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Clinical Study

Multidimensional prognostic factors for chronic low back pain-related disability: a longitudinal study in a Saudi population

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Abstract

BACKGROUND CONTEXT: Chronic low back pain (CLBP) is a major health problem. Identifying prognostic factors is essential for identifying people at risk of developing CLBP-related disability.
PURPOSE: To examine associations between CLBP-related disability at 12-month follow-up and individual, psychosocial and physical factors at baseline, as well as treatment-related factors between baseline and 12-month follow-up among a Saudi population. Additionally, associations between pain intensity and general perceived efficacy (GPE) at 12 months were examined with the aforementioned factors.
DESIGN: A prospective cohort study.
PARTICIPANTS: One hundred Saudi participants over 18 years with a history of LBP greater than 3 months' duration.
MAIN OUTCOME MEASUREMENTS: The primary outcome variable was CLBP-related disability measured by the Arabic Oswestry disability index. Secondary outcome measures were pain intensity over the prior week measured by the VAS and the participant's global perceptions of recovery (general perceived efficacy [GPE]) at 12 months.
METHODS: At baseline (n=115), participants completed questionnaires covering demographics, disability, pain intensity, back beliefs, fear avoidance, psychological distress, and physical activity. They performed standardized physical performance tests, including assessment of pain behaviors using a pain behavior scale. After 12 months, participants (n=100) completed questionnaires on disability, pain intensity, GPE and provided treatment-related information during the previous year. Predictors of disability, pain, and GPE were explored using univariate and multivariate regression analyses.
RESULTS: The prognostic model for moderate-severe CLBP-related disability at 12 months explained 53.0% of the variance. Higher pain intensity, higher fear-avoidance work, and older age predicted higher disability. Having no additional somatic symptoms predicted lower disability. Pain intensity at 12-month follow-up was explained by higher disability at baseline, while not being in paid employment appeared protective (25.7% of variance explained). As univariate associations were weak between predictor variables and GPE, multivariate analysis was not conducted.
CONCLUSION: The study results supported the multifactorial nature of CLBP and reported an important prognostic model in the Saudi population.

Keywords: Chronic low back pain; Prognosis; Multidimensional factors; Disability; Fear-avoidance; longitudinal

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Introduction

Low back pain (LBP) is a major health problem and one of the leading causes of disability worldwide including in Saudi Arabia [1–4]. Due to the high burden related to chronic low back pain (CLBP) [5], identifying prognostic factors is essential for identifying people at risk of developing CLBP-related disability. Prognostic factors of disability are multidimensional, crossing individual, psychosocial, behavioral, and physical categories [6–8]. This suggests disability may vary substantially among different cultures as beliefs, social norms, lifestyle, and healthcare systems are likely to influence disability [3,9]. Despite recent developments in the healthcare system in Saudi Arabia, there is a need for health programs that reduce public health risks such as physical inactivity [10] and obesity [11] and to control the growing burden of preventable diseases such as CLBP [12]. Exploring broad health factors can help healthcare providers to identify people at risk of developing CLBP-related disability.

Substantial attention has been given to the role of psychosocial factors in the development of CLBP-related disability [13–15]. However, less is known about the influence of these factors in the Saudi population [4]. Although no prognostic studies have investigated risk factors for CLBP-related disability among Saudis, preliminary data exist between some psychological factors with CLBP. Specifically, Alshami et al. [16] reported no significant association between pain and psychological distress in people with LBP. However, among Saudi medical students, a significant association between depressive and somatic symptoms with musculoskeletal pain has been identified [17]. Similarly, a cross-sectional study reported a significant association between CLBP-related disability and fear-avoidance beliefs in Saudi females [18]. These data highlight the potential for psychological factors to be prognostic of ongoing CLBP-related disability. However, further data are clearly needed.

Culture influences the perceptions, beliefs, and behavior of people within a social group and is considered an important contributor to CLBP-related disability [19]. The Saudi culture is a unique blend of Arabic traditions and the Islamic perspective that shapes the beliefs and behavior of the Saudi population [20]. For example, opportunities for active healthy lifestyle choices such as walking for transport are limited due to high temperature and traditional attire [21]. While improvements in the quality and access to healthcare facilities are underway in Saudi Arabia under the national transformation plan "Saudi Vision 2030," access to healthcare facilities for females can be limited due to their dependency on male family members to accompany them or provide transportation [22]. Understanding culture is relevant to this study, as it may help to identify potential differences that may exist in predictors of CLBP-related disability between Saudi and other populations.

