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IMPACT OF INCREASED BMI ON QUALITY OF LIFE IN PATIENTS WITH ADHESIVE CAPSULITIS AND LOW BACK PAIN

Original Research

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ABSTRACT

Background: Overweight and obesity have increased significantly in recent decades, contributing to the global burden of non-communicable diseases. Among musculoskeletal conditions, adhesive capsulitis and low back pain (LBP) are frequently observed in overweight individuals and are known to significantly impair quality of life (QOL) and sleep. Despite this, there remains limited comparative data on how increased body mass index (BMI) influences these outcomes between the two conditions.

Objective: To determine the impact of increased BMI on sleep quality and quality of life in patients with adhesive capsulitis and low back pain.

Methods: A cross-sectional study was conducted between June 30 and December 30, 2022, across physiotherapy outpatient departments and clinics in Rawalpindi and Islamabad. A total of 384 participants were recruited through non-probability convenience sampling, equally divided into two groups: 192 patients with adhesive capsulitis and 192 with LBP. Participants were assessed using the Visual Analogue Scale (VAS) for pain, the WHOQOL-BREF questionnaire for quality of life, and the Pittsburgh Sleep Quality Index (PSQI) for sleep quality. Data analysis was performed using SPSS version 21.

Results: The mean BMI in the LBP group was 26.48 ± 3.36, compared to 25.02 ± 4.30 in the adhesive capsulitis group. Global PSQI scores were higher in adhesive capsulitis patients (7.38 ± 3.29) than in those with LBP (6.47 ± 2.41), indicating poorer sleep quality. WHOQOL-BREF scores revealed moderate QOL impairment across all domains in both groups. Spearman's correlation showed no statistically significant association between BMI and sleep quality ($p = 0.91$), although physical and psychological domains of QOL showed weak negative correlations with BMI.

Conclusion: The study highlights that both LBP and adhesive capsulitis considerably impact quality of life and sleep quality. However, increased BMI did not emerge as a significant correlating factor in this population.

Keywords: Adhesive capsulitis, Body mass index, Low back pain, Obesity, Pittsburgh Sleep Quality Index, Quality of life, WHOQOL-BREF.

INTRODUCTION

The human spine is anatomically divided into five regions: cervical, thoracic, lumbar, sacral, and coccygeal, comprising 7 cervical, 12 thoracic, 5 lumbar, 5 fused sacral, and typically 4 coccygeal vertebrae (1). These structures form the primary axis of human posture and mobility, yet spinal movements do not have fixed functional ranges due to variability influenced by age, sex, and habitual posture (2). Among spinal conditions, low back pain (LBP) stands out due to its substantial prevalence, affecting up to 20% of the population at any given time, although some variability exists across studies (3). Conventionally, it is accepted that nearly 80% of individuals will experience LBP at some stage in their lives (4). The biomechanical integrity of the spine plays a pivotal role in the functioning of adjacent musculoskeletal structures, particularly the shoulder complex. Owing to its wide range of motion, the shoulder sacrifices stability, making it susceptible to injuries and overuse syndromes (5). The shoulder girdle comprises multiple bones including the humerus, clavicle, scapula, manubrium, upper ribs, and upper thoracic vertebrae, and functions through the coordinated activity of four key joints: the glenohumeral (GH), acromioclavicular (AC), sternoclavicular (SC), and scapulothoracic (ST) joints (6). The GH joint, as a synovial ball-and-socket joint, facilitates major movements such as flexion-extension, abduction-adduction, internal-external rotation, and circumduction, while scapular movements complement these with elevation, depression, protraction, and retraction (7). Shoulder pathologies, particularly tendinitis and adhesive capsulitis, are prevalent across age groups, with etiologies varying from acute strain in younger individuals to degenerative changes in older adults. Limited vascular supply to the supraspinatus tendon predisposes it to inflammation, fibrosis, and even calcification in some cases (8). Adhesive capsulitis, more commonly known as frozen shoulder, is characterized by progressive restriction in both active and passive shoulder motion, often with normal radiographic findings aside from possible osteopenia (9). The terminology evolved from Codman's "Frozen Shoulder" in 1934 to Naviesar's "Adhesive Capsulitis" in 1945, reflecting greater understanding of its pathophysiology (10). The disease typically progresses through three clinical stages—freezing (painful), frozen (stiff), and thawing (resolving)—marked by initial inflammation and capsular fibrosis, which later resolves spontaneously or with intervention (11). Notably, adhesive capsulitis is frequently associated with systemic conditions, especially diabetes mellitus, which significantly increases its incidence and complicates management (12).

