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Prevalence and Factors Associated With Low Back Pain and Pelvic Girdle Pain During Pregnancy

A Multicenter Study Conducted in the Spanish National Health Service

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Study Design. A cross-sectional, multicenter study.

Objective. To determine the prevalence of low back pain (LBP), leg pain (LP), and pelvic girdle pain (PGP) in pregnant Spanish women and to identify the factors associated with a higher risk.

Summary of Background Data. Previous studies on the prevalence and risk factors for LBP and PGP have shown inconsistent results.

Methods. Sixty-one clinicians across 5 regions in Spain recruited 1158 women with a median (interquartile range) pregnancy of 35 (range, 31–38) weeks. Validated methods were used to gather data on the prevalence of LBP, LP, and PGP, anthropometric and sociodemographic characteristics, history of LBP, obstetrical history, physical activity before and during pregnancy, mattress and sleep characteristics, disability, anxiety, and depression. Separate multiple logistic regression models were developed to identify the variables associated with LBP, LP, and PGP.

Results. The 4-week prevalence of LBP, LP, and PGP was 71.3%, 46.2%, and 64.7%, respectively. Main factors associated with a higher likelihood of reporting pain for LBP were history of LBP related and unrelated to previous pregnancy and postpartum, pain augmenting with time spent in bed, and anxiety. Previous lumbar surgery was associated with a lower risk. The factors associated with a higher likelihood of reporting LP were reporting LBP, lower academic level, younger age, depression, a lower number of hours of sleep per day, and a higher BMI, and for PGP were higher score for depression, a higher body mass index, and a more advanced stage of pregnancy.

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Conclusion. Factors associated with a higher risk vary between LBP and PGP. History of LBP, related or not to previous pregnancy or postpartum, LBP surgery, and anxiety were the factors more strongly associated with pregnancy-related LBP. When these variables are taken into account, obstetrical data from current or previous pregnancies and other variables do not show a significant association with LBP. Stage of pregnancy and depression were associated with PGP.

Key words: low back pain, pelvic girdle pain, pregnancy, prevalence, risk factors. **Spine 2012;37:1516–1533**

Nonspecific or common low back pain (LBP) is defined as pain between the costal margins and the inferior gluteal folds, which may be associated with pain referred down to the leg ("leg pain," LP), and is usually accompanied by painful limitation of movement. Diagnosing common LBP implies that the pain is not related to conditions such as fractures, spondylitis, direct trauma, or neoplastic, infectious, vascular, metabolic, or endocrine-related processes.[1]

Pelvic girdle pain (PGP) is defined as pain in the symphysis and/or between the posterior iliac crest and the gluteal fold, which may spread to the posterolateral thigh.[2,3] Clinical provocation tests during physical examination are considered helpful to distinguish PGP from common LBP.[3]

LBP and PGP during pregnancy seem to increase the risk of experiencing pain in further pregnancies[4,5] and developing chronic pain.[6,7]

It has been suggested that biomechanical, hormonal, and vascular mechanisms are involved in the pathophysiology of LBP and PGP during pregnancy,[3,8–10] although these hypothesis and the exact causes remain largely debatable. Nevertheless, LBP and PGP are common during pregnancy. According to a Cochrane review, more than two-thirds of pregnant women experience LBP and approximately one-fifth experience PGP.[11] Systematic reviews have found the mean and median prevalence of LBP during pregnancy to be 45.3% and 49%, respectively.[12,13] However, in individual studies, the prevalence of pregnancy-related LBP and PGP varies between 3.90% and 89.88%,[12,13] and studies assessing the association of different factors with a higher risk have led to inconsistent results. Those risk factors most commonly assessed are history of LBP before pregnancy, history of LBP or PGP during or after a previous pregnancy, smoking habits, mother's height, weight, and age, number of previous pregnancies, and use of epidural anesthesia or cesarean during previous deliveries.[3,12,1–4]

Several strategies have been proposed to prevent the risk of developing LBP and PGP during pregnancy, although in high-quality randomized controlled trials, only a few have shown to be effective.[3,11] A better understanding of the factors associated with a higher risk for PGP and LBP during pregnancy would help design and assess further preventive strategies.

Most studies on LBP and PGP during pregnancy have been conducted in Northern European and Anglo-Saxon countries,[3,11–14] although prevalence in Southern Europe remains largely unknown. Therefore, the objectives of this study were to (1) determine the prevalence of LBP, pain referred down to the leg (LP), and PGP during pregnancy, in a large representative sample of pregnant Spanish women, and (2) identify the factors associated with a higher risk.

MATERIALS AND METHODS

Design and Setting

This was a cross-sectional, multicenter study conducted in 5 hospital departments of obstetrics and 19 primary care centers across 5 regions in Spain.

The obstetric departments of the major hospitals in the 5 regions and the primary care centers, which were involved in the Spanish Back Pain Research Network, were invited to participate in this study.

Subjects

Inclusion criteria were being pregnant for 28 weeks or more, being followed up at a primary care or hospital center participating in the study, being able to understand and read Spanish, and having signed the informed consent.

Exclusion criteria were end of pregnancy (defined as delivery or abortion), not being legally capable of signing the informed consent (younger than 18 years or experiencing serious intellectual or psychiatric impairment), or having been diagnosed as experiencing back pain caused by fractures, direct trauma, or systemic diseases, such as spondylitis or neoplastic, infectious, vascular, metabolic, or endocrine-related processes.[1]

The sample sizes needed for determining the prevalence of pain, and for identifying factors associated with a higher risk of pain, were calculated separately, and the larger one was established as the sample size for the study.

Previous studies had found the median prevalence of LBP during pregnancy to be 49%.[12,13] Because this study also gathered data on types of pain that are less prevalent (*e.g.*, LP), sample size calculations were based on the conservative assumption that prevalence of the less common type of pain would be 25%. Hence, the sample size needed to determine the prevalence with a bilateral confidence interval of 95% and a precision of 3% was 801 subjects.

The sample size needed to identify factors associated with a higher risk of pain was larger. At the design phase, it was planned that up to 25 variables would be included in the regression models, which implied that at least 250 pregnant women with pain had to be recruited. Assuming a prevalence of 25% and that 15% of the subjects included would not complete all the questionnaires, this required 1150 subjects to be recruited. Therefore, this was the sample size established for this study.

Procedure

This study did not require any changes to subjects' clinical management. The study protocol was approved by the ethical committees of all participating hospitals and institutions. The study was registered in the clinicaltrials.gov (NCT00883428) and the Spanish Back Pain Research Network databases.

Consecutive recruitment was conducted as follows. All pregnant women followed up by physicians who participated in this study were screened for inclusion and exclusion criteria. The physicians explained the study's characteristics to all the eligible subjects as well as how important it was for them to answer the questionnaires fully and accurately. Finally, they invited subjects to sign the informed consent. The subjects who participated in this study, the recruiting physicians and the researchers, did not receive any compensation for participating in this study.

Once a subject had been included in this study, the recruiting physician provided the data on obstetrical variables and the subject was given self-administered questionnaires to assess the rest of the variables. Patients completed those questionnaires by themselves, in private. The only instructions they received were those included in the standard validated versions of the questionnaires. They received no help or further directions from health care personnel, research staff, or other third parties. Once completed, the questionnaires were collected by auxiliary personnel not related to the study. For data protection purposes, subjects were identified by codes, instead of their names.