There is a lack of consistency on which factors should be considered in prognostic studies for CLBP-related disability [6,7], likely due to the complexity of CLBP [3]. A number of previous studies have investigated the prognostic value of predictors related to disability across multiple domains. However, most studies investigated Western populations [7,14,15,23–25]. Although informative, these studies do not explain risk factors for disability among the Saudi population. Investigating the influence of known risk factors among this population will also identify potential differences that may exist in predictors of CLBP-related disability across cultures. Therefore, the primary aim of this study was to examine associations between CLBP-related disability at 12-month follow-up and individual, psychosocial, and physical factors at baseline, and treatment-related factors between baseline and 12-month follow-up among a cohort of Saudi people. Secondary aims were to examine associations between (1) pain intensity and (2) general perceived efficacy (GPE) at 12-month follow-up with the individual, psychosocial, and physical factors at baseline and treatment-related factors at 12-month follow-up.

Methods

Design

A prospective cohort study was conducted.

Setting and participants

Participants were Saudi citizens over 18 years, with a history of nonspecific LBP greater than 3 months' duration (3) who were attending physiotherapy for assessment at baseline. Participants were subsequently screened by the researcher using a standardized screening form for exclusion of: (1) clinical features indicative of serious pathology (eg, malignancy, infection, inflammatory disorders or fracture, spinal cord or cauda equina syndrome) using a red flag screening or specific pathologies, for example, lumbar radiculopathy with a clinical neurologic examination; (2) history of back surgery; (3) pregnancy; or (4) being incapable of completing questionnaires in Arabic. Eligible participants were consecutively recruited from a primary and secondary care physiotherapy setting located in Riyadh Saudi Arabia (October 2016 to March 2017). Participants provided written informed consent prior to enrolment.

Procedure

At baseline, enrolled participants provided demographic and clinical data and completed questionnaires. They also performed a standardized sequence of physical performance tests comprising [26]:

1. Repeated trunk flexion: The time taken in seconds (s) for the participant to bend forward to the end-range of motion and return to the upright position 10 times as fast as possible;
2. Repeated sit to stand: The time taken (s) to rise to full standing and return to sitting five times as fast as possible;

3. Timed up and go: The time taken (s) to rise to full standing and walk forward to a line 3 m away, turn, walk back to the chair and sit down;
4. Loaded reach: The participant was instructed to stand next to the wall holding a weight by their side not exceeding 5% of body mass and then reach forward at shoulder height with the load. The maximum reach distance (cm) was recorded.
5. Fifty-foot walk: The time taken (s) for the participants to walk 25 feet, turn around, and walk back to the starting position, as fast as possible [26].

Three measures were recorded: the presence and severity of observable pain behaviors during the tests and time taken to perform the test, or where applicable, the distance achieved.

At 12 months, follow-up questionnaires were administered by email or in person depending on participant preference. Participants were asked to recall information related to physiotherapy treatment provided and the number of physiotherapy sessions per week. They were also asked to report other treatments they recalled receiving. Nonresponders were contacted no more than five times by either email or phone. The investigator was blinded to the baseline data before conducting follow-up measurements. Ethics approval was granted by The University of Sydney Health Science Research Ethics Committee (2015/771) and King Fahd Medical City Ethics Committee (15-306E).

Measurements

Predictor variables at baseline

Participants provided survey responses to a range of putative demographic, psychosocial, and physical factors comprising:

1. Demographic (individual- and work-related) characteristics;
2. Health-related characteristics: for example, presence of leg pain and somatic symptoms. Somatic symptoms were categorized by the number of somatic symptoms which were at least moderately distressing during the past week such as faintness, pains in the heart or chest, nausea, and breathlessness [27];
3. Current pain intensity using the visual analogue scale (VAS) [28];
4. Back pain beliefs using the validated Arabic back beliefs questionnaire (BBQ) [29];
5. Fear avoidant beliefs using the validated Arabic fear-avoidance beliefs questionnaire (FABQ-physical activity and work subscales) [30];
6. Psychological distress using the validated Arabic depression anxiety and stress scale (DASS-21) [31];
7. Habitual physical activity using the validated Arabic short form International Physical Activity Questionnaire (IPAQ) [32];
8. In addition, the presence and severity of pain-related behaviors observed during physical performance tests were assessed by one researcher (DA) using the pain behavior scale (PaBS), who was trained in this [33]. Assessed behaviors included: sighing, breath-holding, grimacing, rubbing, guarding, and antalgic gait, with the severity of observed pain behaviors measured. The overall PaBS was scored by summing individual ratings of pain behaviors for each test (presence and severity), with a total score calculated (0–15).

Predictor variables recorded at 12-month follow-up

Participants provided information about the number of physiotherapy sessions in the last 12 months, type of physiotherapy treatment provided and other treatments they recalled receiving. No participants reported being unable to recall information. If participants selected more than one category of physiotherapy treatment, they were deemed to have received multimodal physiotherapy.

