

EXPLORING THE INTERPLAY OF LIFESTYLE, PSYCHOLOGICAL AND HEALTH FACTORS IN SPECIFIC LOW BACK PAIN: A COMPREHENSIVE CORRELATIONAL ANALYSIS

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Abstract

Background: Low back pain is a major health concern in India, with studies reporting a lifetime prevalence ranging from 48% to 59%. This condition significantly impacts a large segment of the population, affecting quality of life by disrupting sleep, psychological well-being, and social interactions. Among the various causes of low back pain, one frequently encountered condition is degenerative disc disease, also known as lumbar disc herniation or prolapsed intervertebral disc (PIVD). The chronic pain and physical limitations associated with PIVD profoundly impact patients' lifestyles, leading to substantial reductions in physical activity, challenges in performing daily tasks, and decreased work capacity. These limitations often result in social isolation and a diminished quality of life. **Objective:** To investigate and elucidate the intricate relationships between lifestyle, psychological and health-related factors in individuals specifically suffering from low back pain. **Method:** 80 patients with PIVD who fulfilled the inclusion and exclusion criteria were recruited from the Orthopaedic and Physiotherapy OPD. The data was collected by the interview method for their responses based on the Questionnaires and Body composition was analysed for Health related factors. **Result and Conclusion:** The study suggests that there is a significant relationship between lower back pain and lifestyle factors such as sleep quality and physical activity. Other unexplored factors may play a more influential role in lower back pain. Additionally, a weak negative correlation exists between lower back pain and psychological factors measured by the Beck Depression Inventory (BDI). The analysis reveals a weak positive correlation between lower back pain and physical functioning, while a significant negative correlation is observed between lower back pain and role limitations due to physical health. This suggests that higher levels of lower back pain may result in greater restrictions in physical health-related roles.

Keywords: Health-Related Factors; Lifestyle Factors; Prolapsed Intervertebral Disc; Psychological Factors

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Introduction

Low back pain (LBP) is a prevalent condition affecting millions of individuals worldwide, often leading to significant discomfort, disability, and a decrease in quality of life. Despite its common occurrence, the aetiology of low back pain is multifaceted, involving an interplay of various factors (Kumar *et al.*, 2017).

Low back pain is a significant health concern in India, with studies indicating a lifetime prevalence ranging from 48% to 59%. It not only affects a large proportion of the population but also has substantial impacts on quality of life, including sleep, psychological well-being, and social interactions. The prevalence is higher among females, the rural population, and elementary workers, highlighting the urgent need for public health interventions to address this burden (Bansal *et al.*, 2020; Shetty *et al.*, 2022). Recent research highlights that LBP is not merely a physical ailment but is influenced by a myriad of lifestyle choices, psychological variables, and health-related aspects. Lifestyle factors such as physical activity, diet, and sleep patterns can profoundly affect the incidence and severity of low back pain. Additionally, psychological factors, including stress, anxiety, and depression, have been shown to exacerbate the perception of pain and hinder recovery. Health-related aspects, encompassing both comorbid conditions and overall physical health, further complicate the clinical picture of low back pain (Hill and Fritz, 2011; Correa *et al.*, 2022). Sedentary lifestyles, insufficient physical activity, and poor ergonomic habits are also the contributors to the development of musculoskeletal problems, including low back pain (Shiri *et al.*, 2009; Rishi and Arora, 2018). Among the various etiologies contributing to low back pain, one of the frequently encountered condition is degenerative disc disease, often known as lumbar disc herniation or prolapsed intervertebral disc (PIVD). PIVD is characterized by the deterioration of intervertebral discs, leading to structural changes and possible compression of spinal nerve roots, which can cause pain, numbness, and functional impairment (Rishi *et al.* (2022)). People's lifestyle choices can have a profound impact on their musculoskeletal health and, consequently, on the prevalence of low back pain. Conversely, adopting a healthy lifestyle that includes regular exercise and proper ergonomics may work as a preventive measure against the onset and progression of low back discomfort (Hartvigsen *et al.* (2018)). Numerous studies have examined the association between psychological variables such as

stress, anxiety, and depression with the occurrence and persistence of low back pain (Hill and Fritz, 2011; Correa *et al.*, 2022). Research suggests that psychological discomfort can contribute to the development of chronic low back pain and may exacerbate existing symptoms (Pincus *et al.*, 2002).

