DOI: 10.7860/JCDR/2022/56795.16419

Original Article

Physiotherapy Section

Effect of BMI on Tightness of Iliopsoas Muscle in Students due to Prolonged Sitting for Online Classes during COVID-19 Pandemic

NEHA GOYAL[1], VAISHALI CHAUDHARY[2]

ABSTRACT

Introduction: Muscle tightness is produced by a reduction in a muscle's capacity to deform. As a result of prolong sitting, pelvic position can be changed which can lead to iliopsoas tightness. During the COVID-19 pandemic, as a result of online classes, student's hours of sitting have increased drastically.

Aim: To compare iliopsoas muscle tightness in students who were engaged in prolonged sitting due to online classes with higher Body Mass Index (BMI) and students with normal BMI.

Materials and Methods: This cross-sectional study was conducted in Department of Physiotherapy at Institute of Applied Medicine and Research, Ghaziabad, Uttar Pradesh, India, from April 2021 to January 2022 on 101 students (59 females and 42 males). Height and weight of the subjects were measured by the ruler and digital weighing machine respectively for the BMI calculation. Two groups were made, group with normal BMI students and group with High BMI students. Using modified Thomas test, iliopsoas muscle was measured for the flexibility. Independent sample t-test was used for statistical analysis.

Results: Total 51 students were with normal BMI and 50 were with higher BMI were included in the study. The mean age of the subjects was 19.59 years including 59 females and 42 males. The significantly increased Modified Thomas Test (MTT) angle was found in students with higher BMI when compared to students with normal BMI for both right (p-value=0.003) and left side (p-value <0.001). Iliopsoas muscle tightness was present in more in higher BMI group as compared to normal BMI group.

Conclusion: The study concluded that both the groups had the iliopsoas muscle tightness but the students with higher BMI had more muscle tightness.

Keywords: Coronavirus disease 2019, Flexibility, Modified thomas test, Online classes, Sedentary lifestyle, Universal goniometer

INTRODUCTION

The Coronavirus Disease 2019 (COVID-19) pandemic has brought to light a number of issues that had previously gone unnoticed but were impacting individuals in the same way, with the only difference being "severity". The main concern that has arisen is the flexibility of the muscles in students; as a result of online classes, students' hours of sitting have increased drastically, negatively impacting their physical activity. The muscular tightness is caused by decreased in the ability of muscle to deform which is the results of sedentary lifestyle making physical activity or Activity of Daily Living (ADLs) difficult [1]. Individuals whose work required sitting throughout the day are more prone to develop musculoskeletal discomfort or adaptive shortening of muscles especially at hip joint [2].

A previous study shows strong evidence for work related musculoskeletal disorder present in bankers due to work related stress [3]. Flexibility is an important factor for the normal biomechanical function. Iliopsoas is one of the hip flexor muscles that originate from iliac fossa and lumbar spine and inserted to lesser trochanter of femur [4]. As a result of prolonged sitting, pelvic tilting can occur, which can cause iliopsoas muscle tension and raise the risk of injury due to the excessive pressure on muscles while sitting [5-7].

Flexibility is an important factor in physical and health related fitness and for execution and sustainability of ADLs [8]. If any changes or alteration takes place in flexibility of muscles, it leads to difficulty in ADLs [9,10]. Overweight/obesity has the strongest association with low back pain and chronic low back pain [11]. Therefore, the present study was conducted with the aim of comparing iliopsoas muscle tightness in students with high Body Mass Index (BMI) and those with normal BMI who have been sitting for long period of time for online classes during the COVID-19 pandemic.

Null hypothesis: There is no significant difference in iliopsoas muscle tightness between students with higher BMI and with normal BMI.

Alternative hypothesis: There is significant difference in iliopsoas muscle tightness between students with higher BMI and with BMI.

MATERIALS AND METHODS

This cross-sectional study was conducted in Department of Physiotherapy at Institute of Applied Medicine and Research, Ghaziabad, Uttar Pradesh, India, from April 2021 to January 2022 on 101 students. Institutional Ethical Clearance was taken from IAMR, Ghaziabad, (Ref. No. IAMR/22/3196) and the Helsinki Declaration of 1975 that was revised in 2013 was also considered.

