Prevalence of Lower Cross Syndrome in Auto-Rickshaw Drivers in Kolhapur City

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***Abstract*—Background- Lower Cross Syndrome (LCS) is a musculoskeletal disorder that involves imbalances in the muscles of the pelvis and lower back, commonly associated with extended sitting and poor posture. Auto rickshaw drivers, due to the nature of their profession, are predisposed to developing LCS. This study intended to establish the incidence of LCS among auto rickshaw drivers in Kolhapur city using a multi assessment techniques. Methodology- A total of 100 auto rickshaw drivers of age group of 30 to 45 were selected for the study based on the inclusion and exclusion criteria. Assessment tools including the Modified Oswestry Disability Index (MODI) for assessing the disability due to low back pain, Thomas Test to find out hip flexors tightness, Active Knee Extension Test for hamstring tightness, modified Schober's test (MMST) to rule out the lower back muscle tightness and Manual Muscle Strength Testing for gluteus and abdominal muscles were employed to diagnose LCS. Result- The findings revealed that 59% of the auto rickshaw drivers exhibited symptoms consistent with LCS. This indicates a significant prevalence of the condition within this occupational group. The combination of assessment tools provided comprehensive insights into the muscular imbalances and dysfunctions associated with LCS among auto rickshaw drivers. Conclusion- These findings underscore the importance of implementing preventive measures and ergonomic interventions to mitigate the risk of LCS and promote the musculoskeletal health of this vulnerable population. Further research and interventions focusing on ergonomic design and driver education are warranted to address this occupational health concern effectively.**

***Index Terms*—lower cross syndrome, auto rickshaw drivers, low back pain.**

I. INTRODUCTION

Lower cross syndrome (LCS) is a condition of muscle imbalance and can be known as Unterkreuz syndrome as the name suggests it also involves the distal body parts affecting the muscles of lower body it is also called as distal crossed syndrome and as it also involves the misalignment of spine leading to low back pain sometimes it can be known by the name of pelvic crossed syndrome. It is a syndrome of postural distortion that affects the lower kinetic chain. It causes muscle weakness and stiffness in various muscle groups, which eventually leads to a muscular imbalance and moves the center of gravity, resulting in a variety of symptoms such as low back pain, lumbar lordosis, and functional discomfort, among others.[1] Lower Crossed Syndrome is indeed a cross-pattern of muscle weakness and tension that impacts both the ventral (front) and dorsal (back) aspects of the body. In this syndrome, there's a characteristic imbalance where certain muscles become overly tight and others become weakened, leading to a cascade of postural distortions and musculoskeletal dysfunctions.[2] Weakness in the abdominal muscles, including the transversus abdominis, rectus abdominis, external obliques, and internal obliquus, can contribute significantly to the development of Lower Crossed Syndrome. These muscles play a crucial role in providing stability and support to the trunk and pelvis, helping to maintain proper posture and alignment. When they are weak, the ability of the core to stabilize the spine and pelvis is compromised, leading to increased stress on the lower back and hip muscles. Similarly, weakness in the gluteal muscles, particularly the gluteus maximus, gluteus medius, and gluteus minimus, is a key component of Lower Crossed Syndrome. These muscles are essential for hip extension, abduction, and rotation, as well as for stabilizing the pelvis during movement. When they are weak, the body

compensates by overusingother muscles, such as the hamstrings and lower back muscles, to perform these functions.[3] Lower Crossed Syndrome profoundly affects the musculoskeletal system, leading to alterations in posture and biomechanics that can significantly impact the lower body. These alterations can manifest in various ways and may progress over time, particularlyif left unaddressed. Long periods of sitting, a sedentary lifestyle, unequal weight distribution while sitting still, and muscle weakness and tension from overusing a certain muscle group are risk factors for lower cross syndrome. Long-term asymptomatic individuals with lower cross syndrome may eventually develop symptoms such as low back pain or discomfort, postural deviations, recurring muscular fatigue, changed gait pattern, and functional limitations in performing everyday tasks.[3]

It has been determined from earlier research that sitting posture and the adaptation of prolonged static posture are the main factors contributing to lower cross syndrome. Long-term sitting-related job profiles are more likely to develop this illness. Because bad sitting habits change the body's biomechanics and posture, they eventually have animpact on the postural muscles. Sitting without a supportive back raises the risk of stress overloading the lumbar spineand pelvis, which can alter the position of the central nervous system. The body adjuststo extended periods of sitting, making it harder to stand and walk right away. Over time,this can lead to long-term problems with standing and walking, even for little periods of time. Long periods of inactivity combined with prolonged sitting can cause low back pain, which can be uncomfortable. In the end, they find it harder to go about their everyday business with the same comfort. The sustained load on the spine, the misalignment brought on by ingrained bad posture, the severely deconditioned state of the muscle, and the overpressure at the buttocks are the causes of this.[4]