Understanding the complex relationships that exist between psychological health and low back pain is essential for developing comprehensive and effective interventions that target both the mental and physical aspects of this prevalent health concern. Moreover, health-related factors, encompassing both medical and physical aspects, play a crucial role in shaping the landscape of low back pain in affected individuals (Karran *et al.*, 2020). It has been determined that certain conditions such as obesity, smoking, and comorbidities like diabetes have been identified as potential risk factors for the development and aggravation of low back pain (Shiri *et al.*, 2013; Kivimaki *et al.*, 2022). The objective of this study is to investigate and elucidate the intricate relationships between lifestyle, psychological and health-related factors in individuals specifically suffering from low back pain. Given the complex and interrelated nature of these variables, there is a need for a comprehensive analysis that examines how lifestyle, psychological, and health factors interact to influence low back pain. Such an analysis can provide deeper insights into the multifactorial nature of LBP and help in the identification of key areas for intervention.

Materials and Methods

Study Design

This correlational research was conducted in the Physiotherapy and Orthopedics outpatient department of SGT Medical College Hospital and Research Institute in Gurugram, Haryana. Prior to the study, Institutional Ethical Clearance was obtained from the SGT University Faculty of Physiotherapy with Ethical Number-SGTU/FPHY/2022/423. All procedures employed in the current study adhered to the guidelines outlined in the Helsinki Declaration of 1964 and its subsequent amendments and also followed the STROBE checklist for crosssectional studies. All participants were provided with both oral and written information, participated voluntarily, and were informed about their option to withdraw from the study at any point in time by the Qualified Physiotherapist.

Sample Size Calculation

The G power software was used to compute the sample size of 80 Prolapsed Intervertebral Disc Patients at 95% power considering the 5% significance level.

Setting

Participants for the present study were recruited from the outpatient Department of Orthopaedics and Physiotherapy department of SGT Medical College Hospital and Research Institute.

Selection Criteria of Participants

80 Participants in the current study were enrolled based on specific inclusion criteria, including individuals aged between 20 and 50 years who had been experiencing back pain for a minimum of 4 months, with or without radiating pain. Inclusion also required patients to have a Numeric Pain Rating Scale (NPRS) score exceeding 4, a confirmed diagnosis of lumbar disc herniation/prolapse supported by MRI evidence diagnosed by orthopaedician, and a positive Straight Leg Raising (SLR) test, Patients with Disability Index varying between 0-30 score on ODI Scale, Positive Lasègue's sign whereas Exclusion criteria encompassed orthopaedic and Neurological conditions, Radiological signs of Instability/Deformity, Degenerative Scoliosis/Spondylolisthesis, as well as Acute Spinal fractures, Tumours, or Infections. Various outcome measures were used, as mentioned in Table 1. Additionally, it was reported that 5 patients dropped

out of the study because they did not respond to follow-up in the outpatient department (OPD), so a total of 75 participants continued in the current study.

Procedure

Patients diagnosed with PIVD at SGT Hospital's orthopaedic department received detailed study information and willingly completed demographic data and consent forms. Before the starting the data, all the participants went through the baseline assessment of BMI (Body Mass Index), Lifestyle Factors, Psychological Factors and Health-related factors. Height, measured with a stadiometer after removing shoes and bulky clothing, facilitated BMI calculation. Four questionnaires (Figure 1) were administered through interviews, covering sleep quality, physical activity, depression (using the Beck Depression Inventory scale), and general health (using the SF-36 questionnaire). Body fat composition was analyzed by Bioelectrical impedance (Figure 2). To prepare for a Bioelectrical Impedance Analysis (BIA), the individual stands or lies down on a BIA device equipped with footpads or handheld electrodes. It is important that their skin is clean and dry to ensure accurate measurements, and any metal objects or jewellery should be removed to avoid interference with the electrical signal. During the measurement, the BIA device sends a low-level electrical current through the body via the electrodes. This current travels at different speeds through muscle and fat tissues due to their varying water content. Muscle tissue, with higher water content, allows the current to pass more easily, while fat tissue, with lower water content, provides more resistance. Participants completed assessments in the Physiotherapy Department, taking approximately 55 minutes, with scores subsequently computed and correlated. At the initiation of the study, each participant was assigned a unique identity code to ensure impartiality in the research.

