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PAIN INTENSITY, FUNCTIONAL DISABILITY, AND QUALITY OF LIFE IN ADULTS WITH CHRONIC NON-SPECIFIC LOW BACK PAIN ATTENDING OUTPATIENT PHYSIOTHERAPY CLINICS: A CROSS-SECTIONAL STUDY

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Abstract

Background: *Chronic non-specific low back pain (CNSLBP) is a leading cause of disability worldwide, yet comprehensive data examining the interplay of pain, functional limitation, psychosocial factors, and health-related quality of life in South Asian populations remain scarce. This cross-sectional study investigated the relationships among pain intensity, functional disability, and quality of life, while identifying key physical and psychological predictors in adults with CNSLBP attending outpatient physiotherapy clinics.*

Methods: *A total of 130 adults (65 male, 65 female) aged 22-68 years with CNSLBP exceeding 12 weeks were recruited from outpatient physiotherapy clinics. Pain intensity was measured using the Numeric Pain Rating Scale (NPRS), functional disability using the Oswestry Disability Index (ODI), and health-related quality of life using the SF-36. Secondary measures included the Fear-Avoidance Beliefs Questionnaire (FABQ), Pain Catastrophizing Scale (PCS), Pittsburgh Sleep Quality Index (PSQI), Patient Health Questionnaire-9 (PHQ-9), Generalized Anxiety Disorder-7 (GAD-7), body mass index (BMI), lumbar range of motion (ROM), and the Sorensen trunk endurance test. Descriptive statistics, Pearson correlations, independent samples t-tests, ANOVA, and multiple linear regression analyses were performed (alpha = 0.05).*

Results: *The mean pain intensity was 6.43 +/- 1.71 (NPRS), mean ODI was 54.11 +/- 14.60, and mean SF-36 score was 40.76 +/- 13.94. The majority of participants (85.4%) demonstrated moderate-to-severe disability, and all participants reported at least moderate pain. Pain intensity demonstrated strong positive correlations with ODI ($r = 0.866$, $p < 0.001$) and strong negative correlations with SF-36 ($r = -0.923$, $p < 0.001$). In the multiple regression model for ODI, pain intensity (beta = 0.414, $p < 0.001$) and BMI (beta = 0.292, $p < 0.001$) were the strongest significant predictors, collectively explaining 84.9% of variance. Pain and ODI were the only significant predictors of quality of life (R-squared = 0.883).*

Conclusions: *Pain intensity and BMI are the dominant independent predictors of functional disability in CNSLBP, while pain and disability together*

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predominantly determine quality of life. These findings underscore the importance of multidimensional assessment incorporating both physical and psychosocial dimensions, and support early targeted interventions addressing pain management and weight optimization in this population.

INTRODUCTION

Chronic non-specific low back pain (CNSLBP), defined as persistent pain in the lumbosacral region lasting beyond 12 weeks without a specific identifiable pathological cause, represents one of the most prevalent and debilitating musculoskeletal conditions globally.[1] The Global Burden of Disease Study has consistently ranked low back pain as the leading cause of years lived with disability (YLDs) worldwide, with an estimated prevalence of 7.5% in the global population, imposing substantial economic and healthcare burdens.[2] In low- and middle-income countries (LMICs), including Pakistan, the prevalence of chronic low back pain is reported to be even higher, with estimates ranging from 30% to 60% among working-age adults, yet epidemiological data from these regions remain comparatively limited.[3]

The biopsychosocial model of chronic pain has fundamentally transformed our understanding of CNSLBP, recognizing that the condition arises from a complex interplay of biological, psychological, and social factors rather than a purely biomedical pathology.[4] Within this framework, pain intensity serves as a primary clinical outcome that is known to be strongly associated with functional disability, as measured by instruments such as the Oswestry Disability Index (ODI).[5] However, the magnitude and independence of these associations in diverse populations, particularly in South Asian contexts where cultural attitudes toward pain, physical activity, and healthcare utilization may differ substantially from Western populations, warrant further investigation.

Fear-avoidance beliefs, as captured by the Fear-Avoidance Beliefs Questionnaire (FABQ), and pain catastrophizing, measured by the Pain Catastrophizing Scale (PCS), have emerged as significant psychological mediators in the transition from acute to chronic low back pain.[6,7] Individuals who exhibit elevated fear-avoidance beliefs tend to reduce their physical activity, leading to deconditioning, increased disability, and diminished quality of life—a vicious cycle often referred to as the fear-avoidance model.[8] Similarly, pain catastrophizing—characterized by rumination, magnification, and helplessness in response to pain—has been consistently associated with greater pain intensity, higher disability, and poorer treatment outcomes.[9] Depression and anxiety, assessed through the PHQ-9 and GAD-7 respectively, are highly comorbid with chronic pain conditions and independently contribute to both disability and quality of life impairment.[10]

Physical factors, including elevated body mass index (BMI), reduced lumbar range of motion (ROM), and diminished trunk muscle endurance, have also been implicated as potentially modifiable risk factors for disability in CNSLBP.[11,12] The Sorensen test, which assesses isometric trunk extensor endurance, has been widely used as a clinical measure of spinal stabilization capacity, with lower endurance times associated with greater disability and pain severity.[13] Furthermore, poor sleep quality, as measured by the Pittsburgh Sleep Quality Index (PSQI), has been increasingly recognized as both a consequence and a perpetuating factor in chronic pain states.[14]

Despite the growing body of evidence from high-income countries, there is a notable paucity of comprehensive, multivariable studies examining the relative contributions of these physical and psychosocial factors to disability and quality of life in patients with CNSLBP in Pakistan and the broader South Asian region. Understanding these relationships is essential for developing culturally appropriate, evidence-based rehabilitation strategies that address the multifactorial nature of this condition.[15]

Therefore, the primary objectives of this study were: (1) to describe the demographic, clinical, and psychosocial characteristics of adults with CNSLBP attending outpatient physiotherapy

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clinics; (2) to examine the correlations among pain intensity, functional disability, quality of life, and associated biopsychosocial factors; (3) to identify the independent predictors of functional disability and quality of life using multiple linear regression models; and (4) to explore subgroup differences based on sex, employment status, and physical activity levels. We hypothesized that pain intensity, fear-avoidance beliefs, and pain catastrophizing would be significant predictors of both disability and quality of life, and that physical factors including BMI and trunk endurance would demonstrate additional independent contributions.

