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ASSESSING THE PREVALENCE AND RISK FACTORS OF LOWER CROSS SYNDROME IN OUTPATIENT DEPARTMENT PRESENTING WITH LOWER BACK PAIN

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ABSTRACT

BACKGROUND:

Lower cross syndrome is a muscular imbalance which is defined by tightness of the hip flexors and lumbar extensors, accompanied by the weakness of gluteal and abdominal muscles. This muscular imbalance alters the postural alignment and increases lumbar curvature, causing hyper lordosis, which increases the risk of developing lower back pain.

OBJECTIVE:

1) Assessing the prevalence of Lower Cross Syndrome in outpatient department present with lower back pain.
2) To identify the risk factors associated with lower cross syndrome among patients with lower back pain in outpatient department.
By using Owestry low back disability questionnaire (ODQ), testing muscle strength, joint ROM and postural assessment.11

METHODS:

This cross-sectional study was done to identify the prevalence and risk factors related with lower cross syndrome among individuals presenting with complaints of nonspecific low back pain. Through convenience-based sampling of 250 participants were enrolled according to the inclusion criteria of age from 25 to 40 years, BMI ranged from 18 to 25 kg/m², with mechanical low back pain complain. Data collection tools included ODI to determine functional disability, visual analogue scale (VAS) for pain intensity, test to determine hip flexor muscle tightness and double lowering test to determine abdominal muscle weakness.
*Data were calculated using **SPSS software** with **descriptive statistics** and **inferential tests** to identify associations between demographic, muscular, and postural factors and the presence of LCS. Ethical approval was granted by the **Institutional Review board (IRB)** of **Liaquat National School of Physiotherapy**, and **informed consent** was obtained from all participants.*

RESULT:

This study involved 250 participants complaining of non-specific low back pain, to assess the prevalence and risk factors of lower cross syndrome. According to the ODI questionnaire most participants showed mild to moderate functional disability (ODI 18.62 ± 9.04) about 90.8% tested positive for lower cross syndrome.
*According to the physical assessment it was revealed that the **Double Leg Lowering Test (p = 0.009) confirmed the weakness of core abdominal muscles** and **Thomas Test (positive in 90.8%)** confirmed tightness of hip flexor muscles.*

CONCLUSION:

This study concluded that 90.8% of individuals are positive with lower cross syndrome with low back pain, mainly young adults aged between 25 to 40 years.
Participants experienced moderate intensity of pain with mild to moderate functional disability. The study also found tight hip flexor muscles and weak abdominal muscles which contribute to LCS.

Key words:
1) Lower cross syndrome
2) Muscle imbalance
3) Postural deviation
4) Core weakness
5) Oswestry Disability Index (ODI)
6) Visual Analogue Scale (VAS

INTRODUCTION

Muscle imbalance and lower back pain are among the major concerns in today's population, as it causes difficulty in performing daily activities and affecting the quality of life. According to global burden disease (GBD) from the data of 2019, around 1.71 billion people around the world suffer from musculoskeletal dysfunction and the major cause is back pain. With 570 million common cases worldwide and 7.4% of all YLDs, low back pain is the primary cause of the total burden of musculoskeletal disorders (WHO, 2022). It cause changes in structural and functional alterations of the back muscles resulting in muscle imbalance and changes in posture (Matheve et al., 2023).

Muscle imbalance is a disproportion in tension and strength of the opposing muscles groups leading to altered joint mechanics, compromised mobility and stability of joint. Muscles that are more susceptible to tightness or shortness are also more susceptible to inhibition and weakness. Altered muscle recruitment pattern leads to compensatory movement causing Janda's**"Tightness weakness" phenomena**, which occur When significant tightness is present, which results in reduction of muscle strength, causing imbalance (Libenson, 2007).

According to Janda, our body has two types of muscles,

1) Postural muscles (iliopsoas, quadratus lumborum, erector spinae, and back rotators)
2) Phasic muscles (gluteus maximus)

He observed that postural muscles are more prone to stiffness, as compared to other muscles as their primary function is endurance (Matheve et al., 2023).