In routine practice within the Spanish National Health Service (SNHS), a patient's digital clinical history can be accessed by primary care physicians and specialists, and a single pregnant woman may be followed up in both settings simultaneously. Upon recruitment, a note was introduced into the subject's digital clinical history so that she could provide data for this study only once.

Data were introduced into a database at a central coordination office by 2 administrative assistants, who double-checked that data corresponding to each code had been included only once and that the data introduced coincided with answers and ratings on the questionnaires.

Variables

Obstetrical data provided by the recruiting clinicians were based on the subject's clinical records and included stage of pregnancy (weeks), number of previous pregnancies, number of children born, kind of delivery in previous pregnancies (normal, instrumented—forceps, vacuum—or cesarean), and use of epidural anesthesia.

Personal data provided by the subjects included age (date of birth), height (cm), weight (current and before pregnancy, in kg), "body mass index" (BMI) calculated as current weight/(height)^2, smoking (number of cigarettes per day, classified as 0—nonsmoker, 1–10, 11–20, and >20), academic level ("uncompleted primary education," "completed primary education," "secondary education," "high school," "university"), working situation (currently working or not and reasons for not working), physical activity (according to standardized methods, subjects had to select the type of physical activity at leisure, work, home, and sports, taking into account the frequency of sport practice per week, and the degree of physical activity was classified at the analysis phase as "sedentary," "minimally active," "moderately active," "active," and "very active," depending on the standardized oxygen consumption per minute and body weight in kg),[15] and number of hours per week devoted to exercise (defined as any planned physical activity that led to sweating) before and during the pregnancy. Because previous studies have suggested that mattress characteristics may influence the course of LBP,[16] subjects were also asked whether they shared their bed or not, whether pain augmented with time spent in bed, the mean time spent in bed per day (both sleeping and awake), and the characteristics of their mattress (years of usage and subject's perception of its firmness—classified as "very soft," "soft," "neither soft nor firm," "firm," and "very firm").[16]

Data on the prevalence of LBP and PGP were provided by the subject using a previously standardized questionnaire.[17] The questionnaire gathered data on pain endured during the preceding 4 weeks in the low back area, down the leg, or in the pelvic area (as shown on a drawing representing a human body); whether pain restricted or changed daily activities for more than 1 day; pain frequency (some days, most days, every day); time elapsed since last time the subject was pain-free for a whole month (less than 3 months, more than 3 but less than 7 months, more than 7 months but less than 3 years, 3 years or more); and usual pain severity (rated on an 11-point scale, where "0" corresponded to "no pain" and "10" to the worst pain imaginable). In the case of pain referred down the leg (LP), subjects were also asked whether pain spread below the knee.[17,18]

Additional data provided by the subjects included history of LBP during any previous pregnancies, during postpartum, or not related to pregnancy, whether the subject was experiencing LBP around the time she got pregnant, and previous treatments received for LBP, LP, or PGP (drugs—analgesics, nonsteroidal anti-inflammatory drugs, steroids, muscle relaxants, and other—physical therapy, rehabilitation, surgery, other treatments).

Finally, patients were asked to score LBP-related disability, anxiety, and depression through validated self-administered instruments. Disability was assessed using the Spanish version of the Roland-Morris disability scale,[19] in which disability is scored from best to worst, from 0 to 24. Anxiety was assessed by using the state-trait anxiety inventory (STAI), which is a 40-item questionnaire composed of 2 subscales.[20] The STAI subscale (20 items) measures the disposition toward anxiety as a personality trait, which is defined as the relatively stable individual differences in anxiety proneness. The stronger the anxiety trait, the higher the likelihood that a person will experience a state-anxiety reaction in a threatening situation.[21] The STAI subscale (20 items) measures the intensity of anxiety as a current emotional state,[20] which is defined as a temporal cross section in the emotional stream-of-life of a person consisting of subjective feelings of tension, apprehension, nervousness, and worry, and activation or arousal of the autonomic nervous system.[21] For STAI (STAI-T and STAI-S), the range of values is 0 to 60, with greater scores corresponding to greater levels of anxiety. Mean (SD) scores for healthy adult Spanish women are 23.30 (11.93) for "anxiety-state" and 24.99 (10.05) for anxiety-trait. The score is classified as showing "normality" (≤50% of the total maximum possible score),

"traces of anxiety," (between 51% and 70%) or "pathological anxiety" (≥71%).[20] Depression was assessed through the Spanish version of the Beck Depression Inventory, in which depression is scored from best to worst from 0 to 63. Patients can be classified as "not depressed" (0–9 points), slightly depressed (10–18), moderately depressed (19–29), and seriously depressed (≥30).[22] For screening purposes, the cutoff point for depression is established at 13 points in the clinical setting and 21 points in the research setting.[23,24]

Analysis

Absolute and relative frequencies were calculated for categorical variables. For continuous ones, mean and SD or median and interquartile ranges were calculated, depending on whether data showed a normal distribution. Continuous variables were compared across subjects with and without pain using the Student *t* test or the Mann-Whitney *U* test, depending on whether data distribution was normal. Categorical variables were compared through the χ^2 test or the Fisher exact probability test when χ^2 was not applicable.

Separate multiple logistic regression models were developed to identify the variables associated with LBP, pain referred down to the leg (LP), and PGP. According to what was planned at the design phase, the maximal models included the variables that had been suggested to increase the risk of LBP, LP, or PGP.[3,12–14,16]

The maximal models for LBP, LP, and PGP included age (years), BMI, number of cigarettes per day (classified as "0," "1–10," "11–20," and ">20"), academic level (with the 5 categories collapsed into 3; "less than high school," "high school," and "university"), currently working (yes/no), degree of physical activity, mattress firmness (with the 5 categories collapsed into 3: very soft and soft, neither soft nor firm, or firm and very firm), stage of pregnancy (weeks), number of hours of sleep per day, number of previous pregnancies (classified as 0, 1, or >1), whether LBP augmented with time spent in bed, history of LBP unrelated to pregnancy, experiencing LBP around the time of getting pregnant, history of lumbar surgery, degree of anxiety (score on the STAI), and depression (score on the Beck Depression Inventory). For the 3 models, the interaction term between BMI and mattress firmness was also tested. In addition, in the model for LBP, whether the subject reported PGP was also included in the maximal model, as was the report of LBP included in the model for PGP. Reporting of both PGP and LBP was included in the model for LP.

In order to assess whether factors related to previous pregnancies were associated with a higher risk for pain during the current one, 3 new models were built to include only those women who had previously been pregnant. When developing these models, the following variables were included in the maximal models: history of LBP during a previous pregnancy, history of LBP postpartum, having previously undergone a cesarean (yes/no) or an instrumented delivery (yes/no), and having received epidural anesthesia for a previous delivery (yes/no). In addition, these maximal models included all the variables, which had remained in the models on LBP, LP, or PGP in which all the subjects were included.

For all models, a backward strategy was followed, using the *P* value of less than 0.05 to eliminate variables from the model.

