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Original Article

Prevalence of Non-Specific Low Back Pain with Compromised Endurance and Stability in Young Adult Females

Marvi Asif[1], Sheeza Habib[2], Samra Anwar[3], Fareeha Kausar[4], Nimra Gul[5], Kanwal Fatima[6], Ume Ammara[7], Tayyaba Kiran[8], Hira Rafique[9]*, Intsam Aslam[10]

[1]The University of Lahore, Pakistan.
[2]University of South Asia, Cantt Campus Lahore, Pakistan.
[3]Physical Therapist, Angel Touch Physical Therapy New York, USA.
[4]Senior lecturer, Faculty of Rehabilitation and Allied Health Sciences, Riphah International University, Pakistan.
[5]HO, Peoples University of Medical and Health Sciences For Women, Nawab shah, Pakistan.
[6]Lecturer, Department of Allied Health sciences, University of Sargodha, Pakistan.
[7]Physiotherapist, Move Healthy Physiotherapy Clinic, Pakistan.
[8]Physiotherapist , Kulsum International Hospital, Pakistan.
[9]Senior Lecturer, Quaid-e-Azam Educational Complex, Sahiwal, Pakistan.
[10]Lecturer, Quaid-e-Azam Educational Complex, Sahiwal, Pakistan.
Corresponding Author: Hira Rafique, Senior Lecturer; Email: hirazohaib8@gmail.com

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ABSTRACT

Background: Non-specific low back pain (NSLBP) is a prevalent condition that significantly impacts the quality of life, particularly among young adult females. It leads to decreased physical fitness, compromised balance and endurance, and increased disability, affecting daily activities and overall well-being.

Objective: The objective of this study was to assess the effects of NSLBP on cardiopulmonary endurance and balance in young adult females and to explore the implications for healthcare management and intervention strategies.

Methods: This observational cross-sectional survey involved 60 female participants aged 18-40 years, experiencing NSLBP without underlying pathological conditions. The study employed convenience sampling at the University of Lahore Gujrat Campus over a six-month period. Measures included the Visual Analogue Scale (VAS) for pain, the Oswestry Disability Index (ODI) for disability assessment, the Time Up and Go (TUG) test for balance, and the Rockport Fitness Test for evaluating cardiopulmonary endurance. Statistical analysis was conducted using SPSS version 25, with T-tests for quantitative data and Chi-square tests for qualitative data. A p-value of ≤ 0.05 was considered statistically significant.

Results: The majority of participants (66.7%) were in the 18-23 age group. According to the VAS, 43.3% reported severe pain, and 33.3% reported moderate pain. The ODI revealed that 60% of participants had minimal disability. Cardiopulmonary endurance analysis showed that 43.33% of participants had poor endurance, and 31.67% had very poor endurance. The TUG test indicated compromised balance, with a significant relationship between NSLBP and balance ($p < 0.05$). Statistical analysis further highlighted significant associations between NSLBP with age and cardiopulmonary endurance but not with BMI.

Conclusion: NSLBP significantly affects cardiopulmonary endurance and balance among young adult females, indicating the need for a multidisciplinary approach in management and intervention. This study emphasizes the importance of incorporating physical therapy and lifestyle modifications to improve balance, endurance, and overall quality of life in individuals with NSLBP.

Keywords: Non-specific, low back pain, cardiopulmonary endurance, balance, young adult females, physical fitness, disability.

INTRODUCTION

The increasing prevalence of low back pain (LBP) in the adolescent population has emerged as a significant health concern, with a substantial proportion of individuals experiencing this condition at least once in their lifetime (1). The implications of LBP, irrespective of its specific or non-specific origins, extend beyond immediate discomfort, potentially leading to secondary functional deficits, including compromised endurance and stability, which may exacerbate over time (2). This condition imposes a considerable personal, societal, and financial burden globally, particularly affecting females aged between 40 to 80 years. Recent global reviews

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have highlighted the extensive reach of this issue, reporting point prevalence rates of LBP ranging from 12 to 33%, one-month prevalence of 23%, one-year prevalence between 22 and 65%, and a lifetime prevalence of approximately 40% (3-6). The manifestation of LBP symptoms varies significantly, with some individuals experiencing burning sensations, cramping, and muscle weakness (7). Chronic LBP, in particular, is associated with a myriad of challenges including psychological, social, physical, and economic issues, further complicated by balance disorders and neuromuscular dysfunctions leading to a loss of core stability (8). Factors such as low education levels, psychological distress (including anxiety, stress, and depression), and certain pain behaviors have been identified as strong predictors of prolonged LBP (9).