He also believed that the way people live today makes these imbalances worse. Stress, fatigue, and limited movement in daily routines combined with less variety in physical activity tend to add to the problem (Jull & Janda, 1987). According to him, repetitive movements mainly reinforce postural muscles while overlooking the phasic muscles, and this one-sided development can eventually set the stage for imbalance (Haraldsson, 2023)

Janda noticed that postural adaptations such as prolonged sitting cause the hip flexors to become tight or shortened, as a result the brain responds naturally and reduces the activation of antagonist muscle (gluteus muscles). This adaptation promotes increased lumbar concavity because of forward pelvic tilt and shortening of hip flexors and over activity of hip flexors substitute for the weakened abdominal muscles. The hip extension is restricted due to presence of tight iliopsoas muscle and reduced activation of antagonist gluteus maximus muscle causing inadequate hip extension. As a result the contralateral erector spinae and ipsilateral hamstring muscles become overactive and tight in order to perform required movement (Shriya Das, 2017).

Globally, LBP is a major problem, mainly impacting the adult working community and is recognized as the primary contributor of disability. The lifetime risk of developing LBP ranges from 50% to 80%, between year 1990 and 2015.

Disability caused by LBP has increased by 54% in low-middle-income countries (LMIC)(Ginindza, 2020).Low back pain is defined as muscle tension or stiffness below the

costal margin and above the inferior gluteal fold with or without leg pain (Ginindza, 2020). In persistent LBP, It is typically impossible to pinpoint the exact cause of pain, which might originate from any portion of the lumbar segment (A, 1993).(LMIC)(Ginindza, 2020).

Individuals affected by low back pain often experience a substantial decline in their quality of life. As the pain and imbalance reduce mobility and flexibility, making tasks such as bending, lifting or walking more difficult. As mobility decreases, the affected individuals may adopt compensatory movement patterns that further aggravate muscle imbalances, contributing to increased strain on joints and surrounding tissues. Over time with continuous stress and with absence of treatment this dysfunction can become chronic discomfort, postural abnormalities and an increased risk of injury. (A, 1993).

METHODS:

this cross-sectional study was done to identify the prevalence and risk factors related with lower cross syndrome among individuals presenting with complain of nonspecific low back pain, which was conducted in outpatient department and external recruitment of office workers, housewives and students. Through convenience-based sampling of 250 participants were enrolled according to the inclusion criteria of age from 25 to 40 years, BMI ranged from 18 to 25 kg/m², with mechanical low back pain complain.

Data collection tools included ODI to determine functional disability, visual analogue scale (VAS) for pain intensity, test test to determine hip flexor muscle tightness and double lowering test to determine abdominal muscle weakness.

Data were calculated using **SPSS software** with **descriptive statistics** (mean, standard deviation, frequency, percentage) and **inferential tests** (Chi-square and ttests) to identify associations between demographic, muscular, and postural factors

and the presence of LCS. Ethical approval was granted by the**Institutional Review board (IRB)** of **Liaquat National School of Physiotherapy**, and **informed consent** was obtained from all participants.

This study involved 250 participants complaining of non-specific low back pain, to assess the prevalence and risk factors of lower cross syndrome. According to the ODI questionnaire most participants showed mild to moderate functional disability (ODI 18.62 ± 9.04) about 90.8% tested positive for lower cross syndrome.

According to the physical assessment it was revealed that the **Double Leg Lowering Test (p = 0.009) confirmed the weakness of core abdominal muscles** and **Thomas Test (positive in 90.8%)** confirmed tightness of hip flexor muscles.

RESULTS

A total of 250 participants with non-specific low back pain were included in the study. The mean age was 29.50 ± 4.86 years (range 25–40 years). The mean body mass index (BMI) was 23.00 ± 3.12 kg/m². The average height and weight were 166.03 ± 8.46 cm and 63.72 ± 11.39 kg, respectively. Participants reported a mean of 7.16 ± 3.25 working hours per day. Females comprised 63.6% (n=159) of the sample, while males accounted for 36.4% (n=91). Regarding occupation, 33.6% were employees, 29.2% students, and 17.2% housewives.

