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ORIGINAL RESEARCH

Relationship of depression in participants with nonspecific acute or subacute low back pain and no-pain by age distribution

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Background and purpose: Nonspecific low back pain (LBP) is the most prevalent musculoskeletal condition in various age ranges and is associated with depression. The aim of this study was to determine the Beck Depression Inventory (BDI) scores in participants with nonspecific LBP and no-pain by age distribution.

Methods: A case–control study was carried out following the Strengthening the Reporting of Observational Studies in Epidemiology criteria. A sample of 332 participants, divided into the following age categories: 19–24 (n=11), 25–39 (n=66), 40–64 (n=90), 65–79 (n=124), and ≥80 (n=41) years was recruited from domiciliary visits and an outpatient clinic. The BDI scores were self-reported in participants with nonspecific acute or subacute (≤3 months) LBP (n=166) and no-pain (n=166).

Results: The BDI scores, mean ± standard deviation, showed statistically significant differences ($p<0.001$) between participants with nonspecific acute or subacute LBP (9.590±6.370) and no-pain (5.825±5.113). Significantly higher BDI scores were obtained from participants with nonspecific acute and subacute LBP in those aged 40–64 years ($p<0.001$; 9.140±6.074 vs 4.700±3.777) and 65–79 years ($p<0.001$; 10.672±6.126 vs 6.210±5.052). Differences were not significant in younger patients aged 19–24 ($p=0.494$; 5.000±2.646 vs 8.250±7.498), 25–39 ($p=0.138$; 5.440±5.245 vs 3.634±4.397), and in those aged ≥80 years ($p=0.094$; 13.625±6.1331 vs 10.440±5.591).

Conclusion: Participants with nonspecific acute and subacute LBP present higher BDI depression scores, influenced by age distribution. Specifically, patients in the age range from 40 to 80 years with LBP could require more psychological care in addition to any medical or physical therapy. Nevertheless, physical factors, different outcomes, and larger sample size should be considered in future studies.

Keywords: depression, low back pain, musculoskeletal diseases, age distribution

Introduction

Worldwide, the Global Burden of Disease Study 2013 established low back pain (LBP) as the first musculoskeletal disorder and the fourth leading condition, after ischemic heart disease, lower respiratory infections, and cerebrovascular disease that causes disability for the life years.[1] LBP is a common condition, which is referred to primary care and physical therapy units.[2] Furthermore, 20 to 40% of the general population has suffered low back pain during the previous month.[3] The LBP estimated incidence rate includes 80% of the active population worldwide.[4] Its prevalence has increased during recent years in Spain as the population ages and psychological distress increases (anxiety or depression), among other factors.[5]

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Pain intensity, functional impairment, and health-related quality of life do not correlate with lumbar degenerative radiological changes.[6] The variability of temporary disability duration in patients with LBP and depression, among other conditions, produces a strong impact in the Spanish Public Health. Furthermore, a multifactorial influence, such as medical-biological or socioeconomic factors, may determine the disability of these pathologies.[7] Indeed, beliefs about the nature of pain and personal ability influence both physical and mental health outcomes in LBP patients. Organic pain beliefs are more deeply related to disability and depression than psychological pain beliefs.[8] Therefore, the fear-avoidance model is associated with depressive symptoms in a multiple-target approach to understand LBP mechanisms.[9] Participants with LBP should be screened and treated for depression to reduce disability and limit pain-related activities.[10]

The negative prognostic factors for disability in participants with nonspecific subacute pain are involvement of several body regions, older age, baseline disability, and longer duration. Furthermore, anxiety and depression show limited evidence of association with disability in patients with subacute pain.[11] Nevertheless, a recent systematic review suggested that the prognosis in acute and subacute LBP (pain of <12 weeks duration) may be influenced by depression.[12] Furthermore, specific outcome and psychometric tools are necessary in the aging process associated with patients with LBP. Older adults are more likely to experience a major disabling LBP incident compared to younger individuals.[13] Therefore, this highlights the importance to examine the relationship between age and depression in LBP patients.

Health practitioners should consider depressive symptoms at the first consultation to improve acute and subacute LBP treatment.[14] Approximately 72% of total costs per patient with subacute LBP in primary care are related to depression and emotional distress.[15]

To date, the depression scores in the Spanish population have not been compared according to LBP status and age categories. The aim of this study was to determine the Beck Depression Inventory (BDI) scores in a sample of participants with nonspecific acute or subacute LBP and no-pain by age distribution.

