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Pain, mood, and suicidal behavior among injured working adults in Chile

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Abstract

Background: Chronic pain is comorbid with psychiatric disorders, but information on the association of chronic pain with depressive symptoms, generalized anxiety, and suicidal behavior among occupational cohorts is inadequate. We investigated these associations among employed Chilean adults.

Methods: A total of 1946 working adults were interviewed during their outpatient visit. Pain was assessed using the Short Form McGill Pain questionnaire (SF-MPG) while depression and generalized anxiety were examined using the Patient Health Questionnaire-9 (PHQ-9) and Generalized Anxiety Disorder-7 (GAD-7), respectively. The Columbia–Suicide Severity Rating Scale was used to assess suicidal behavior and suicidal ideation. Multivariable logistic regression models were used to estimate adjusted odds ratios (aORs) and 95% confidence intervals (95%CI) for the association of chronic pain with mood disorders, as well as suicidal behavior.

Results: High chronic pain (SF-MPG > 11) was reported by 46% of participants. Approximately two-fifths of the study participants (38.2%) had depression, 23.8% generalized anxiety, 13.4% suicidal ideation, and 2.4% suicidal behavior. Compared to those with low pain (SF-MPG ≤ 11), participants with high chronic pain (SF-MPG > 11) had increased odds of experiencing depression only (aOR = 2.87; 95% CI: 2.21–3.73), generalized anxiety only (aOR = 2.38; 95% CI: 1.42–3.99), and comorbid depression and generalized anxiety (aOR = 6.91; 95% CI: 5.20–9.19). The corresponding aOR (95%CI) for suicidal ideation and suicidal behavior were (aOR = 2.20; 95% CI: 1.58–3.07) and (aOR = 2.18 = 95% CI: 0.99–4.79), respectively.

Conclusions: Chronic pain is associated with increased odds of depression, generalized anxiety, and suicidal behavior. Mental health support and appropriate management of patients experiencing chronic pain are critical.

Keywords: Pain, Chronic pain, Depression, Anxiety, Suicidal ideation, Suicidal behavior, Injured working adults

Introduction

Chronic pain is a debilitating health condition estimated to affect 1 in 5 adults worldwide [1] with profound emotional and cognitive effects [2] and economic impacts, including loss of productivity, absenteeism due to illness, presenteeism, and loss of employment [3]. In the United States alone, 100 million adults — more than the number

affected by heart disease, diabetes, and cancer combined — suffer from common chronic pain conditions, with an estimated loss in productivity due to chronic pain being \$61 billion per year [4]. Several epidemiologic studies have shown associations between chronic pain and mood disorders, including generalized anxiety and depression [5–8]. More than half of people treated for depression also report problems with pain [9]. A growing body of evidence shows patients suffering from chronic physical pain are more likely to report suicidal behavior, ideation, plans, and/or attempts [10–14]. Of note, patients

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with chronic pain are at an increased risk of dying from suicide compared to those without chronic pain [13, 14]. Few previous studies have examined the association between chronic pain and depression and generalized anxiety in South America, including in Colombia [8, 15], Brazil [7, 16, 17], Paraguay [7] and Ecuador [7]. Only two of these previous studies have examined the association between pain and suicidal behaviors [18, 19], with one study reporting null findings [19].

Given that (1) few studies have examined pain with depression, generalized anxiety, and suicidal behaviors in South American populations; (2) one previous study found no association between pain and suicide risk in Colombia [19], and (3) no study has been conducted in Chile, the most stable and prosperous country in South America, we conducted a larger-scale cross-sectional epidemiological study to investigate the association of chronic pain with symptoms of depression, generalized anxiety, and suicidal behavior among injured working adults in Chile.

Materials and methods

Study population

The sample for this study included participants of the Stress, Pain, Sleep, and Neuropsychiatric Disorders (SPLendid) study in a workers' compensation hospital system in Chile. The SPLendid study was designed to examine pain, work-related stress, and neuropsychiatric outcomes in the context of injured working adults in Chile with the intention of developing workplace intervention programs. The study was conducted between September 2015 and February 2018 among patients attending the Hospital del Trabajador in Santiago, Chile. The Hospital del Trabajador is the largest workers' compensation hospital and the referral center for trauma and professional diseases of Asociación Chilena de Seguridad, the biggest workers' compensation system in Chile, with almost 2.5 million affiliated workers. Working adults were eligible for the study if they attended the workers' compensation hospital for the following injuries: spinal cord, mild brain injury, bone fractures, burns, and soft tissue injuries of various etiologies. Eligible participants also must be able to read and write Spanish. All participants provided written informed consent. The institutional review boards of the Hospital del Trabajador, Santiago, Chile, and the Office of Human Research Administration, Harvard T.H. Chan School of Public Health, Boston, MA, approved all procedures used in this study.