Outcome variables at 12-month follow-up

The primary outcome variable was CLBP-related disability measured by the Arabic Oswestry disability index (ODI) [34]. Secondary outcome measures were pain intensity over the last week measured by the VAS [28] and the participant's global perceptions of recovery (general perceived efficacy [GPE]) [35] at 12 months. Participants rated their overall perceived recovery on a 10-item Likert scale (from −5 "much worse," 0 "unchanged," to +5 "completely recovered"). This scale has excellent test–retest reliability (ICC: 0.90–0.99) and correlates well with pain and disability (r=0.58–0.48), respectively [35].

Data analysis

Data entry and analyses were performed using SPSS version 22 (Inc., Chicago, IL). Descriptive statistics were used to report demographic, work, health, and treatment features of participants. Mean (SD) and range values were reported for continuous data, and frequencies (percent) for categorical data. Data were assessed using the Shapiro-Wilk test for normal distribution. Participant self-reported pain and disability were compared between baseline and 12-month follow-up using paired sample t tests. Baseline self-reported pain and disability were compared between respondents and nonrespondents using independent t tests and interpreted according to the clinically important differences identified in previous literatures [36–38].

In preparation for regression modeling, associations between predictor variables were explored using chi-square tests, scatterplots, and Pearson correlation coefficients. Collinearity between predictor variables was assessed with correlation coefficients ≥0.7 indicating high levels of collinearity [39]. Predictor variables selection was adjusted accordingly. The severity of leg pain in the last month and

the last 12 months were highly correlated (r=0.74, p<.001), so the severity of leg pain in the last month (ie, self-reported leg pain) was selected for analyses. All other factors did not demonstrate multicollinearity. The DASS-21 total scores were used to avoid collinearity.

Univariate linear regression analyses were used to explore the association between outcome variables and predictor variables. Subsequently, predictor variables were selected for multivariate regression analyses based on the strength of association identified in univariate analyses for continuous variables and chi-square tests for categorical variables [40,41]. General linear models (GLM) were conducted with (1) disability at 12 months and (2) pain intensity at 12 months as the outcome variables. Candidate predictor variables were included in the GLM if they demonstrated associations of at least r≥0.3 with pain intensity and r≥0.4 with disability [42]. Age and gender were controlled for each GLM respected previously published recommendations of 5 to 10 events (participants) per predictor variable ratio [43,44]. The level of statistical significance was set at 5%.

Backward stepwise logistic regression was performed to ascertain the effects of the predictor variables in the final GLM model on the likelihood of participants having moderate to severe disability at 12 months (ie, ODI score≥21). Predictor variables that were identified in the final GLM were included in the analysis. Predictor variables were excluded from the model in a stepwise fashion if the p value was <.05.

To assess the accuracy of the final models, final regression analyses were rerun after excluding nonsignificant predictor variables, and b coefficients and the adjusted R^2 scores were compared between the two models with and without nonsignificant predictor variables [45]. As a final stage of analyses, we assessed the assumptions of the model and the normality of the residuals. Assumptions were analyzed by assessing the Levene's test to assess the equality of variance for the outcome variables [39,45]. Cases with missing outcome data were excluded from the analysis.

Results

One hundred of the 115 participants assessed at baseline responded at follow-up, a response of 86.9%. The baseline characteristics for respondents and nonrespondents are summarized in Table 1. The 38 male and 62 female participants at follow-up had a mean (SD) age of 40 (13.6). Body mass index (BMI) was high especially among females (mean [SD]: 30.8 [6.6]) with 49% of participants categorized as obese. Ten of the 15 baseline participants lost to follow-up were female, whose baseline characteristics were similar to the follow-up cohort. No significant differences were found for baseline pain (t_{115}=0.51, p=.610) or disability (t_{115}=−0.595, p=.553) between respondents and nonrespondents (Appendix A).

Work- and health-related characteristics of participants are presented in Table 2. At baseline, 44% of participants were "not in-paid employment" including home makers and students. A high proportion (59%) reported at least one distressing somatic symptom during the previous week.