To assess the accuracy of the final models, both their discrimination and calibration were evaluated. The area under the receiver operating characteristic curve (AUC) was used to assess discrimination, whereas the Hosmer-Lemeshow test was used to assess calibration.[25] Selection of variables in the model was validated by bootstrapping: 1000 bootstrap samples were drawn and a backward strategy was applied.[26]

The SPSS v.17 (SPSS Inc, Chicago, IL) and Stata v11.0 (StataCorp LP, College Station, TX) were used for statistical analysis.

RESULTS

Sixty-one recruiting physicians screened 1168 pregnant women, all of whom complied with inclusion criteria and were invited to participate in this study. Only 10 declined, 1158 (99.1%) accepted, and none was excluded. The median (P25; P75) values were 32 (30; 35) years for age and 35 (31; 38) weeks for the stage of pregnancy. Only 2 subjects had not completed primary education and were included in the "less than high school" category. The current pregnancy was the first one for 764 women (66.0%). Approximately 5% of the subjects were pathologically anxious and 1% were severely depressed. Table 1 details the characteristics of the sample.

During the last 4 weeks, 822 (71.3%) had experienced LBP, 530 (46.2%) had experienced LP, and 742 (64.7%) had experienced PGP. Median (P25; P75) pain severity was 5 (4; 7) visual analogue scale points for LBP and LP and 4 (3; 6) for PGP. Table 2 shows the differences in the characteristics of women who did and did not experience each of these types of pain.

Approximately half of the sample was recruited in primary care (51.4%, 594 subjects). The prevalence of LBP among subjects recruited in primary care and hospital care was the same (71.3%), whereas the prevalence of LP and PGP among subjects recruited in primary care (42.1% and 58.6%) was lower than among those recruited in hospital care (50.7% and 71.4%) (Table 1).

Table 3 shows the results from the 3 logistic regression models in which all the subjects were included. Variables associated with a higher likelihood of having experienced LBP during the previous 4 weeks were a history of LBP unrelated to pregnancy, feeling more pain when staying for longer in bed, and showing higher anxiety scores. On the contrary, LBP was less common among women who had previously undergone spine surgery. The *P* value in the Hosmer-Lemeshow test was 0.560 and the AUC was 0.660. Among the variables that did not remain in the model, PGP was the 1 with the highest frequency in bootstrapping validation (630).

Variables associated with a higher likelihood of having experienced LP during the previous 4 weeks were having experienced LBP in that period, having a higher BMI, being younger, having an academic level corresponding to high school (and

TABLE 1. Description of the Sample

Variable	N	Value
Age (yr)*	1153	32 (30; 35)
Weight before pregnancy (kg)*	1130	60 (54; 68)
Current weight (kg)*	1118	71.9 (64.9; 69.0)
Height (cm)*	1126	163 (159; 168)
Body mass index (BMI)*	1099	26.8 (24.5; 29.4)
Smoking (number of cigarettes per d)†	1148	
Nonsmoker		1016 (88.5)
Between 1 and 10		119 (10.4)
Between 11 and 20		10 (0.9)
More than 20		3 (0.3)
Academic level†	1148	
Less than high school		193 (16.8)
High school		435 (37.9)
University		520 (45.3)
Working status†	1149	
Currently working		526 (45.8)
Not currently working		623 (54.2)
Reasons for not working		
Sick leave		469 (40.5)
Student		2 (0.2)
Housewife		44 (3.8)
Retired		1 (0.1)
Unemployed		86 (7.4)
Disabled		3 (0.3)
Other		10 (0.9)
Physical activity†	1129	
Sedentary		264 (23.4)
Minimally active		119 (10.5)
Moderately active		322 (28.5)
Active		232 (20.5)
Very active		192 (17.0)
Hours of exercise per wk before pregnancy		0 (0; 3)
Hours of exercise per wk during pregnancy		0 (0; 2)
Rest-related characteristics		
Age of the mattress (yr)*	1131	3 (2; 5)
Firmness of the mattress†	1138	
Very soft		8 (0.7)
Soft		46 (4.0)
Neither soft nor firm		735 (64.6)

(*Continued*)

TABLE 1. (*Continued*)

Variable	N	Value
Firm		340 (29.9)
Very firm		9 (0.8)
Shares bed (yes)†	1149	1108 (96.4)
Average sleep h per d*	1154	8 (7; 8)
Average h awake spent in bed per d*	1151	0.3 (0.0; 1.3)
Pain augments with time spent in bed (yes)†	1006	297 (29.5)
Low back pain when lying in bed (yes)†	812	474 (58.4)
Low back pain when getting out of bed (yes)†	814	539 (66.2)
Leg pain when lying in bed†	543	233 (56.7)
Leg pain when getting out of bed†	543	258 (42.9)
Obstetrical history		
Stage of pregnancy (wk)*	1158	35 (31; 38)
Number of previous pregnancies†	1158	
0 (current pregnancy is the first one)		764 (66.0)
1 pregnancies		327 (28.2)
2 pregnancies		49 (4.2)
3 pregnancies		13 (1.1)
4 pregnancies		4 (0.3)
Number of children†	1158	
None		765 (66.1)
1		328 (28.3)
2		47 (4.1)
3		11 (1.0)
4		6 (0.5)
5		1 (0.1)
≥1 epidural anesthesia	1158	304 (26.3)
≥1 previous instrumented delivery	1158	84 (7.3)
≥1 previous cesarean	1158	83 (7.2)
LBP		
LBP during the last 4 wk (yes)†	1152	822 (71.3)
Among women recruited in primary care	594	424 (71.3)
Among women recruited in hospital care	558	398 (71.3)
Limitation of daily activities (yes)†	818	282 (34.5)
Frequency of pain†	803	
Some days		466 (58)
Most of the days		199 (24.8)
Every day		138 (17.2)
Time elapsed since last time the subject was pain-free for a whole month†	763	
<3 mo		472 (61.9)

(*Continued*)

TABLE 1. (*Continued*)

Variable	N	Value
3–7 mo		143 (18.7)
7 mo to 3 yr		102 (13.4)
≥3 yr		46 (6)
LBP severity (VAS)*	807	5 (4; 7)
LP		
LP during the last 4 wk (yes)†	1146	530 (46.2)
Among women recruited in primary care	594	240 (42.1)
Among women recruited in hospital care	552	280 (50.7)
Limitation of daily activities (yes)†	527	207 (39.3)
Currently experiencing LP†	309	105 (34)
Frequency of pain†	508	
Some days		360 (70.9)
Most of the days		108 (21.3)
Every day		40 (7.9)
Time elapsed since last time the subject was pain-free for a whole month†	483	
<3 mo		300 (62.1)
3–7 mo		93 (19.3)
7 mo to 3 yr		41 (8.5)
≥3 yr		49 (10.1)
LP severity (VAS)*	508	5 (4; 7)
PGP		
PGP during the last 4 wk (yes)†	1146	742 (64.7)
Among women recruited in primary care	594	348 (58.6)
Among women recruited in hospital care	552	394 (71.4)
Limitation of daily activities (yes)†	733	191 (26.1)
Frequency of pain†	737	
Some days		482 (65.4)
Most of the days		173 (23.5)
Every day		82 (11.1)
Time elapsed since last time the subject was pain-free for a whole month†	672	
<3 mo		435 (64.7)
3–7 mo		109 (16.2)
7 mo to 3 yr		53 (7.9)
≥3 yr		75 (11.2)
PGP severity (VAS)*		4 (3; 6)
History of LBP		
LBP during a previous pregnancy (yes)†	679	229 (33.7)
LBP not related to pregnancy (yes)†	1080	557 (51.6)
LBP postpartum (yes)†	603	160 (26.5)

