, respectively) prior to pregnancy. 2) To identify possible factors associated with LBP during pregnancy.

Material and Methods: A cross-sectional analytic study was conducted. Pregnant women answered questions about their physical activity prior to and during pregnancy, using the Thai version of the short International Physical Activity Questionnaire (IPAQ), and assessed their lower back pain via the visual analog scale and the Thai version of the Oswestry Disability Index (ODI).

Results: A total of 342 pregnant women were enrolled. APA and IPA prior to pregnancy were detected in 172 and 170 cases, respectively. The proportions of LBP during pregnancy in each group were 61.6% and 64.7%, respectively. No statistically significant difference was found between the two groups (p-value=0.555). When adjusted with multiple factors in logistic regression model, APA prior to pregnancy decreased the risk of LBP during pregnancy (p-value=0.02), with an adjusted odds ratio (aOR) (95% CI) of 0.51 (0.281–0.916). In contrast, APA during pregnancy (p-value=0.01), pelvic pain (p-value<0.001), and LBP in a previous pregnancy (p-value<0.001) increased the risk of LBP during pregnancy, with aORs (95% CI) of 2.53 (1.236–5.197), 4.83 (2.563–9.110), and 7.49 (3.390–16.570), respectively.

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Conclusion: APA prior to pregnancy and limiting some types of activity during pregnancy may have a protective effect on LBP during pregnancy.

Keywords: adequate physical activity, low back pain, pregnancy

Introduction

Pregnancy has impactful physiological effects on women, affecting not only the cardiovascular, endocrine, and respiratory systems but also the musculoskeletal system. Changes in the axial skeleton and a shift in the point of gravity result in progressive lordosis, along with a weakening of the abdominal muscles, which stretch to accommodate the expanding uterus. Weight gain also leads to increased force on the spine, resulting in discomfort in the lower lumbar region[1-3]. More than 60% of pregnant women experience low back pain (LBP)[1,4], and most do not visit a physician for diagnosis or have further management[5]. The limitation of the diagnosis of LBP is the difficulty of diagnosis[3], as pain is a subjective symptom, making it hard to identify its severity; thus, medical equipment needs to be part of the evaluation. The Oswestry LBP Disability Questionnaire (also known as the Oswestry Disability Index (ODI)) is used to assess the functional outcome or severity of LBP symptoms. The risk factors for LBP during pregnancy include teenage pregnancy, LBP in a previous pregnancy, a high body mass index (BMI), excessive pregnancy weight gain, a sedentary lifestyle during the pre-pregnancy period, and a male fetus[2,4,6]. A sedentary lifestyle during the pre-pregnancy period increases women's risk of LBP compared to women with an active lifestyle[3]. An active lifestyle and regular exercise are believed to lead to more muscle strength, resulting in less LBP during pregnancy. Therefore, all women should be encouraged to engage in aerobic exercise or active physical activity (PA) before, during, and after pregnancy[1]. The World Health Organization's (WHO) recommendation is for people aged 18–64 years old to have at least 150 to 300 minutes/week of moderate-intensity or 75 to 150 minutes/week of vigorous-intensity PA, and the recommended PA for pregnant and postpartum women is at least 150 minutes of moderate-intensity PA that incorporates muscle-strengthening activity[7,8].

This study focused on the association between PA prior to pregnancy and LBP during pregnancy. Rodrigues et al. reported that the prevalence of LBP during pregnancy was lower in women who maintained regular PA prior to and during pregnancy[9]. PA prior to pregnancy and LBP during pregnancy have not been studied in Thailand. This study was conducted to accurately assess this issue. The primary objective was to compare the proportions of LBP in women with adequate PA (APA) prior to pregnancy and in those with inadequate PA (IPA) prior to pregnancy. The secondary objective was to assess the factors influencing LBP during pregnancy.