Analytic population

A total of 2000 participants were interviewed. Of these, 21 participants were excluded due to missing information

on the Short Form McGill Pain Questionnaire, 4 were excluded for missing information on the Patient Health Questionnaire-9, 8 were excluded for missing information on the Generalized Anxiety Disorder-7, 9 were excluded for missing data on CSSRS suicidal ideation, 22 were excluded for missing data on CSSRS suicidal behavior, and 1 participant was excluded for being outside the age range (>85). A total of 1946 participants were included in the final analysis.

Study procedures

Pain assessment

The Short-Form McGill Pain Questionnaire (SF-MPG) was used to measure current perceived pain among adults with chronic pain [20]. The SF-MPG comprises two subscales: a sensory subscale with 11 words or items and an affective subscale with 4 words or items. The sensory subscale includes items that describe the properties of the pain experienced (i.e., continuous, intermittent or neuropathic pain), whereas the affective subscale includes items that describe the emotional perception of pain (i.e., tiring-exhausting, sickening, fearful, and punishing-cruel) [21]. The items are rated on a Likert Scale for pain intensity with 0 = none, 1 = mild, 2 = moderate, and 3 = severe. The total score is obtained by summing the item scores. The sensory subscale total score ranges from 0 to 33, and affective subscale total score ranges from 0 to 12. The SF-MPG total overall score ranges from 0 to 45. We used the median score of the two subscales to define high and low pain scores (SF-MPG median: 11.0, SF-MPG sensory subscale median: 9.0, SF-MPG affective subscale median: 2.0). This approach is consistent with prior studies that summarized pain scores based on their distribution in the absence of a clinical diagnostic cutoff [22, 23]. In addition, the median split is a common method used to dichotomize variables in psychological research [24, 25], and in other fields [26], and often-times it is viewed as a more parsimonious way to split continuous data [24]. In addition, the cut-off we used to group between low and high pain in our study was consistent with mean scores [27, 28] and median scores [29] reported in the literature for the SF-MPG.

Depressive symptoms assessment

The Patient Health Questionnaire-9 (PHQ-9) was used to screen participants for depression. The PHQ-9 contains 9 questions about a participants' depression symptoms over the 14 days prior to assessment. The items were scored from 0 to 3 according to the response categories: never, several days, more than half the days, or nearly every day. The total PHQ-9 score ranged from 0 to 27, and presence of depressive symptoms was defined as a PHQ-9 score ≥ 10 based on the accepted diagnostic

properties for depression at this cut-off [30]. The PHQ-9 was previously validated in Spanish-speaking populations [31, 32] and specifically in the Chilean population [33].

Generalized anxiety symptoms assessment

Generalized anxiety symptoms was assessed using the Generalized Anxiety Disorder Scale (GAD-7). The GAD-7 contains seven questions about generalized anxiety symptoms over the 14 days prior to assessment. Items were scored from 0 to 3 according to response categories: never, several days, more than half the days, or nearly every day. The total score ranges from 0 to 21. The presence of anxiety symptoms was defined as a GAD-7 score ≥ 10 , being this a reasonable cut-point to identify moderate to severe cases of GAD [34]. The GAD-7 has previously been used in Spanish-speaking populations [35, 36].

Suicidal assessment

Suicidal ideation and suicidal behaviors during the past month were assessed using the Columbia Suicidal Rating Scale (C-SSRS) Screen version [37, 38]. The C-SSRS Screen is a structured interview based on the more comprehensive full-length version. The scale measures suicidal ideation severity and suicidal behavior using two subsets of items. The first subset captures suicidal ideation severity during the past month. The questions ask: wish to be dead, non-specific active suicidal thoughts, suicidal thoughts with methods, suicidal intent, and suicidal intent with plan. The second subset measures suicidal behavior during the past three months. The questions asked about the presence of actual and aborted suicide attempts. For the purposes of the present study, suicidal ideation was defined by a “yes” answer to any one of the five suicidal ideation severity items. Suicidal behavior was defined as a “yes” answer to the suicidal behavior question. The C-SSRS has previously been validated in Spanish-speaking populations [39, 40].