Methods

Design

A cross-sectional case-control study was carried out from January 2015 to January 2016. The Strengthening the Reporting of Observational Studies in Epidemiology guidelines were applied.[16]

Ethical considerations

The study was approved by the Clinical Research Ethics Committee of the Universidade da Coruña (Spain; number CE 21/2016). Informed written consent was obtained from all volunteers before their inclusion in the research study. Furthermore, the Helsinki Declaration and ethical standards in human experimentation were adhered to at all times.

Sample

A sample of 332 subjects was divided into the following age categories: 19–24 (n=11), 25–39 (n=66), 40–64 (n=90), 65–79 (n=124), and ≥80 (n=41) years. Participants were recruited from domiciliary visits (for healthy participants) and from Carmasalud Clinical and Research Center (for LBP participants). A consecutive sampling method was used to select the participants in the study.

The inclusion criteria were: Spanish subjects, aged >18 years, and normal (no pain) participants or participants with nonspecific acute or subacute LBP.[11,12,14,15,17] A nonspecific pain condition was defined as soreness of mechanical origin.[17] Furthermore, LBP was considered as pain predominantly located in the posterior trunk region, between the subcostal line and the upper part of the iliac bones.[12–15] Finally, acute and subacute LBP were categorized as pain of <12 weeks' duration,[14,15] in keeping with The Quebec Task Force on Spinal Disorders LBP categorization, as acute (<2–4 weeks), subacute (up to 12 weeks), and chronic (>12 weeks).[17,18]

The exclusion criteria were: fractures; pain radiating to lower limbs with intensity equal to or greater than LBP; pain located in other body regions different from LBP; neurological deficit in lower limbs; active systemic neoplastic, infectious, or autoimmune conditions; prior surgery in the spinal column; inability to understand the research instructions; and patients of other nationalities (non-Spanish).[19] In addition, participants with nonspecific chronic LBP (>3 months) were excluded.[11,12,14,15]

Procedure

First, sociodemographic data (age, gender, height, weight, and body mass index [BMI]) were collected prior to the questionnaire. Second, the BDI scores were self-reported in participants with acute or subacute LBP (n=166) and no-pain (n=166).[11,12,14,15,19] The BDI questionnaire comprises 21 items. Each item is scored from 0 to 3 points (total range from 0 to 63). The BDI score categories are, no depression (0–9), mild depression (10–16), moderate depression (17–29), and severe depression (30–63). This questionnaire presents a coefficient alpha of 0.86 for psychiatric patients and 0.81

for nonpsychiatric subjects, and distinguishes the depression subtypes, and depression from anxiety.[20] The BDI is a valid and reliable tool in the Spanish population and can be used cross-culturally in Europe.[21]

Statistical analysis

A descriptive analysis of the variables was carried out. The mean, standard deviation (SD), and range values were calculated for the age, sex, weight, height, BMI, and BDI. Furthermore, these analyses were performed both overall and by age distribution (19–24, 25–39, 40–64, 65–79, and ≥80 years) for both groups (with LBP and no-pain). Independent *t*-tests for each sample were used to assess significance.

In addition, the relationship of LBP and age distribution to the BDI depression scores was assessed by two methods. First, a test of equality of means of the BDI for the LBP versus no-pain groups was performed. Second, an analysis of variance (ANOVA) model was used with two factors (LBP and age distribution) and interaction. The dependent variable was the BDI of each participant and the two independent variables were the LBP presence (LBP or no-pain group) as well as the age ranges (19–24, 25–39, 40–64, 65–79, and ≥80 years). Statistical analyses were carried out using the statistical package SPSS 22.0 (IBM Corp, Armonk, NY, USA). A confidence interval (CI) of 99% and a $p<0.01$ were considered statistically significant for differences between the mean BDI scores in participants with LBP and no-pain.

Results

A sample of 119 men (35.8%) and 213 women (64.2%) completed the study. Table 1 demonstrates the BDI depression scores and sociodemographic characteristics by age distri-

Table 1 BDI depression scores and sociodemographic characteristics by age distribution of participants with LBP and no-pain