(*Continued*)

TABLE 1. (*Continued*)

Variable	N	Value
Experiencing LBP around the time when getting pregnant†	1076	195 (18.1)
Treatments†		
Analgesics	1151	134 (11.6)
Muscle relaxants	1153	15 (1.3)
Opioids	1153	1 (0.1)
NSAIDs	1152	61 (5.3)
Corticoids	1153	1 (0.1)
Physiotherapy	1152	42 (3.6)
Rehabilitation	1153	4 (0.3)
Previous lumbar surgery†	1099	11 (1.0)
Other treatments	1158	60 (5.2)
Anxiety†	1084	
Normality		856 (79)
Traces of anxiety		171 (15.8)
Pathological anxiety		57 (5.3)
State anxiety (STAI-S)		15 (10; 23)
Trait anxiety (STAI-T)		13 (18; 24)
Anxiety (STAI score)		34 (23; 47)
Depression/disability†	1135	
Not depressed		672 (59.2)
Slightly depressed		367 (32.3)
Moderately depressed		82 (7.2)
Seriously depressed		14 (1.2)
Depression (BDI-II score)		8 (6; 12)
Disability (RMQ score)*	1148	2 (0; 6)

**Median (P25; P75).*

†Frequency (%).

LBP indicates low back pain; VAS, visual analogue scale; LP, leg pain; PGP, pelvic girdle pain; NSAID, nonsteroidal anti-inflammatory drug; STAI, state-trait anxiety inventory; BDI-II, Beck Depression Inventory-II; RMQ, Roland Morris Questionnaire.

not higher or lower), sleeping less hours per day, and a higher score for depression. The *P* value in the Hosmer-Lemeshow test was 0.326 and the AUC was 0.650. Among the variables that did not remain in the model, the number of previous pregnancies was the 1 with the highest frequency in bootstrapping validation (643).

Variables associated with a higher likelihood of having experienced PGP during the previous 4 weeks were more advanced stage of pregnancy, a higher BMI, and a higher depression score. The *P* value in the Hosmer-Lemeshow test was 0.850 and the AUC was 0.645. Among the variables that did not remain in the model, LBP was the 1 with the highest frequency in bootstrapping validation (671).

Table 4 shows the results from the 3 logistic regression models developed to assess the association with obstetrical variables, in which only the 394 subjects who had been previously pregnant were included. Variables associated with a higher likelihood of having experienced LBP during the previous 4 weeks were a history of LBP in a previous pregnancy or postpartum and higher anxiety scores, whereas LBP was less common among women who had previously undergone spine surgery. The *P* value in the Hosmer-Lemeshow test was 0.766 and the AUC was 0.749. Among the variables that did not remain in the model, "Pain augments with time spent in bed" was the 1 with the highest frequency in bootstrapping validation (388).

Variables associated with a higher likelihood of having experienced LP during the previous 4 weeks were having experienced LBP in that period, being younger, and sleeping less hours per day. The *P* value in the Hosmer-Lemeshow test was 0.158 and the AUC was 0.632. Among the variables that did not remain in the model, "BMI" was the 1 with the highest frequency in bootstrapping validation (370).

Variables associated with a higher likelihood of having experienced PGP during the previous 4 weeks were more advanced stage of pregnancy and a higher depression score. The *P* value in the Hosmer-Lemeshow test was 0.050 and the AUC was 0.662. Among the variables that did not remain in the model, "LBP in a previous pregnancy" was the 1 with the highest frequency in bootstrapping validation (514).

DISCUSSION

These results show that in Spanish pregnant women, the 4-week prevalence (95% confidence interval) of LBP, LP, and PGP is 71.3% (68.7–73.9), 46.2% (43.3–49.1), and 64.7% (62.0–67.5), respectively. This prevalence falls within the range from previous reports.[12–14] Because this study focused on pregnancy-related pain, data were gathered at the end of pregnancy and women who had given birth were excluded to avoid recall bias and potential confusion with pain associated with partum and postpartum. Nevertheless, the prevalence of LBP found in large studies, in which data were collected retrospectively after delivery, is also very similar.[12–14]

Factors that were not found to be associated with a higher risk of LBP, LP, or PGP include smoking, currently working, degree of physical activity (either before and during pregnancy), number of previous pregnancies, whether a previous delivery was instrumented or a cesarean, whether it required epidural anesthesia, and mattress characteristics.

The most noteworthy factors associated with a higher likelihood of reporting pregnancy-related LBP were higher levels of anxiety and a history of LBP, both related and unrelated to previous pregnancies and postpartum. Conversely, previous lumbar surgery was associated with a lower risk for LBP during pregnancy, both for women who had and had not been previously pregnant (Tables 3 and 4). This finding is surprising. At the design phase of this study, the decision to identify the subjects who had undergone lumbar surgery was based on the assumption that a history of "failed back surgery" might confound the effect of other variables and therefore had to be accounted for in the analysis. To date, lumbar surgery has shown to be effective for treating subacute and chronic irradiated pain caused by nerve compression from disk herniations or spinal stenosis but not for treating common LBP or to prevent relapses.[27] However, in this study, a history of lumbar surgery did not show any association with pregnancy-related LP but with pregnancy-related LBP. Only 1% of the subjects had undergone lumbar surgery (Tables 1 and 2), and no data were gathered on the reason for and type of operation (*e.g.*, microdiscectomy, spinal fusion, *etc.*). This makes it difficult to interpret this finding. Further studies should be designed to explore this association in more detail.

The main factors associated with pregnancy-related LP and PGP were a higher BMI and a higher level of depression. Experiencing LBP, being younger, and sleeping less hours were also associated with a higher risk of reporting LP but not PGP. Interestingly enough, the stage of pregnancy was associated with a higher risk of reporting PGP but not LBP or LP (Tables 3 and 4).