Covariates

Structured questionnaires were used to determine participants' sociodemographic and occupational characteristics. Participants age was categorized as 18–24, 25–34, 35–44, 45–54, 55–64, 65–74, and 75–84 years. Other sociodemographic characteristics examined were sex (male vs. female), country of birth (Chile vs. others), belonging to indigenous or native groups (no vs. yes), highest degree of education attained (elementary school, high school, college or technical training), marital status (married/living with a partner, single, previously married), body mass index (BMI; < 18.5 , 18.5 – 24.9 , 25 – 29.9 , > 30 kg/m²), lifetime smoking (no vs. yes), and lifetime alcohol consumption (no vs. yes). Participants'

occupational characteristics included work sector (construction, finance, commercial, manufacturing, public services, transportation, others), type of occupation (administrative, manual worker, professional, salesperson, technician, teacher, others), time since the accident in days (1–42 days: Acute; 43–84 days: Subacute; > 84 days: Chronic) [41, 42], type of accident (commute or work injury), and type of injury (burn, fall, cut, attrition, firearm, blunt trauma, repetitive use, others) [43].

Statistical analysis

Frequency distributions of sociodemographic and occupational characteristics were examined using mean \pm standard deviation (SD) for continuous variables and numbers and percentages (%) for categorical variables. Associations between pain status and sociodemographic and occupational characteristics were examined using Chi-squared tests for categorical variables and analysis of variance (ANOVA) for continuous variables. The median value [25th and 75th percentiles] was calculated for time since the accident, as the distribution of these values was right-skewed. Wilcoxon-Mann Whitney test was used to evaluate differences in medians. PHQ-9 and GAD-7 scores were used to create categorical variables: depression or anxiety symptoms (no vs. yes); and mood disorder status (no depression or anxiety, depression only, anxiety only, or both depression and anxiety). Multivariable logistic regression procedures were used to calculate odds ratios (ORs) and 95% confidence intervals (95% CI) for the association of chronic pain with depressive symptoms, generalized anxiety symptoms, and suicidal behaviors. We fit separate models with symptoms of depression, generalized anxiety and suicidal behaviors as outcome and chronic pain as exposure. Assessment of confounders was performed by entering a priori selected putative confounders (e.g., age, sex, marital status, type of workplace and type of injury) [44–46] into a logistic regression model one at a time and by comparing the adjusted OR (aOR) and unadjusted ORs. Final logistic regression models included covariates that altered unadjusted ORs by at least 10%. Additionally, the suicidal ideation and behavior models included further adjustment for depression status as measured by the first eight questions of the PHQ-9 [46, 47]. Question 9 was not included since it asks about suicidal ideation (“Thoughts that you would be better off dead, or of hurting yourself in some way”). The PHQ-8 depression questionnaire has been demonstrated to minimally influence scale performance, mean scores, or diagnostic cut points compared with the PHQ-9 [48, 49]. Statistical analyses were performed using SPSS Statistics, Version 23.0 (IBM SPSS v23.0, Armonk, NY, USA).

Results

Sociodemographic characteristics of the study population are shown in Table 1. The mean age of participants was 45.9 ± 13.7 years old. Participants were more likely to be men (72.9%) and born in Chile (94.1%). Only 3.2% of participants self-identified as belonging to an indigenous or native group. Most participants had at least a high school or some college education (83.9%), were married or living with a partner (62.1%) and had a lifetime history of smoking (58.4%) and alcohol consumption (61.8%). Approximately 46% of participants were classified as having high perceived chronic pain as measured by the SF-MPG. Participants with high pain were more likely to be older, men, and be more highly educated ($p < 0.001$; Table 1).

Participants worked in the sectors of manufacturing (26.6%) or public services (21.4%). The majority of participants were most likely to classify their occupation as manual workers (58.1%). The median time since their accident was 188 days. The majority of accidents occurred during work (65.6%) and were attributed to falling (35.5%) or blunt trauma (32.6%). Participants with high pain were less likely to be manual workers, reported a longer time since the accident occurred, and were also more likely to have falling or blunt trauma injuries ($p < 0.001$; Table 2).

Psychiatric characteristics of the population are presented in Table 3. Overall, 38.2% of the population had depression symptoms, and 23.8% had generalized anxiety symptoms. 13.4% of the study population had suicidal ideation, and 2.4% had suicidal behavior. Participants with high pain were significantly more likely to have depression or generalized anxiety symptoms, suicidal ideation, and suicidal behavior (Table 3).