Methods

Study Design and Setting

This analytical cross-sectional study was conducted at the outpatient physiotherapy clinics of Saidu Group of Teaching Hospitals, Swat, Khyber Pakhtunkhwa, Pakistan. Data collection was performed over a six-month period. The study protocol was approved by the institutional ethics review board of Saidu Medical College, and written informed consent was obtained from all participants prior to data collection. The study adhered to the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines for cross-sectional studies.[16]

Participants

A total of 130 adult participants were consecutively recruited using convenience sampling. Inclusion criteria were: (1) age 18 years or older; (2) presence of non-specific low back pain persisting for more than 12 weeks; (3) currently attending outpatient physiotherapy treatment; and (4) ability to provide informed consent. Exclusion criteria comprised: (1) specific spinal pathology including radiculopathy, spinal stenosis, spondylolisthesis, or inflammatory arthropathy confirmed by clinical examination and available imaging; (2) history of previous spinal surgery; (3) current pregnancy; (4) diagnosed inflammatory or systemic disease (e.g., rheumatoid arthritis, ankylosing spondylitis); and (5) neurological disorders affecting mobility or sensation.

Outcome Measures

Primary Outcomes

Pain Intensity. Pain intensity was assessed using the 11-point Numeric Pain Rating Scale (NPRS), where participants rated their average low back pain over the past week from 0 (no pain) to 10 (worst pain imaginable). The NPRS has demonstrated excellent test-retest reliability (ICC = 0.96) and is widely recommended as a core outcome measure in low back pain research.[17]

Functional Disability. The Oswestry Disability Index (ODI) version 2.1a was used to measure functional disability related to low back pain. The ODI consists of 10 items, each scored from 0 to 5, yielding a total score from 0 to 100, with higher scores indicating greater disability. Severity categories are defined as: minimal disability (0-20), moderate disability (21-40), severe disability (41-60), crippled (61-80), and bed-bound/exaggerating symptoms (81-100).[18]

Health-Related Quality of Life. Quality of life was assessed using the physical component summary score of the SF-36 Health Survey, a widely validated generic instrument measuring eight health domains. Scores range from 0 to 100, with higher scores indicating better quality of life. The SF-36 has been extensively validated in chronic pain populations and demonstrates strong psychometric properties.[19]

Secondary Measures

Fear-Avoidance Beliefs. The Fear-Avoidance Beliefs Questionnaire (FABQ) was administered to assess patients' beliefs about how physical activity and work affect their low back pain. The total FABQ score ranges from 0 to 66, with higher scores indicating stronger fear-avoidance beliefs.[20]

Pain Catastrophizing. The Pain Catastrophizing Scale (PCS) was used to measure catastrophic thinking related to pain across three dimensions: rumination, magnification, and helplessness. The total PCS score ranges from 0 to 52, with higher scores indicating greater catastrophizing.[21]

Depression and Anxiety. Depressive symptoms were measured using the Patient Health Questionnaire-9 (PHQ-9), and anxiety symptoms

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using the Generalized Anxiety Disorder-7 (GAD-7). Both instruments are validated screening tools with scores ranging from 0 to 27 and 0 to 21 respectively, with higher scores indicating greater symptom severity.[22,23]

Sleep Quality. The Pittsburgh Sleep Quality Index (PSQI) was used to assess sleep quality and disturbances over the preceding month. A global PSQI score greater than 5 indicates poor sleep quality.[24]

Physical Measures. Lumbar range of motion was measured in degrees using a standard goniometer during flexion in the standing position. Trunk extensor endurance was assessed using the Sorensen test, recording the maximum time (in seconds) the participant could maintain a horizontal upper body position while prone with the lower body fixed.[25] Body mass index (BMI) was calculated as weight in kilograms divided by height in meters squared. Physical activity level was self-reported and categorized as low, moderate, or high based on the International Physical Activity Questionnaire (IPAQ) short form classification criteria.[26]

Statistical Analysis

All statistical analyses were performed using Python (version 3.12) with SciPy, Statsmodels, and Pandas libraries. Descriptive statistics were computed for all variables: mean +/- standard deviation (SD) for continuous variables, and frequencies with percentages for categorical variables. The Shapiro-Wilk test was used to assess normality of continuous variables. Pearson correlation coefficients were calculated to examine bivariate relationships among the primary and secondary outcome variables. For subgroup comparisons, independent samples t-tests were used for normally distributed data, and Mann-Whitney U tests for non-normally distributed data. One-way ANOVA was employed for comparisons across three physical activity groups when homogeneity of variance (Levene's test) was confirmed; otherwise, the Kruskal-Wallis test was used. Statistical significance was set at alpha = 0.05 (two-tailed).

Multiple linear regression analyses were conducted to identify independent predictors of functional disability (ODI) and quality of life (SF-36). For the ODI model, the predictor variables were age, BMI, symptom duration, pain intensity (NPRS), FABQ, PCS, lumbar ROM, Sorensen test time, PSQI, and PHQ-9. For the SF-36 model, all ODI model predictors plus ODI and GAD-7 were included. Variance inflation factors (VIFs) were examined to assess multicollinearity, with VIF > 10 considered indicative of problematic collinearity. The proportion of variance explained was reported as R-squared and adjusted R-squared.

Results

Participant Characteristics

A total of 130 participants (65 male, 65 female) with a mean age of 43.90 +/- 13.32 years (range: 22-68 years) were included in the analysis. The demographic and clinical characteristics of the sample are presented in Table 1. The mean BMI was 29.10 +/- 4.50, with 51.5% of participants classified as having low physical activity, 33.8% moderate, and 14.6% high. More than half (55.4%) were employed, and a substantial majority (76.9%) reported regular analgesic use. The mean symptom duration was 48.87 +/- 25.53 months, indicating an average pain history of approximately four years.

Table 1. Demographic and Clinical Characteristics of Participants (N = 130)

Variable	Statistic	Value
Demographic Characteristics		
Age (years)	Mean +/- SD	43.90 +/- 13.32
	Range	22-68
Sex	Male, n (%)	65 (50.0)
	Female, n (%)	65 (50.0)

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Variable	Statistic	Value
BMI (kg/m2)	Mean +/- SD	29.10 +/- 4.50
	Range	21.0-36.9
Employment	Employed, n (%)	72 (55.4)
	Unemployed, n (%)	58 (44.6)
Physical Activity	Low, n (%)	67 (51.5)
	Moderate, n (%)	44 (33.8)
	High, n (%)	19 (14.6)
Clinical Characteristics		
Symptom Duration (months)	Mean +/- SD	48.87 +/- 25.53
Pain (NPRS)	Mean +/- SD	6.43 +/- 1.71
	Range	3.7-9.5
ODI (%)	Mean +/- SD	54.11 +/- 14.60
	Range	19-90
SF-36 QoL	Mean +/- SD	40.76 +/- 13.94
	Range	20-75
Analgesic Use	Yes, n (%)	100 (76.9)
	No, n (%)	30 (23.1)
Psychosocial Measures		
FABQ	Mean +/- SD	18.82 +/- 6.17
PCS	Mean +/- SD	22.16 +/- 7.13
PHQ-9	Mean +/- SD	9.75 +/- 3.12
GAD-7	Mean +/- SD	7.74 +/- 2.79
PSQI	Mean +/- SD	11.03 +/- 3.08
Physical Measures		
Lumbar ROM (degrees)	Mean +/- SD	52.19 +/- 4.09
Sorensen Test (seconds)	Mean +/- SD	83.22 +/- 25.05
Physiotherapy Sessions	Mean +/- SD	11.32 +/- 5.23

The distribution of functional disability severity, as classified by the ODI, revealed that the vast majority of participants experienced significant functional limitations: 51.5% (n = 67) had severe disability, 27.7% (n = 36) were classified as crippled, 13.8% (n = 18) had moderate disability, 6.2% (n = 8) were bed-bound, and only 0.8% (n = 1) had minimal disability (Figure 1). Regarding pain severity, 54.6% (n = 71) reported severe pain (NPRS 7-10) and 45.4% (n = 59) reported moderate pain (NPRS 4-6), with no participants in the mild pain category (Figure 2). These findings indicate a high-burden sample with predominantly severe pain and substantial disability.