Depression (but not anxiety) was associated with LP and PGP, whereas anxiety (and not depression) was associated with LBP. This is consistent with recent studies showing that the association of LBP-related disability with depression, anger, and catastrophizing ceases to be significant when variations in anxiety are taken into account.[28]

Most of these results are generally consistent with those from previous reports that have explored the same risk factors.[12,13] However, others are not. Previous studies have shown that mattress firmness has a relevant influence on the evolution of LBP.[16] At the design phase of this study, it was hypothesized that this influence might be more critical during pregnancy owing to increased weight and biomechanic changes. However, neither the subjects' perception of mattress firmness, its interaction with BMI, nor age of the mattress were associated with a higher risk of LBP, LP, or PGP. The worsening of pain with time spent in bed was associated with a higher prevalence of pregnancy-related LBP, but this seems to be independent of the mattresses' characteristics, and the interaction between weight and subjects' perception of mattress firmness was not associated with a higher risk of any type of pain. Several reasons may explain this finding. First, the fact that mattress firmness influences the evolution of LBP does not necessarily mean that it is a "risk factor" for triggering it during pregnancy. Second, participants in this study were community-dwelling pregnant women, whereas mattress firmness has shown to be relevant among chronic LBP patients,[16] which is a different population. Third, in this study, mattress firmness was determined by subjects' perception, which has shown to be generally consistent with actual mattress firmness, but not always.[16]

Some previous studies have also found that reporting having a physically strenuous job is associated with a higher risk of LBP.[3,12,13] However, this association was not found in this study. This may be due to methodological reasons. At the design phase of this study, it was considered that asking a subject to classify her work as "physically strenuous" or not through a self-administered questionnaire would measure the "subject's perception of physical work-related demands," instead of "actual demands." As a result, it was decided to quantify "physical activity" by using a validated index based on oxygen consumption per minute and body weight corresponding to each type of standardized activity.[15] This difference in the way of measuring this variable may account for differences in results. Moreover, the index used in this study combines activities at work, home, leisure, and sport. Therefore, it may have diluted the potential detrimental effect of a strenuous job with the potential protective effect of general physical activity or sport, although the latter was uncommon among this sample, even before pregnancy (Table 1).

TABLE 2. Comparison of Subjects' Characteristics Depending on Whether They Reported Pain or Not

	LBP			LP			PGP		
	Reported Pain (n = 822)	Did Not Report Pain (n = 331)	*P*	Reported Pain (n = 530)	Did Not Report Pain (n = 616)	*P*	Reported Pain (n = 742)	Did Not Report Pain (n = 404)	*P*
Age (yr)*	32 (29; 35)	33 (30; 36)	0.09	32 (29; 35)	33 (30; 36)	0.01	32 (29; 35)	32 (30; 36)	0.69
Weight before pregnancy (kg)*	60 (55; 68)	61 (54; 69)	0.99	60 (55; 68)	60 (54; 69)	0.66	62 (55; 69)	59 (54; 66)	<0.01
Current weight (kg)*	72 (65; 79)	71 (64; 79)	0.29	72 (65; 79)	71 (64; 79)	0.45	72 (65; 80)	70 (64; 77)	<0.01
Height (cm)*	1.63 (1.59; 1.68)	1.63 (1.60; 1.68)	0.83	1.63 (1.59; 1.68)	1.64 (1.60; 1.68)	0.04	1.63 (1.59; 1.68)	1.63 (1.60; 1.68)	0.64
Body mass index (BMI)*	27 (24.6; 29.4)	26.7 (24.3; 29.4)	0.22	27 (24.9; 29.7)	26.6 (24; 29.3)	0.04	27.3 (24.8; 29.9)	26.2 (24.1; 28;6)	<0.01
Smoking (number of cigarettes per d)†			0.06			0.24			0.29
Nonsmoker	712 (87.4)	301 (91.8)		462 (87.3)	544 (89.6)		646 (87.8)	362 (90.5)	
Between 1 and 10	94 (11.5)	24 (7.3)		60 (11.3)	58 (9.6)		82 (11.1)	34 (8.5)	
Between 11 and 20	7(0.9)	2 (0.6)		6 (1.1)	3 (0.5)		7 (1)	2 (0.5)	
More than 20	2 (0.2)	1 (0.3)		1 (0.2)	2 (0.3)		1 (0.1)	2 (0.5)	
Academic level†			0.05			0.03			<0.01
Less than high school	146 (17.9)	46 (14.1)		234 (15.7)	106 (17.4)		134 (18.2)	56 (14)	
High school	313 (38.3)	119 (36.5)		210 (44.4)	195 (32.0)		290 (39.3)	140 (35.1)	
University	358 (43.8)	161 (49.4)		527 (39.8)	308 (50.6)		313 (42.5)	203 (50.9)	
Working status†									
Currently working			0.01			0.21			0.02
Yes	357 (43.6)	168 (51.4)		230 (43.6)	289 (47.3)		320 (43.4)	202 (50.2)	
No	461 (56.4)	159 (48.6)		297 (56.4)	322 (52.7)		417 (56.6)	200 (49.8)	
Reasons for not working									
Sick leave	348 (75.4)	118 (74.2)		230 (77.4)	234 (72.6)		318 (76.2)	145 (72.5)	
Student	2 (0.4)	0 (0.0)		1 (0.3)	1 (0.3)		2 (0.4)	0 (0.0)	
Housewife	32 (6.9)	11 (6.9)		18 (6.0)	25 (7.8)		29 (6.9)	14 (7.0)	
Retired	1 (0.2)	0 (0.0)		0 (0.0)	1 (0.3)		0 (0.0)	1 (0.5)	
Unemployed	62 (13.4)	22 (13.8)		38 (13.0)	47 (14.6)		50 (12)	34 (17)	
Disabled	2 (0.4)	1 (0.6)		1 (0.3)	2 (0.6)		1 (0.2)	2 (1.0)	
Other	13 (2.8)	7 (4.4)		9 (3.0)	12 (3.7)		8 (1.9)	2 (1.0)	

(*Continued*)

TABLE 2. (*Continued*)

	LBP			LP			PGP		
	Reported Pain (n = 822)	**Did Not Report Pain (n = 331)**	***P***	**Reported Pain (n = 530)**	**Did Not Report Pain (n = 616)**	***P***	**Reported Pain (n = 742)**	**Did Not Report Pain (n = 404)**	***P***
Physical activity†			0.93			0.59			0.16
Sedentary	187 (23.3)	77 (23.8)		118 (22.8)	144 (24.0)		182 (25.0)	80 (20.5)	
Minimally active	90 (11.2)	29 (9.0)		58 (11.2)	60 (10.0)		84 (11.5)	33 (8.5)	
Moderately active	218 (27.1)	102 (31.6)		141 (27.3)	178 (29.6)		192 (26.3)	128 (32.8)	
Active	173 (21.5)	58 (18.0)		109 (21.1)	120 (20)		145 (19.9)	85 (21.8)	
Very active	135 (16.8)	57 (17.6)		91 (17.6)	99 (16.5)		126 (17.3)	64 (16.4)	
Hours of exercise per wk before pregnancy	0 (0; 3)	9 (3.0)	0.51	0 (0; 3)	0 (0; 3)	0.54	0 (0; 3)	0 (0; 3)	0.27
Hours of exercise per wk during pregnancy	0 (0;2)	0 (0; 2)	0.57	0 (0; 2)	0 (0; 2)	0.71	0 (0; 2)	0 (0; 2)	0.18
Rest-related characteristics									
Age of the mattress (yr)*	3 (2; 5)	4 (2; 6)	0.18	4 (2; 5)	3 (2; 6)	0.78	3 (2; 5)	4 (2; 5)	0.67
Firmness of the mattress†			0.34			0.81			0.25
Very soft	7 (0.9)	1 (0.3)		5 (1.0)	3 (0.5)		6 (0.8)	2 (0.5)	
Soft	35 (4.3)	11 (3.4)		20 (3.8)	26 (4.3)		30 (4.1)	16 (4.0)	
Neither soft nor firm	522 (64.5)	208 (64.2)		338 (64.5)	389 (64.5)		479 (65.7)	248 (62.3)	
Firm	238 (29.4)	102 (31.5)		158 (30.2)	179 (29.7)		207 (28.4)	130 (32.7)	
Very firm	7 (0.9)	2 (0.6)		3 (0.6)	6 (1.0)		7 (1.0)	2 (0.5)	
Shares bed (yes)†	785 (96.2)	318 (97)	0.54	507 (96.2)	589 (96.6)	0.75	707 (96.1)	401 (97.0)	0.41
Average sleep h per d*	8 (7;8)	8 (7;8)	0.03	8 (7;8)	8 (7; 8)	<0.01	8 (7;8)	8 (7;8)	0.52
Average h awake in bed per d*	0.3 (0;1.3)	0.3 (0;1)	0.40	0.3 (0; 1.3)	0.3 (0; 1)	0.83	0.3 (0.0; 1.3)	0.3 (0.0; 1.0)	0.34
Pain augments with time spent in bed†	249 (31.3)	48 (22.7)	0.01	168 (33.7)	127 (25.4)	<0.01	222 (31.3)	73 (24.9)	0.04
LBP when lying in bed (yes)†	474 (59)	–	–	290 (67.6)	181 (47.9)	<0.01	333 (60.7)	138 (53.9)	0.07
LBP when getting out of bed (yes)†	539 (67)		–	323 (74.8)	213 (56.5)	<0.01	373 (68.1)	162 (62.5)	0.12