Participants with high pain had 4.05-fold increased odds of experiencing symptoms of depression or generalized anxiety compared to those who reported low pain after adjusting for sociodemographic and occupational confounders (aOR = 4.05; 95%CI: 3.32–4.94). Compared to participants with low pain, those who reported high pain had higher odds of depression (aOR = 2.74; 95% CI: 2.13–3.52) and generalized anxiety symptoms alone (aOR = 2.16; 95% CI: 1.32–3.53), and co-occurring symptoms of depression and generalized anxiety (aOR = 7.19 95% CI: 5.45–9.51). After adjusting for putative confounders, participants with high pain had 3.48-fold increased odds of reporting suicidal ideation than those with low pain (aOR = 3.70; 95%CI: 2.72–5.04). Further adjustment for depressive symptoms attenuated this association but remained strong (aOR = 2.34; 95%CI: 1.68–3.27). Participants with high pain had 4.05-fold increased odds of reporting suicidal behavior compared to those with low pain (OR = 4.05; 95%CI: 1.92–8.54).

After adjusting for symptoms of depression, the magnitude of the association between high pain and suicidal behavior was attenuated (OR = 2.35; 95%CI: 1.08–5.07; Table 4). We further conducted an additional analysis using the SF-MPG continuous score, and the interpretation remained the same, but the associations were largely attenuated (Supplementary Table 1). The associations between pain and symptoms of depression, generalized anxiety, and suicidal behaviors were similar when analyzed separately using the SF-MPG sensory pain and affective pain subscales (Supplementary Tables 2 and 3).

Discussion

Pain is highly prevalent and contributes greatly to morbidity and mortality. In a review of 18 adult population surveys from 10 high-income countries (HICs) and seven low- or middle-income countries LMICs ($N = 42,249$), the prevalence of chronic pain was 37.3% in HICs and 41.1% in LMICs [8]. In our study of injured Chilean working adults, 46% of participants were classified as having chronic pain, and they were more likely to be older, men, current smokers, and had higher levels of education compared to participants with low pain. Our study findings and available data collectively show that chronic pain is generalized. The positive association that we observed between chronic pain and age was largely consistent with findings reported from other epidemiologic studies [50, 51]; however, the prevalence of pain across demographic characteristics such as gender and education level in our study differed from previous evidence [51], including that from a study conducted in Chile and another in Colombia [52, 53]. These differences in the prevalence of chronic pain might be attributable to differences in populations included, measurement scales used, and study designs employed.

Chronic pain was associated with depression and anxiety spectrum disorders in both LMICs and HICs [8]. In a recent review of 47 LMICs ($N = 273,952$), depression was significantly associated with severe pain in 44 of the 47 countries included (OR = 3.93; 95% CI 3.54–4.37) [7]. Neither of these prior reviews includes associations between pain and mood disorder symptoms in a Chilean population. This is important as chronic pain has been reported to be highly prevalent in 32% of the general population [52]. To the best of our knowledge, our study is the first to examine this association in a Chilean population. Taken together, our study and previous work demonstrate a robust association between chronic pain and mood disorders, including depression and anxiety.

Previous studies have examined the association between chronic pain and suicidal behaviors. Several studies conducted in the United States [54, 55], Australia [56], Canada [57], Japan [58], and India [59] have shown

Table 1 Sociodemographic characteristics of a population of injured working adults in Santiago, Chile according to pain status as measured by the Short-Form McGill Pain Questionnaire ^a (N = 1946)