The mean Visual Analogue Scale (VAS) score was 5.96 ± 1.21. The mean Oswestry Disability Index (ODI) score was 18.62 ± 9.04. Based on ODI categorization, 63.6% had minimal disability, 34.0% moderate disability, and 2.4% severe disability.

Lumbar range of motion (ROM) assessed using an inclinometer showed mean flexion of 56.88 ± 14.88°, extension of 37.26 ± 12.40°, right lateral flexion of 24.02 ± 7.09°, and left lateral flexion of 24.12 ± 6.51°. The mean Double Leg Lowering Test angle was 49.14 ± 14.54°.

Lower Cross Syndrome (LCS) was present in 227 participants (90.8%), while 23 participants (9.2%) tested negative.

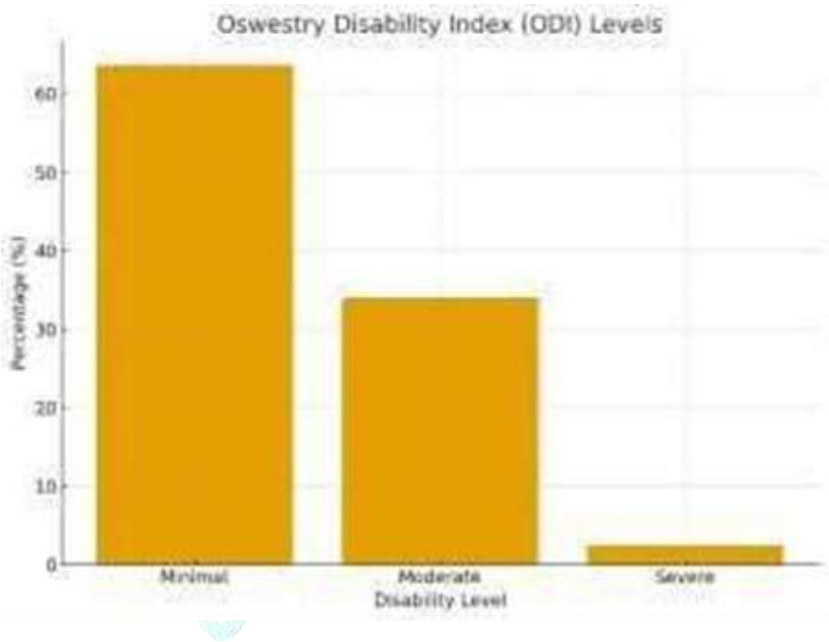
Chi-square analysis demonstrated significant associations between LCS and gender (p=0.000), BMI (p=0.025), pain score (p=0.047), aggravating factors (p=0.005), anterior pelvic tilt and lumbar lordosis (p=0.000–0.002), and Double Leg Lowering Test results (p=0.009). No significant associations were found between LCS and age

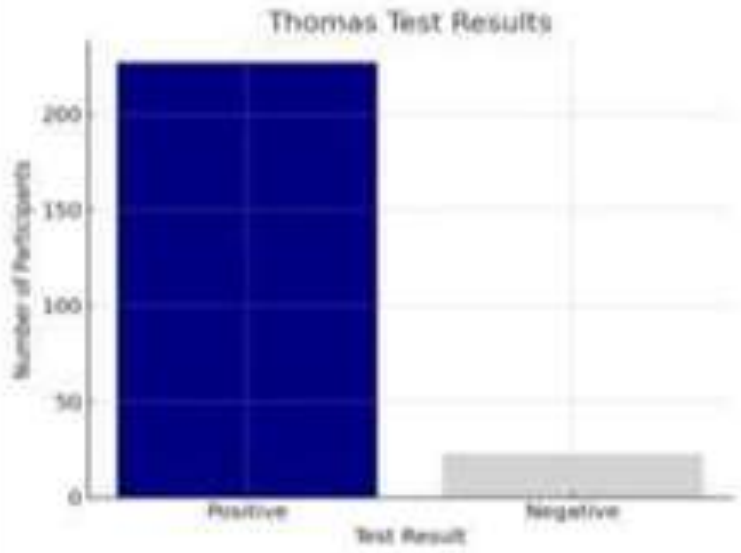
(p=0.880), working hours (p=0.734), relieving factors (p=0.537), comorbidities (p=0.865), or lumbar ROM values (p>0.05).