Auto-rickshaw drivers commonly complaints of low back pain, due to which it becomesvery difficult for them to work as well as to follow their regular routine Since auto rickshaws are the most popular form of public transportation, many people in the community of auto rickshaw drivers are unaware of their health status. They worklong hours and are subjected to other environmental elements that may affect their lifestyle, so it's critical to educate them early on about potential risk factors, posture, and musculoskeletal health in order to prevent future difficulties.[5] In lower cross syndrome there is muscleimbalance causing pain and postural changes, many with the sitting posture are prone to develop lower cross syndrome so it is important to know its prevalence in auto- rickshaw drivers and hence the above study was conducted.

II. MATERIALS AND METHODS

The observational cross- sectional study was conducted for a period of 6 months. The study protocol was presented for approval in front of institutional ethical committee and protocol committee of D. Y. Patil Education Society, Kolhapur. After the approval from committee field work was started.97 participants fulfilling the inclusion and exclusion criteria were included in the study.

Inclusion criteria- Male auto rickshaw drivers of Kolhapur city in the age of 30 to 45 years, driving rickshaw from last 5 years and more for minimum 8 hours a day.

Exclusion criteria- Participants having any lower limb and spinal fracture, having any
history of spinal deformity or any lower limb deformity, recent lower limb surgery
or spinal surgery, having any history of trauma and fall, any arthritic joint condition.

A written consent form was obtained from the participants. Data collection sheet including their personal details, job description and study related questioner was provided to the participant and rest of the sheet containing assessment part was filled by the researcher. Assessment was taken with the different special test for tightness of muscle (Thomas test, modified Schober's test, Active knee extension test), muscle strength was calculated to rule out muscle weakness of abdominal and gluteus maximusmuscle for which MRC scale was used, those who were experiencing low back pain were provided with the translated version of Modified Oswestry disability index to find out the interference of the pain into their daily routine. All these majors were taken into consideration to find out the prevalence of lower cross syndrome among the autorickshaw drivers. Addition to it, all the auto-rickshaw drivers were checked for their posture to rule out any associated complain of anterior pelvic tilt and lumbar lordosis. Master chart was prepared and the results were obtained through statistical analysis.

Modified Oswestry disability index
Scoring
0-20: minimal impairment
21-40: moderate impairment
41-60: severe impairment
61-80: crippled back pain
81-100: patient is either bed bound or symptoms are exaggerating.

Figure No 1: assessment of lower cross syndrome

Figure No 2: assessment of lower cross syndrome

III. RESULT

Table 1. Descriptive statistics of age, years of experience and working hours.

Variable	Mean	SD
Age	39.53	3.38
Working since (years)	16.97	4.19
Working hours	11.18	1.39

The mean ageof participants was found to be 39.53 years with the standard deviation of 3.38. on an average the participants have been working for approximately 16.97 years with the standard deviation of 4.19. The mean working hours per day were calculated to be 11.18 with the standard deviation of 1.39.

Table 2. descriptive statistics for assessment tools.

Assessment tool	Mean	SD
MODI (percentage)	27.93	0.12
MMST	2.76	0.68
Abdominal Strength MMT grading out of 5	2.53	0.50
Gluteus Maximus MMT grading out of 5	3.08	0.28

Among the included participants mean MODI percentage was found to be 27.93 with standard deviation of 0.12. Mean value of MMST was found to be 2.76 with standard deviation of 0.68. Mean value of abdominal strength and gluteus maximus strength was found to be 2.53and 3.08 with standard deviation of 0.50 and 0.28 respectively.

To find out the prevalence of lower cross syndrome among the included participants following assessments like Modified Oswestry disability index, Thomas test, Modified Schober's test, active knee extension test, and manual muscle testing for abdominal and gluteal muscles were done and those who tested positive for all the above-mentioned test with having muscle strength below grade five on manual muscletesting and those complaining about low back pain were reported to have lower cross syndrome. Apart from the above-mentioned assessment tools anterior pelvic tilt and lumbar lordosis was also taken to find out postural complications associated among included participants.

Table 3. Prevalence of lower cross syndrome using various assessment tools.