Sociodemographic and BDI data	Total group mean ± SD (range), N=322	LBP mean ± SD (range), N=166	No-pain mean ± SD (range), N=166	*p*-value (t[a]) LBP vs no-pain
Age (years)	57.89±19.27 (19–99)	58.05±18.76 (20–90)	57.73±19.82 (19–99)	0.883 (–0.148)
19–24	21.73±1.85	22.13±1.89	46.50±15.85	
25–39	31.64±4.58	32.20±4.25	38.28±13.59	
40–64	51.21±7.24	50.10±7.51	42.06±11.93	
65–79	71.38±4.36	71.74±4.36	74.16±9.62	
≥80	83.73±4.02	83.88±3.28	73.94±5.74	
Weight (kg)	70.16±12.16 (46–120)	69.90±12.10 (46–120)	70.47±12.24 (47–110)	0.674 (0.421)
19–24	73.50±12.63	71.87±13.99	75.69±13.92	
25–39	69.13±13.79	65.80±11.74	69.72±14.70	
40–64	71.23±12.40	72.04±13.79	70.68±10.84	
65–79	71.46±11.36	70.79±10.56	70.01±12.35	
≥80	64.85±9.69	64.94±10.67	70.25±11.88	
Height (cm)	164.87±9.26 (130–190)	163.97±9.05 (148–189)	165.78±9.41 (130–190)	0.075 (1.784)
19–24	173.64±9.88	171.38±10.46	171.75±8.84	
25–39	169.36±9.36	164.80±8.47	169.24±9.97	
40–64	166.63±8.14	167.34±8.22	169.44±8.66	
65–79	162.74±8.25	161.43±8.78	161.42±7.88	
≥80	157.88±7.80	159.06±7.21	164.19±9.45	
BMI (kg/m^2)	25.79±3.73 (16.26–42.22)	25.96±3.64 (17.72–42.22)	25.62±3.83 (16.26–38.06)	0.405 (–0.834)
19–24	24.33±3.17	24.41±3.61	25.47±2.96	
25–39	23.91±3.10	24.10±2.98	24.17±3.53	
40–64	25.58±3.49	25.62±3.66	24.58±3.03	
65–79	26.97±3.76	27.17±3.55	26.85±4.20	
≥80	26.09±3.96	25.64±3.48	25.47±2.96	
BDI	7.71±6.07 (0–30)	9.59±6.37 (0–30)	5.83±5.11 (0–24)	<0.001 (–5.938)
19–24	7.36±6.56	8.25±7.50	2.75±1.83	
25–39	4.32±4.78	5.44±5.24	5.36±5.01	
40–64	7.17±5.61	9.14±6.07	3.90±3.72	
65–79	8.62±6.06	10.67±6.12	8.21±5.75	
≥80	11.68±5.94	13.63±6.13	4.13±3.05	

Notes: In all the analyses, $p<0.01$ (with a 99% confidence interval) was considered statistically significant; [a]independent *t*-test.
Abbreviations: BDI, beck depression inventory; BMI, body mass index; LBP, low back pain; SD, standard deviation.

Table 2 BDI by factor with 95% Scheffe intervals

Age (years)	Participants	n	Mean	SD	Lower limit	Upper limit	Mean difference	Levene test, *p*-value (*F*)	*t*-test[a] *p*-value (*t*)
19–24	LBP	8	8.25	7.50	4.44	12.06	3.250	0.150 (2.470)	0.494 (0.713)
	No-pain	3	2.65	2.65	0.00	11.21			
	Total	11	7.36						
25–39	LBP	25	5.44	5.24	4.10	6.78	1.805	0.823 (0.051)	0.138 (1.504)
	No-pain	41	3.63	4.40	2.59	4.68			
	Total	66	4.32						
40–64	LBP	50	9.14	6.07	8.11	10.17	4.440	0.001 (11.523)	<0.001 (4.244)
	No-pain	40	4.70	3.78	3.55	5.85			
	Total	90	7.17						
65–79	LBP	67	10.67	6.13	9.70	11.64	4.461	0.174 (1.873)	<0.001 (4.375)
	No-pain	57	6.21	5.05	5.16	7.26			
	Total	124	8.62						
≥80	LBP	16	13.63	6.13	11.55	15.70	1.858	0.394 (0.744)	0.094 (1.714)
	No-pain	25	10.44	5.59	8.78	12.10			
	Total	41	11.68						
Total	LBP	166	9.59	6.37	8.97	10.21	3.765	004 (8.650)	<0.001 (5.928)
	No-pain	166	5.83	5.11	5.20	6.45			
	Total	332	7.71						

Notes: In all the analyses, $p<0.01$ (with a 99% confidence interval) was considered statistically significant; [a]a test of equality of means was performed.
Abbreviations: BDI, beck depression inventory; LBP, low back pain.

bution of participants with LBP and no-pain. Regarding the overall sample, the BDI scores, as mean±SD, demonstrated statistically significant differences ($p<0.001$) between participants with LBP (9.590±6.370 points) and no-pain (5.83±5.11 points), although within normal ranges of depression. Considering the equality of variances, tests of equality of means of BDI in the participants with LBP and no-pain for the overall and age distribution sample are presented in Table 2.