Table 1
Participant demographic characteristics (n=100)

Variable	Respondents (n=100)	Nonrespondents (n=15)
Age mean (SD)	40.0 (13.6)	39.2 (12.9)
Gender n (%)		
Male	38 (38.0)	5 (33.3)
Female	62 (62.0)	10 (66.7)
Married n (%)	62 (62.0)	11 (73.3)
BMI* mean (SD)		
Overall	29.8 (5.9)	31.8 (8.3)
Male	28.1 (4.0)	27.6 (5.9)
Female	30.8 (6.6)	34.0 (8.8)
BMI categories n (%)		
Underweight	0	1 (6.7)
Healthy	22 (22.0)	2 (13.3)
Overweight	29 (29.0)	4 (26.7)
Obese	49 (49.0)	8 (53.3)
Educational level n (%)		
No formal education	4 (4.0)	0
Primary school	14 (14.0)	1 (6.7)
High school	22 (22.0)	7 (46.7)
Diploma certificate	10 (10.0)	2 (13.3)
University degree	50 (50.0)	5 (33.3)
Nonsmoker n (%)	93 (93.0)	11 (73.3)

* Body mass index (BMI) categories: underweight (<18.5), healthy (18.5–24.9), overweight (≥25.0), obese (≥30.0), and extremely obese (≥40.0).

At follow-up, 62% of participants reported that they had received physiotherapy treatment in the last 12 months (Table 3). Of those who received physiotherapy treatment, 95% received exercise. In addition, 47% reported that they received multimodal physiotherapy treatment. The characteristics of participants who did not receive physiotherapy treatment in the follow-up period are presented in Appendix B.

Overall, participants were classified as having a moderate disability at follow-up (mean [SD]: 24.4 (15.0) (Appendix C) which was not significantly different to baseline (t_{100}=1.3, p=.197). Participants were also classified as having moderate pain at each time-point (mean [SD]: 4.8 [2.9]). A significant and clinically important reduction in pain (1.4 points [95% CI: 0.8–2.0]) at 12-month follow-up (p<.001) was observed compared to baseline. Sixty percent of participants reported that their back pain had improved relative to baseline, of whom 45% reported it was much improved (GPE score≥3). Of those who reported improvement of their condition, 45% were classified as having a minimal disability at baseline.

Univariate and chi-square analyses of the associations between predictor and outcome variables revealed that age, BMI, education, absenteeism, reporting somatic symptoms, expectation of problematic LBP, VAS, FABQ-work, FABQ-physical activity, DASS-21, and PaBS were each associated with disability at 12-month follow-up (r≥0.4; p<.05; Table 4). Further, age, BMI, education, pain onset,

Table 2
Participant work- and health-related characteristics (n=100)

Work description n (%)		
Clerical, sales, and service workers	9 (9.0)	
Professionals	37 (37.0)	
Managers & administrators	6 (6.0)	
Laborers & related workers	1 (1.0)	
Not in-paid employment	44 (44.0)	
Missing data	3 (3.0)	
Work activities involving mainly n (%)		
Sitting	25 (25.0)	
Standing	8 (8.0)	
Walking	6 (6.0)	
Mixed activities*	60 (60.0)	
Not selected†	1 (1.0)	
Work absenteeism in the past 12 months n (%)	Due to LBP	Due to other illness
0 days	45 (45.0)	53 (53.0)
1–5 days	37 (37.0)	32 (32.0)
6–30 days	10 (10.0)	9 (9.0)
>30 days	8 (8.0)	6 (6.0)
Pain duration (mo) mean (SD), (range)	52.7 (63.6), (3-240)	
Leg pain (yes) n (%)	Last month	Last 12 months
	43 (43.0)	46 (46.0)
Expectation of problematic LBP‡ n (%)		
No	13 (13.0)	
Possibly	43 (43.0)	
Probably	29 (29.0)	
Definitely	13 (13.0)	
Missing	2 (2.0)	
Number distressing somatic symptoms in past week n (%)		
0	41 (41.0)	
1	31 (31.0)	
≥2	28 (28.0)	

* Mixed activities mean the average working day included mixed of sitting or standing and walking.

† Not-selected: participant who did not choose any primary activities.

‡ Expectation of problematic LBP means expectation that LBP would be problematic in 12 months' time.

Table 3
Participant treatment-related characteristics (n=100)

Participants who had physiotherapy treatment after initial evaluation n (%)	
None	38 (38.0)
Yes	62 (62.0)
Total number of sessions mean (SD)	8.2 (12.9)
Types of physiotherapy treatment (of those receiving physiotherapy, n=62: n (%) (yes)	
People who received manual therapy	28 (45.2)
People who received electrotherapy	11 (17.7)
People who received exercise:	59 (95.2)
Aerobic exercise	9 (15.3)
Stretching exercise	2 (3.3)
Strengthening exercise	1 (1.7)
Mixed exercise	33 (55.9)
Other types of exercise	14 (23.7)
Multimodal physiotherapy treatment	29 (47.0)
Other types of treatment: n (%) (yes)	30 (30.0)
Medication (eg, analgesics)	11 (36.6)
Nonsurgical treatment*	2 (6.6)
Yoga	3 (10.0)
Gym exercise	3 (10.0)
Chiropractic treatment	2 (6.6)
Reflexology	2 (6.6)
Cortisone injection	3 (10.0)

* Some types of noninvasive technology used to treat the spine such as Khan Kinetic treatment.

working status, days that LBP prevented work, severity of leg pain, expectation of problematic LBP, ODI, FABQ-work, IPAQ, and manual therapy as a treatment were each associated with pain intensity at 12-month follow-up ($r \geq 0.3$; $p < .05$). Only three significant associations were found between predictor variables and GPE ($r \leq 0.2$; $p < .05$). As associations were very weak, multivariate analysis with GPE as a dependent variable was not conducted.