Material and Methods

This cross-sectional analytic study was performed among pregnant individuals who visited the antenatal unit, HRH Princess Maha Chakri Sirindhorn Medical Center, Department of Obstetrics and Gynecology, Faculty of Medicine, Srinakharinwirot University in Nakorn Nayok, Thailand, between June 2022 and January 2023. Pregnant women of gestational age beyond 20 weeks that were over 18 years of age were included in the study. The exclusion criteria were pregnant women with contraindications to normal daily activities, both from pregnancy-related conditions (e.g., placenta previa and short cervical length) or other health conditions (e.g., stroke, hemiplegia, postoperative status, and accidents). Also excluded were pregnant women having had a history of pathology of the spine (e.g., lumbar disk hernia, scoliosis, or a history of spine surgery), pregnant individuals whom could not read or write Thai, and pregnant individuals who declined participation. The study was approved by the Srinakharinwirot University's Ethics Committee (SWUEC-M-006/2565E), and registered with the Thai Clinical Trials Registry (TCTR20230524004). Informed consent was obtained from all participants. The pregnant individuals that received a questionnaire were asked to complete the self-administrated part of the questionnaire, which included general personal data. They were then measured PA using the Thai version of the short format International Physical Activity Questionnaire (IPAQ). The participants were then examined to assess LBP, as to whether the pain was located between the edge of the lower ribs and the buttocks They were then ruled out as to other causes of structural LBP by physicians at the antenatal care clinic, and then continued to answer the rest of the questionnaire.

The questionnaire consisted of five items as follows: (i) obstetrical data; such as number of gestations, parities, and abortions, gestational age, and antenatal care risks assessed by medical personnel; (ii) demographic data; such as age, height, pre-pregnancy weight, current weight, marital status, religion, education level, occupation, income, history of dysmenorrhea, and LBP in a previous pregnancy; (iii) the Thai version of the short IPAQ, which was translated and validated by Rattanawiwatpong et al.[10], to assess PA status prior to and during pregnancy. The questionnaire's validity, with Spearman's correlation (r_s) of 0.32, was comparable to previous validation studies in other countries. Kappa (k) was 0.22, and the proportion of agreement (p) was 0.65; additionally, the test's reliability with intraclass correlation coefficient (ICC) of 0.69, k was 0.59, and p was 0.90; (iv) the Visual Analog Scale (VAS) to assess the severity of LBP and pelvic pain; and (v) the Thai version of the Oswestry LBP Disability Questionnaire, which was translated and validated by Sanjaroensuttikul et al.[11], to assess LBP disability. The questionnaire was tested for reliability, with Cronbach's alpha of all items being 0.8107; indicating high reliability. The content validity test, using the item correlation, ranged from 0.6-1; indicating that the Thai version of the Oswestry questionnaire was qualified.

In accordance with Rodrigues et al.[9] study, the required sample size was calculated by using the two independent proportions, based on 0.05 of alpha error, 0.8 of power, and 20% of lost or missing data: at least 163 participants in each group were required. A total of 342 participants were included in this study. Statistical analyses were performed using Statistical Package for the Social Sciences version 28.0.1.1. The demographic and clinical characteristics of the patients within each group were examined by tabulating the frequency and percentages, or median and interquartile range (IQR) and comparing the differences between both groups using the t-test and the Mann–Whitney U and chi-square tests. The difference in the proportions of LBP in each group was compared using the Chi-square test. Finally, the effects of factors associated with LBP in pregnancy were identified by multiple logistic regression analysis to estimate the odds ratio, and their 95% confidence intervals (CIs). A p-value of <0.05 was considered statistically significant.

Results

A total of 342 participants were enrolled. The participants were between 23 and 33 years of age, and between 24 and 35 weeks' of gestation: 144 (42.1%) women were nulliparous, and the remaining 198 participants (57.9%) were multiparous. Overall, 216 participants (63.2%) experienced LBP during pregnancy: 113 participants (33.0%) had pelvic pain during pregnancy, 96 participants (28.1%) had both LBP and pelvic pain, 120 participants (35.1%) experienced only LBP, and 17 participants (4.9%)

Table 1 Demographic and clinical data (N=342)