Table 1. OutcomeMeasures

S.no	Purpose	Components	Assessment Method
1	Lifestyle factors	Sleep Quality	Pittsburgh Sleep Quality Index (PSQI) (Campanini, 2022)
		Physical Fitness	International Physical Activity Questionnaire (IPAQ) (de Jesus-Moraleida <i>et al.</i> , 2020)
2	Psychological factor	Depression	Beck Depressive Inventory-II (BDI-II) (Upton, 2020)
3	Health-related factors	General Health	SF-36 Questionnaire (Járomi <i>et al.</i> , 2021)
		Body composition	Bioelectrical Impedance Analysis (BIA). Kechagias <i>et al.</i> , 2021



Figure 1. Filling of Questionnaire



Figure 2. Measurement of Body Composition by Bioelectrical Impedance

Results and Discussion

Statistical Analysis

Statistical Analysis was done utilizing R Software version 4.3.0, where the mean and standard deviation of the variables were computed. The analysis for demographic characteristics was calculated using the independent t-test, whereas Karl Pearson's correlation was employed to investigate the association between lifestyle, psychological, and health-related factors in patients with PIVD experiencing low back pain. Correlations falling within the range of $0 < r < 0.25$ were classified as weak, $0.25 < r < 0.75$ as moderate, and $0.75 < r < 1$ as strong. Significance was determined at $P < 0.05$.

Results

In the present study, 75 subjects were enrolled aged between 20 and 50 years who had been experiencing back pain for a minimum of 4 months, with or without radiating pain.

In the present study, the findings presented in Table 2 illuminate that the participants had an average age of 37.7 years, accompanied by a standard deviation of 8.02. The mean height and weight were computed at 169.58 centimetres and 67.07 kilograms, respectively. The body mass index (BMI) was determined to be 23.33, exhibiting a variation of 2.16 from the mean. Furthermore, the systolic and diastolic blood pressure readings were recorded at 121.07 and 79.73, respectively.

The scores presented in Table 3 are for various dimensions of health. Physical Functioning scored an average of 37.53 (± 16.03), indicating moderate physical function. Role limitations due to physical health had an average score of 6.00 (± 21.69), while emotional role limitations scored 28.43 (± 39.01). Energy/Fatigue showed a moderate level at 44.19 (± 18.37), and emotional well-being was relatively high at 50.56 (± 13.50). Social functioning scored

Table 2. Explains about the distribution of study participants according to demographic variables

Variables	Mean $\pm$ SD
Age	37.7 $\pm$ 8.02
Height	169.58 $\pm$ 7.72
Weight	67.07 $\pm$ 7.42
BMI	23.33 $\pm$ 2.16
SBP	121.07 $\pm$ 8.63
DBP	79.73 $\pm$ 7.35

Table 3. Explains about the Distribution of study participants questionnaire related to General Health Factors

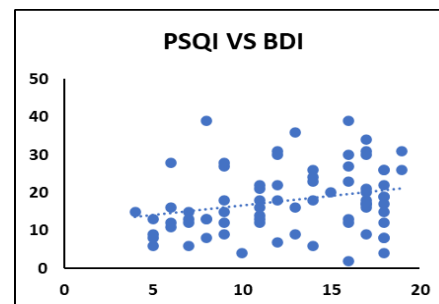
SF-36	Mean $\pm$ SD
Physical Functioning	37.53 $\pm$ 16.03
Role limitations due to physical health	6.00 $\pm$ 21.69
Role limitations due to emotional problems	28.43 $\pm$ 39.01
Energy/fatigue	44.19 $\pm$ 18.37
Emotional well-being	50.56 $\pm$ 13.50
Social functioning	41.65 $\pm$ 19.31
Pain	35.73 $\pm$ 18.52
General Health	44.00 $\pm$ 7.02
BIA	31.92 $\pm$ 6.65

41.65 (± 19.31), and pain was moderate at 35.73 (± 18.52). General health perception averaged at 44.00 (± 7.02), and the BIA dimension had an average score of 31.92 (± 6.65).

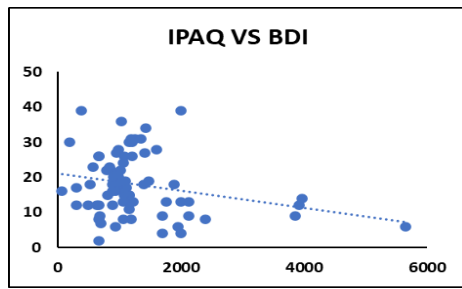
In this present study, Table 4 and Figures 3(a) and 3(b) depict the relationship between lifestyle factors amongst psychological factors. It was found that when the PSQI correlates with BDI, there were positive and moderate correlations and negative with weak correlations between IPAQ versus BDI. However, the results were statistically significant at a 0.05 level of significance.