The multivariate linear regression models for disability at 12-month follow-up resulted in a model explaining 46.7% of the variance (Table 5). The final model was explained by age, ≥1 distressing somatic symptom, FABQ-work and VAS ($p < .05$). Results revealed that a one-point increase in age, FABQ-work, and pain intensity would increase disability scores by 0.22, 0.37, and 1.15 points, respectively. A report of having no somatic symptoms was associated with a level of disability that was 8.05 units lower than the overall mean.

The logistic regression analysis resulted in a model explaining 53.0% (Nagelkerke R^2) of the variance in moderate to severe disability at 12 months and correctly classified 82.0% of cases (Table 5). Those with ≥1 distressing somatic symptom were 4.32 [95% CI=1.41–13.23] times more likely to have moderate–severe disability than those reporting no somatic symptoms. Increasing age, FABQ-work, and pain intensity were each associated with an increased likelihood of moderate–severe disability at 12 months. The odds of moderate–severe disability increased by 1.05 (5%) [95% CI=1.01–1.10] for each increase of 1 unit in FABQ-work, by 1.07 (7%) [95% CI=1.03–1.12] for each increase of 1 year in age, and by 1.36 (36%) [95% CI=1.06–1.75] for each increase of 1 unit in baseline pain intensity.

The multivariate linear regression models for pain intensity at 12-month follow-up resulted in a model explaining 25.7% of the variance (Table 5). The final model was explained by disability at baseline and working status ($p < .05$). These results indicate that a one-point increase in disability would increase pain intensity scores by 0.06 points. Not being in paid employment was associated with a lower level of pain intensity that was 1.7 units lower than the overall mean.

Discussion

This study investigated prognostic factors for continued CLBP-related disability in a Saudi population, which to our knowledge is the first time that a prognostic model for CLBP-related disability has been tested in this population.

Table 4
Univariate analysis and chi-square tests between predictors and outcome variables (n=100)