Characteristics	All participants (N = 1946)		Low pain (N = 1053)		High pain (N = 893)		P-value
	n	%	n	%	n	%	
Age (years), mean \pm SD ^b	45.9 \pm 13.7		44.6 \pm 14.2		47.4 \pm 12.9		< 0.001
18–24	141	7.2	97	9.2	44	4.9	< 0.001
25–34	347	17.8	213	20.2	134	15.0	
35–44	366	18.8	207	19.7	159	17.8	
45–54	494	25.4	237	22.5	257	28.8	
55–64	452	23.2	219	20.8	233	26.1	
65–74	129	6.6	71	6.7	58	6.5	
75–84	17	0.9	9	0.9	8	0.9	
Sex							
Men	1418	72.9	842	80.0	576	64.5	< 0.001
Women	528	27.1	211	20.0	317	35.5	
Country of birth							
Chile	1832	94.1	981	93.2	851	95.3	0.046
Other	114	5.9	72	6.8	42	4.7	
Belong to indigenous/native group							
No	1883	96.8	1021	97.0	862	96.6	0.685
Yes	62	3.2	32	3.0	30	3.4	
Highest degree of education							
Elementary school	313	16.1	150	14.3	163	18.3	0.002
High school	1066	54.8	615	58.5	451	50.5	
College or technical training	566	29.1	287	27.3	279	31.2	
Marital Status							
Married/living with a partner	1207	62.1	681	64.7	526	58.9	< 0.001
Single	464	23.9	259	24.6	205	23.0	
Previously married ^c	274	14.1	112	10.6	162	18.1	
Body Mass Index (kg/m ²)							
< 18.5	12	0.6	7	0.7	5	0.6	0.291
18.5–24.9	468	24.1	263	25.0	205	23.1	
25–29.9	842	43.4	466	44.3	376	42.3	
> 30	617	31.8	315	30.0	302	34.0	
Lifetime smoking							
No	810	41.6	442	42.0	368	41.2	0.733
Yes	1136	58.4	611	58.0	525	58.8	
Current smoking							
No	1417	72.8	799	75.9	618	69.2	0.001
Yes	529	27.2	254	24.1	275	30.8	
Lifetime alcohol consumption							
No	744	38.2	363	34.5	381	42.7	< 0.001
Yes	1202	61.8	690	65.5	512	57.3	
Current alcohol consumption							
No	739	38.0	358	34.0	381	42.7	< 0.001
Yes	1206	62.0	695	66.0	511	57.3	

^a Categorical variable for SF-MPG total score uses a median split with low reported pain categorized as below the median and high pain as above the median (SF-MPG median: 11.0)

^b Based on reported age

^c Widowed, separated, or divorced

Table 2 Occupation and injury characteristics of a working adult population in Santiago, Chile according to pain status as measured by the Short-Form McGill Pain Questionnaire ^a (N = 1946)

Characteristics	All participants (N = 1946)		Low pain (N = 1053)		High pain (N = 893)		P-value	
	n	%	n	%	n	%		
Occupation								
Work sector								
Construction	217	11.2	134	12.7	83	9.3	< 0.001	
Finances	36	1.8	23	2.2	13	1.5		
Commercial	356	18.3	222	21.1	134	15.0		
Manufacturing	518	26.6	294	27.9	224	25.1		
Public services	417	21.4	188	17.9	229	25.6		
Transportation	175	9.0	104	9.9	71	8.0		
Other ^b	227	11.7	88	8.4	139	15.6		
Type of occupation								
Administrative	262	13.5	152	14.4	110	12.3	< 0.001	
Manual worker	1130	58.1	662	62.9	468	52.5		
Professional	130	6.7	68	6.5	62	7.0		
Salesperson	52	2.7	25	2.4	27	3.0		
Technician	157	8.1	62	5.9	95	10.7		
Teacher	14	0.7	7	0.7	7	0.8		
Other ^c	200	10.3	77	7.3	123	13.8		
Diagnosis and injury								
Time since the accident, median [IQR] (days) ^d	188 [71–524]		153 [59–391]		245 [88–846]		< 0.001	
Acute (1–42)	291	15.0	181	17.2	110	12.3		< 0.001
Subacute (43–84)	267	13.7	161	15.3	106	11.9		
Chronic (> 84)	1388	71.3	711	67.5	677	75.8		
Type of accident								
Commute	669	34.4	337	32.0	332	37.3	0.015	
Work injury	1275	65.6	716	68.0	559	62.7		
Type of injury								
Burn	49	2.5	28	2.7	21	2.4	< 0.001	
Fall	690	35.5	346	32.9	344	38.5		
Cut	192	9.9	134	12.7	58	6.5		
Attrition	249	12.8	159	15.1	90	10.1		
Firearm	33	1.7	27	2.6	6	0.7		
Blunt trauma	635	32.6	318	30.2	317	35.5		
Repetitive use	7	0.4	4	0.4	3	0.3		
Other	90	4.6	36	3.4	54	6.0		

