OPEN ACCESS

ORIGINAL ARTICLE

Association of Recruitment and Activation of Lumbar Multifidus and Transversus Abdominis with Low Back Pain in Physiotherapy Students; A Cross Sectional Survey

Saira Irshad[1], Sidrah Liaqat[2]

[1,2]Physiotherapist, Mayo hospital Lahore

Keywords

Low back pain, Lumbar Multifidus, Physical Therapy, Transversus Abdominis

Author`s Contribution

[1,2]Conception and design,Collection and assembly of data, Analysis and interpretation of the data, Final approval and guarantor of the article

Article Info.

Received: Nov 25, 2019
Accepted: Jun 17, 2020

Conflict of Interest: None

Funding Sources: None

Address of Correspondence

Saira Irshad
Email: dpt.physio@gmail.com

Cite this article as: Irshad S, Liaqat S. Association of Recruitment and Activation of Lumbar Multifidus and Transversus Abdominis with Low Back Pain in Physiotherapy Students; A Cross Sectional Survey. JRCRS. 2020; 8(1)SPEC:S19-S23. DOI: 10.5455/JRCRS. 202008SI05

A B S T R A C T

Background: Low back pain is one of the leading cause and commonly treated conditions among musculoskeletal disorders. Among medical professions physiotherapist demonstrate high prevalence of low back pain which is linked with the onset of LBP during undergrad study, therefore this study was conducted to evaluate LBP among undergrad physiotherapist

Objective: To determine the association of recruitment and activation of lumbar multifidus and transversus abdominis with low back pain in physiotherapy students of Lahore, Pakistan.

Methodology: In this cross sectional survey data of 102 undergraduate physical therapy students was collected through convenient sampling via questionnaire and physical assessment to identify the activation and recruitment of lumbar multifidus and transversus abdominis. Data was analyzed using SPSS version20.

Results: No significant difference was noted between the left and right side of lumbar multifidus response in students with and without LBP. No significant difference was noted between the left and right side of transversus abdominus response in students with and without LBP.

Conclusion: In this study low back pain was experienced by a large number of physiotherapy undergraduates. But no association was found between activation and recruitment of LM and TrA with low back pain.

Introduction

Low back pain is one of the leading cause and commonly treated conditions among musculoskeletal disorders.[1]. It is expected that at some point in their lives approximately 80-90% of the people are affected with low back pain. [2, 3] Many studies have evaluated the factors related to demographics, socioeconomic, physical, and occupational in the development of low back pain.[2, 6] Most individuals with low back pain experience that regardless of their gender, age or career. Out of the factors causing low back pain around half of LBP is due to occupation-related risk factors. LBP not only affects work efficiency but it also affects activities of daily living.[4, 5] Among medical professions physiotherapists demonstrate a high prevalence of low back pain. Despite extensive knowledge about body mechanics, work-related musculoskeletal disorders (WRMSD) are quite common among physiotherapists. It is estimated that 60% of LBP in this group occur as work-related injuries.[6] According to another study, this prevalence is 80%.[7] It might be related to the activities that these professionals have to do.[6] Physiotherapy students are exposed to these injuries because of poor working postures and manual handlings in the difficult environment during helping and treating patients.[5, 7]

Recurrence of low back pain usually subsides after injury with the intervention.[8] Most people including physiotherapists will experience recurrence of LBP if treatment is not taken. When no treatment is taken for improvement of LBP, muscle imbalances may occur due to poor movement. These muscular imbalances produce stresses on various structures that can develop pain, muscle weakness and dysfunction in the recruitment of local stabilizer.[9]

Two of the most important muscles contributing to lumbar segmental stability are cylinder muscles comprising of transversus abdominis (TrA) and lumbar multifidus (LM). In anybody movement, these two muscle need to contract for stable spine. But these muscles can show altered timing and recruitment when they fail to contract or are delayed in contraction.[10] Multifidi has a wide role as spinal stabilizers. Its role is to extend the spine and rotate the vertebral segments. Overall this muscle works locally to control the motion of each vertebral segment.[11] The other muscle contributing to the stability of lumbar spine is transverses abdominis.[10]

The local stabilizers should contract to stabilize the joint by independently contracting of global muscles. When the work of local stabilizers is reduced and global muscles take over the role of movement there is generally latency in the recruitment of local stabilizing muscles this further restricts the normal, accentuation of compensatory movements and poor postures.[12,13] In LBP segmental reflex inhibition of LM and TrA results in altered recruitment patterns.[14] This muscles is identified as directional specific and acts asymmetrically during arm movements, thus stabilizing the lumbar spine.[15] For optimal control of the spine intervention aiming at the training of LM and TrA is required.[16]

Physiotherapy students due to altered posture are prone to low back pain.[17] In this study association of recruitment and activation of lumbar multifidus and erector spinae with low back pain in physiotherapy students was identified.