In the broader context of health, the World Health Organization defines quality of life (QOL) as an individual's perception of their position in life, influenced by culture, values, expectations, and personal goals (13). Given the physical limitations imposed by both LBP and adhesive capsulitis, patients with either condition often report compromised QOL (12,13). Additionally, both conditions are associated with poor sleep quality, which further deteriorates overall well-being (9,10). A commonly acknowledged contributing factor to musculoskeletal deterioration is body mass index (BMI), a surrogate measure of obesity first standardized in 1972 as weight in kilograms divided by height in meters squared. This classification defines individuals with BMI <18.5 as underweight, 18.5–24.9 as normal, 25–29.9 as overweight, and ≥30 as obese (14). Over the past decades, there has been a global shift toward increased prevalence of overweight and obesity, surpassing underweight statistics. While obesity predominantly affects weight-bearing joints, its influence on upper body musculoskeletal health, including shoulder disorders, is increasingly recognized (2,7). Furthermore, individuals with high BMI often face higher failure rates in conservative treatment protocols for adhesive capsulitis, suggesting a multifactorial burden associated with excess weight (9,11). A recent local study reported that both LBP and adhesive capsulitis were among the most frequently encountered musculoskeletal conditions, underscoring the need for targeted interventions (15). These conditions not only impair physical function but also compromise psychological and social domains of health. Considering the overlapping burden of increased BMI, musculoskeletal pain, and diminished QOL, it becomes imperative to explore these associations in greater depth. Thus, the present study aims to determine the impact of elevated BMI on quality of life and sleep quality in patients suffering from adhesive capsulitis and low back pain.

METHODS

This analytical cross-sectional study was conducted across physiotherapy outpatient departments in Islamabad and Rawalpindi over a six-month period, from June 30 to December 30, 2022. Ethical approval was obtained from the Research Ethics Committee of Riphah International University prior to the commencement of the study, and written informed consent was secured from all participants. A total of 384 individuals were recruited using a non-probability convenience sampling technique. The sample size was calculated using

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OpenEpi, based on a 95% confidence interval and a significance level of $p<0.05$. Participants were equally divided into two groups: 192 patients with adhesive capsulitis and 192 patients with low back pain (LBP), based on pre-defined diagnostic criteria. Eligibility was determined using specific inclusion and exclusion criteria. For the adhesive capsulitis group, participants aged between 35 and 65 years with a clinically established diagnosis of adhesive capsulitis and no other coexisting shoulder pathologies were included. Similarly, for the LBP group, individuals within the same age range who had been diagnosed with either centralized or radiating low back pain were selected (3,5). Patients with a history of previous orthopedic surgeries, documented psychiatric conditions, or cognitive impairments were excluded from both groups to ensure data integrity and avoid confounding factors. Data collection included detailed demographic profiling, encompassing age, gender, height, weight, body mass index (BMI), presence of diabetes, duration of symptoms, and current or past treatment modalities. Pain intensity was assessed using the Visual Analogue Scale (VAS), a validated psychometric tool that quantifies pain on a 10 cm (100 mm) horizontal line, where 0 represents “no pain” and 10 indicates the “worst imaginable pain.” Participants marked their current pain level on the scale, and scores were calculated by measuring the distance in millimeters from the zero point, reflecting the subjective pain experience.

The quality of life (QOL) was measured using the WHOQOL-BREF questionnaire, a widely accepted instrument developed by the World Health Organization. Derived from the original WHOQOL-100, the WHOQOL-BREF consists of 26 items, distributed across four domains: physical health, psychological well-being, social relationships, and environmental conditions. Responses were recorded on a five-point Likert scale, and domain scores were converted to a standardized 0–100 scale for comparative interpretation. This tool has demonstrated strong psychometric properties, including test-retest reliability, internal consistency, and content validity, making it suitable for diverse populations (5,7). Sleep quality was evaluated through the Pittsburgh Sleep Quality Index (PSQI), a validated self-reported questionnaire comprising 19 items that collectively assess sleep patterns over the past month. These items contribute to seven component scores—subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medication, and daytime dysfunction—culminating in a global score ranging from 0 to 21. Higher scores reflect poorer sleep quality. The PSQI has been shown to have robust internal homogeneity and test-retest reliability, with broad applicability across different population groups. Statistical analysis was carried out using SPSS version 21. Descriptive statistics were computed for demographic variables and outcome measures. To evaluate the relationship between BMI and both sleep quality and quality of life, Spearman’s rank-order correlation was applied due to the ordinal nature of the data and non-parametric distribution patterns.