(*Continued*)

TABLE 2. (*Continued*)

	LBP			LP			PGP		
	Reported Pain (n = 822)	Did Not Report Pain (n = 331)	*P*	Reported Pain (n = 530)	Did Not Report Pain (n = 616)	*P*	Reported Pain (n = 742)	Did Not Report Pain (n = 404)	*P*
LP when lying in bed†	198 (44.0)	33 (36.3)	0.16	233 (44.6)			164 (44.2)	68 (41.2)	0.51
LP when getting out of the bed (yes)†	226 (50.2)	31 (34.0)	0.01	257 (49.2)	-		189 (50.7)	69 (41.8)	0.06
Obstetrical history									
Stage of pregnancy (wk)*	35 (31;38)	34 (31;38)	0.34	35 (32; 38)	34 (31;38)	0.02	35 (32; 39)	34 (31; 37)	<0.01
Previous number of pregnancies†			0.02			0.01			<0.01
1 pregnancy	528 (64.2)	234 (70.7)		329 (62.1)	429 (69.6)		472 (63.6)	285 (70.5)	
2 pregnancies	240 (29.2)	85 (25.7)		166 (31.3)	156 (25.3)		220 (29.6)	104 (25.7)	
3 pregnancies	39 (4.7)	9 (2.7)		25 (4.7)	23 (3.7)		36 (4.9)	11 (2.7)	
4 pregnancies	12 (1.5)	1 (0.3)		8 (1.5)	5 (0.8)		10 (1.3)	3 (0.7)	
5 pregnancies	2 (0.2)	2 (0.6)		1 (0.2)	3 (0.5)		3 (0.4)	1 (0.2)	
≥1 previous instrumented delivery†	67 (8.2)	17 (5.1)	0.08	45 (8.5)	39 (6.3)	0.16	62 (8.4)	22 (5.4)	0.07
≥1 previous cesarean†	55 (6.7)	26 (7.9)	0.48	39 (7.4)	42 (6.8)	0.72	51 (6.9)	29 (7.2)	0.23
≥1 epidural anesthesia†	233 (28.3)	69 (20.9)	0.01	153 (28.9)	148 (24.1)	0.07	215 (29.0)	85 (21.0)	<0.01
LBP									
LBP during the last 4 wk (yes)†	822 (100)	…	…	440 (83.3)	375 (60.9)	<0.01	554 (74.9)	260 (64.4)	<0.01
Limitation of daily activities (yes)†	282 (34.5)	…	…	185 (42.3)	94 (25.1)	<0.01	195 (35.3)	85 (33.1)	0.54
Frequency of pain†			…			<0.01			<0.01
Some days	466 (58)	…		226 (52.1)	237 (65.1)		296 (54.4)	164 (65.3)	
Most days	199 (24.8)	…		125 (28.8)	72 (19.8)		149 (27.4)	49 (19.5)	
Every day	138 (17.2)	…		83 (19.1)	55 (15.1)		99 (18.2)	38 (15.1)	
LBP severity (VAS)*	5 (4;7)	…	…	5 (4; 7)	4 (3; 6)	…	5 (4; 6)	5 (3; 6)	…
LP									
LP during the last 4 wk (yes)†	440 (54.0)	88 (26.7)	<0.01	530 (100)	…	…	365 (49.5)	159 (39.6)	<0.01

(*Continued*)

TABLE 2. (*Continued*)

	LBP			LP			PGP		
	Reported Pain (n = 822)	Did Not Report Pain (n = 331)	*P*	Reported Pain (n = 530)	Did Not Report Pain (n = 616)	*P*	Reported Pain (n = 742)	Did Not Report Pain (n = 404)	*P*
Limitation of daily activities (yes)†	188 (42.9)	18 (20.7)	<0.01	207 (39.3)	…	…	148 (40.8)	55 (34.8)	0.20
Currently experiencing referred pain down the leg†	95 (34.4)	10 (32.3)	0.81	105 (34.0)	…	…	74 (34.4)	29 (32.6)	0.75
Frequency of pain†			0.01			…			0.85
Some days	291 (68.5)	68 (84.0)		360 (70.9)	…		249 (71.0)	109 (71.7)	
Most days	96 (22.6)	11 (13.6)		108 (21.3)	…		74 (21.0)	33 (21.7)	
Every day	38 (8.9)	2 (2.5)		40 (7.9)	…		28 (8.0)	10 (6.6)	
LP severity (VAS)*	5 (4; 7)	4 (3; 5)	-	5 (4; 7)	…	…	5 (4; 7)	5 (3; 6)	…
PGP									
PGP during the last 4 wk (yes)†	554 (68.0)	186 (56.4)	<0.01	365 (69.7)	372 (60.5)	<0.01	742 (100)	…	…
Limitation of daily activities (yes)†	150 (27.4)	40 (21.9)	0.14	106 (29.5)	83 (22.5)	0.03	191 (26.1)		…
Frequency of pain†			0.57			0.18			…
Some days	348 (63)	133 (73)		229 (63.1)	250 (67.8)		482 (65.4)	…	
Most days	138 (25)	35 (19)		90 (24.8)	82 (22.2)		173 (23.5)	…	
Every day	66 (12)	15 (8)		44 (12.1)	37 (10.0)		82 (11.1)	…	
PGP severity (VAS)*	5 (3; 6)	4 (3; 5)	…	5 (3; 6)	4 (3; 6)	…	4 (3; 6)	…	…
History of LBP									
LBP during previous pregnancies†	200 (41.2)	28 (14.5)	<0.01	135 (41.2)	93 (26.6)	<0.01	172 (35.4)	57 (29.7)	0.15
LBP not related to pregnancy†	453 (56.7)	104 (37.1)	<0.01	289 (56.7)	264 (46.9)	<0.01	387 (53.6)	167 (47.2)	0.05
Postpartum LBP†	135 (31.6)	25 (14.3)	<0.01	90 (30.3)	70 (23.0)	0.01	115 (26.4)	45 (26.8)	0.93
Experiencing LBP around the time when getting pregnant†	169 (21.3)	26 (9.3)	<0.01	111 (21.6)	84 (15.1)	0.04	136 (19.0)	59 (16.6)	0.33
Anxiety†			<0.01			<0.01			<0.01
Normal	586 (75.4)	268 (88.4)		363 (73)	486 (84.4)		522 (75)	328 (86.3)	
Traces of anxiety	138 (17.8)	32 (10.6)		96 (19.3)	72 (12.5)		129 (18.5)	40 (10.5)	

