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Prevalence of Lower Crossed Syndrome among Collegiate Young Females in Kochi

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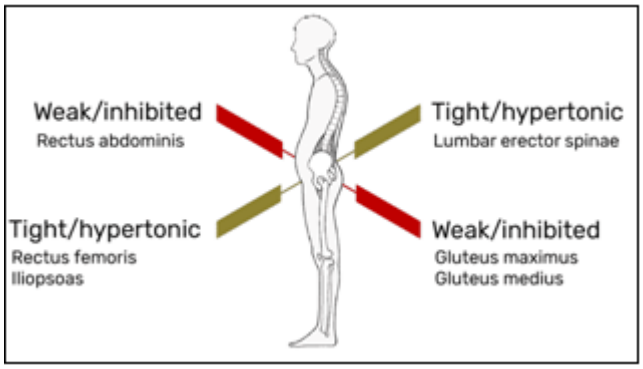
Abstract: ***Background: Lower crossed syndrome is a musculoskeletal imbalance characterized by specific patterns of muscle weakness and tightness that crosses between the dorsal and the ventral sides of the body. This postural imbalance among young individuals can lead to Low Back Pain in future. Hence, this study aims to find out the prevalence of the lower crossed syndrome in young female college students of Medical Trust Institute of Medical Science, Ernakulam. Method: In the following study, 33 students were selected according to the inclusion criteria. Length of bilateral Iliopsoas muscle was measured by Modified Thomas test using Universal Goniometer. Length of spinal extensor muscle was checked by non-elastic measuring tape. Strength of abdominal muscle and bilateral Gluteus maximus muscle were evaluated according to MRC grading of manual muscle testing. Results: The study results showed that 9 out of 33 female volunteers have Lower Crossed Syndrome. Conclusion: The study concluded that 27.27% of young collegiate females have lower crossed syndrome. The rest of the participants were found to have weakness or tightness of atleast one of the muscle groups.***

Keywords: Lower crossed syndrome, Abdominals, Gluteus Maximus, Iliopsoas, Spinal extensors, Low Back Pain

1. Introduction

The frequent imbalance between postural and phasic muscles in and around the pelvis causes postural distortion and painful movement patterns. There are thirty-three muscles attached to the pelvis and the most common imbalance or pattern of muscle dysfunction is the Lower Crossed Syndrome or Pelvic Crossed Syndrome as documented first by Vladamir Janda and Jull. [(1)]

The lower cross syndrome is a neuromuscular condition in which there are tight thoracic lumbar extensors and hip flexors, while the abdominals and gluteus maximums are weak. The pattern of imbalance creates joint dysfunction at L4-L5 and L5-S1 segments, sacroiliac and hip joint. [(2)]



There are mainly two types of muscles present in our body: ***Postural or static muscles*** (iliopsoas, quadratus lumborum, erector spinae group, rotators of the back, multifidus) and ***Phasic or dynamic muscles*** (Abdominals). Pathology affecting both types of muscles can lead to LCS. [(3)]

The researcher noticed that due to prolonged sitting all day, with time, hip flexors become tight. Thus, the brain will eventually start to inhibit opposite gluteus muscles. These imbalances will lead to lumbar lordosis because of anterior pelvic tilt and hip flexion contracture, and the over activity of the hip flexors compensating for the weak abdominals. [(4)]

The hip extension would be limited due to tightened psoas and inhibited gluteus maximus. So, contralateral lumbar erector spinae and ipsilateral hamstring would have to be overactive. [(5, 6)]

People with such threatening combinations of biomechanical muscle imbalances frequently complains of low back pain due to the excessive stress it places on the lower back structures and if left unchecked and untreated, it can lead to chronic low back pain in later stages. [(7)]

Studies have reviewed that as in adults, the prevalence of low back pain in childhood increases with age and have shown higher prevalence by 20 years of age. [(8, 9)] Also, there are studies which identify the features associated with low back pain as well as risk factors and its development. [(10, 11, 12)]

There is literature evidence which suggests that females are more prone to develop the lower cross syndrome than males. [(5)] Hence, this study was designed to find out the prevalence of lower crossed syndrome among collegiate young females

of age group 18-23 years which in the long term may lead to low back pain.

2. Need of Study

Lower crossed syndrome in young population increases the incidence of mechanical low back pain as abnormal motor recruitment of muscles lead to muscle tightness and weakness. Therefore, clinical identification and prevention of occurrence of lower crossed syndrome among young individuals is important to prevent future pathology. Females were chosen as analysis suggests that females are more prone to develop lower crossed syndrome than male of an equivalent age bracket.

Aims and Objectives
To find out prevalence of lower cross syndrome in young females of age between 18-23 years

3. Methodology

Study design
Cross-sectional study

Study setting
The study was conducted at Medical Trust Institute of Medical Sciences, Cochin.