RESULTS

A total of 384 participants were included in the study, comprising 230 males (59.9%) and 154 females (40.1%). The mean age of the overall sample was 47 ± 10.25 years, while the average BMI was calculated at 25.76 ± 3.93. Based on BMI classification, 2.1% of participants were underweight, 39.8% had normal weight, 46.4% were overweight, and 11.7% were obese. Among the 192 patients diagnosed with low back pain (LBP), 127 (66.1%) were male and 65 (33.9%) were female, with a mean age of 46.95 ± 11.20 years. In comparison, the adhesive capsulitis group included 103 males (53.6%) and 89 females (46.4%), with a mean age of 48 ± 9.18 years. Pain intensity, assessed using the Visual Analogue Scale (VAS), showed an overall mean score of 5.02 ± 1.81. Patients with adhesive capsulitis reported a mean VAS score of 4.77 ± 1.83, whereas those with LBP had a slightly higher mean score of 5.26 ± 1.77. The WHOQOL-BREF scores, converted to both 4–20 and 0–100 scales, indicated moderate quality of life in both patient groups. In patients with LBP, the mean scores across domains were: physical health 12.24 ± 2.01 (51.65 ± 12.65), psychological well-being 13.77 ± 1.91 (60.45 ± 11.77), social relationships 15.68 ± 1.64 (73.01 ± 10.32), and environmental factors 13.71 ± 1.79 (60.76 ± 11.18). Patients with adhesive capsulitis presented similar scores: physical health 12.17 ± 2.68 (51.26 ± 16.83), psychological well-being 13.64 ± 1.88 (59.46 ± 11.35), social relationships 14.51 ± 2.24 (65.56 ± 14.02), and environmental factors 13.18 ± 1.70 (57.45 ± 10.65).

Sleep quality, assessed via the Pittsburgh Sleep Quality Index (PSQI), showed a mean score of 6.92 ± 2.92 across all participants. The LBP group reported a mean PSQI score of 6.47 ± 2.41, while adhesive capsulitis patients had a higher mean score of 7.38 ± 3.29, indicating comparatively poorer sleep quality in the latter group. Spearman correlation analysis was used to examine the association between BMI and quality of life domains, as well as sleep quality. In the adhesive capsulitis group, BMI was negatively correlated with the physical health domain ($r = -0.166$, $p = 0.001$) and psychological well-being ($r = -0.143$, $p = 0.005$), while no significant correlations were observed with social ($r = 0.059$, $p = 0.248$) and environmental domains ($r = 0.029$, $p = 0.575$). Similarly, in the LBP group, a stronger negative correlation was found between BMI and physical health ($r = -0.375$, $p = 0.001$), and psychological well-being ($r = -0.260$, $p = 0.001$), with minimal or no correlation with social ($r = 0.007$, $p = 0.924$) and environmental domains ($r = -0.003$, $p = 0.965$). The correlation between BMI and PSQI was statistically insignificant across both groups ($p = 0.91$). To further explore intergroup differences aligned with the study's objective, subgroup-specific inferential comparisons were conducted between adhesive capsulitis and low back pain (LBP) groups for quality of life (QOL) and sleep quality. Independent t-tests were performed for all four domains of the WHOQOL-BREF and Pittsburgh Sleep Quality Index (PSQI) scores. The findings revealed no statistically significant differences in physical health (p = 0.74), psychological well-being (p = 0.58), social relationships (p = 0.07), and environmental conditions (p = 0.15) domains of QOL between the two groups. However, a statistically significant difference was found in PSQI scores (p = 0.01), indicating poorer sleep quality among patients with adhesive capsulitis compared to those with LBP. These results suggest that while QOL domains remain comparable across the two conditions, sleep quality is disproportionately affected in patients with adhesive capsulitis.