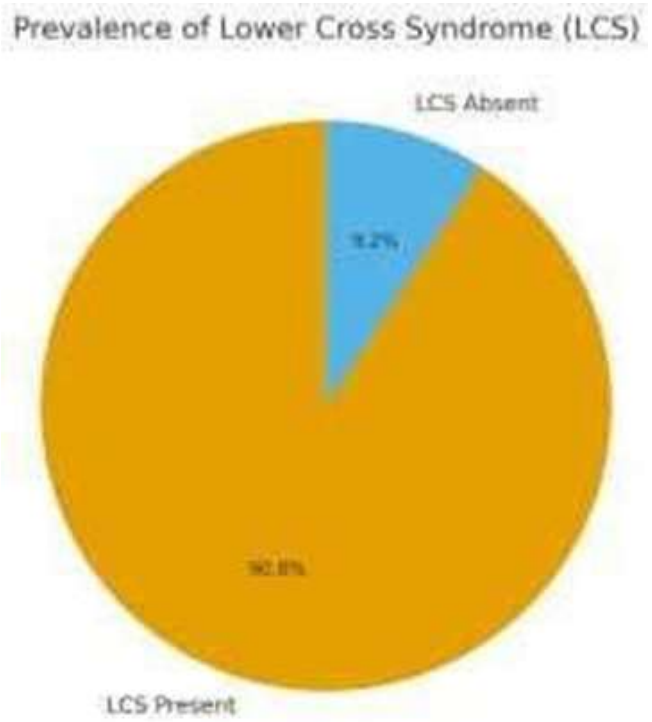
Heavy pain was reported by 89.6% of participants. Prolonged sitting (51.2%) and prolonged standing (48.8%) were the most common aggravating factors. Pain duration was predominantly 4–6 months. Overuse was reported as the mechanism of injury in 100% of cases.

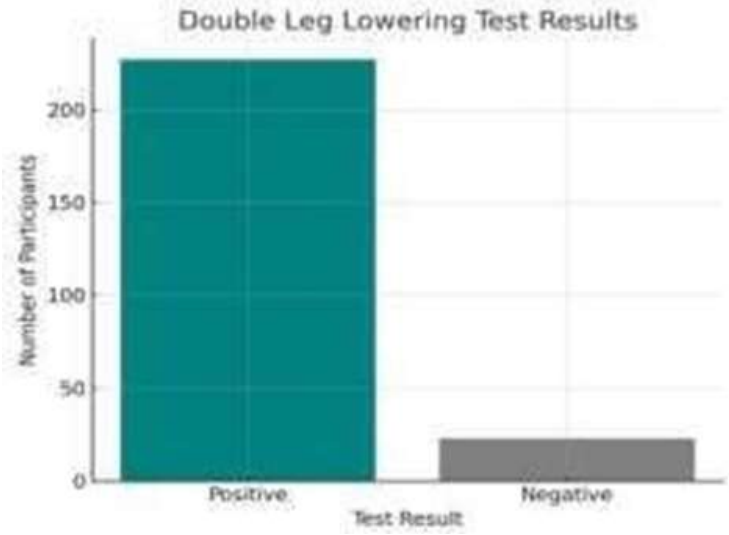
The Thomas Test was positive in 90.8% of participants. Ober's test and Trendelenburg sign findings were consistent with iliotibial band tightness and gluteal weakness.