Assessment of Lower cross syndrome using technique	Prevalence
MODI	85%
Thomas test	83%
Modified Schober's test	66%
Active knee extension test	91%

Abdominal Muscle strength	100%
Glutes Maximus Muscle Strength	99%

85 % of populationwere experiencing low back pain on Modified Oswestry Disability Index. 83% of themwere positive for Thomas test having tightness of hip flexors. 66% of them were having tightness in the lower back according to modified Schober's test. 91% of the participants were reported to have hamstring tightness through active knee extension test.

Table 4. classification of total participants according to the MODI

MODI	No. of Participants	Percentage
0 to 20	37	43.53%
21 to 40	38	44.71%
41 to 60	10	11.76%
Total	85	100%

Among the 85%, having low back pain 37 that is 43.53% reported minimal impairments, 38 that is 44.71% reported moderate impairments, and 10 that is 11.76% reported severeimpairments.

Table 5. Detail classification of abdominal muscle strength

Abdominal Strength MMT grading out of 5	No. of Participants	Percentage
Grade 2	32	32%
Grade 3	50	50%
Grade 4	18	18%
Total	100	100%

100% of the participants were having abdominal muscle weakness among which 32% of them having grade 2, 50% were having grade 3, 18% were having grade 4.

Table 6. Detailed classification of gluteus maximus muscle strength

Gluteus Maximus MMT grading out of 5	No. of Participants	Percentage
Grade 3	61	61%
Grade 4	38	38%
Grade 5	1	1%
Total	100	100%

99% were reported to have gluteal muscle weakness with grade less than 5 among which 61% were showing grade 3 weakness, 38% were showing grade 4 weakness. It was found that from the included auto-rickshaw drivers 65 % had anterior pelvic tiltand 70 had lumbar lordosis.

Table 7. Prevalence of lower cross syndrome in auto rickshaw

Lower Cross Syndrome	No. of Participants	Percentage
Participants fulfilling the criteria of lower cross syndrome	59	59%
Participants not fulfilling the criteria of lower cross syndrome	41	41%
Total	100	100%

59 out of 100 participants meet the criteria for lower cross syndrome, they tested positive for all the test and had MMT less than 5 for abdominal and gluteus maximus muscle with complaints of low back pain indicating a significant proportion of auto rickshaw drivers affected by this musculoskeletal condition.

IV. DISCUSSION

In above study the participants were included within the age group of 30 to 45 years. Previous studies show that the majority of the auto rickshaw drivers are from the age group of 25 to 45. Our study reveals that out of 100 participant's majority of participants that is 49 were from the age group of 36 to 40, whereas 09 participants were belonging from the age group of 31 to 35. And the majorities of the studies states that the middle- aged peoples are prone to develop the musculoskeletal conditions.[6]

In above study, those who were having working experience of 5 and more than 5 years and working for minimum 8 hours a day were included. The study conducted by RahulShaik et al. [5] also suggests that there is an association of musculoskeletal problems withworking hours and working experience. Those having history of any lower limb and spinal surgeries, fracture, deformity also history of trauma, fall and any arthritic condition were excluded from the study to avoidany false positive outcome.

A. Outcome measure

1. Modified Oswestry disability index

The Modified Oswestry Disability Index (MODI) was integrated in above study to ascertain the presence and degree of low back pain among patients, as well as to gaugehow significantly this pain impacts their daily activities. Analysis of the gathered data revealed that 85% of the participants reported experiencing low back pain and 15% of participants reported no complaints of low back pain. Given the extended duration during which auto-rickshaw drivers maintain a seated position, there is a notable escalation in the strain placed on their spine, which can eventually culminate in experiencing lower back pain. Past studies have demonstrated that prolonged periods of sitting can induce muscle stiffness and fatigue, and in severe cases, it can manifest as low back pain. [7]

B. Special test

1. Thomas test

This test was used to find out the tightness of hip flexors out of total, 83% of the participants were positive for the Thomas test. Muscle tightness arises from heightened tension triggered by either active or passive mechanisms. When muscles undergo spasm or contraction, they tend to shorten.[8] This shortening of muscle is due to the long-term postural adaptation in sitting, it also results in reduced range of motion of hip.