Table 1: Spearmen correlation between both groups

Adhesive capsulitis WHOQOL-BREF	BMI correlation	Low back pain WHOQOL-BREF	BMI correlation
Domain 1	-0.166 (p-value 0.001)	Domain 1	-0.375 (p-value 0.001)
Domain 2	-0.143 (p-value 0.005)	Domain 2	-0.260 (p-value 0.001)
Domain 3	0.059 (p-value 0.248)	Domain 3	0.007 (p-value 0.924)
Domain 4	0.029 (p-value 0.575)	Domain 4	-0.003 (p-value 0.965)

Table 2: QOL and PSQI Group Comparison

Domain	Adhesive Capsulitis Mean ± SD	Low Back Pain Mean ± SD	p-value	Statistical Test
Physical	12.17 ± 2.68	12.24 ± 2.01	0.74	t-test
Psychological	13.64 ± 1.88	13.77 ± 1.91	0.58	t-test
Social	14.51 ± 2.24	15.68 ± 1.64	0.07	t-test
Environmental	13.18 ± 1.7	13.71 ± 1.79	0.15	t-test
Sleep Quality (PSQI)	7.38 ± 3.29	6.47 ± 2.41	0.01	t-test

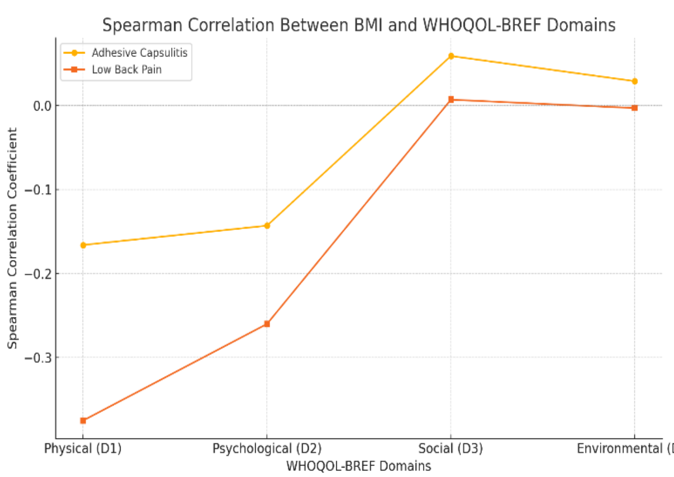

Figure 2 Spearman Correlation Between BMI and WHOQOL-BREF Domains

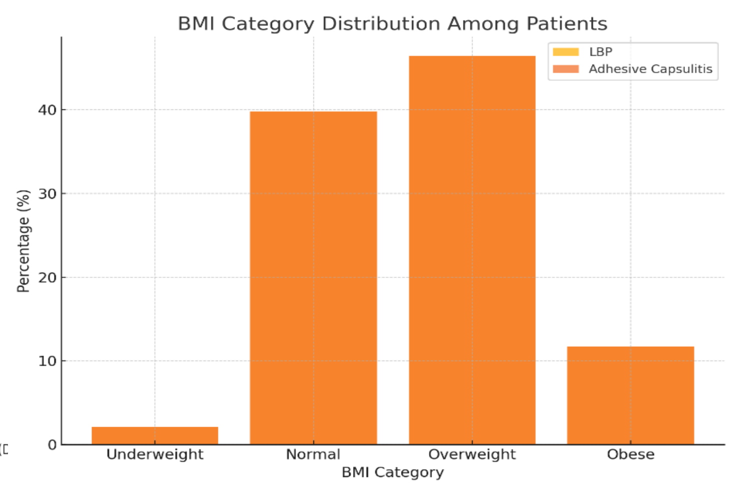

Figure 1 BMI Category Distribution Among Patients

DISCUSSION

This study aimed to explore the relationship between body mass index (BMI), quality of life (QOL), and sleep quality among individuals diagnosed with low back pain (LBP) and adhesive capsulitis. The findings contribute to the growing body of literature highlighting the interplay between musculoskeletal disorders, excess body weight, and general well-being. The sample predominantly consisted of middle-aged individuals, with the majority falling into the overweight BMI category. This observation is consistent with established epidemiological patterns, where overweight and obesity have been associated with an increased risk of developing musculoskeletal conditions such as LBP and adhesive capsulitis (15,16). The elevated BMI levels across both patient groups reinforce the notion that excess weight contributes to biomechanical stress and inflammation, which may exacerbate the onset and severity of these conditions. In both LBP and adhesive capsulitis cohorts, moderate scores were reported across all domains of the WHOQOL-BREF questionnaire, reflecting the multidimensional impact of chronic musculoskeletal pain. These scores suggest that physical discomfort not only affects mobility and functionality but also exerts significant psychological and social burdens. The results are aligned with earlier research reporting that musculoskeletal pain markedly reduces individuals' perceived quality of life, particularly in terms of physical functioning and emotional well-being (17). Similar patterns have also been observed in individuals with chronic rheumatic and orthopedic disorders, where impairments in functional capacity were closely linked with reduced QOL outcomes (18). The current findings reaffirm that musculoskeletal dysfunctions, even in the absence of systemic disease, can substantially compromise daily living and psychosocial health. In terms of sleep quality, the mean Pittsburgh Sleep Quality Index (PSQI) score was higher in patients with adhesive capsulitis compared to those with LBP, indicating poorer sleep among the former group. This disparity is noteworthy as it suggests that shoulder-related pain and stiffness may be more disruptive to nocturnal comfort and rest than spinal pain, possibly due to mechanical limitations in sleeping positions. Although a negative correlation between BMI and sleep quality was observed, it did not reach statistical significance in the present study. This is in contrast to earlier findings where a significant relationship was established between increased BMI and deteriorated sleep parameters, including shorter duration and more frequent disturbances (19). The discrepancy may be attributed to variations in sample size, population characteristics, or methodological tools across studies.