Inclusion criteria: Age group of 17-25 years, with minimum 5-8 hours of sitting per day and within the normal BMI ranges (18.5 to <24.9 Kg/m^2) and higher BMI ranges (25.0 to 29.9 Kg/m^2) were included in the study [12].

Exclusion criteria: Below the age of 17 years and above the age of 25 years, students with any complaint of Lower Back Pain (LBP), hip pain, knee pain or some kind of accident or trauma and any lower limb surgery were excluded from the study.

The present study was conducted with the students taking online classes during the COVID-19 pandemic. The participants in the present study were voluntary and an informed consent was obtained before the beginning of the test. The participating students were briefed about the purpose of the present study and informed that the data or the information collected from them will remain confidential. The students were evaluated for the BMI calculated as weight (Kg)/ height squared (m^2) [12] and iliopsoas muscle tightness using the standardised testing procedure, that is, modified thomas test using the universal goniometer [13,14].

Procedure

The subject was asked to stand on the digital weighing machine for the weight measurement and made the subject to stand against the wall for the height measurement with the help of ruler.

Modified Thomas Test (MTT): The subject was made to sit at the edge of the examination table and roll back onto the table while pulling both knees towards the chest. This is to ensure that the lumbar spine is flat on the table and the pelvic is posteriorly rotated. The subject was asked to hold the contralateral lower limb toward the chest and lower the other limb towards the floor. For each side, angle of hip flexion were measured using a universal goniometer. The stationary arm of goniometer was aligned with the lateral midline of the pelvic and moving arm was aligned with midline of the femur using lateral epicondyle as a reference point. The hip joint at 0° is considered at neutral position anything above this range was considered as iliopsoas muscle tightness or flexibility of iliopsoas muscle is considered as the angle of hip flexion [15,16] [Table/Fig-1,2].

[Table/Fig-1]: Starting position for the modified Thomas test.
[Table/Fig-2]: Goniometric measurement for the iliopsoas muscle tightness using modified Thomas test. (Images from left to right)

STATISTICAL ANALYSIS

The independent sample t-test has been used through the Statistical Package for Social Sciences (SPSS) version 22.0, IBM software with the 5% significance level.

RESULTS

Out of 101 students, 59 were females and 42 were males, with mean age of 19.59±1.801 years. Demographic data of both the groups is given in [Table/Fig-3]. The mean BMI of normal BMI group (20.90±2.54 kg/m^2) was significantly less than the mean BMI of higher group (25.99±0.21 kg/m^2) with p-value <0.001

Variables	N	Minimum	Maximum	Mean	Std. Deviation
Age (years)					
Mean age	101	17	25	19.59	1.801
Normal BMI	51	17	25	19.56	2.032
Higher BMI	50	17	23	19.62	1.550
Body Mass Index (BMI) (kg/m^2)					
Normal	51	18.5	24.9	20.90	2.54
Higher	50	25	29.8	25.99	0.21
Modified thomas test					
Right	101	0	23	7.91	4.718
Left	101	0	24	7.52	4.768

[Table/Fig-3]: Demographic data (N=101).

Out of total, 51 were with normal BMI and 50 were with higher BMI. Modified Thomas test value of 7.91±4.718 was recorded for right side. For the left side mean MTT value were 7.52±4.768. Mean MTT value of 6.57 and 5.90 was recorded for the right and left side respectively for students with normal BMI. At the same time mean of 9.28 and 9.18 was recorded for the right and left side MTT values respectively for students with higher BMI. Significantly increased MTT angle was found in students with higher BMI when compared to students with normal BMI for both right (p-value=0.003) and left sided (p-value <0.001). Iliopsoas muscle tightness was present more in higher BMI group as compared to normal BMI group [Table/Fig-4].