Table 4. Explains the Correlation between Lifestyle factors and psychological factors

		BDI
PSQI	Pearson Correlation	0.284
	p-value	0.014*
IPAQ	Pearson Correlation	-0.248
	p-value	0.032*



(a)



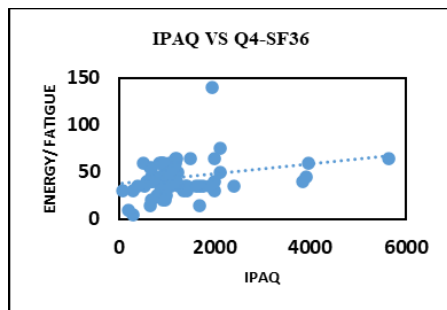
(b)

Figure 3. (a) PSQI VS BDI and (b) IPAQ VS BDI

In Table 5 and Scatter Diagram Figure 4, the correlation between PSQI and the Physical Functioning component of SF-36. The correlation between PSQI and Physical Functioning is -0.321. This indicates a moderate negative correlation between sleep quality (PSQI) and physical functioning. The associated p-value of 0.005** suggests that this correlation is statistically significant at the 0.01 level.

Table 5. Explains the Correlation between Lifestyle factors amongst Health factors

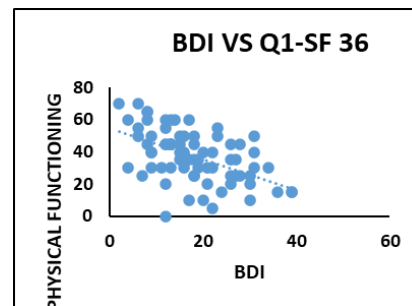
	PSQI		IPAQ	
	r-value	p-value	r-value	p-value
SF-36	-0.321	0.005**	0.249	0.031*
Physical Functioning	0.044	0.710	0.054	0.647
Role limitations due to physical health	0.072	0.538	0.102	0.384
Role limitations due to emotional problems	-0.160	0.169	0.229	0.048*
Energy/fatigue	-0.058	0.618	0.058	0.619
Emotional well-being	-0.187	0.109	0.194	0.095
Social functioning	-0.212	0.067	0.355	0.002**
Pain	-0.339	0.003**	0.215	0.064
General Health	0.020	0.868	-0.184	0.113
BIA	-0.321	0.005**	0.249	0.031*

**Figure 4. Correlation between IPAQ (lifestyle factor) and Energy/Fatigue Component of SF36(Q4) (Health factors)**

In Present study Table 6 and Figure 5, the correlation between psychological factors assessed by the BDI questionnaire and health factors related to physical functioning evaluated by the SF-36 questionnaire is presented. The correlation is represented by an r-value of -0.512, indicating a moderate negative relationship between these factors. The corresponding p-value of 0.001 suggests that this relationship is statistically significant.

Table 6. Correlation between Psychological Factors amongst Health Factors

SF-36(Questionnaires)	BDI	
	r-value	p-value
Physical Functioning	-0.512	0.001**
Role limitations due to physical health	-0.263	0.022*
Role limitations due to emotional problems	-0.143	0.219
Energy/fatigue	-0.317	0.006**
Emotional well-being	-0.249	0.032*
Social functioning	-0.330	0.004**
Pain	-0.148	0.204
General Health	-0.052	0.657
BIA	0.025	0.832

**Figure 5. Correlation between BDI (Psychological factors) and Physical functioning (Health factors)**

In Present Table 6 and Figure 6, displays the correlation between psychological factors, as measured by the BDI questionnaire, and health factors related to role limitations due to physical health, as assessed by the SF-36 questionnaire. The correlation is represented by an r-value of -0.263, indicating a weak negative relationship. The corresponding p-value is 0.022, suggesting that this relationship is statistically significant.

In Table 6 and Figure 7, Presents the correlation between the BDI questionnaire, and health factors related to energy/fatigue, as assessed by the SF-36 questionnaire. The correlation is represented by an r-value of -0.317, indicating

a moderate negative relationship. The corresponding p-value is 0.006, suggesting that this relationship is statistically significant.