Demographic data	IPA prior to pregnancy (n=170)	APA prior to pregnancy (n=172)	p-value
Age (years)*	28.5±5.5	28.6±5.2	0.896
Elderly gravida**	21 (12.4%)	20 (11.6%)	0.836
Teenage pregnancy**	4 (2.4%)	5 (2.9%)	0.507
Marital status**			0.532
Single	33 (19.4%)	30 (17.4%)	
Married	136 (80.0%)	142 (82.6%)	
Divorced	1 (0.6%)	0 (0.0%)	
Religion**			0.333
Buddhist	137 (80.6%)	147 (85.5%)	
Muslim/other	33 (19.4%)	25 (14.5%)	
Education**			0.313
Primary to secondary school or lower	94 (55.3%)	104 (60.4%)	
Bachelor's degree or higher	76 (44.7%)	68 (39.5%)	
Occupation**			0.763
Housewife	34 (20.0%)	40 (23.3%)	
Government officer	25 (14.7%)	22 (12.8%)	
Employee	79 (46.5%)	73 (42.4%)	
Agricultural worker	2 (1.2%)	4 (2.3%)	
Others	30 (17.6%)	33 (19.1%)	
Maternal income (Baht per month)**			0.270
<10,000	51 (30.0%)	45 (26.2%)	
10,000–14,999	50 (29.4%)	52 (30.2%)	
15,000–19,999	24 (14.1%)	39 (22.7%)	
20,000–24,999	24 (14.1%)	21 (12.2%)	
≥25,000	21 (12.4%)	15 (8.7%)	
Clinical data			
History of dysmenorrhea**	42 (24.7%)	28 (16.3%)	0.053
Previous abortion**	30 (17.6%)	32 (18.6%)	0.425
Multiparous**	98 (57.6%)	100 (58.1%)	0.927
Low back pain in previous pregnancy**	55 (56.1%)	55 (55.0%)	0.703
Interval from previous pregnancy***	1.0 (1–9)	1.8 (1–6)	0.972
Previous cesarean delivery**	20 (11.8%)	18 (10.5%)	0.702
Gestational age***	30 (24–34)	31 (26–35)	0.824
Pre-pregnancy BMI*	24.5±5.6	24.1±5.5	0.453
Underweight**	14 (8.2%)	18 (10.5%)	0.479
Overweight**	22 (12.9%)	21 (12.2%)	0.838
Weight gain during pregnancy***	9.0 (5.0–12.8)	8.3 (5.0–12.2)	0.621
Male fetus**	79 (46.5%)	99 (57.5%)	0.045
Suspected fetal growth restriction**	5 (2.9%)	6 (3.5%)	0.774
APA during pregnancy**	6 (3.5%)	82 (47.7%)	<0.001

IPA=inadequate physical activity, APA=adequate physical activity, BMI=body mass index

*Continuous variables with normal distribution: mean±S.D. with t-test p-value

**Categorical data: frequency (%) with chi-squared test p-value

***Continuous data with abnormal distribution: median (Q1–Q3) with p-value from the Mann-Whitney U test

Elderly gravida: age ≥35 years, teenage pregnancy: age <20 years, underweight: BMI<18.5 kg/m^2, overweight: BMI ≥25 kg/m^2

had pelvic pain without LBP. Among the participants, 172 (50.3%) pregnant women had APA prior to pregnancy, and 82 (23.9%) pregnant women continued to have APA during pregnancy. The baseline demographic and clinical data are presented in Table 1. The demographic and clinical data were almost identical in the two groups; except for fetal sex and APA during pregnancy.

The proportions of LBP in each group are shown in Table 2. The proportions of LBP were 61.6% and 64.7% in the groups with APA and IPA prior to pregnancy, respectively, and there were no statistically significant differences between the two groups. Of the 216 participants who had LBP during pregnancy, their ODI categories were no disability (score 0–4), mild disability (score 5–14), moderate disability (score 15–24), and severe disability (score 25–34); including 62 (28.7%), 112 (51.9%), 37 (17.1%), and 5 (2.3%) participants, respectively. The number of participants that experienced pelvic pain prior to pregnancy was similar between the APA and IPA groups.