The box plot of BDI in overall participants with LBP and no-pain is shown in Figure 1A, and according to age distribution in Figure 1B. ANOVA of the BDI variable with two factors and interaction (LBP presence and age distribution) was carried out. The analysis results are presented in Table 3. It was observed that there was no interaction between the two factors ($p=0.5547$). Nevertheless, the main effects showed statistically significant differences of BDI when comparing age distribution ($p<0.0001$) or LBP presence ($p=0.0002$). Figure 1C illustrates the influence of LBP presence and age distribution on the mean scores of BDI. The ANOVA model indicated that LBP influenced the degree of depression, with a partial coefficient of determination $R^2=3.43\%$. Moreover, a partial coefficient of determination $R^2=12.19\%$ was associated with age distribution.

Discussion

Despite normal ranges of BDI scores, this study supports evidence showing higher depression scores in participants with acute or subacute nonspecific LBP versus asymptomatic participants with no-pain, especially in age ranges from the 4th to 8th decade of their life. Furthermore, anxiety and depression are frequently present in patients with LBP attending tertiary care centers.[22] The depression scores in different age ranges of the Spanish population with LBP and no-pain has not been studied.[5] Consequently, this is the first study to determine the BDI scores in a sample of participants with nonspecific acute or subacute LBP and no-pain by age distribution.

Despite the lack of knowledge about the mechanism and origin of LBP, acute LBP participants seems to be influenced by selective pain sensitivity enhancement and differential gene expression profiles with regard to no-pain participants.[23] Neuronal differences have been observed between depression and LBP.[24] The fear avoidance model, including kinesiophobia and quality of life implications, has been proposed for patients with depressive symptoms and LBP.[7,8,25] In this sense, this study supports depression as one of the possible treatment focuses in participants with acute and subacute LBP.

Therefore, this study establishes that in patients with nonspecific acute and subacute LBP, there is a relationship with the BDI depression score. This reflects several studies that have shown that depression negatively influences LBP prognosis in the health care system.[1,9–15,22,26]