^a Categorical variable for SF-MPG total score uses a median split with low reported pain categorized as below the median and high pain as above the median (SF-MPG median: 11.0). ^b Includes agriculture, education, security, cleaning services, administration, food service, automotive, mining, retired, gardener, electrical engineer, maintenance, etc. ^c Includes chauffeur, conductors, concierge, security guard, food service, landlord, food distribution, telecommunication, machine operator, cleaning services, etc. ^d Median value [25th and 75th percentiles] were calculated for time since accident, since the distribution of these values was right skewed. Wilcoxon-Mann Whitney test was used to evaluate differences in medians. Fisher's exact test was used to assess difference between categorical variables

associations between chronic pain and suicidal ideation or behaviors. For example, among U.S. adults (N = 5692), the presence of a pain condition was significantly associated with lifetime suicidal ideation (OR = 1.4; 95%CI: 1.1–1.8) and plans (OR = 1.5; 95%CI: 1.1–2.1) [55]. Among Canadian adults over 66 years old, completed

suicide was associated with moderate (OR = 1.91; 95% CI: 1.66–2.20) and severe pain (OR = 7.52; 95% CI: 4.93–11.46). Among patients admitted for attempted suicide and controls at a teaching hospital in India (N = 137 patients and N = 137 controls), those with idiopathic pain (OR = 6.78; 95% CI: 2.39–20.76) and physical illnesses

Table 3 Psychiatric characteristics of a population of injured working adults in Santiago, Chile according to pain status as measured by the Short-Form McGill Pain Questionnaire^a (N = 1946)

Characteristics	All participants (N = 1946)		Low pain (N = 1053)		High pain (N = 893)		P-value
	n	%	n	%	n	%	
Depression ^b or anxiety							
No	1131	58.1	778	73.9	353	39.5	< 0.001
Yes	815	41.9	275	26.1	540	60.5	
Depression or anxiety							
No	1131	58.1	778	73.9	353	39.5	< 0.001
Depression only (PHQ-9)	352	18.1	154	14.6	198	22.2	
Anxiety only (GAD-7)	71	3.6	35	3.3	36	4.0	
Both depression and anxiety	392	20.1	86	8.2	306	34.3	
Suicidal Ideation							
Suicidal ideation							
No suicidal ideation	1685	86.6	989	93.9	696	77.9	< 0.001
Suicidal ideation	261	13.4	64	6.1	197	22.1	
Suicidal behavior							
No suicidal behavior	1899	97.6	1044	99.1	855	95.7	< 0.001
Suicidal behavior	47	2.4	9	0.9	38	4.3	

^a Categorical variable for SF-MPG total score uses a median split with low reported pain categorized as below the median and high pain as above the median (SF-MPG median: 11.0)

^b Participants with PHQ-9 > 10 are characterized as having depression symptoms. Those with GAD-7 ≥ 10 are characterized as having generalized anxiety symptoms

Table 4 Association of pain with depression, anxiety, and suicidal behavior among a population of injured working adults in Santiago, Chile (N = 1946)

Depression, anxiety and suicidal ideation	Low pain (N = 1053)		High pain (N = 893)		Unadjusted OR (95% CI)	Adjusted OR (95% CI) ^a	Adjusted OR (95% CI) ^b	Adjusted OR (95% CI) ^c
	n	%	n	%				
Depression or anxiety								
No	778	73.9	353	39.5	Reference	Reference	Reference	–
Yes	275	26.1	540	60.5	4.33 (3.57–5.24)	4.03 (3.31–4.90)	4.05 (3.32–4.94)	–
Depression and anxiety								
No	778	73.9	353	39.5	Reference	Reference	Reference	–
Depression only (PHQ-9)	154	14.6	198	22.2	2.83 (2.22–3.62)	2.73 (2.13–3.51)	2.74 (2.13–3.52)	–
Anxiety only (GAD-7)	35	3.3	36	4.0	2.27 (1.40–3.67)	2.13 (1.30–3.48)	2.16 (1.32–3.53)	–
Both depression and anxiety	86	8.2	306	34.3	7.84 (5.99–10.28)	7.05 (5.36–9.28)	7.19 (5.45–9.51)	–
Suicidal Behaviors								
Suicidal ideation								
No suicidal ideation	989	93.9	696	77.9	Reference	Reference	Reference	Reference
Suicidal ideation	64	6.1	197	22.1	4.37 (3.25–5.89)	4.06 (2.99–5.51)	3.70 (2.72–5.04)	2.34 (1.68–3.24)
Suicidal behavior								
No suicidal behavior	1044	99.1	855	95.7	Reference	Reference	Reference	Reference
Suicidal behavior	9	0.9	38	4.3	5.16 (2.48–10.72)	4.77 (2.27–10.02)	4.05 (1.92–8.54)	2.35 (1.08–5.07)