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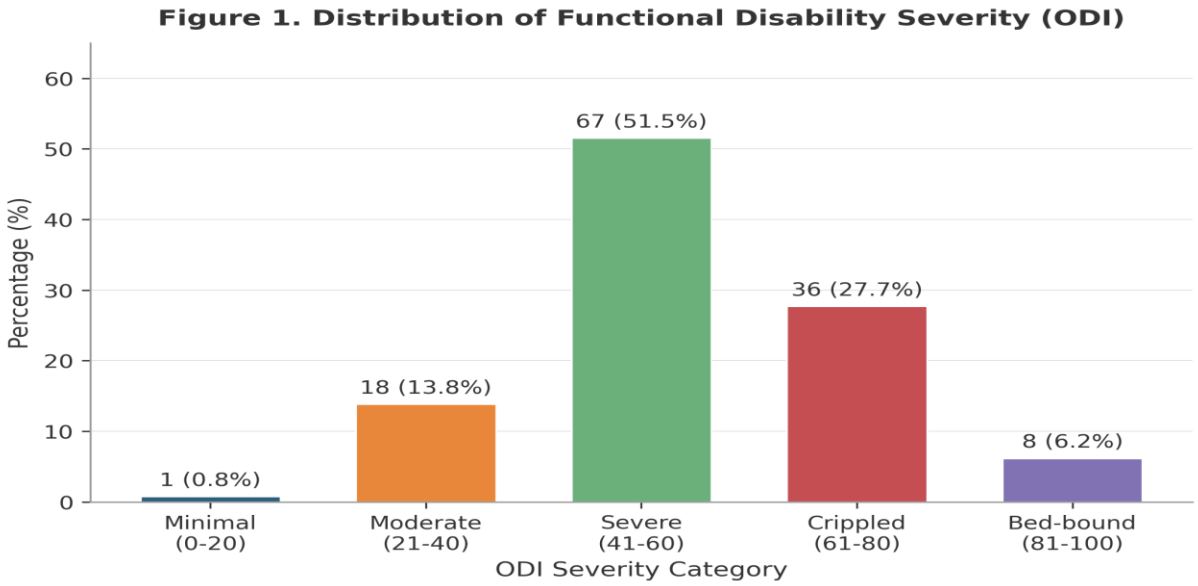

Figure 1. Distribution of functional disability severity categories based on the Oswestry Disability Index (N = 130).

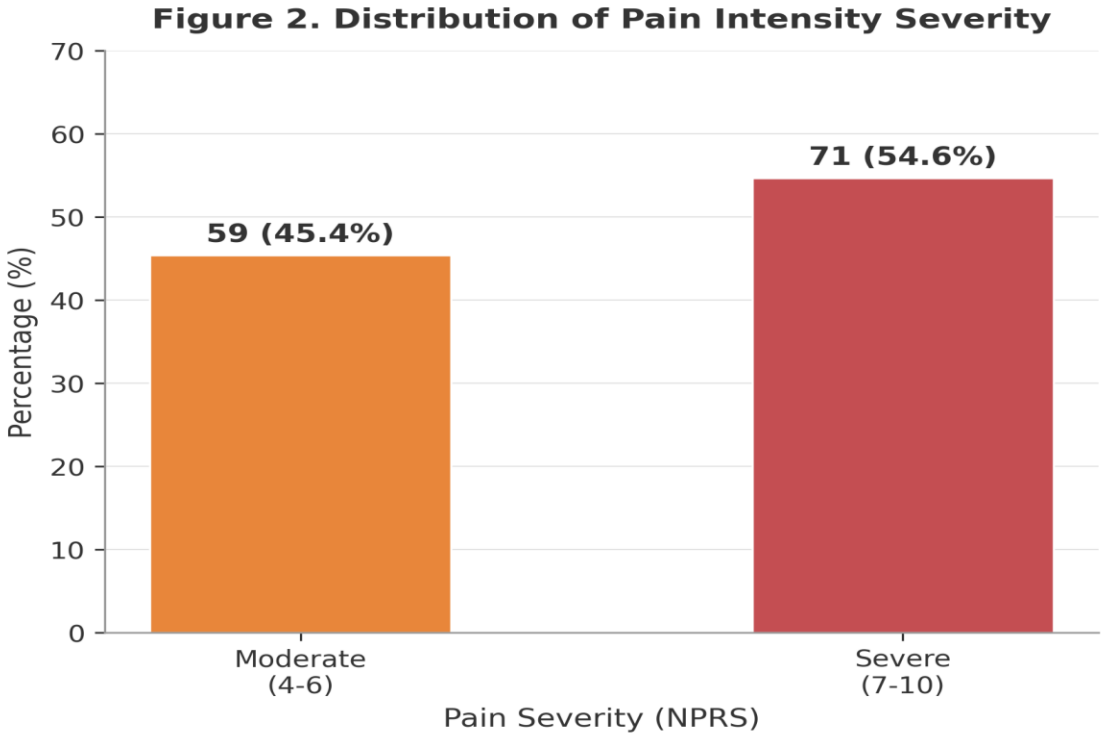

Figure 2. Distribution of pain intensity severity categories based on the Numeric Pain Rating Scale (N = 130).

Figure 3 presents the sociodemographic and clinical characteristics of the study sample. The sex distribution was equal (50% male, 50% female), while the majority of participants reported low physical activity levels and were currently using analgesic medications.