Sample size
33 subjects were selected by using convenient sampling technique.

Inclusion criteria
1) Girls in age group of 18-23yrs.
2) Those who have given their consent for participation in this study.

Exclusion criteria
1) Girls with back pain due to menstruation or other gynaecological problem.
2) Those having history of spinal trauma, joint dysfunction or congenital defects.
3) Those having pain due to any systemic inflammatory disease.
4) Acute spasm of Para spinal muscles of back or sprain of any Para vertebral structures like ligament or fascia.
5) Un co-operative patients.

Materials used
1) Universal goniometer
2) Non elastic measuring tape
3) Stopwatch
4) Plinth

4. Procedure

In the following study, considering all exclusion criteria, 33 subjects were selected by doing convenient sampling. After taking consent from the subjects, procedure was explained to them. Demographic data including age, sex, height, weight and Body Mass Index (BMI) were collected from 33 healthy individuals. Prior to the evaluation of muscle length and strength, all the volunteers performed warm up exercises under supervision.

Length of bilateral Iliopsoas muscle was measured by Modified Thomas test using Universal Goniometer. Length of spinal extensor muscle was checked by non-elastic measuring tape. Strength of abdominal muscle and bilateral gluteus maximus muscle were evaluated according to MRC grading of manual muscle testing. The subjects were asked to assume the testing position and then different tests for checking the muscle tightness and muscle strength of the required muscles were performed. Data was collected on the basis of these tests. The collected data was then subjected for data analysis.

Measurement of iliopsoas muscle length:
The volunteer was instructed to lie in supine with half of the thigh out of the couch while the therapist was standing by the tested table. Lumbar spine was checked for excessive lordosis. The volunteers were instructed and demonstrated to pull (flex) and hold the non-tested hip in flexed position, bringing the knee close to the chest to flatten out the lumbar spine and to stabilize the pelvis and the knee of the tested leg was allowed to extend so that the two-joint rectus femoris does not limit the range. One student researcher measured the length of opposite side iliopsoas with a universal goniometer by keeping the fulcrum over greater trochanter, movable arm kept parallel to the lateral border of femoral shaft and stationary arm parallel to the tested table. The test was done on both sides. The iliopsoas was considered tight if hip extension angle was less than 15°.

Figure 1: Measurement of iliopsoas tightness (Thomas test)

Measurement of strength of abdominal muscle:-
Abdominal muscle strength was measured by positioning the volunteers in supine lying with both hip and knee flexed.
The grading of the test is:

Grade 5=hands clasped behind the head and scapula clears the table, 20-30 sec hold.
Grade 4=arms crossed over chest and scapula clears the table, 15-20 sec hold.
Grade 3=arms straight and scapula clears the table, 10-15 sec hold.
Grade 2=arms extended, towards knees and scapula clears the table, 1-10 sec hold
Grade 1=unable to raise more than head off table.

Therapist was standing at side of the table at level of volunteer's chest to ascertain scapular clearance from table during test. A trunk curl up was emphasized until scapula

clears the table. Instruction was given as "Tuck your chin and bring your head, shoulders and arms off the table, as in a sit up". The muscle is considered to be weak if the grade is 4 or less.

Figure 2: Measurement of abdominal strength

Measurement of length of spinal extensors muscle:-
The volunteers were instructed to stand erect with the cervical, thoracic, and lumbar spine in 0° of lateral flexion and rotation. Spinous process of C7 and S1 vertebrae was marked and distance between two processes was measured by a tape measure. The pelvis was then stabilized by keeping the student researcher's hand over PSIS to prevent anterior tilt of the pelvis. Instruction was given to the volunteers to bend forward gradually while keeping the arm relaxed maintaining equal load on both feet. The motion was stopped when resistance to additional flexion is experienced by the volunteer and the student researcher feels the pelvis start to tip anteriorly. Then the distance between the two spinous processes were again measured. The difference between the first and second measurement indicates the amount of thoracic and lumbar flexion. The muscle was considered tight when the measurement is less than 10cm.

Figure 3: Measurement of spinal extensor length (initial position)

Figure 4: Measurement of spinal extensor length (final position)

Measurement of Gluteus Maximus strength:
The volunteer was asked to lie in prone position with knee flexed to 90 degree. Student researcher was in standing position on the tested side at the level of pelvis. Pelvis was stabilized by applying downward pressure at the low back by one hand of the therapist. The volunteers were instructed to extend the hip maintaining the knee flexion at 90°. The test was done on both sides. The strength of gluteus maximus was graded according to MRC grading.