Regarding comorbidities, 78% of participants reported none, while hypertension (12.8%) and diabetes (4.8%) were the most common conditions. No statistically significant association was observed between comorbidities and LCS (p=0.865).









DISCUSSION:

The findings revealed a high prevalence of LCS (90.8%), indicating that most participants showed characteristic muscle imbalances, including abdominal and gluteal weakness with tightness of the hip flexors and lumbar extensors muscles. Prolonged sitting and prolonged standing were significantly associated with lower cross syndrome highlighting the effect of sustained mechanical stress and sedentary behavior on pelvic alignment and postural control.

The mean age of participants was 29.5 ± 4.86 years with females comprising 63.6% of the sample. Gender showed a significant association with LCS which may be explained by anatomical and occupational factors affecting pelvic stability. Although the mean BMI 23.0 ± 3.12 kg/m² was within the normal range, BMI demonstrated a significant association with LCS p = 0.025 suggesting that even minor variations in body composition may affect the lumbopelvic mechanics.

Participants reported moderate pain intensity VAS = 5.96 ± 1.21 and mild to moderate

functional limitation ODI = 18.62 ± 9.04 with many of the individuals presenting with minimal disability. Significant associations were observed betwee lower cross syndrome and anterior pelvic tilt
$p = 0.012$, increased lumbar lordosis $p < 0.001$, and core weakness measured through the Double leg lowering test $p = 0.009$ highlighting the role of impaired lumbopelvic stability in the pathogenesis of LCS.
The high prevalence which was identified in this study can be compared to the findings reported by Burile et al. (2024) who documented a significant incidence of LCS among housemaids exposed to repetitive physical tasks and poor ergonomics. Similarly, Anna et al. (2022) reported the presence of lower cross syndrome among young college women showing that the condition affects various demographic groups.
The association between core weakness and LCS aligns with findings by Cooper et al. (2016) who identified significant gluteus medius weakness in individuals with chronic low back pain. Kandil et al. (2024) further demonstrated that correcting pelvic alignment through Global postural Reeducation significantly reduced pain and disability supporting the importance of addressing muscle imbalance. The relationship between BMI and pelvic tilt is consistent with findings by Metgud et al. (2016), who reported increased pelvic tilt and altered lumbosacral angles in individuals with greater BMI and reduced core activation. Additionally, Youdas et al. (2000) and Sorensen et al. (2015) showed that increased lumbar lordosis is linked with greater pain intensity during prolonged standing strengthening the biomechanical link between hyperlordosis and LBP.
This study has numerous important strengths that make the findings more reliable and consistent. As validated questionnaire (ODI) and standardized clinical assessments like Double leg lowering test Thomas and Trendelenburg tests helped to determine the problems related to posture and muscle balance of participants. Importantly the study followed strict inclusion and exclusion criteria by reducing confounding factors. However, the cross-sectional design limits causal interpretation and the relatively small sample size may affect generalizability. Also, psychosocial and lifestyle variables that may have influenced the outcomes were not comprehensively assessed.
Clinically the greater prevalence of lower cross syndrome highlights the need for routine screening of postural deviations and muscle imbalances in patients with low back pain.
Management strategies should focus on core strengthening, gluteal activation, stretching of hip flexors and ergonomic education to address underlying biomechanical dysfunction. Future longitudinal and interventional studies with larger samples and objective biomechanical assessments are recommended to establish causality and enhanced evidence-based management of LCS.

CONCLUSION:

This study found a high prevalence 90.8% of lower cross syndrome among individuals present with low back pain, mainly affecting young adults aged between 25 to 40 years with female predominance. Most participants had normal BMI, moderate pain, and mild to moderate disability. Significant associations were observed between gender, BMI, pain severity, posture, and LCS. Functional tests confirmed weak core muscles and tight hip flexors as key features.
Prolonged sitting, inactivity, and poor posture were major contributing factors. Early physiotherapy including core strengthening, posture correction, and ergonomic education is essential to prevent progression and improve long term spinal health

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