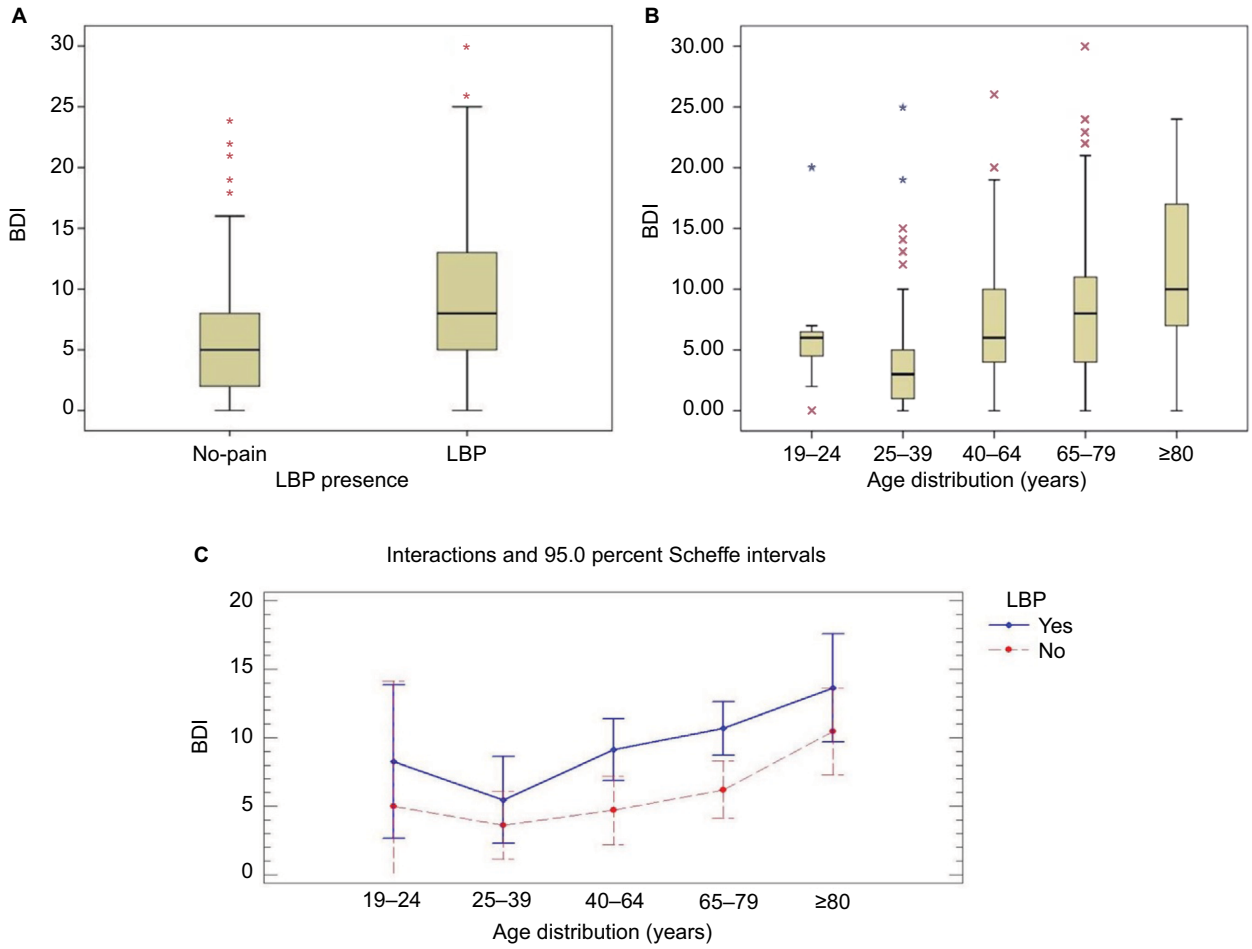

Figure 1 Boxplots of BDI by LBP presence (**A**), BDI by age distribution (**B**), and mean of BDI with 95.0% Scheffe intervals by age distribution and LBP presence (**C**).
Notes: LBP presence (LBP or no-pain group), as well as age distribution of 19–24 (young adults), 25–39 (middle aged-1), 40–64 (middle aged-2), 65–79 (aged), and ≥80 years were considered. In all the analyses, $p<0.01$ (with a 99% confidence interval) was considered statistically significant.
Abbreviations: BDI, beck depression inventory; LBP, low back pain.

Table 3 ANOVA analysis of BDI, two factors (LBP presence and age distribution) with interaction

Source	Sum of squares	Df	Variance	*F*-ratio	*p*-value
LBP presence	418.17	1	418.17	14.29	0.0002
Age distribution	1485.12	4	371.28	12.68	<0.0001
Interaction	88.51	4	22.13	0.76	0.5547
Residual	9425.75	322	29.27		
Total (corrected)	12186.70	331	36.82		

Notes: LBP presence (LBP or no-pain group), as well as age distribution of 19–24 (young adults), 25–39 (middle aged-1), 40–64 (middle aged-2), 65–79 (aged), and ≥80 years were considered. In all the analyses, $p<0.01$ (with a 99% confidence interval) was considered statistically significant.
Abbreviations: ANOVA, analysis of variance; BDI, beck depression inventory; LBP, low back pain; df, degrees of freedom.

The BDI has been widely used and is a valid and reliable tool to analyze depression, including in the Spanish population.[20,21] The BDI's internal consistency has shown a coefficient alpha of 0.81, as well as 0.60 and 0.74 score of clinical ratings of BDI and Hamilton Psychiatric Rating Scale for Depression concurrent validity for nonpsychiatric subjects, respectively. In addition, the BDI differentiates depression subtypes.[20]

The sociodemographic characteristics of the sample were homogeneous in order to avoid their influence between LPB and no-pain groups. Among patients with LBP, age was correlated with physical disability and wellness.[27] BMI was shown to be capable of predicting LBP.[28] Height and weight measures, associated with BMI calculation, may be associated with radiating LBP during the life course.[29]

Several limitations should be considered in this study. First, physical factors, such as pain characteristics, recurrence, or physical disability, have not been evaluated. Despite this, previous studies have shown that depression may not be influenced by these physical factors.[27] Second, younger age ranges, such as children and adolescents, were not assessed. Nevertheless, an increased risk to develop spinal pain was shown in the most active adolescents.[30] Third, chronic LBP was excluded to avoid the central sensitization, which occurs in a longer-term process.[31] Fourth, the assessor

was not blinded, although the BDI questionnaire was self-reported. Although the BDI is a valid and reliable tool and may be used cross-culturally in Europe, particular caution should be taken in the Spanish sample. Indeed, regression analyses demonstrated the inconsistency of the Spanish sample compared with other European countries in the relative weight of items 3, 6, 7, 9, 13, 15, and 21.[21] Finally, a more diverse group of individuals and a larger sample size may improve the study power and help to identify variation between countries.[1]

In conclusion, participants with nonspecific acute and subacute LBP present higher BDI depression scores at certain age ranges. In particular, those in the age range from 40 to 80 years with LBP may require psychological assessment and care in addition to any medical or physical therapy treatment.

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Author contributions

All authors contributed to concept, design, analyses, interpretation of data, drafting of manuscript or revising it critically for important intellectual content.

Disclosure

The authors report no conflicts of interest in this work.

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