MTT	Group	Mean	Standard deviation	Standard error mean	Mean difference	Sig. (2-tailed)
Right	Normal BMI group (n=51)	6.57	4.575	0.641	-2.711	0.003*
	Higher BMI group (n=50)	9.28	4.504	0.637		
Left	Normal BMI group (n=51)	5.90	4.415	0.618	-3.278	<0.001*
	Higher BMI group (n=50)	9.18	4.579	0.648		

[Table/Fig-4]: MTT values in both the groups (1=Normal BMI, 2=Higher BMI). Independent Sample t-test, *p<0.05: significant

DISCUSSION

The study demonstrated that the BMI has an impact on the muscle tightness. An increase in the BMI led to an increase in the tightness of muscles. Previous study showed that to perform a specific activity or sport sufficient flexibility needs to be obtained [16]. The present study supports the statement as prolonged sitting leads to muscle tightness which can make the ADLs difficult.

The primary health results assumed to be linked with flexibility are relief from low-back pain, prevention of musculoskeletal damage, and better-quality posture [5,10]. A sedentary lifestyle is considered as a risk factor for LBP among the general population, but, it is also known that youths who do not practice physical exercise are far more likely to become sedentary adults [1]. Also another previous study by Pradip B et al., stated that hip muscles tightness could develop in desk job professionals, making them prone for musculoskeletal discomforts [1]. Hip joint is surrounded by various muscles, among which the iliopsoas is the main muscles which can go for tightness after a prolonged period of sitting especially in students and desk job people [7]. In the present study, authors only focused on the iliopsoas muscle as it is known that iliopsoas muscle is the only muscle that connects lumbar spine to the hip. In case of shortening, it increases the anterior pelvic tilt and puts excessive strain on the lumbar spine as well as on the intervertebral disc resulting in low back pain [1,4].

It has already been concluded by the many researchers that the iliopsoas muscle tightness is present in prolong desk job workers and in the Information Technology (IT) professionals [2,3]. However, information about the student population and the influence of BMI on iliopsoas muscle stiffness was not found. Hence, the present study was focused on the same.

In previous studies, one or more musculoskeletal health symptoms were reported by 94% of IT professionals in the past 12 months [1,2,6]. Previous study had cited that 5 hour per day as being a critical time for the development of musculoskeletal disorder and muscle tightness in employees working with visual display unit [6]. Hence, the subjects included in the present study were college students from 17 to 25 years of age who spend minimum 5-8 hours in sitting position. In the present study, it was found that the students with higher BMI and with normal BMI both have iliopsoas muscle tightness but the higher BMI students were more prone for tightness as compared to the normal BMI students who were engaged in the prolonged sitting. As a result, individuals are prone to low back pain or other symptoms associated with the back or hip in some point of time in their life [1].

Limitation(s)

The sample size was small and pelvic tilt position can be altered during the modified Thomas test.

CONCLUSION(S)

In the present study iliopsoas muscle tightness was present in both groups i.e. normal and higher BMI in both right and left side. However, the higher BMI (overweight) students had more iliopsoas muscle tightness as compared to normal BMI students. Hence, the alternative hypothesis was accepted. Although, iliopsoas muscle flexibility is an important aspect that impact the ADLs, future research is required with the obese group of subjects, as sedentary lifestyle is the major cause of it.

Acknowledgement

Special thanks to all the participants who participated in the process of data collection and fellow MPT Scholar, Tarunjit Kaur for supporting the authors throughout the research process. No technical, financial support was received for the study from any person or organisation.