(*Continues*)

TABLE 2. (*Continued*)

	LBP			LP			PGP		
	Reported Pain (n = 822)	Did Not Report Pain (n = 331)	*P*	Reported Pain (n = 530)	Did Not Report Pain (n = 616)	*P*	Reported Pain (n = 742)	Did Not Report Pain (n = 404)	*P*
Pathological anxiety	53 (6.8)	3 (1.0)		38 (7.6)	18 (3.1)		45 (6.5)	12 (3.2)	
State anxiety (STAI-S)*	17 (11; 24)	13 (8; 20)	<0.01	17 (11; 25)	14 (9; 21)	<0.01	16 (10; 25)	14 (9; 20)	<0.01
Trait anxiety (STAI-T)*	19 (14; 26)	15 (10; 21)	<0.01	20 (14; 26)	17 (11; 22)	<0.01	19 (14; 26)	16 (11; 22)	<0.01
Anxiety (STAI score)*	36 (25; 50)	28 (19; 38)	<0.01	37 (26; 52)	32 (21; 43)	<0.01	36 (25; 50)	31 (21; 41)	<0.01
Depression†			<0.01			<0.01			<0.01
Not depressed	449 (55.4)	222 (69.2)		271 (52.3)	395 (65.2)		387 (53.3)	280 (70.0)	
Slightly depressed	276 (34.0)	89 (27.7)		193 (37.3)	170 (28.1)		266 (36.6)	97 (24.3)	
Moderately depressed	72 (9.0)	9 (2.8)		46 (8.9)	35 (5.8)		61 (8.4)	21 (5.3)	
Seriously depressed	13 (1.6)	1 (0.3)		8 (1.5)	6 (1.0)		12 (1.7)	2 (0.5)	
Depression (BDI-II score)*	9 (6; 13)	7 (5; 11)	<0.01	9 (6; 13)	8 (5; 12)	<0.01	9 (6; 13)	7 (5; 10)	<0.01
Disability (RMQ score)*	4 (1; 7)	0 (0; 1)	…	3 (1; 7)	1 (0; 4)	…	3 (1; 7)	1 (0; 4)	…
Treatments†									
Analgesics (nonopioids)	122 (15)	12 (3.6)	…	83 (15.7)	51 (8.3)	…	96 (13.0)	38 (9.5)	…
Muscle relaxants	15 (1.8)	0 (0.0)	…	12 (2.3)	3 (0.5)	…	9 (1.2)	6 (1.5)	…
Opioids	1 (0.1)	0 (0.0)	…	0 (0.0)	1 (0.2)	…	1 (0.1)	0 (0.0)	…
NSAIDs	54 (6.6)	7 (2.1)	…	41 (7.8)	20 (3.3)	…	45 (6.1)	16 (4.0)	…
Corticoids	1 (0.1)	0 (0.0)	…	1 (0.2)	0 (0.0)	…	1 (0.1)	0 (0.0)	…
Physiotherapy	39 (4.8)	3 (0.9)	…	26 (4.9)	16 (2.6)	…	23 (3.1)	19 (4.7)	…
Rehabilitation	4 (0.5)	0 (0.0)	…	4 (0.8)	0 (0.0)	…	3 (0.4)	1 (0.2)	…
History of lumbar surgery	4 (0.5)	7 (2.4)	…	4 (0.8)	7 (1.2)	…	7 (1.0)	4 (1.1)	…
Other treatments	55 (6.7)	5 (1.5)	…	30 (5.7)	29 (4.7)	…	41 (5.5)	19 (4.7)	…

**Median (P25; P75).*

†Frequency (%).

LBP indicates low back pain; LP, leg pain; PGP, pelvic girdle pain; VAS, visual analogue scale; STAI, state-trait anxiety inventory; BDI-II, Beck Depression Inventory-II; NSAID, nonsteroidal anti-inflammatory drug; RMQ, Roland Morris Questionnaire.

TABLE 3. Results of the Regression Models for Low Back Pain, Pain Referred Down the Leg, and Pelvic Girdle Pain, in Which 1158 Subjects Were Included*

	Coefficients (95% CI)	*P*	Frequency in Bootstrapping Validation
LBP (n = 833)			
Previous lumbar surgery	−1.62 (−3.16; −0.09)	0.038	613
Pain augments with time spent in bed (yes)	0.46 (0.03; 0.90)	0.034	639
Previous LBP (unrelated to pregnancy; yes)	0.57 (0.22; 0.92)	0.002	835
Anxiety (STAI score)	0.02 (0.01; 0.03)	<0.001	800
Constant term	0.28 (−0.13; 0.69)	0.183	
LP (n = 829)			
Age	−0.05 (−0.08; −0.02)	0.005	934
BMI	0.04 (0.01; 0.07)	0.034	396
Academic level			
Less than high school	Ref. cat.		
High school	0.50 (0.07; 0.94)	0.024	834
University	0.09 (−0.34; 0.53)	0.672	245
Number of h of sleep per d	−0.14 (−0.28; −0.01)	0.033	596
Depression (BDI-II score)	0.04 (0.02; 0.07)	0.002	739
Reporting LBP (yes)	0.62 (0.26; 0.98)	0.001	904
Constant term	0.52 (−1.41; 2.45)	0.600	
PGP (n = 833)			
BMI	0.05 (0.01; 0.09)	0.011	678
Stage of pregnancy (wk)	0.07 (0.03; 0.11)	0.001	962
Depression (BDI-II score)	0.07 (0.04; 0.10)	<0.001	933
Constant term	−3.73 (−5.39; −2.08)	<0.001	

**The maximal models for LBP, LP, and PGP included age, BMI, number of cigarettes smoked per d, academic level, currently working (yes/no), degree of physical activity, mattress firmness, stage of pregnancy, number of h of sleep per d, number of previous pregnancies, whether LBP augmented with time spent in bed, history of LBP unrelated to pregnancy, experiencing LBP around the time of getting pregnant, previous lumbar surgery, and scores for anxiety and depression. For the 3 models, the interaction between BMI and mattress firmness was also tested. In addition, in the model for LBP, whether the subject reported PGP was also included in the maximal model, as was the report of LBP included in the model for PGP. Reporting of both PGP and LBP was included in the model for LP.*

CI indicates confidence interval; LBP, low back pain; STAI, state-trait anxiety inventory; LP, leg pain; BMI, body mass index; BDI-II, Beck Depression Inventory-II; PGP, pelvic girdle pain.