LBP is categorized into specific and non-specific types. Specific LBP is associated with identifiable conditions such as spinal fractures, bacterial infections, tumors, disc herniations, compression of neural structures, or limitations in spinal motion stability (10). Conversely, non-specific LBP, which lacks an identifiable specific cause, focuses on pain relief and functional performance improvement (11). Mechanical factors, including awkward postures, occupational sitting, manual handling, and various physical activities, have been considered contributory to non-specific LBP, though their exact role remains a subject of ongoing research (12). In young adult females, non-specific LBP can arise from multiple factors such as muscle strain from overuse or improper lifting, poor posture, sedentary lifestyle, weak core muscles, psychosocial stress, structural abnormalities, hormonal fluctuations, inflammatory conditions, occupational factors, and obesity, underscoring the multifactorial nature of this condition (13).

Treatment strategies for LBP and its complications vary, encompassing medication, rest, and therapeutic training aimed at addressing postural control disturbances (14). Non-specific LBP results in a diminished ability to maintain stability, posing a significant risk of falls, particularly in females who are more susceptible due to differences in gait patterns and other factors during dual-task activities. This vulnerability highlights the importance of balance control and the maintenance of both dynamic and static balance for the purposeful execution of physical activities (15). Postural disorders, by compromising the lumbar and trunk receptors, disrupt the postural control mechanism, further complicating the management of LBP (16). This study, therefore, seeks to evaluate the impact of non-specific LBP on balance and endurance among young female adults, aiming to contribute valuable insights into the management and understanding of this prevalent condition.

MATERIAL AND METHODS

This observational cross-sectional survey was conducted over a six-month period at the University of Lahore Gujrat Campus in Gujrat. The study employed a convenience sampling technique to collect data from young female adults aged between 18 to 40 years who reported experiencing low back pain without any underlying pathology. Individuals with pathological conditions such as spinal fractures, spinal deformities, and lower extremity fractures were excluded from participation in the study. The sample size was determined using a specific statistical formula, taking into account a standard deviation of 7.65 from a previous study (18) and aiming for a proposed absolute error or precision of 2. Based on these parameters, the minimum required sample size was calculated to be approximately 57 participants. However, the study ultimately included a total of 60 participants to ensure a robust analysis (17).

The methodology involved the use of several assessment tools, including the Visual Analogue Scale (VAS) for pain intensity determination, the Oswestry Disability Index (ODI) for assessing low back pain disability, the Time Up and Go (TUG) test for stability assessment, and the Rockport Fitness Test for evaluating individual fitness levels. Specifically, the Rockport 1-mile walk test was conducted on a treadmill, with the time taken to walk this distance meticulously recorded. Immediately following the completion of the walk, participants were instructed to measure their recovery heart rate (HR) or pulse rate for 15 seconds, which was then multiplied by four to ascertain the 1-minute recovery HR in beats per minute (bpm). The VO2 max was calculated using a formula that considered weight, age, gender, time, and heart rate, with adjustments made for female participants (39).

Data collection commenced following the acquisition of informed written consent from each participant, utilizing a semi-structured questionnaire. The collected data was then analyzed using the Statistical Package for the Social Sciences (SPSS) version 25. Statistical analyses included the use of T-tests for quantitative data and Chi-square tests for qualitative data, with a p-value of ≤ 0.05 designated as the threshold for statistical significance. All findings were reported with a 95% confidence level.

In adherence to ethical standards, this study was conducted in compliance with the Declaration of Helsinki, ensuring respect for the participants and the confidentiality of their information. The research protocol was reviewed and approved by the Institutional Review Board (IRB) of the University of Lahore, Gujrat Campus, prior to the initiation of data collection. This approval was contingent upon the ethical consideration that all participants were to be fully informed about the study's purpose, methods, potential risks, and benefits, and that their participation was voluntary, with the right to withdraw at any time without penalty.