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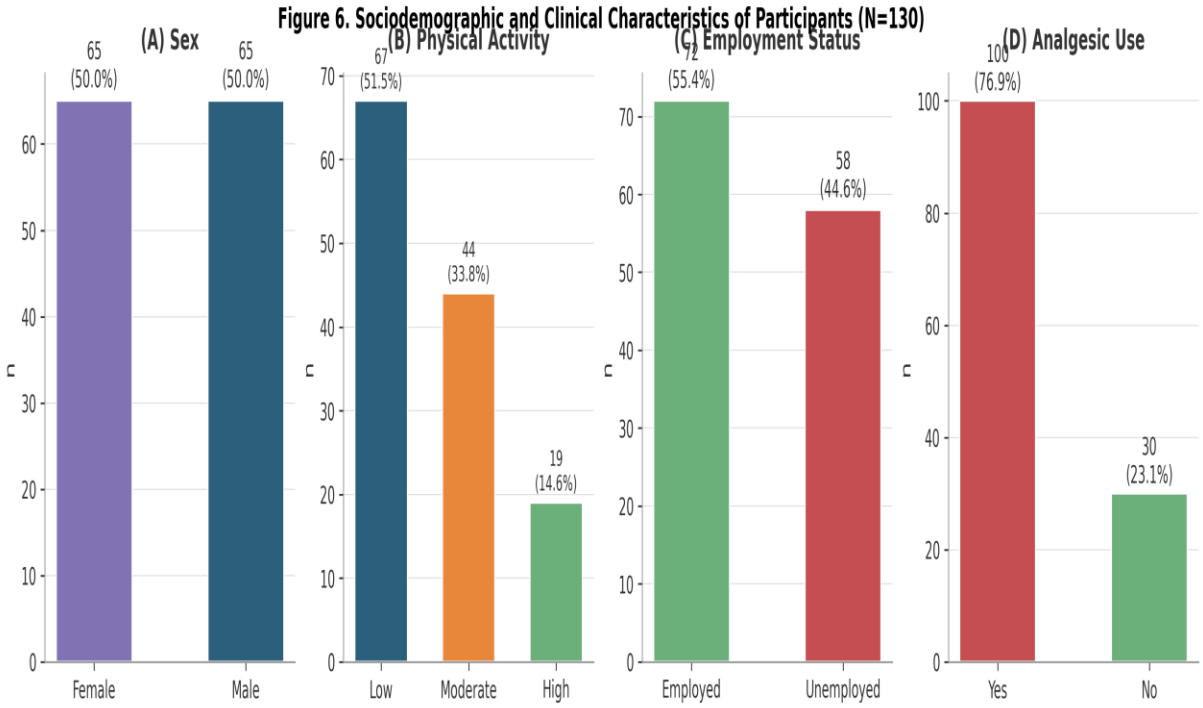

Figure 3. Sociodemographic and clinical characteristics: (A) sex distribution, (B) physical activity levels, (C) employment status, and (D) analgesic use (N = 130).

Correlation Analysis

The Pearson correlation coefficients among the key study variables are presented in Table 2 and visualized as a correlation heatmap in Figure 4. Pain intensity (NPRS) demonstrated a very strong positive correlation with functional disability (ODI; $r = 0.866$, $p < 0.001$) and a very strong negative correlation with quality of life (SF-36; $r = -0.923$, $p < 0.001$). The ODI and SF-36 were strongly inversely correlated ($r = -0.874$, $p < 0.001$). Among the psychosocial variables, FABQ ($r = 0.838$, $p < 0.001$), PCS ($r = 0.851$, $p < 0.001$), PHQ-9 ($r = 0.761$, $p < 0.001$), and PSQI ($r = 0.754$, $p < 0.001$) all demonstrated strong positive correlations with pain intensity. The physical measures of lumbar ROM ($r = -0.713$, $p < 0.001$) and Sorensen test time ($r = -0.899$, $p < 0.001$) showed strong negative correlations with pain, indicating that greater physical impairment was associated with higher pain levels. The scatter plots illustrating the relationships between pain and disability (Figure 5) and between pain and quality of life (Figure 6) visually confirm these strong linear associations. The scatter plot of ODI versus SF-36 (Figure 7) similarly demonstrates the strong inverse relationship between disability and quality of life.

Notably, age ($r = 0.006$, $p = 0.944$) and symptom duration ($r = 0.019$, $p = 0.829$) showed negligible correlations with pain intensity, suggesting that these demographic and disease-duration factors were not linearly associated with pain severity in this sample. BMI demonstrated a weak and non-significant bivariate correlation with pain ($r = -0.069$, $p = 0.433$) but a significant moderate correlation with ODI ($r = 0.237$, $p = 0.007$).

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Table 2. Pearson Correlation Coefficients Among Key Study Variables (N = 130)

Variable	Pain (NPRS)	ODI	SF-36 QoL	FABQ	PCS	PHQ-9	GAD-7	PSQI	Lumbar ROM	Sorensen	BMI
Pain (NPRS)	—	0.866***	-0.923***	0.838***	0.851***	0.761***	0.631***	0.754***	-0.713***	-0.899***	-0.069
ODI		—	-0.874***	0.718***	0.758***	0.662***	0.541***	0.618***	-0.683***	-0.789***	0.237**
SF-36 QoL			—	-0.774***	-0.782***	-0.703***	-0.592***	-0.670***	0.697***	0.807***	-0.012
FABQ				—	0.741***	0.597***	0.488***	0.580***	-0.602***	-0.741***	-0.046
PCS					—	0.718***	0.559***	0.658***	-0.672***	-0.784***	0.030
PHQ-9						—	0.652***	0.614***	-0.517***	-0.684***	0.062
GAD-7							—	0.544***	-0.475***	-0.588***	0.005
PSQI								—	-0.545***	-0.669***	0.050
Lumbar ROM									—	0.733***	0.102
Sorensen Test										—	0.053
BMI											—

***p < 0.001; **p < 0.01; *p < 0.05. NPRS = Numeric Pain Rating Scale; ODI = Oswestry Disability Index; SF-36 = 36-Item Short Form Health Survey; FABQ = Fear-Avoidance Beliefs Questionnaire; PCS = Pain Catastrophizing Scale; PHQ-9 = Patient Health Questionnaire-9; GAD-7 = Generalized Anxiety Disorder-7; PSQI = Pittsburgh Sleep Quality Index; ROM = Range of Motion; BMI = Body Mass Index.