Outcome variable	Predictor variables	R or χ^2	p Value
Disability	Age	0.40	<.001
	Gender (female)	0.30	.040
	BMI	0.40	<.001
	Marital status (married)	0.30	.040
	Smoking status (yes)	0.20	.040
	Education (university degree)	0.40	.003
	Pain onset (suddenly)	0.20	.343
	Pain duration	0.13	.210
	Working status (not in paid employment)	0.30	.061
	Working activities (sedentary)	0.11	.740
	Absenteeism (0−5 days)	0.40	.006
	Days of LBP prevented work (0−5 days)	0.32	.020
	Knowing someone who had LBP (yes)	0.23	.143
	Reporting≥2 somatic symptoms	0.50	.001
	Self-reported leg pain (yes)	0.30	.070
	Expectation of problematic LBP (possibly)	0.40	.001
	Previous consultation for LBP (yes)	0.30	.040
	Baseline pain intensity (VAS)	0.44	<.001
	Back beliefs (BBQ)	0.20	.04
	Fear avoidance-physical activity (FABQ)	0.40	<.001
	Fear avoidance-work (FABQ)	0.54	<.001
	Depression, stress, and anxiety (DASS-21)	0.40	<.001
	Pain behaviors (PaBS)	0.41	<.001
	Physical activity (IPAQ)	0.32	.003
	Number of physiotherapy sessions	0.22	.032
	Manual therapy (yes)	0.11	.750
	Electrotherapy (yes)	0.22	.197
	Exercise (yes)	0.24	.133
	Multimodal physiotherapy treatment (yes)	0.10	.980
	Other types of treatment (yes)	0.10	.823
Pain intensity	Age	0.32	.001
	Gender (female)	0.22	.096
	BMI	0.30	.008
	Marital status (married)	0.20	.167
	Smoking status (yes)	0.20	.152
	Education (university degree)	0.40	.002
	Pain onset (suddenly)	0.30	.011
	Pain duration	0.10	.389
	Working status (not in paid)	0.40	.001
	Working activities (sedentary)	0.10	.856
	Absenteeism (0−5 days)	0.20	.334
	Days of LBP prevented work (0−5 days)	0.30	.020
	Knowing someone who had LBP (yes)	0.20	.236
	Reporting ≥2 somatic symptoms	0.14	.390
	Self-reported leg pain (yes)	0.30	.011
	Expectation of problematic LBP (possibly)	0.30	.018
	Previous consultation for LBP (yes)	0.20	.138
	Baseline disability (ODI)	0.40	<.001
	Back beliefs (BBQ)	0.11	.271
	Fear avoidance-physical activity (FABQ)	0.21	.035
	Fear avoidance-work (FABQ)	0.30	.002
	Depression, stress, and anxiety (DASS-21)	0.12	.256
	Pain behaviors (PaBS)	0.10	.310
	Physical activity (IPAQ)	0.30	.009
	Number of physiotherapy session	0.20	.135
	Manual therapy (yes)	0.30	.022
	Electrotherapy (yes)	0.11	.547
	Exercise (yes)	0.20	.338
	Multimodal physiotherapy treatment (yes)	0.20	.320
	Other types of treatment (yes)	0.20	.272
GPE	Age	0.21	.040
	Gender (female)	0.14	.400
	BMI	0.04	.700
	Marital status (married)	0.12	.500
	Smoking status (yes)	0.14	.400
	Education (university degree)	0.13	.443
	Pain onset (suddenly)	0.20	.190
	Pain duration	0.01	.960
	Working status (not in paid)	0.20	.270
	Working activities (sedentary)	0.20	.340
	Absenteeism (0−5 days)	0.10	.810
	Days of LBP prevented work (0−5 days)	0.20	.290
	Knowing someone who had LBP (yes)	0.10	.690
	Reporting≥2 somatic symptoms	0.10	.766
	Self-reported leg pain (yes)	0.10	.759
	Expectation of problematic LBP (possibly)	0.20	.365
	Previous consultation (yes)	0.20	.240
	Baseline pain intensity (VAS)	0.21	.035
	Baseline disability (ODI)	0.20	.130
	Back beliefs (BBQ)	0.10	.450
	Fear avoidance-physical activity (FABQ)	0.14	.164
	Fear avoidance-work (FABQ)	0.24	.017
	Depression, stress, and anxiety (DASS-21)	0.14	.152
	Pain behaviors (PaBS)	0.03	.740
	Physical activity (IPAQ)	0.20	.101
	Number of physiotherapy session	0.10	.542
	Manual therapy (yes)	0.10	.595
	Electrotherapy (yes)	0.14	.401
	Exercise (yes)	0.03	.954
	Multimodal physiotherapy treatment (yes)	0.13	.580
	Other types of treatment	0.14	.400

BMI, body mass index; VAS, visual analogue scale; BBQ, back beliefs questionnaire; FABQ, fear-avoidance beliefs questionnaire; DASS-21, depression anxiety and stress scale; PaBS, pain behaviors scale; IPAQ, international physical activity questionnaire; GPE, general perceived efficacy.

Table 5
Multivariate regression models at 12 months

Outcome variable	Predictor variable	β coefficient (SE) or odds ratio	95% CI	p Value
Disability (ODI)*	Age	0.22 (0.106)	0.008–0.429	.042
	No reported somatic symptoms	−8.05 (3.588)	−15.186 to −0.914	.028
	Fear-avoidance beliefs work (FABQ)	0.369 (0.123)	0.125–0.612	.003
	Pain intensity (VAS)	1.149 (0.535)	0.086–2.212	.035
Moderate to severe disability at 12 months (ODI)†	Somatic symptoms			
	No reported somatic symptom	1 (Ref)		
	Reported ≥1 somatic symptom	4.32	1.41–13.23	.010
	Pain intensity (VAS)	1.36	1.06–1.75	.016
	Age	1.07	1.03–1.12	.002
	Fear avoidance beliefs-work (FABQ)	1.05	1.01–1.10	.024
Pain intensity (VAS)‡	Working status "not in-paid"	−1.698 (0.730)	−3.155 to −0.241	.023
	Disability (ODI)	0.063 (0.028)	0.007–0.119	.029

ODI, Oswestry disability index; FABQ, fear-avoidance beliefs questionnaire; VAS, visual analogue scale.

* Nagelkerke R^2 53.9% (adjusted R^2=0.467) of the variance (n=100). These results indicate that a one-point increase in age, fear-avoidance work and pain intensity would increase disability scores by 0.22, 0.37, and 1.15 points, respectively. A report of having no somatic symptoms was associated with lower disability that was 8.05 units lower than the overall mean.