REFERENCES

[1] Pradip B, Sudhir B, Nidhi B. Prevalence of tightness in hip muscles in middle aged Indian men engaging in prolonged desk jobs: A descriptive study. Int J Phys Educ Sports Health. 2018;5(2)15-21.
[2] Bashyal P, Bhatbolan S, Billore N, Sindhu N. Flexibility in muscles around the hip among middle aged Indian men engaging in prolonged desk jobs: A cross-sectional study. Int J Phys Educ Sports Health. 2018;5(1):223-29.
[3] Islam S. Prevalence of common work related musculoskeletal disorders among the bankers at Savar (Doctoral dissertation, Bangladesh Health Professions Institute, Faculty of Medicine, the University of Dhaka, Bangladesh). 2016.
[4] Mondal M, Sarkar B, Alam S, Das S, Malik K, Kumar P, et al. Prevalence of piriformis tightness in healthy sedentary individuals: A cross-sectional study. Int J Health Sci Res. 2017;7(7):134-42.
[5] Koli BK, Anap DB. Prevalence and severity of hamstring tightness among college student: A cross sectional study. International Journal of Clinical and Biomedical Research. 2018:65-68.
[6] Vijay SA. Work-related musculoskeletal health disorders among the information technology professionals in India: A prevalence study. International Journal of Management Research and Business Strategy. 2013;2(2):118-28.
[7] Kim GM, Ha SM. Reliability of the modified Thomas test using a lumbo-plevic stabilization. J Phys Ther Sci. 2015;27(2):447-49.
[8] Clapis PA, Davis SM, Davis RO. Reliability of inclinometer and goniometric measurements of hip extension flexibility using the modified Thomas test. Physiother Theory Pract. 2008;24(2):135-41.
[9] Malai S, Pichaiyongwongdee S, Sakulsriprasert P. Immediate effect of hold-relax stretching of iliopsoas muscle on transversus abdominis muscle activation in chronic non-specific low back pain with lumbar hyperlordosis. J Med Assoc Thai. 2015;98:S6-11.
[10] Shah MM, Tiwari S. Flexibility of the lower back and hamstring muscles among 14 to 17 year old school boys. Int J Phys Educ Sports Health. 2016;3(6):370-72.
[11] Shiri R, Karppinen J, Leino-Arjas P, Solovieva S, Viikari-Juntura E. The association between obesity and low back pain: A meta-analysis. Am J Epidemiol. 2010;171(2):135-54.s
[12] National Heart, Lung, Blood Institute, National Institute of Diabetes, Kidney Diseases (US). Clinical guidelines on the identification, evaluation, and treatment of overweight and obesity in adults: The evidence report. National Heart, Lung, and Blood Institute; 1998.
[13] Vigotsky AD, Lehman GJ, Beardsley C, Contreras B, Chung B, Feser EH. The modified Thomas test is not a valid measure of hip extension unless pelvic tilt is controlled. PeerJ. 2016;4:e2325.
[14] Grieshaber DT. Assessing the reliability of two orthopedic special tests to determine hip flexor contracture with the assessment of pelvic tilt angle during a back squat (Doctoral dissertation, North Dakota State University). 2008.
[15] Roach KE, Miles TP. Normal hip and knee active range of motion: The relationship to age. Physical therapy. 1991;71(9):656-65.
[16] Harvey D. Assessment of the flexibility of elite athletes using the modified Thomas test. Br J Sports Med. 1998;32(1):68.

PARTICULARS OF CONTRIBUTORS:
1. Master Scholar, Department of Physiotherapy, IAMR, Ghaziabad, Uttar Pradesh, India.
2. Associate Professor, Department of Physiotherapy, IAMR, Ghaziabad, Uttar Pradesh, India.

NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:
Dr. Vaishali Chaudhary,
NH-58, Delhi-Meerut Road, Ghaziabad, Uttar Pradesh, India.
E-mail : vaishali.chaudhary@iamr.ac.in

PLAGIARISM CHECKING METHODS: [Jain H et al.]
- Plagiarism X-checker: Apr 04, 2022
- Manual Googling: May 11, 2022
- iThenticate Software: May 14, 2022 (18%)

ETYMOLOGY: Author Origin

AUTHOR DECLARATION:
- Financial or Other Competing Interests: None
- Was Ethics Committee Approval obtained for this study? Yes
- Was informed consent obtained from the subjects involved in the study? Yes
- For any images presented appropriate consent has been obtained from the subjects. Yes

Date of Submission: **Mar 31, 2022**
Date of Peer Review: **Apr 23, 2022**
Date of Acceptance: **May 12, 2022**
Date of Publishing: **Jun 01, 2022**