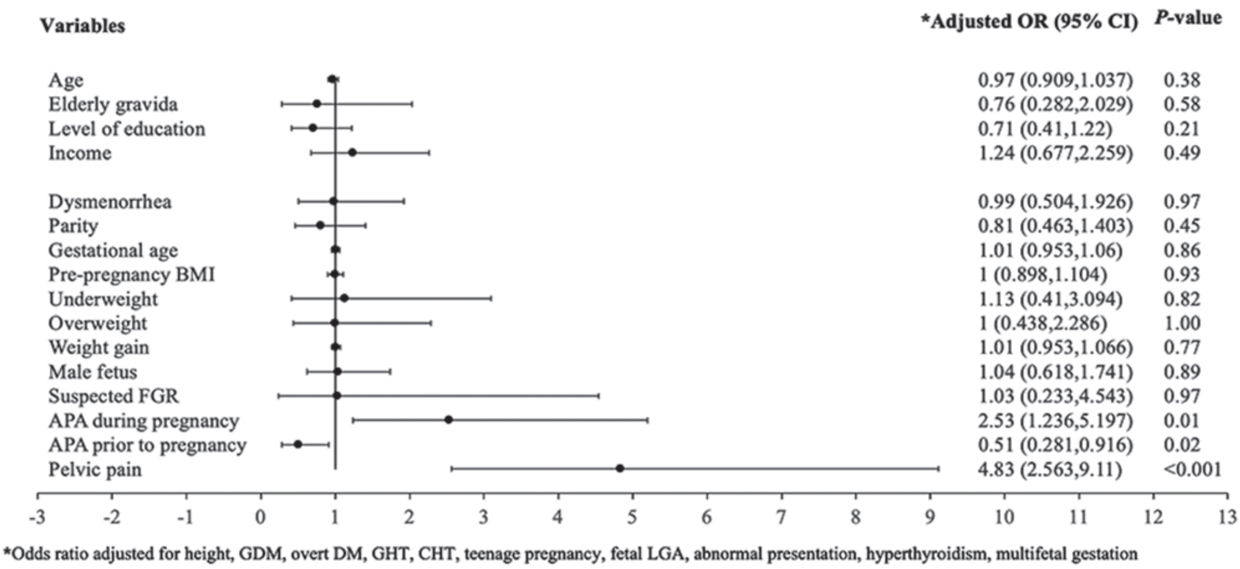
The factors associated with LBP are presented in Figure 1, and the subgroup analysis for the multiparous women is shown in Figure 2. APA prior to pregnancy decreased the risk of LBP during pregnancy (p-value=0.02), with an adjusted odds ratio (aOR) (95% CI) of 0.51 (0.281–0.916). In contrast, APA during pregnancy (p-value=0.01), and pelvic pain (p-value<0.001) increased the risk of LBP during pregnancy, with aORs (95% CI) of 2.53 (1.236–5.197), and 4.83 (2.563–9.110), respectively.

The results were similar in the subgroup analysis for multiparous pregnancies (n=198); APA prior to pregnancy decreased the risk of LBP during pregnancy (p-value=0.03), with an aOR (95% CI) of 0.38 (0.160–0.920). In contrast, pelvic pain (p-value=0.01) and LBP (p-value<0.001) in a previous pregnancy increased the risk of LBP during pregnancy, with aORs (95% CI) of 3.21 (1.370–7.560) and 7.49 (3.390–16.570), respectively.

Table 2 Low back pain and pelvic pain in pregnancy categorized by physical activity prior to pregnancy