† Results from multivariate logistic regression analysis for moderate to severe disability at 12 months (n=52). Moderate to severe disability was defined as: scored≥21% in ODI. Nagelkerke R^2 53.0% correctly classified 82.0% of cases.

‡ Nagelkerke R^2=37.7% (adjusted $\underline{R}^2$=0.257) of the variance (n=100). These results indicate that a one-point increase in disability would increase pain intensity scores by 0.06 points. Not being in paid employment was associated with lower level of pain intensity that was 1.7 units lower than the overall mean.

The prognostic model for moderate–severe disability at 12 months explained 53.0% of the variance, with higher pain intensity, higher fear avoidance-work and older age predicting higher disability, while having no additional distressing somatic symptoms was a predictor of lower disability. Pain intensity at 12-month follow-up (25.7% of variance explained) was explained by higher disability at baseline, while not being in paid employment seemed to be protective in this population.

Among this population, our prognostic model for moderate–severe CLBP-related disability at 12 months explained 53.0% of the variance. Despite the cultural differences, this is comparable to previous international reports in longitudinal studies that reported models explained between 41% and 53% [46–48] of variance but higher than other studies where between 31% and 35% [23,49,50] of variance was explained. The final model included pain intensity, age, fear avoidance beliefs (work), and reporting additional somatic symptoms as predictors of continued disability. In line with the broader literature, this finding indicates that long-term CLBP-related disability in Saudi Arabia has multifactorial contributions. Despite the differences in predictor variables measured across different prognostic studies [25,51], some variables, such as pain intensity and age consistently predict higher disability among the CLBP population [14,15,23,25,46,52], which is consistent with our findings. While pain is a complex phenomenon, pain intensity may be a modifiable risk factor. Different interventions such as exercise and manual therapy have been shown to effectively improve pain intensity [53,54].

A previous report has also shown somatic symptoms to be associated with CLBP-related disability [55]. Our results are consistent with international data that showed the odds of having moderate to severe disability were increased for those who had one or more somatic symptoms; however, those who reported no somatic symptoms had a lower risk of disability [56,57]. Somatic symptoms may be linked to different psychological factors such as depression and anxiety with subsequent effects on pain and disability [58]. Further, the report of somatic symptoms may reflect the presence of other comorbidities [59] and may also be linked with central sensitization as highlighted in tools such as the central sensitization inventory [60] which feature similar factors. Somatic symptoms have been minimally investigated among the Saudi population. Further studies are warranted to examine whether somatic symptoms in this population are associated with other comorbidities and/or psychological factors.

Our results are also consistent with previous research results showing that higher fear-avoidance is prognostic of greater disability [23,47,61]. The fear avoidance model highlights a pathway for how fear, pain catastrophizing and unhelpful health information can influence disability and contribute to a vicious cycle of pain and disability [62]. This suggests that fear-avoidance may be an important target for management intended to reduce CLBP-related disability as reduction in fear–avoidance score has been shown to be related to reduction in disability [63]. Further research is needed in the Saudi population to examine the influence of targeting fear avoidance beliefs as a management strategy.

Regarding pain intensity, our regression model explained 25.7% of the variance of CLBP-related pain intensity. This result is comparable to the amount of variance explained in the broader literature, for example, between 23% and 32% [23,46,48]. The final model in this

study revealed that baseline disability and "not being in paid employment" were important variables predicting pain intensity at 12-month follow-up. Despite the cultural differences, the finding of baseline disability being a prognostic factor is similar to previous reports [7,23,46,48]. The pain–disability relationship we observed in people with CLBP appears to be bidirectional as the presence of each factor was prognostic of the other. However, the interaction between pain and disability is not fully clear [6]. Fear avoidance and self-efficacy have been proposed as mechanisms to explain aspects of pain–disability relationship [64]. For example, while people with chronic pain may fear performing an activity, which they anticipate will cause pain, whether or not they subsequently perform the activity depends on how confident they were in being able to cope with the pain [65].

Our finding that not being in paid employment reduced the risk of long-term disability contrasts with several previous reports. Typically, being unemployed is a predictor of increased risk of CLBP-related disability at long term [47]. As such, our conflicting finding here is somewhat surprising. This may be due to reduced exposure to psychosocial risk factors associated with higher stress at work [66]. A further possibility is the reduction of exposure to occupational physical risk factors such as awkward postures and prolonged sitting could contribute to this finding [67]. Finally, consideration of this finding in light of Saudi culture is important. In this population, cultural norms mean many Saudi families have home help, thus reducing the burden of household duties. As 44% of our study cohort were not in paid employment and included 28% of home makers, it may be that the impact of their CLBP on daily activities was lower due to the lower burden of household duties because of home help. Further investigation of this factor is warranted among similar cultures to elucidate this factor.