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Figure 3. Correlation Matrix of Key Study Variables

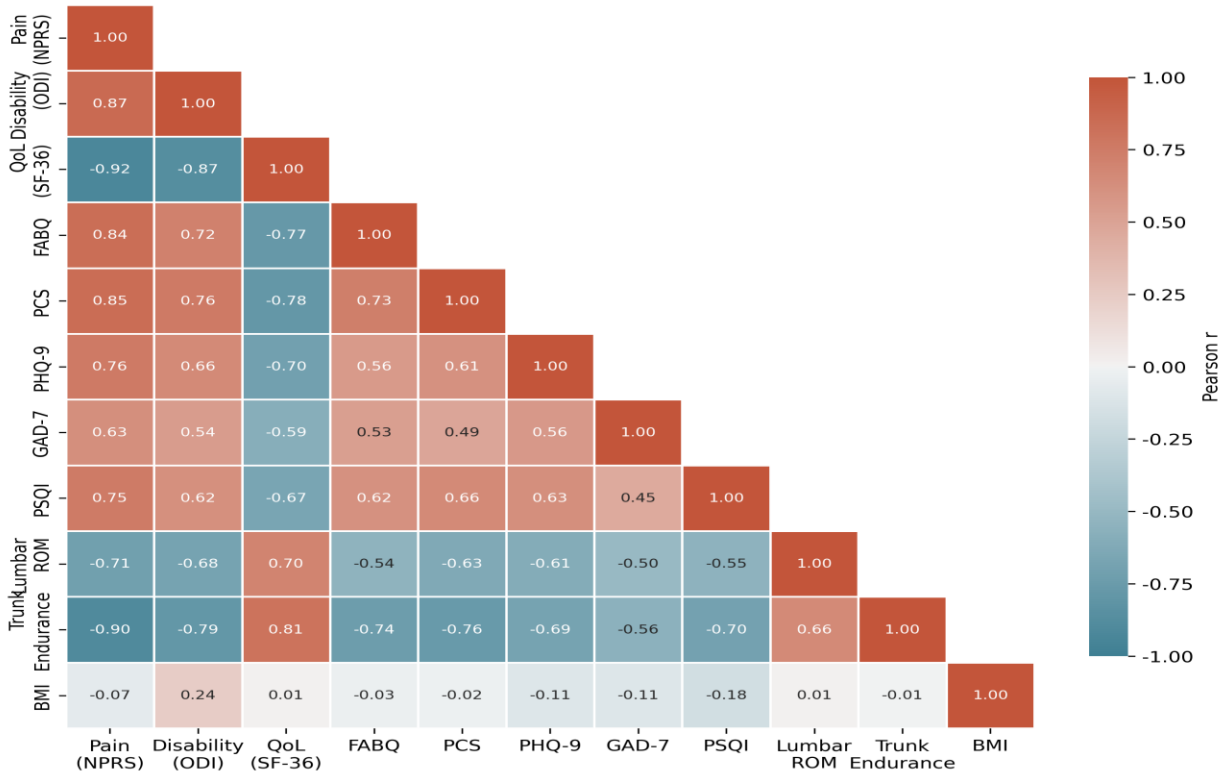

Figure 4. Correlation heatmap showing Pearson correlation coefficients among key study variables.

Figure 4. Scatter Plot of Pain Intensity vs. Functional Disability

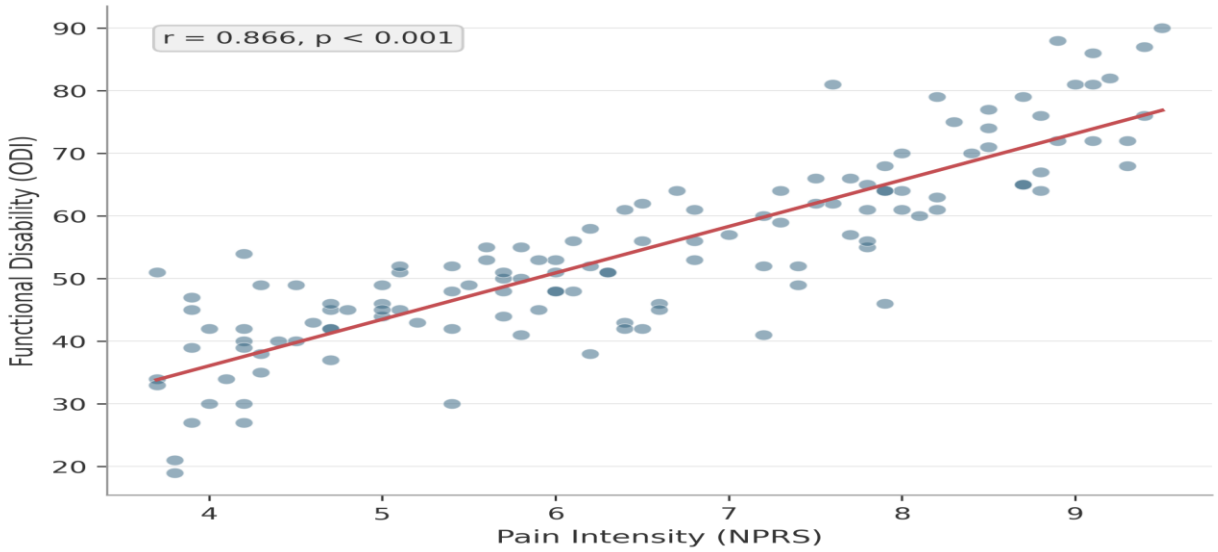

Figure 5. Scatter plot with regression line demonstrating the strong positive association between pain intensity (NPRS) and functional disability (ODI; r = 0.866, p < 0.001).

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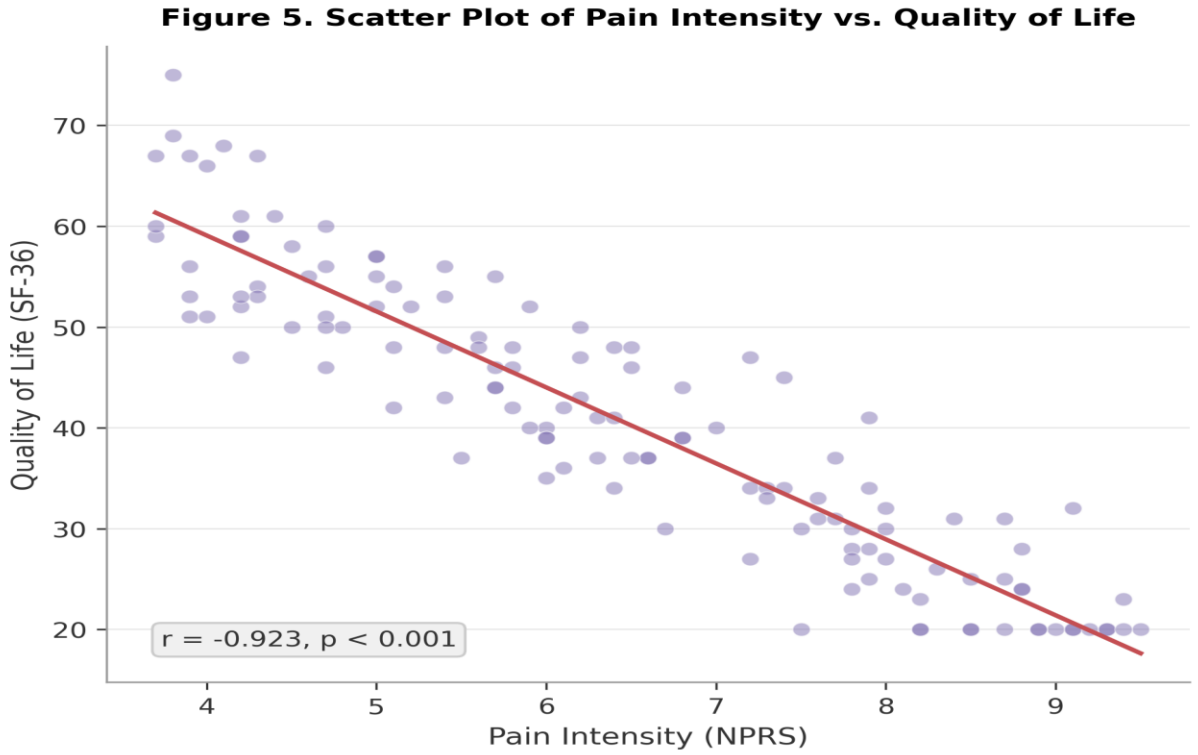

Figure 6. Scatter plot with regression line demonstrating the strong negative association between pain intensity (NPRS) and quality of life (SF-36; r = -0.923, p < 0.001).