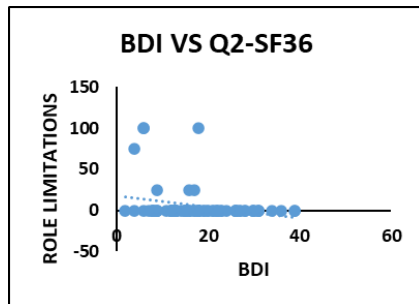


Figure 6. Correlation between BDI (psychological factors) and to role limitations due to physical health (health factors)

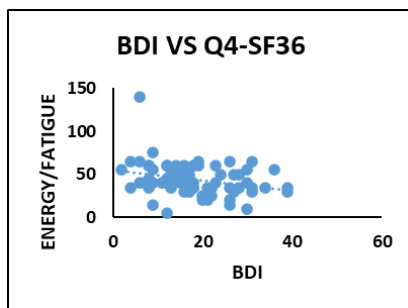


Figure 7. Correlation between BDI (Psychological factors) and Energy/Fatigue (health factors)

In Table 6 and Figure 8, displays the correlation between psychological factors, as measured by the BDI questionnaire, and health factors related to emotional well-being, as assessed by the SF-36 questionnaire. The correlation is represented by an r-value of -0.249, indicating a weak negative relationship. The corresponding p-value is 0.032, suggesting that this relationship is statistically significant.

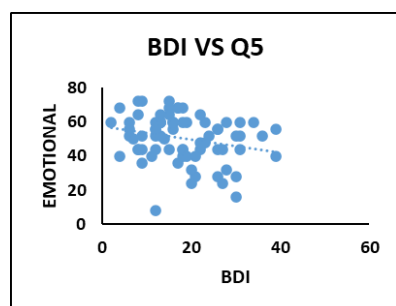


Figure 8. Correlation between BDI (psychological factors) and Emotional well-being (health factors)

In Table 6 and Figure 9, Illustrate the correlation between psychological factors, as measured by the BDI questionnaire, and health factors related to social functioning, as evaluated by the SF-36 questionnaire. The correlation is represented by an r-value of -0.330, indicating a moderate negative relationship. The corresponding p-value is 0.004, suggesting that this relationship is statistically significant.

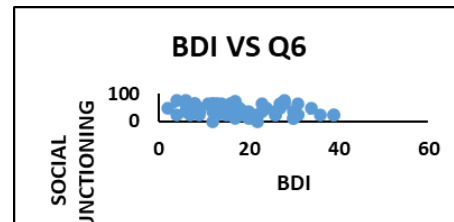


Figure 9. Correlation between BDI (psychological factors) and social functioning (health factors)

Discussion

This study aimed to examine the relationship between lifestyle, psychological factors, and health-related factors in patients with low back pain. While previous research (Ge *et al.*, 2022) has explored various aspects of low back pain including lifestyle, psychological function, and anxiety, no study has specifically investigated the connection between lifestyle, psychological factors, and health-related factors in this population.

Lifestyle Factors

The findings of this study indicate a significant correlation between sleep quality and depressive symptoms, suggesting that better sleep quality is associated with lower levels of depressive symptoms ($P < 0.05$). The result of this study correlates with the study conducted by Wang *et al.* (2016), which showed a strong association between the severity of depression with insomnia in patients with chronic low back pain. This might occur due to the following reasons: (1) One of the primary characteristics of depression is sleep disturbance, in addition, reduced physical activity resulting from depression may affect the sleep quality due to factors such as lack of motivation, fatigue and psychomotor retardation; (2) Individuals with depression and chronic pain may be more dysfunctional in their views about sleep, have worse sleep hygiene, and have more pre-sleep arousal. Furthermore, the study found that higher levels of physical activity were linked to lower levels of

depressive symptoms ($p < 0.05$). These results highlight the importance of sleep quality and physical activity in influencing depressive symptoms among individuals with low back pain.

There exists a possible bidirectional link between sleep quality and low back pain (p-value 0.067). The result of this study is in line with a previous study conducted by Alsaadi *et al.* (2014) concluded that untreated sleep disturbance may result in a vicious cycle of pain and sleep disturbance, making it more difficult to manage LBP and perhaps increasing the risk of patients experiencing psychological distress. Additionally, the paper found a significant correlation between pain and physical activity with a p-value of 0.002. The result is in line with previous studies that regular physical activity reduces the risk of low back pain (Kędra *et al.*, 2021; Galmés-Panadés and Vidal-Conti, 2022). This suggests that optimizing physical activity may be recommended for managing chronic low back pain. Both very low and very high levels of physical activity are associated with low back pain (Zheng *et al.*, 2023).