Treatment-related factors at 12-month follow-up were not associated with outcome in this study except for a weak association between pain and manual therapy as a treatment modality. Interestingly, exercise had no impact on outcome. This finding was unexpected as it differs from the current knowledge of the role of exercise therapy for people with CLBP [68]. For example, strength/resistance exercise has been found to improve the strength and functional abilities among people with CLBP [68]. Possible explanations could be the way exercise was delivered and/or participants' adherence with exercise. It is not known whether our participants were supervised or adhered with the program provided or not. It has been reported that exercise programs should be supervised and individually tailored to be effective [69]. A previous report among Saudis has shown a high level of nonadherence to their exercise program [70]. Further, possible factors impacting exercise adherence may be linked to previously identified barriers for physical activity in Saudi Arabia, for example, high ambient temperatures in Riyadh, lack of social support, lack of time, and lack of designated areas for females for exercise [21,71,72]. However, some of these barriers are currently being addressed in Saudi Arabia which will likely influence future physical activity research in this area. Healthcare is one of the main focus areas of the ambitious Saudi Vision 2030, a national transformation program that seeks to improve the quality of healthcare services and facilities across the Kingdom to improve public health services.

The presence of comorbidities in our sample such as obesity may also have influenced the effects of exercise as has been previously demonstrated [70,73]. Finally, while most people who received physiotherapy reported being prescribed an exercise program in line with clinical guidelines [74], it is worth noting that only 62% of people attended physiotherapy, which again may affect the interpretation of these results. These findings in the Saudi population are novel and important and indicate that further examination of the relationship between disability and exercise therapy is warranted.

Our results indicate an overall trend toward improvement in pain intensity (ie, significant and clinically relevant reduction in pain intensity of 1.4 points at 12-month follow-up compared to baseline) but not in disability. However, 60% of the cohort reported improvement of their condition on the GPE scale, 45% of whom reported being much improved. As 45% of those who reported improvement were classified as having a mild disability at baseline, they might be less likely to show a meaningful reduction in disability if they were not very disabled at baseline. These findings indicate that the course of recovery in this sample is consistent with the previous literature in other CLBP populations [7].

Clinical implications

This study identified key prognostic factors that clinicians can use in practice to identify those at risk of ongoing CLBP-related disability and pain. Specifically, somatic symptoms have not been previously examined in research or clinical practice among Saudis. Therefore, clinicians should routinely assess for the presence of somatic symptoms. This may prompt further assessment and/or treatment of comorbid symptoms and their potential underlying mechanisms.

Given the evidence for the influence of pain intensity and fear avoidance on disability, undertaking a multidimensional examination inclusive of these factors may help identify those who are at risk, and may influence clinical decision-making. Targeting modifiable risk factors that drive pain and disability, for example, pain-related fear may hold benefits clinically [75]. Further research is warranted to investigate the effectiveness of targeting modifiable risk factors in reducing CLBP-related disability and pain among Saudis.

Strengths and limitations

The main strength of this study is that a range of different factors was examined for their association with

disability for the first time among a Saudi population, providing novel results on different prognostic factors for CLBP-related disability over 12 months. This study also has some limitations. While a range of variables was investigated, CLBP is highly complex and the models yielded may not capture this complexity, suggesting other frameworks may need investigation. Examination of this population over multiple time points, with larger sample sizes, would be important to track any changes in disability. The participant group is representative of city dwelling individuals. However, rural populations may have different patterns of habitual physical and household activities, social roles, and customs [76]. Therefore, further examination in rural populations might be important to further examine predictive factors. Outcome and most predictor variables were based on self-report questionnaires. As a result, it is hard to rule out the possibility of recall bias which may lead to under- or overestimation. While this study identifies predictive variables, no inferences about causality can be made. No Hosmer–Lemeshow goodness of fit test was estimated and no internal or external validation of the model was undertaken so the explained variance may be optimistic. Hence, there may be limited ability to make any causal inference about specific treatments. However, pending larger studies this model serves as useful means of identifying relevant factors associated with long-term disability in the Saudi CLBP population context.

Conclusion

The study results supported the multifactorial nature of CLBP and reported an important prognostic model in the Saudi population. Specifically, pain intensity at baseline, somatic symptoms, fear-avoidance beliefs, and age were identified as important predictors of CLBP-related disability. Further evaluation of the effects of clinical management of these factors on CLBP-related disability in Saudi people is warranted. This study also supports the role of baseline disability for predicting pain intensity at 12-month follow-up. However, the results contradict previous reports that being unemployed is a predictor of increased risk of CLBP-related disability. This may reflect cultural factors unique to Saudi Arabia

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Supplementary materials

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