^a Adjusted for age (continuous), sex (male/female), marital status (married/single/previously married)

^b Further adjusted for type of workplace (categories), type of injury (categories), and time since the accident (categories)

^c Further adjusted for type of workplace (categories), type of injury (categories), time since accident (categories), and depression (PHQ-8)

(OR = 3.12; 95% CI: 1.37–7.24) had an increased odds of suicide attempts compared to controls [59]. To our knowledge, only one study has examined the association between pain and suicide risk in South America. In an underpowered study conducted at a hospital pain clinic in Colombia ($N = 49$), the authors found no association between the risk of suicide and perceived levels of pain [19]. In our study, participants with high pain were more likely to report suicidal ideation; however, the association was not statistically significant.

Chronic pain is highly prevalent and is associated with increased odds of depression, generalized anxiety, suicidal ideation, and suicidal behavior among working Chilean adults. The findings of this study and those from other populations [54, 55], reinforce the knowledge that chronic pain and associated psychiatric symptoms may not be independent entities but rather comorbid symptoms interacting synergistically [60, 61]. This is consistent with the five most prevalent co-occurring symptom clusters labeled as the “SPADE pentad,” which include chronic pain, anxiety, depression, sleep disturbance, and low energy/fatigue [60]. The co-occurrence of SPADE symptoms negatively affects treatment response and undermines patients’ general health, quality of life, and physical functioning [60]. The recent Institute of Medicine report indicates chronic pain is debilitating and requires immediate, appropriate treatment rather than being sidelined [2]. Given its comorbidity with psychiatric disorders, an interdisciplinary approach that addresses the burdensome co-occurring SPADE symptoms will be most promising for patients with chronic pain and optimize their quality of life and other health outcomes [60].

The results of our study are compatible with the current understanding of the biological mechanism of chronic pain and psychiatric outcomes [50, 62, 63]. Functional imaging studies suggest that this bidirectional relationship is partly attributed to shared neural mechanisms. For instance, participants experiencing lower back pain, fibromyalgia, or other types of chronic pain, show functional imaging alterations in regions responsible for the response to emotional stimuli, like the anterior cingulate cortex and the prefrontal cortex regions [64]. In comparison, participants reporting depressive symptoms showed a shift in the insula region responsible for processing emotional stimuli to a region associated with processing pain in pain-free individuals [64]. Similar evidence has been reported for anxiety and other mood disorders [64].

Some important limitations must be considered when interpreting the results of our study results. First, our study’s cross-sectional data collection design does not allow for determining the temporal relationship between chronic pain and psychiatric outcomes.

Second, measures of chronic pain were mainly related to the type of work injury reported by participants at the time of enrollment in the study; thus, we were unable to account for the influence of chronic pain predating the work injury. Furthermore, our use of self-reported data in the exposure, outcome, and other covariates, may have introduced some degree of measurement error. Although we used multivariable logistic regression procedures to adjust for putative confounders, we cannot exclude the possibility of residual confounding. Finally, the participants in this study were injured working adults in Santiago, Chile; thus, the results may not be generalizable to other populations.

Supplementary Information

The online version contains supplementary material available at <https://doi.org/10.1186/s12888-022-04391-3>.

Additional file 1. Additional information supporting this article can be found in the file: Appendices_SPLENDID_BMC Psychiatry.docx

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Authors’ contributions

BG and JCV conceived and designed the study. LEF, MK, MDC and BG analyzed the data. JCV, MK, MDC, LEF, LA, JC, MAW, DJQ, and BG drafted the manuscript. All authors interpreted the data, critically revised the draft for important intellectual content, and gave final approval of the manuscript to be published.

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Availability of data and materials

Data supporting this study will be provided by the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate

The methods implemented in this study were performed in accordance with the Declaration of Helsinki. All analyses presented were conducted at the Harvard T.H. Chan School of Public Health, Boston, Massachusetts, USA. All participants provided written informed consent. The institutional review boards of the Hospital del Trabajador, Santiago, Chile and the Office of Human Research Administration, Harvard T.H. Chan School of Public Health, Boston, MA approved all procedures used in this study.

Consent for publication

Not applicable.

Competing interests

The authors declare no conflicts of interest.

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