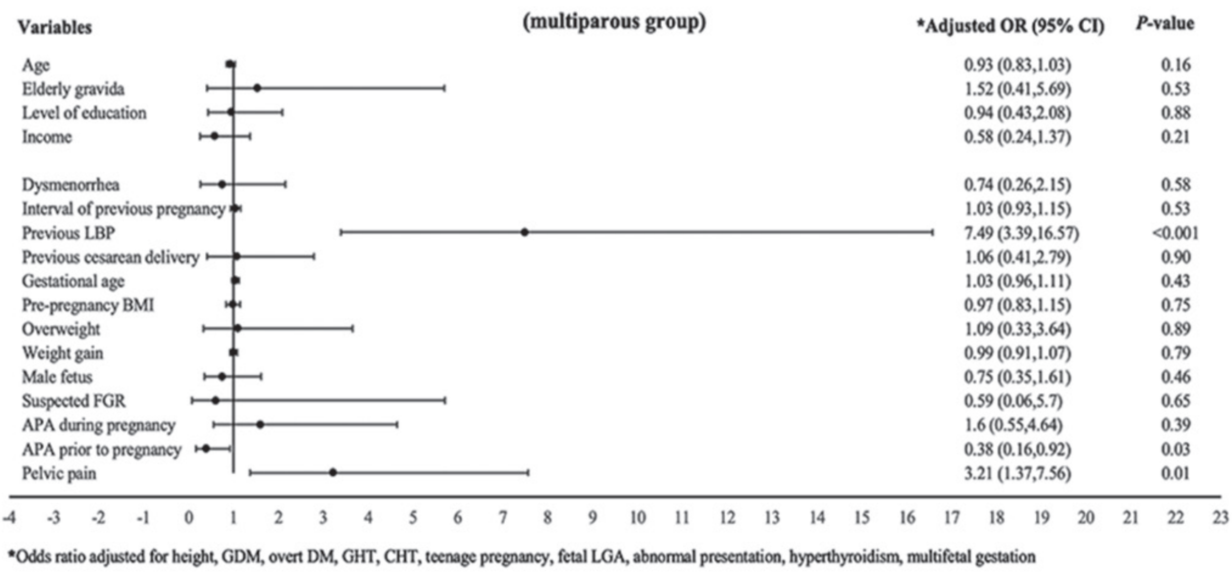
Pain parameters	IPA prior to pregnancy (n=170)	APA prior to pregnancy (n=172)	p-value*
Low back pain§	110 (64.7%)	106 (61.6%)	0.555
Visual analog scale§§	4.6 (4.4–5.4)	4.7 (4.4–5.4)	0.461
Oswestry Disability Index§§	8 (4–13)	8 (4–14)	0.489
No disability (score 0–4)§	32 (18.8%)	30 (17.4%)	
Mild disability (score 5–14)§	59 (34.7%)	53 (30.8%)	
Moderate disability (score 15–24)§	18 (10.6%)	19 (11.0%)	
Severe disability (score 25–34)§	1 (0.6%)	4 (2.3%)	
Complete disability (score 35–50)§	0 (0.0%)	0 (0.0%)	
Pelvic pain§	57 (33.5%)	56 (32.6%)	0.849
Visual analog scale§§	4.5 (4.3–5.5)	4.4 (2.7–4.8)	0.052

IPA=inadequate physical activity, APA=adequate physical activity
*Continuous variables: mean±S.D. with the t-test p-value or median (Q1–Q3) with the Mann-Whitney U test p-value
Categorical data: frequencies compared using the Chi-squared test. A p-value<0.05 was considered significant
§Frequency (%), §§Median (Q1–Q3)



OR=odds ratio, CI=confidence interval, LBP=low back pain, BMI=body mass index, FGR=fetal growth restriction, APA=adequate physical activity, GDM=gestational diabetes mellitus, DM=diabetes mellitus, GHT=gestational hypertension, CHT=chronic hypertension, LGA=large for gestational age

Figure 1 Possible factors associated with low back pain during pregnancy (N=342)



OR=odds ratio, CI=confidence interval, LBP=low back pain, BMI=body mass index, FGR=fetal growth restriction, APA=adequate physical activity, GDM=gestational diabetes mellitus, DM=diabetes mellitus, GHT=gestational hypertension, CHT=chronic hypertension, LGA=large for gestational age

Figure 2 Possible factors associated with low back pain during pregnancy in the multiparous group (N=198)

Discussion

In this study, 63.2% of the participants experienced LBP, and 28.1% experienced both LBP and pelvic pain during pregnancy. The prevalence of LBP during pregnancy in this study is compatible with previous research[12,13]. Of the pregnant women, 19.4% of those whom experienced LBP encountered moderate to severe disability: as categorized by the ODI. LBP is a common pregnancy-related unpleasantness that causes suffering and decreased quality of life. On the contrary, LBP is a problem neglected by pregnant Thai women and most surmise that experiencing LBP is part of pregnancy.

In relation to PA, the proportions of LBP during pregnancy were 61.6% and 64.7% in the groups with APA and IPA prior to pregnancy, respectively, and there were no statistically significant differences between the two groups. These results differ from the study by Rodrigues et al.[9], which found that the proportion of LBP in the IPA group was significantly higher than in the APA group. These discordant results might be due to differences in ethnicity, socioeconomic circumstances, the number of participants, and the method of PA evaluation not being clarified in the previous study. This present study included a larger number of pregnant individuals, and identified the adequacy of PA using WHO recommendations. However, there might be other confounding factors that were not included in the study. Especially, the type of PA such as stretching exercise or strengthening activity, which might be associated with the results. Additionally, prospective studies are therefore suggested for further evaluation of complex exercises for more accurate results.