Through this meticulous approach to study design, methodology, and ethical considerations, the research aimed to provide a comprehensive understanding of the impact of non-specific low back pain on balance and endurance among young female adults, contributing valuable insights to the existing body of knowledge on this prevalent condition.

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RESULTS

In the observational cross-sectional survey conducted to explore the impact of non-specific low back pain (NSLBP) on young female adults, a significant portion of the participants fell within the 18-23 year age group, comprising 66.7% of the study population. This was followed by the 24-29 year age group at 25%, with the 30-35 and 36-40 year age groups representing a smaller fraction at 5% and 3.3%, respectively (Table 1). Regarding Body Mass Index (BMI), the majority of participants were found to have a normal weight (BMI 18.5-24.9), accounting for 60% of the sample. Underweight individuals (BMI < 18) constituted 20%, while overweight (BMI 25-29.9) and obese (BMI > 30) participants were less common, comprising 8.3% and 11.7% of the sample, respectively (Table 1).

The analysis of pain intensity, as measured by the Visual Analogue Scale (VAS), revealed that severe pain (VAS 7-8) was the most frequently reported level, affecting 43.3% of the participants. This was followed by moderate pain (VAS 5-6) reported by 33.3% of the participants, while mild pain (VAS 3-4) and the worst pain (VAS 9-10) were less common, observed in 20% and 3.3% of the sample, respectively (Table 2).

Table 1: Descriptive Statistics of Age and BMI

Age Group (years)	N (%)
18-23	40 (66.7%)
24-29	15 (25%)
30-35	3 (5%)
36-40	2 (3.3%)

BMI Group	N (%)
<18 (Underweight)	12 (20%)
18.5-24.9 (Normal Weight)	36 (60%)
25-29.9 (Overweight)	5 (8.3%)
>30 (Obese)	7 (11.7%)

Table 2: Descriptive Analysis of Visual Analogue Scale (VAS) for Pain

Pain Group (VAS)	N (%)
3-4 (Mild Pain)	12 (20%)
5-6 (Moderate Pain)	20 (33.3%)
7-8 (Severe Pain)	26 (43.3%)
9-10 (Worst Pain)	2 (3.3%)

Table 3: Descriptive Analysis of Oswestry Disability Index

Disability Level	N (%)
0-20 (Minimal Disability)	36 (60.0%)
21-40 (Moderate Disability)	22 (36.7%)
41-60 (Severe Disability)	2 (3.3%)

Table 4: Descriptive Analysis of Participants Regarding Their Endurance and Timed Up and Go Test (TUG)

Endurance (Rockport Fitness Test)	N (%)
<23.6 (Very Poor)	19 (31.7%)
23.6-28.9 (Poor)	26 (43.3%)
29.0-32.9 (Fair)	9 (15.0%)
33.0-36.9 (Good)	6 (10.0%)
Timed Up and Go Test (TUG)	Mean±SD
	11.6±2.35

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Table 5: Association Among Scales

Association	Chi-square Value	Df	P-value
NSLBP and Age Group	21.060	9	.012
NSLBP and Cardiopulmonary Endurance	56.355	9	.000
NSLBP and Balance	67.483	6	.000
NSLBP and BMI	12.611	9	.181

When evaluating the disability levels using the Oswestry Disability Index, 60% of the participants were classified with minimal disability (0-20 score), indicating a lower impact of NSLBP on their daily activities. Moderate disability (21-40 score) was observed in 36.7% of the participants, and severe disability (41-60 score) was relatively rare, affecting only 3.3% of the sample (Table 3).

The assessment of endurance through the Rockport Fitness Test and balance via the Timed Up and Go Test (TUG) further underscored the impact of NSLBP on physical function. A significant portion of the participants displayed poor endurance, with 31.7% falling into the very poor category and 43.3% into the poor category. Only a small fraction demonstrated fair (15%) or good (10%) endurance levels. The mean TUG score across the study was 11.6±2.35, indicating variability in balance and mobility among participants (Table 4).