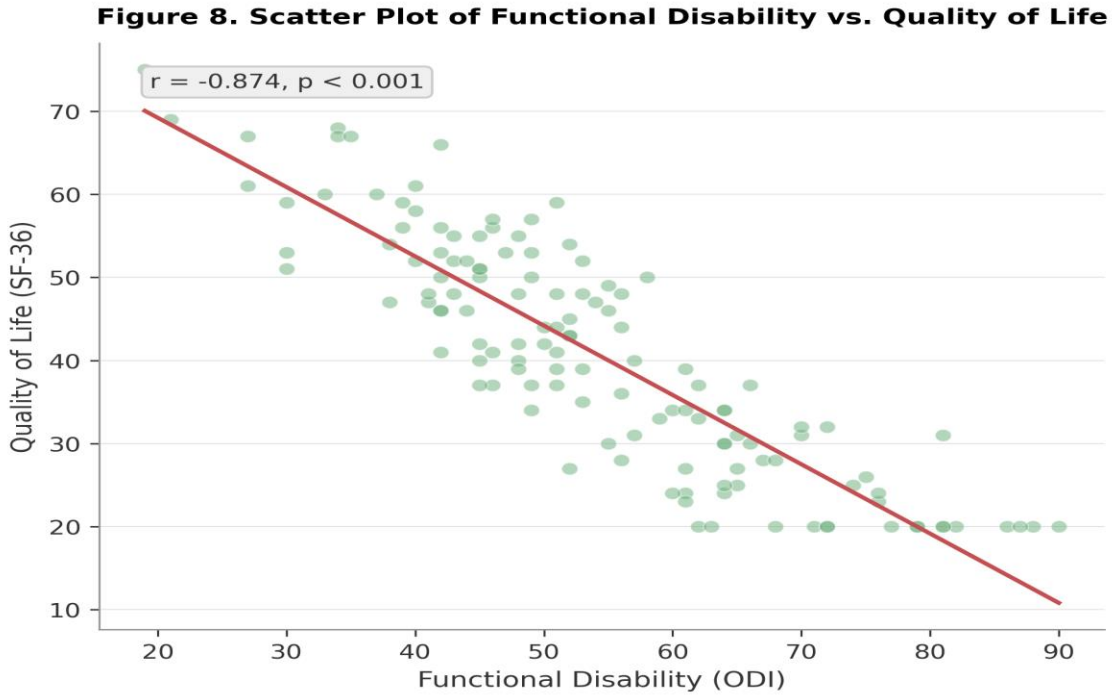

Figure 7. Scatter plot with regression line demonstrating the strong negative association between functional disability (ODI) and quality of life (SF-36; r = -0.874, p < 0.001).

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Multiple Linear Regression Analysis

Predictors of Functional Disability (ODI)

The multiple linear regression model for ODI was statistically significant ($F(10, 119) = 66.88$, $p < 0.001$), explaining 84.9% of the variance in functional disability (adjusted R-squared = 0.836). The regression coefficients are presented in Table 3 and visualized as a forest plot in Figure 8. Pain intensity (NPRS) emerged as the strongest predictor (beta = 0.414, B = 7.137, $p < 0.001$), followed by BMI (beta = 0.292, B = 0.950, $p < 0.001$) and lumbar ROM (beta = -0.115, B = -0.410, $p = 0.031$). Age, symptom duration, FABQ, PCS, Sorensen test time, PSQI, and PHQ-9 were not statistically significant independent predictors in the multivariable model, likely due to the strong multicollinearity between pain and many of these variables (VIF for NPRS = 14.87, indicating shared variance with other predictors).

Table 3. Multiple Linear Regression Results for Functional Disability (ODI) (N = 130)

Predictor	B	SE	Beta	t	p
(Intercept)	-3.121	15.432	—	-0.202	0.840
Age	-0.028	0.040	-0.025	-0.686	0.494
BMI	0.950	0.124	0.292	7.655	<0.001***
Symptom Duration	0.023	0.022	0.041	1.080	0.282
Pain (NPRS)	7.137	1.176	0.414	6.069	<0.001***
FABQ	-0.058	0.163	-0.024	-0.352	0.725
PCS	0.081	0.142	0.040	0.568	0.571
Lumbar ROM	-0.410	0.188	-0.115	-2.181	0.031*
Sorensen Test	0.040	0.049	0.069	0.829	0.409
PSQI	-0.026	0.268	-0.005	-0.097	0.923
PHQ-9	0.143	0.271	0.031	0.528	0.599

R-squared = 0.849; Adjusted R-squared = 0.836; $F(10, 119) = 66.88$, $p < 0.001$. ***$p < 0.001$; *$p < 0.05$. B = unstandardized coefficient; SE = standard error; beta = standardized coefficient.