2. Modified Schober's test

This test was used to assess the tightness of lower back muscles and also lumbar spinemobility from the data collected it was cleared that among the selected participants 66% were reported positive. The study done by Kendall states that the tightness developed in the lower extensor muscles results from the weakness of abdominal muscle and long sitting period.[9]

3. Active knee extension test

The active knee extension test revealed a 91% prevalence rate, showing a common problem with tight hamstrings among auto rickshaw drivers, which is frequently related with Lower Crossed Syndrome (LCS). This syndrome can aggravate lumbar lordosis, exacerbating symptoms such as pain in the lower back and postural problems. Implementing measures to improve hamstring flexibility may be beneficial for reducingmusculoskeletal strain and the chance of LCS development.

4. Abdominal and gluteal maximus muscle strength

The near-universal prevalence values of 100% for abdominal muscular strength and 99% for gluteus maximus muscle strength indicate that auto rickshaw drivers frequentlyexperience weakness or inhibition in these muscle groups. In the previous study conducted by Anjali V Kulkarni et.al[10] shows that the maximum weakness of abdominalmuscle is seen in the age group of 36 to 40, whereas the study finding regarding gluteal muscle weakness shows that the majority of the participants showed grade 4 weakness. Weakness in the abdominal and gluteal muscles might disrupt the dynamic stability of the lumbo-pelvic region, predisposing drivers to LCS and increasing their susceptibility to musculoskeletal issues. Targeted strengthening workouts for these muscle groups may be required to rectify muscular imbalances and improve spinal stability.

5. Anterior pelvic tilt and lumbar lordosis

The intermediate prevalence rates of 65% for anterior pelvic tilt and 70% for lumbar lordosis highlight the pervasive nature of postural abnormalities among auto rickshaw drivers. These statistics suggest a concerning trend that could contribute to the onset orexacerbation of a condition known as Lumbar Canal Stenosis. Lumbar canal stenosis ischaracterized by an anterior pelvic tilt and pronounced lumbar lordosis, both of whichcan be attributed to prolonged periods of sitting and adopting poor ergonomic positions while driving.

V. CONCLUSION

The above study concluded that the prevalence of lower cross syndrome in auto rickshaw drivers among Kolhapur city was found to be 59% according to the qualifying criteria of lowercross syndrome. In which multiple tools were incorporated such as modified Oswestry disability index, Thomas test, Modified Schober's test, active knee extension test, manual muscle testing for abdominal and gluteus muscle. The goal of the study was to create awareness among the auto rickshaw drivers about their posture, musculoskeletal health and to find out the exact pattern of muscle weakness and tightness leading or resulting eventually to low back pain affecting the lifestyles of theindividual.

REFERENCES

[1] 1.Sahu P, Phansopkar P. Screening for lower cross syndrome in asymptomatic individuals. J

Med Pharm Allied Sci. 2021 Nov 1;10(6):3894-8.

[2] 2.Shriya das, Bibhuti Sarkar et.al. (2017); prevalence of lower crossed syndrome in young adults: a cross-sectional study. *int. j. of adv. res.* 5 (June). 2217-2228] (issn 2320- 5407).

[3] 3.Simmi Mehra, Rohin Garg, Sundip Charmode et al. lower crossed syndrome. AIIMS Rajkot. Facta Anatomica; 2(9), Oct. 2023.

[4] 4.Baker R, Coenen P, Howie E, Williamson A, The short term musculoskeletal and cognitive effects of prolonged sitting during office computer work. International journal of environment research and public health. 2018 Aug;15(8):1678

[5] 5.Shaik R, Gotru CK, Swamy CG, Sandeep R. The prevalence of musculoskeletal disorders an d their association with riskfactors in auto rickshaw drivers-a survey in Guntur

[6] 6.Tigari H, Santhosh HB. Socio-economic background of auto-rickshaw drivers. Shanlax International Journal of Management. 2020;8(1):48-53.

[7] 7.Arshad HS, Maqsood U, Aziz A. Awareness of Sitting Posture in Patients Having Chronic Low Back Pain. Int. J Sci Res. 2015;4(4):481

[8] 8.Janssen I, Heymsfield SB, Wang Z, Ross R. Skeletal muscle mass and distribution in 468 men and women aged 18-88 yr. Journal of applied physiology. 2000Jul 1.

[9] 9.Kendall FP, McCreary EK, Provance PG, Rodgers MM, Romani WA. Muscle:testing and function with posture and pain. Baltimore, MD: Lippincott Williams & Wilkins:2005 Feb 24

[10] 10.Anjali Kulkarni, Rasika Kaitkar, prevalence of lower cross syndrome in adult males with sedentary lifestyle. International journal of scientific research, volume- 11,may 2022, doi: 10.36106/ijsr.