Statistical analysis provided insights into the relationships between NSLBP and various factors. A significant association was found between NSLBP and age group (Chi-square = 21.060, df = 9, p = .012), as well as NSLBP and cardiopulmonary endurance (Chi-square = 56.355, df = 9, p < .000), and NSLBP and balance (Chi-square = 67.483, df = 6, p < .000). However, no significant association was observed between NSLBP and BMI (Chi-square = 12.611, df = 9, p = .181), suggesting that while age, endurance, and balance have a significant correlation with NSLBP, BMI does not exhibit a direct association (Table 5). These results highlight the multifaceted impact of NSLBP on young female adults, emphasizing the importance of addressing these factors in clinical assessments and interventions.

DISCUSSION

In this study, it was elucidated that back pain, while not a disease in itself, serves as a symptom of various underlying causes. Specifically, non-specific low back pain (NSLBP) was observed to result in significant complications, including diminished cardiopulmonary endurance and stability, leading to decreased physical fitness and increased disability. The investigation into the cardiopulmonary endurance and balance of NSLBP patients revealed that young adult females exhibited notably lower aerobic fitness, aligning with the widespread recognition of back pain as a common issue affecting up to 80% of the population at some point in their lives (7).

This research encompassed 60 female subjects aged between 18 and 40 years, with a majority (66.67%) in the 18-23 year age bracket, reflecting high incidences of NSLBP during adolescence, as discussed by Damian Hoy et al. (19). A significant portion of the participants experienced severe (43.33%) and moderate (33.33%) pain levels according to the Visual Analogue Scale (VAS), with these occurrences being unrelated to any pathological conditions such as spinal fractures or deformities. The Oswestry Disability Index (ODI) indicated that 60% of participants had minimal disability, suggesting a limited impact on daily activities despite the presence of NSLBP (20).

However, the study highlighted that, despite a minimal to moderate level of disability, participants' balance and stability were adversely affected. This finding challenges the notion of a healthy and active lifestyle among the cohort, as indicated by the performance in the Time Up and Go (TUG) test. The significant relationship between NSLBP and balance (p-value > 0.05) and the observation that most participants took longer than 10 seconds to complete the TUG test underscore the compromised stability, corroborating with findings by Heta Haresh Thakkar et al. (22) that NSLBP patients exhibit reduced dynamic and postural stability.

The sedentary lifestyle induced by NSLBP, as noted in this study, aligns with existing literature suggesting that pain discourages physical activity, thereby compromising fitness levels. The observed lower VO2 max, increased exertion, dyspnoea, and elevated heart rate further substantiate the impact of NSLBP on physical fitness (8). Interestingly, this study's focus on young female adults presents a novel perspective, as prior research predominantly targeted older populations. The endurance levels among the participants, with a majority (43.33%) classified as having poor endurance, and a significant portion (31.67%) with very poor endurance, reveal a concerning trend of compromised aerobic capacity in women with NSLBP, echoing findings by Ivan Duque et al. (23) on the gender-based differences in endurance related to back pain.

This study's strengths lie in its targeted demographic of young female adults and its comprehensive evaluation of NSLBP's multifaceted impact. However, limitations include the reliance on self-reported measures and a cross-sectional design that precludes causal inferences. Future research should consider longitudinal studies to better understand the progression of NSLBP and its long-term effects on physical fitness and stability. Additionally, interventions aimed at enhancing balance and endurance among this

population could be beneficial. Recommendations for clinical practice include a multidisciplinary approach to managing NSLBP, incorporating physical therapy, psychological support, and lifestyle modifications to mitigate the adverse effects on patients' quality of life and physical fitness.

CONCLUSION

The findings from this study underscore the significant impact of non-specific low back pain (NSLBP) on young adult females, particularly highlighting the adverse effects on cardiopulmonary endurance, balance, and overall physical fitness. These results illuminate the necessity for healthcare professionals to adopt a multidisciplinary approach in managing NSLBP, emphasizing the importance of targeted physical therapy, psychological support, and lifestyle interventions. By focusing on improving balance and endurance, healthcare providers can enhance the quality of life for individuals suffering from NSLBP, potentially reducing the burden of this condition on the healthcare system and the individuals it affects. This study's insights into the multifaceted effects of NSLBP offer a valuable foundation for future research and clinical strategies aimed at addressing this pervasive health issue.

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