Psychological Factors

The present study suggests that individuals with lower levels of depressive symptoms may experience slightly less severe lower back pain compared to those with higher levels of depressive symptoms. Mental illnesses, including depression, psychosis, anxiety, and sleep issues, are significantly associated with a higher incidence of back pain (Stubbs *et al.*, 2016). Poor mood is also connected to back pain-related absences from work (Saravanan *et al.*, 2021). Disturbed sleep is a stressful symptom that significantly reduces the quality of life for individuals with depression Zaidel *et al.* (2021). Psychological factors such as fear, catastrophizing, and depression play a role in the relationship between pain and disability in individuals with chronic low back pain.

Health-Related Factors

Patients with chronic low back pain who also have depression experience more intense pain, lower health-related quality of life, and worse overall outcomes. However, the exact causative relationship between pain and depression is still not fully understood. Previous research indicates that low back pain (LBP) has a greater impact on patients' physical health than their mental well-being (Ogunlana *et al.*, 2012). The severity of physical discomfort is the primary factor that LBP patients react to the most. As pain and functional impairment worsen, the health-related quality of life (HRQOL) of low back pain patients tends to deteriorate. Smoking has been linked to

degenerative spinal disease, a common cause of low back discomfort (Rajesh *et al.*, 2022; Elmasry *et al.*, 2015). Verbrugghe *et al.* (2020) reported that higher levels of physical activity have been associated with reduced discomfort. Exercise is thought to prevent low back pain through the following mechanisms: improving the blood supply to the ligaments, tendons, and discs, these activities additionally tone the back muscles and increase trunk flexibility, reduce damage, and speed up recovery. They also affect pain perception through improving mood. Being overweight or obese has been identified as a primary contributing factor to low back pain. Higher fat mass and percentage have been correlated with increased intensity of lower back pain and disability (Zhou *et al.*, 2021 and Hussain *et al.*, 2017); maintaining a healthy weight, engaging in physical activity, and managing pain perception can play a role in preventing and managing low back pain.

Limitations - In the present study self-reported measures were used to collect data, including questionnaires for lifestyle factors, health factors, and psychological factors. However, self-report data is subjective and susceptible to recall bias or social desirability bias, which may impact the accuracy of the results. The study did not consider potential confounding factors, such as socioeconomic status, comorbidities, or medication use, which could affect the observed associations between lifestyle factors, health factors, and psychological factors. The accuracy of the results in the study investigating the relationship between lifestyle, psychological, and health-related factors in low back pain patients (PIVD) may be compromised because of the limited sample size. Another limitation of this study is that, while significant correlations between various factors were identified, correlation does not imply causation, and thus definitive statements about causal relationships cannot be made.

Future Scope of the Study - It is recommended that future studies may explore the utilization of objective measures to validate self-report data, aiming to mitigate potential biases related to recall and social desirability. Furthermore, conducting thorough assessments that consider confounding factors such as socioeconomic status, comorbidities, and medication use would advance the comprehension of the associations between lifestyle, psychological, and health-related factors in individuals with PIVD. Future research should consider the implementation of longitudinal or experimental study designs to investigate relationships over time and manipulate variables.

Clinical Implications - The clinical implications of the relationship among lifestyle, psychological, and health-related factors in patients with low back pain include the need for a holistic approach to care. Healthcare professionals should consider the impact of sleep quality, depressive symptoms, physical activity levels, and lifestyle factors such as smoking and obesity on low back pain. Addressing these factors through interventions such as sleep management, promoting physical activity, lifestyle modifications, psychological screening and support, patient education, and multidisciplinary collaboration can improve patient outcomes and overall well-being.

Conclusion

In conclusion, this study suggests that there is a significant relationship between lower back pain and lifestyle factors such as sleep quality and physical activity. Other unexplored factors may play a more influential role in lower back pain. Additionally, a weak negative correlation exists between lower back pain and psychological factors measured by the Beck Depression Inventory (BDI).

The analysis reveals a weak positive correlation between lower back pain and physical functioning, while a significant negative correlation is observed between lower back pain and role limitations due to physical health. This suggests that higher levels of lower back pain may result in greater restrictions in physical health-related roles.

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