Previous studies have found that LBP has several associated factors; such as LBP in a previous pregnancy, pelvic pain in the current pregnancy, dysmenorrhea, a high BMI, the number of gestations and parity, gestational age, extreme maternal age, the interpregnancy interval, low socioeconomic status, low PA prior to pregnancy, and a male fetus[2,12,14]. All of all these factors were included in this study, and it was found that the factors increasing the risk of LBP were LBP in a previous pregnancy, APA and pelvic pain in the current pregnancy; wherein, the factor decreasing the risk of LBP was APA prior to pregnancy. It was concluded that APA prior to pregnancy and limiting some types of activity during pregnancy may have a protective effect on LBP during pregnancy, which is concordant with prior research[15]. In this study, the aforementioned APA was categorized into two groups, with a cut-off point of 150 minutes of moderate-intensity PA. In this study PA was recategorized during the pregnancy as metabolic equivalent of tasks (METs), according to the WHO recommendation for a minimal energy expenditure of 600 MET minutes per week, as a health benefit for all adults; including pregnant women[7]. Total energy expenditure in MET mins/week as low (<600), moderate (600–3,000), and high (>3,000) levels of PA[16] were measured to evaluate a to whether there was any relation between the level of PA and LBP during pregnancy. It was found that women with low levels of PA during pregnancy were less likely to have LBP compared to those with moderate and high levels of PA. This finding contrasts with a recent study, the GESTAtion and FITness project, which compared an exercise program for pregnant individuals with a control group and found that the exercise group had a lower increase in the VAS of LBP than the control group[17]. The difference in the outcome might come from the difference between PA and exercise programs.

Exercise has many aspects[18,19]; including stretching, stabilizing, aerobic, and strengthening exercises, which are programmed for health benefits[20]. In contrast, the PA evaluated in this study mainly focused on aerobic exercise. APA during pregnancy, as recommended by the WHO, might be associated with LBP in this study due to the range of duration and that the intensity was high among some pregnant individuals, who might have undertaken vigorous exercise without stabilizing or strengthening exercises. This is the limitation of this study. Recent meta-analysis and systematic reviews have shown that exercise programs for pregnant women included: pelvic stabilizing exercise, pelvic floor muscle training, and muscle strengthening that could reduce LBP during pregnancy[21,22]. This concluded that multimodality exercises had a benefit in reducing LBP during pregnancy. This study affirms that pregnant women should have APA with controlled or programmed exercise to not only reduce LBP during pregnancy, but also to improve quality of life during pregnancy.

To the best of our knowledge, this is the first study in Thailand to study the association between pre-pregnancy PA and LBP during pregnancy. The strengths of this study were its ability to confirm the association of APA prior to pregnancy and LBP during pregnancy, which could be promoted and used for the primary prevention of LBP in pregnant women. Furthermore, this study included various possible associated factors and excluded all pathological causes of LBP to identify the most accurate risk factors for LBP during pregnancy. The questionnaire used in this study comprised of easily understood questions that have been previously validated in the Thai language. Finally, this study included a large sample size of pregnant women and focused on the topic of PA and LBP. However, this study has some limitations. Real PA using an accelerometer was not evaluated, instead it used a questionnaire. Consequently, there might have been some recall bias from the participants answering the IPAQ about PA prior to pregnancy, as this study was a cross-sectional analytic study. Additionally, it could only identify associated factors, but could not confirm causation. Moreover, this study focused on PA, which is mainly aerobic activity; whereas, other types of exercise might have benefits or associations with LBP. Due to these disadvantages of the study, further research is planned.

Conclusion

APA prior to pregnancy was associated with a decreased risk of LBP during pregnancy; however, APA during pregnancy was associated with an increased risk of LBP during pregnancy. APA prior to pregnancy and limiting some types of activity during pregnancy may have a protective effect on LBP during pregnancy.

Conflict of interest

All the authors declare that they had no conflicts of interest in relation to this article.

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