Despite these meaningful insights, the study had several limitations. The use of non-probability convenience sampling restricts the generalizability of the findings, as the sample may not accurately represent the broader population. Additionally, the cross-sectional design precludes any causal inferences between BMI, QOL, and sleep quality. The reliance on self-reported questionnaires, although standardized, may introduce response bias, particularly in areas such as sleep patterns and emotional well-being. Moreover, while BMI served as a useful screening metric for weight-related classification, it does not account for body composition differences such as muscle mass or fat distribution, which may further influence clinical outcomes. Nonetheless, the study offers valuable strengths, including the use of validated measurement instruments such as the WHOQOL-BREF and PSQI, and a balanced sample size across the two conditions. By incorporating both LBP and adhesive capsulitis groups, the research enabled comparative insight into two prevalent and disabling musculoskeletal disorders. The inclusion of domain-specific quality of life analysis also allowed a more nuanced understanding of how BMI may differentially affect various aspects of well-being. Future research should consider prospective longitudinal designs to explore causal pathways, and integrate objective measures such as actigraphy for sleep assessment or bioelectrical impedance for body composition analysis (20). Stratification based on age, gender, comorbidities, and pain duration could also refine subgroup analyses. Additionally, intervention-based studies exploring whether weight loss and physical rehabilitation can improve QOL and sleep quality in this population would offer clinically applicable insights. Overall, the study reinforces the interlinked burden of excess weight, musculoskeletal pain, and impaired daily functioning, and highlights the need for integrated management strategies to enhance outcomes for affected individuals.

CONCLUSION

In conclusion, this study highlights the substantial impact of low back pain and adhesive capsulitis on patients' quality of life and sleep quality, emphasizing the broader implications of chronic musculoskeletal conditions beyond physical discomfort. While body mass index did not show a significant association with these outcomes, the findings underscore the importance of comprehensive clinical approaches that prioritize pain relief and psychological support. Addressing the multidimensional burden of these conditions can enhance both functional recovery and overall well-being. These insights advocate for more integrated treatment strategies and pave the way for future research to better understand the complex interplay between physical health, psychological resilience, and lifestyle factors in musculoskeletal care.

AUTHOR CONTRIBUTION

Author	Contribution
Ammanullah Nazir	Substantial Contribution to study design, analysis, acquisition of Data Manuscript Writing Has given Final Approval of the version to be published
Muhammad Waleed Tariq	Substantial Contribution to study design, acquisition and interpretation of Data Critical Review and Manuscript Writing Has given Final Approval of the version to be published
Muhammad Arslan Malik	Substantial Contribution to acquisition and interpretation of Data Has given Final Approval of the version to be published
Samiullah Khan	Contributed to Data Collection and Analysis Has given Final Approval of the version to be published
Yousaf Bilal Shah	Contributed to Data Collection and Analysis Has given Final Approval of the version to be published
Anees Arshad*	Substantial Contribution to study design and Data Analysis Has given Final Approval of the version to be published

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