The gradings of this test are:
Grade 5= Complete hip extension and holds end flexion against maximum resistance.
Grade 4= Complete hip extension is possible and can be held against heavy to moderate resistance.
Grade 3= Completes full hip extension and holds end position but takes no resistance.
Grade 2= Completes full range of hip extension in side lying position.
Grade 1= Palpable contraction of gluteus maximus will be seen as narrowing of the gluteal crease. No visible joint movement.

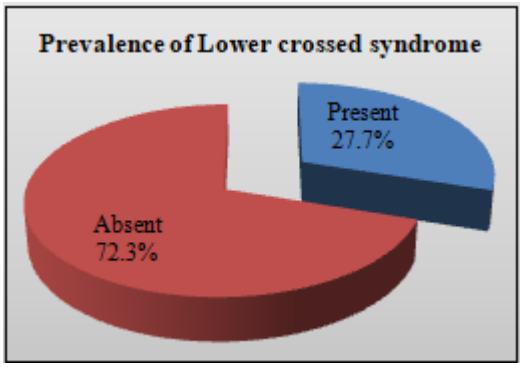
The muscle is considered to be weak if the grade is 4 or less.

Figure 5: Measurement of gluteus maximus strength

5. Results and Statistical Analysis

Table 1: Demographic summary

Variables	*Mean & SD*
Age (years)	19.52 ± 1.7
Height (cm)	155 ± 6.23
Weight (kg)	49.98 ± 10.46
BMI (Kg/m2)	20.08 ± 3.76



Graph 1: Prevalence of Lower Crossed Syndrome

Graph 1 shows that 27.7% participants had lower crossed syndrome

Table 2: Frequency distribution of muscle length

Muscles	*Normal*	*Tight*
Right Iliopsoas (n=33)	15 (45%)	18 (55%)
Left Iliopsoas (n=33)	15 (45%)	18 (55%)
Spinal extensors (n=33)	13 (39%)	20 (61%)

Table 2: shows frequency distribution of right iliopsoas, left iliopsoas and spinal extensor muscle length

Table 3: Frequency distribution of muscle strength

Muscles	*MMT grade*			
	2	*3*	*4*	*5*
Right gluteus maximus (n=33)	0 (0%)	5 (15%)	20 (61%)	8 (24%)
Left gluteus maximus (n=33)	0 (0%)	5 (15%)	21 (64%)	7 (21%)
Abdominals (n=33)	0 (0%)	16 (48%)	11 (33%)	6 (19%)

Table 3: shows frequency distribution of right gluteus maximus, left gluteus maximus and abdominal muscle strength.

6. Discussion

The study was conducted on collegiate young females of mean age 19.52 ± 1.7. The evaluation was done by checking weakness and tightness of respective muscles which can result in lower crossed syndrome.

The results of this study showed that the prevalence of lower crossed syndrome among collegiate young females found to be 27.27%. i.e., 9 out of 33 subjects had lower crossed syndrome, where gluteus maximus on both sides and abdominals have grade less than 5. Similarly, iliopsoas on both sides and spinal extensor muscles are tight.

Moreover, the majority of subjects had abdominal muscle weakness. Overall, 81% of subjects showed abdominal weakness. In a similar study done by Sneha Dhanani and Dr Tarpan Shah showed in their study of 60 young females, none of the subjects has grade 5 abdominal strength. ([6]) Likewise, a study was done on collegiate young females on abdominal weakness and low back pain revealed that low back pain is related to abdominal weakness. ([7])

While the total number of subjects taken into consideration, each student had muscle imbalance in at least one muscle which has been evaluated. Study results showed that among 33 subjects, 76% of subjects had right gluteus maximus weakness, 79% of subjects had left gluteus maximus weakness and 81% of subjects had abdominal muscle weakness. Similarly, 55% of subjects had right and left iliopsoas muscle tightness and 61% of subjects had spinal extensor tightness.

Studies have proved that weakness and tightness of certain muscles cause low back pain which leads to the lower crossed syndrome. [(1, 6, 7)] Low back pain could be a universal downside and lower crossed syndrome is one among the threatening combos of biomechanical muscle imbalance because of excessive stress it places on the structures of lower back.

Physiotherapy for this condition is aimed at stretching the tight muscles and strengthening the weak muscles to restore balance. Core muscle strengthening can be given to the abdominal muscles. Strengthening and resistance exercises can be given to the gluteus and stretching can be given to the spinal extensors and iliopsoas muscles as preventive treatment for Lower Crossed Syndrome.

7. Conclusion

The study concluded that 27.27% of young collegiate females have lower crossed syndrome. Among the total participants, each student has a muscle imbalance in at least one muscle which has been evaluated. So, allsubjects included in this study are at risk of having lower crossed syndrome

8. Future Scope

In this study we have included only 30 young collegiate females. Future studies are needed to be done with including both males and females with larger sample size

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