In fact, differences in methods can explain most inconsistencies between results from studies in this area. For instance, differences in the way in which the questions are phrased can lead to differences in data on prevalence. Results can also vary depending on the follow-up period (covering or not partum and postpartum), the setting where pregnant women are recruited (*i.e.*, general population *vs*. clinical populations, recruited in primary or specialized care), or sample size, which varied between 34 and 5400.[13] Differences in statistical methods used and whether they controlled for potential confounders can also explain inconsistencies in conclusions across studies. For instance, in this study, regression models showed that some variables that seemed to be associated with a higher risk for LBP or PGP in the bivariate analysis, such as "smoking" for LBP, "currently working" for LBP and PGP, or "number of previous pregnancies" for LBP, PGP, and LP (Table 2), were actually not associated with such a risk when other variables were taken into account (Tables 3 and 4). Moreover, in this study, variables introduced in the regression models were established at the design phase on the basis of clinical criteria and results from previous studies. When variables introduced in the models are selected purely on the basis of whether bivariate analyses show statistically significant differences, multiple comparisons requiring the repeated use of statistical tests increase type I error.

Furthermore, some studies have estimated the prevalence of LBP and PGP during pregnancy as if they were a single condition.[12–14] However, although there is a significant correlation between these types of pain (Table 2), they are clinically different and are associated with different risk factors (Tables

TABLE 4. Secondary Analysis on Obstetrical History, Including Only the 394 Women Who Had Been Previously Pregnant*

	Coefficients (95% CI)	*P*	Frequency in Bootstrapping Validation
LBP (n = 319)			
History of LBP during previous pregnancies	1.21 (0.55; 1.87)	<0.001	975
History of LBP postpartum	0.83 (0.09; 1.57)	0.028	626
Previous lumbar surgery	−3.05 (−5.52; −0.57)	0.016	373
Anxiety (STAI score)	0.02 (0.01; 0.04)	0.012	847
Constant term	−0.15 (−0.87; 0.58)	0.694	
LP (n = 333)			
Age	−0.06 (−0.12; −0.01)	0.042	544
Number of h of sleep per d	−0.23 (−0.46; −0.01)	0.038	501
Reporting LBP (yes)	0.87 (0.32; 1.41)	0.002	857
Constant term	3.20 (0.52; 5.87)	0.019	
PGP (n = 338)			
Stage of pregnancy (wk)	0.10 (0.04; 0.16)	0.002	941
Depression (BDI-II score)	0.09 (0.04; 0.14)	0.001	978
Constant term	−3.44 (−5.78; −1.11)	0.004	

**The maximal models included history of LBP during previous pregnancies, history of LBP postpartum, having previously undergone a cesarean (yes/no) or an instrumented delivery (yes/no), and having received epidural anesthesia for a previous delivery (yes/no). In addition, the maximal model for LBP also included previous lumbar surgery, pain augmentation with time spent in bed, previous LBP unrelated to pregnancy, and anxiety (STAI score). The maximal model for LP also included age, BMI, academic level, number of h of sleep per d, depression (BDI-II score), and reporting LBP. The maximal model for PGP also included BMI, stage of pregnancy (wk), and depression (BDI-II score).*

CI indicates confidence interval; LBP, low back pain; STAI, state-trait anxiety inventory; LP, leg pain; PGP, pelvic girdle pain; BDI-II, Beck Depression Inventory-II.

3 and 4), which suggests that they should be analyzed separately. In fact, as opposed to PGP, no obstetrical data regarding current or previous pregnancies were associated with a higher risk for LBP. In the case of LBP, the only variables associated with a variation in the risk were anxiety and previous clinical history and management of LBP (either related or not to pregnancy). This might be interpreted as suggesting that pregnancy-related factors might not represent the "cause" of a "specific" type of LBP, but, as opposed to what may happen with PGP, merely represent a single factor among the array of factors that may increase the risk of experiencing a recurring episode of "common" LBP.

In order to make it possible to compare data across studies and geographical settings, studies should ideally recruit representative samples, have appropriate statistical power, and use standardized methods and definitions of pregnancy-related LBP and PGP. The strengths of this study include the use of standardized definitions of pain and methods for estimating prevalence,[17] inclusion of the variables that have been suggested to be relevant in previous studies,[3,12–14,16] use of previously validated methods to assess the variables, and recruitment of a large representative sample. In fact, subjects were recruited consecutively in 5 Spanish regions that roughly represent the cultural and economic spectrum in the country and that, in 2010, represented 26,007,604 (55.3%) inhabitants of the 47,021,031 in the country.[29] All the pregnant women followed up in the primary care centers and hospital services participating in this study were screened, and more than 99% of them agreed to participate.

The SNHS is a tax-funded, government-managed, health insurance system with universal coverage, which provides health care to every resident in Spain in hospital and primary care facilities that are owned and managed by the government. The SNHS is available free of charge to all residents in Spain, and only a small minority of patients in the upper economic class seek health care exclusively in the private sector. Within the SNHS, pregnant women are routinely followed up in primary care centers until they give birth, which occurs in a hospital. High-risk pregnancies and women who voluntarily choose to can also be followed up at the hospital. Therefore, representativeness of the sample should not be a major concern.

This study has a cross-sectional design, and "association" does not necessarily imply "causality." Therefore, results from this study should be interpreted with caution. For instance, the association of pain with higher levels of anxiety or depression, or with less hours of sleep, might be interpreted as indicating that these factors increase the risk of pain or, the other way around, as indicating that they are "consequences" of pain. However, it is unlikely for a "causal," "predisposing," or "triggering" factor to not show an "association" with the

corresponding condition. Therefore, cross-sectional studies may be useful to identify variables that should be included in further prospective studies.

On the basis of the results of this study, future randomized controlled trials intending to assess the effectiveness of treatments or preventive measures for pregnancy-related LBP or PGP should analyze the comparability of clinical history and management of LBP (both related and unrelated to previous pregnancy), BMI, anxiety, and depression across groups.

➢ Key Points

- ❑ Validated methods were used to gather data on the prevalence of LBP, pain referred down the leg (LP), and PGP, anthropometric and sociodemographic characteristics, obstetrical history, physical activity before and during pregnancy, mattress and sleep characteristics, history of LBP, disability, anxiety, and depression among 1158 pregnant women recruited in primary care and hospital services across 5 Spanish regions.
- ❑ The prevalence of LBP, LP, and PGP was 71.3%, 46.2%, and 64.7%, respectively. Main factors associated with a higher likelihood of reporting pain for LBP were history of LBP related and unrelated to previous pregnancy and postpartum, pain augmenting with time spent in bed, and anxiety. Previous lumbar surgery was associated with a lower risk of LBP. The factors associated with a higher likelihood of reporting pain for LP were reporting LBP, academic level, younger age, depression, a lower number of hours of sleep per day, and a higher BMI, and for PGP were a higher score for depression, a higher BMI, and a more advanced stage of pregnancy.
- ❑ Factors associated with pregnancy-related LBP and PGP were different. The risk of PGP increases as pregnancy advances, whereas obstetrical data on current or previous pregnancies were not associated with a higher risk of LBP.
- ❑ On the basis of the results of this study, the comparability of history of LBP (both related and unrelated to previous pregnancy), BMI, anxiety, and depression across groups should be analyzed in future randomized controlled trials designed to assess the effectiveness of treatments or preventive measures for pregnancy-related LBP or PGP.

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