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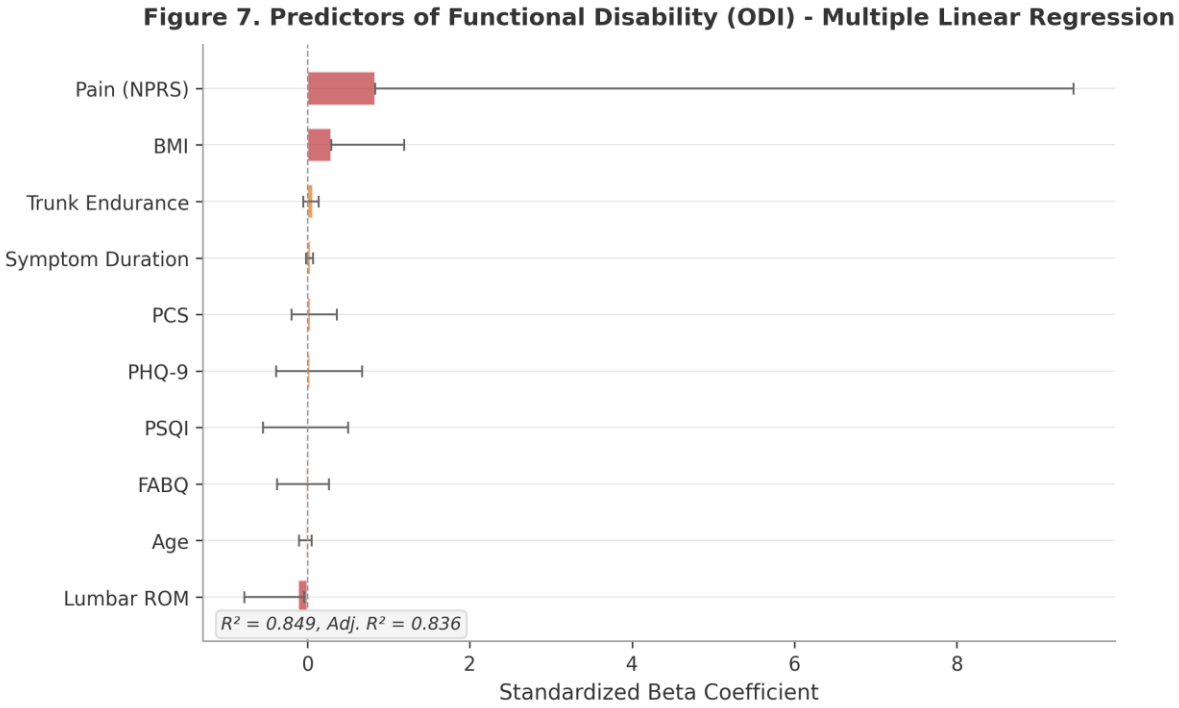

Figure 8. Forest plot displaying standardized beta coefficients with 95% confidence intervals from the multiple linear regression model predicting functional disability (ODI). Red bars indicate statistically significant predictors ($p < 0.05$); orange bars indicate non-significant predictors.

Predictors of Quality of Life (SF-36)

The regression model for quality of life was also statistically significant ($F(12, 117) = 73.36$, $p < 0.001$), accounting for 88.3% of the variance in SF-36 scores (adjusted R-squared = 0.871). As shown in Table 4, pain intensity (beta = -0.369, B = -6.111, $p < 0.001$) and ODI (beta = -0.360, B = -0.344, $p < 0.001$) were the only significant independent predictors of quality of life. No other variables, including the psychosocial measures, retained statistical significance in the multivariable model, again likely reflecting the substantial shared variance with pain and disability (VIF for NPRS = 19.98).

Table 4. Multiple Linear Regression Results for Quality of Life (SF-36) (N = 130)

Predictor	B	SE	Beta	t	p
(Intercept)	87.065	13.126	—	6.633	<0.001***
Age	0.014	0.035	0.013	0.397	0.692
BMI	0.129	0.129	0.042	0.997	0.321
Symptom Duration	0.028	0.019	0.051	1.490	0.139
Pain (NPRS)	-6.111	1.156	-0.369	-5.285	<0.001***
ODI	-0.344	0.078	-0.360	-4.416	<0.001***
FABQ	-0.003	0.139	-0.001	-0.018	0.985
PCS	0.086	0.122	0.044	0.702	0.484
Lumbar ROM	0.137	0.163	0.040	0.843	0.401

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Predictor	B	SE	Beta	t	p
Sorensen Test	-0.062	0.041	-0.111	-1.499	0.137
PSQI	0.140	0.228	0.031	0.613	0.541
PHQ-9	0.042	0.233	0.009	0.178	0.859
GAD-7	0.012	0.213	0.002	0.056	0.955

R-squared = 0.883; Adjusted R-squared = 0.871; F(12, 117) = 73.36, p < 0.001. ***p < 0.001. B = unstandardized coefficient; SE = standard error; beta = standardized coefficient.

Subgroup Analyses

The subgroup comparison results are presented in Table 5. Males demonstrated significantly higher depression scores (PHQ-9: 10.29 +/- 3.02 vs. 9.20 +/- 3.14, p = 0.045) and poorer sleep quality (PSQI: 11.62 +/- 3.20 vs. 10.45 +/- 2.87, p = 0.030) compared to females, although no significant sex-based differences were observed for pain intensity, ODI, or SF-36 scores. No statistically significant differences were found between employed and unemployed participants across any of the primary or secondary outcome measures. Regarding physical activity levels, a significant difference was observed only for PCS (p = 0.024), with participants reporting low physical activity demonstrating higher catastrophizing scores (23.51 +/- 6.80) compared to those with high physical activity (18.58 +/- 5.98).

Table 5. Subgroup Comparisons of Key Outcome Variables

Variable	Group	Mean +/- SD	Test	p
By Sex				
Pain (NPRS)	Male	6.68 +/- 1.71	MW	0.092
	Female	6.18 +/- 1.68		
ODI	Male	56.18 +/- 14.72	MW	0.106
	Female	52.03 +/- 14.30		
SF-36 QoL	Male	39.63 +/- 14.03	MW	0.355
	Female	41.89 +/- 13.86		
PHQ-9	Male	10.29 +/- 3.02	MW	0.045*
	Female	9.20 +/- 3.14		
PSQI	Male	11.62 +/- 3.20	t	0.030*
	Female	10.45 +/- 2.87		
By Employment Status				
Pain (NPRS)	Employed	6.24 +/- 1.83	MW	0.162
	Unemployed	6.67 +/- 1.52		
ODI	Employed	52.92 +/- 15.94	t	0.302
	Unemployed	55.59 +/- 12.73		
SF-36 QoL	Employed	41.92 +/- 14.40	MW	0.247
	Unemployed	39.33 +/- 13.33		

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Variable	Group	Mean +/- SD	Test	p
By Physical Activity Level				
PCS	Low	23.51 +/- 6.80	ANOVA	0.024*
	Moderate	21.66 +/- 7.62		
	High	18.58 +/- 5.98		

MW = Mann-Whitney U test; t = independent samples t-test; ANOVA = one-way analysis of variance. *p < 0.05.

Discussion

This cross-sectional study examined the interrelationships among pain intensity, functional disability, quality of life, and a comprehensive set of biopsychosocial factors in 130 adults with CNSLBP attending outpatient physiotherapy clinics in Pakistan. The findings revealed that participants experienced substantial pain (mean NPRS = 6.43), severe functional disability (mean ODI = 54.11), and markedly diminished quality of life (mean SF-36 = 40.76). Pain intensity emerged as the single most powerful predictor of both disability and quality of life, while BMI independently predicted disability beyond the effects of pain.

Pain, Disability, and Quality of Life

The very strong positive correlation between pain intensity and functional disability (r = 0.866) observed in this study is consistent with previous research in diverse populations. Hill et al.[27] reported a similar strong association (r = 0.76) in a large primary care cohort, while Hush et al.[28] demonstrated that baseline pain intensity was the strongest predictor of disability at 12-month follow-up. The even stronger correlation observed in our sample (r = 0.866) may reflect the chronicity and severity of our cohort, where the mean symptom duration exceeded four years and 85.4% of participants demonstrated moderate-to-severe disability. The nearly perfect negative correlation between pain and quality of life (r = -0.923) underscores the pervasive impact of chronic pain on overall health status, extending beyond physical function to encompass social participation, emotional well-being, and general health perception.

The finding that pain and disability together explained 88.3% of the variance in quality of life, with both remaining significant independent predictors, aligns with the conceptualization of quality of life as a distal outcome that is mediated through the functional consequences of pain. This is consistent with the World Health Organization's International Classification of Functioning, Disability and Health (ICF) framework, which posits that health conditions (pain) lead to impairments in body function and structure, which in turn result in activity limitations and participation restrictions that collectively determine quality of life.[29]

The Role of Body Mass Index

A particularly noteworthy finding was the significant independent contribution of BMI to functional disability (beta = 0.292, p < 0.001), even after controlling for pain intensity, psychosocial factors, and physical measures. This finding is consistent with emerging evidence that elevated BMI is not merely associated with chronic low back pain but independently contributes to the severity of functional limitations.[30] Several mechanisms may explain this relationship. Excess adiposity increases mechanical loading on the lumbar spine, alters spinal biomechanics and posture, promotes a pro-inflammatory state through adipokine release, and may reduce physical activity levels, creating a self-perpetuating cycle of disability.[31] The mean BMI of 29.10 +/- 4.50 in our sample places the average participant in the overweight category approaching obesity, suggesting that weight management interventions could be an important component of comprehensive rehabilitation programs for this population.

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Psychosocial Factors: Bivariate but Not Independent Predictors

While the bivariate correlations revealed strong associations between the psychosocial variables (FABQ, PCS, PHQ-9, GAD-7, PSQI) and both disability and quality of life, none of these measures retained statistical significance as independent predictors in the multivariable regression models. This finding is likely attributable to the substantial multicollinearity between pain intensity and these psychosocial variables (e.g., VIF for NPRS = 14.87-19.98). In other words, pain intensity and the psychosocial variables capture overlapping variance in the outcomes, making it difficult to disentangle their unique contributions in a cross-sectional design.

This pattern of results does not diminish the clinical importance of psychosocial factors; rather, it suggests that in this sample, pain intensity served as a robust proxy for the overall biopsychosocial burden of the condition. The strong correlations between pain and PCS (r = 0.851), pain and FABQ (r = 0.838), and pain and PHQ-9 (r = 0.761) indicate that patients with higher pain also tend to catastrophize more, hold stronger fear-avoidance beliefs, and experience greater depressive symptoms. This clustering of symptoms is consistent with the biopsychosocial model, which views these factors as mutually reinforcing rather than independent.[4,8] Longitudinal studies with larger samples may be better positioned to identify the unique predictive contributions of individual psychosocial variables.

Physical Measures

The bivariate analyses confirmed that reduced lumbar ROM and diminished trunk extensor endurance (Sorensen test) were strongly associated with greater pain and disability, consistent with established literature linking physical impairment to functional outcomes in CNSLBP.[12,13] However, in the multivariable model, only lumbar ROM retained marginal significance as a predictor of ODI (p = 0.031), while Sorensen test time did not. This may reflect the fact that pain intensity accounted for much of the variance also captured by these physical measures, as evidenced by the strong correlations between pain and both ROM (r = -0.713) and Sorensen time (r = -0.899). The strong correlation between pain and Sorensen time (r = -0.899) was particularly notable, suggesting that pain-related fear and inhibition may substantially influence performance on endurance tests, a finding that has been reported previously.[32]

Subgroup Findings

The subgroup analyses revealed minimal sex-based differences in pain and disability, consistent with several recent meta-analyses suggesting that while sex differences exist in pain prevalence, the relationship between pain and disability is largely similar between men and women.[33] The significantly higher depression (PHQ-9) and poorer sleep quality (PSQI) observed in males were unexpected, as most epidemiological studies report higher rates of depression in women with chronic pain. This finding may reflect specific cultural or socioeconomic factors in the study population and warrants further investigation.

The absence of significant employment-related differences in pain and disability contrasts with some previous studies that have reported higher disability among unemployed individuals.[34] This may be partly explained by the fact that 76.9% of participants were using analgesics and all were actively receiving physiotherapy, potentially attenuating the differences that might otherwise exist between employment groups. The significant association between lower physical activity levels and higher pain catastrophizing scores is consistent with the fear-avoidance model and supports the rationale for graded activity and exposure-based interventions in this population.[8]

Clinical Implications

The findings of this study have several important clinical implications for the management of CNSLBP. First, the overwhelming predictive power of pain intensity for both disability and quality of life underscores the paramount importance of effective pain management as the foundation of any rehabilitation program. Second, the independent contribution of BMI to disability suggests that integrating weight management strategies into physiotherapy programs could

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enhance functional outcomes. Third, while psychosocial factors did not emerge as independent predictors in the multivariable model, their strong bivariate associations with all outcomes support the routine screening for fear-avoidance beliefs, catastrophizing, depression, and anxiety in clinical practice, as these factors may identify patients who require additional psychological interventions alongside physical rehabilitation.[35]

Limitations

Several limitations should be acknowledged. The cross-sectional design precludes causal inferences; longitudinal studies are needed to establish the temporal relationships among these variables. Convenience sampling from a single institution limits the generalizability of the findings to the broader CNSLBP population. The high multicollinearity between pain intensity and several psychosocial and physical variables restricted the ability to identify their unique contributions in the regression models. Self-reported measures may be subject to recall and reporting biases, and the absence of objective measures of physical activity (e.g., accelerometry) is a limitation. Additionally, cultural factors specific to the Pakistani population may influence pain reporting, disability perception, and health-seeking behavior, and these factors were not explicitly measured.

Conclusions

This study demonstrates that adults with CNSLBP attending outpatient physiotherapy clinics in Pakistan experience substantial pain, severe functional disability, and markedly diminished quality of life. Pain intensity and BMI are the strongest independent predictors of functional disability, while pain intensity and disability together account for the vast majority of variance in quality of life. Although psychosocial factors (fear-avoidance beliefs, catastrophizing, depression, anxiety, and poor sleep quality) showed strong bivariate associations with all primary outcomes, their unique contributions were subsumed by pain intensity in multivariable models, reflecting the interrelated nature of the biopsychosocial factors in chronic pain. These findings support the implementation of comprehensive, multidimensional rehabilitation approaches that prioritize effective pain management and weight optimization, while incorporating routine psychosocial screening and targeted interventions for patients with elevated psychological distress.

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