Methodology

In this co realtion study data was collected according to purposive sampling technique from 102 undergraduate students, ages 18 to 25, from Children's Hospital & Institute of Child Health, Azra Naheed Medical College, Riphah College of Rehabilitation Sciences, and School of Physiotherapy King Edward Medical University, Lahore, Pakistan from March 2014 to August 2014. For data collection, a questionnaire was used to obtain information about demographics, age and BMI of subjects and after that physical assessment including testing for activation and recruitment of LM and TrA was done. The questionnaire used for this study has 75% to 91.7% test retest reliability for low back pain prevalence with kappa statistics.[10] It was developed originally in a study conducted by Burger and fellows, the panel included orthopedic manual physiotherapists, a lecturer, a researcher of that relevant university, two physiotherapy lecturers, a sport physiotherapist.[10]

To assess the activation and recruitment of lumbar multifidus and transversus abdominis physical assessment was done according to Burger et al.[10] For lumbar multifidus subject was tested in prone position. The researcher placed the fingers deeply on the paraspinal area at the level of L4. The subject was asked to locally contract/swell the muscle just beneath the fingers of the researcher. If tension in muscle was felt and subject held the contraction for 15 seconds keeping the spine neutral and not holding the breath, then it was recorded as recruitment and if the subject was not able to hold the contraction it was recorded as activation. No contraction indicated the lack of control on that particular spinal level.

Transversus abdominis was tested with the patient in a crook lying position. The researcher placed the fingers infero-medial to the anterior superior iliac spine along the inguinal ligament to feel the contraction of transversus abdominis. The subject was instructed to draw in the lower abdominal wall without depressing the rib cage. If the tension in muscle was felt and subject held the contraction for 15 seconds keeping the spine neutral and not holding the breath, then it was recorded as recruitment and if the subject was not able to hold the contraction it was recorded as activation.

Data was analyzed by using SPSS 20.Association between the lumbar multifidus and transversus abdominis activation and recruitment with low back pain was analyzed using Chi square test. The level of significance was kept 0.05.

Results

Investigation The prevalence of low back pain through all years of study was found to be 66.7%. The mean age of students with low back pain was 20.90 years ±1.46.The mean age of students with no low back pain was 20.94 years ±1.41. Total number of males and females with low back pain was 11 and 57, and without low back pain was 10 and 24 respectively. The mean BMI of students with LBP was 21.28 ± 2.53 and without low back pain was 21.65 ± 2.93 which is within normal limits of BMI ranging from 18.5-24.9. (Table I)

Association of lumbar multifidus and transverses abdominis with LBP showed p-values 0.562, 0.291, 0.125, 0.342 which is p-value> 0.05 showing no association between recruitment and activation of lumbar multifidus and transversus abdominis with low back pain in physiotherapy students. (Table II)

Discussion

LBP is a frequent complaint made by physiotherapy students. This study was directed to find out the association of LM and TrA with low back pain.

There is some evidence in the literature to explain the role of the multifidus and transversus abdominis in stabilization of the lumbar spine and deficient activation of these muscles may explain the occurrence of LBP. But in some studies, LM and TrA may be consequence of pain rather than the cause of pain.[19-22]

Role of trunk muscle strength in preventing LBP and decreased strength and atrophy of muscles is being reported in previous studies. Decreased strength and atrophy of Lumbar multifidus and transversus abdominus was reported in the literature to be linked with LBP in

contrast to this, the current study did not find any such association.[21]

Results of the study showed that there was no association between lumbar multifidus and transversus abdominis activation and recruitment with low back pain. These findings are inconsistent with other studies supporting this association.[17, 18]

In clinical practice, it is usually assumed that a relationship exists between these muscles so they are often assessed and rehabilitated together. However, no strong clinical studies have tested or documented this association[23]

In this study, the performance of physical assessment for the assessment of recruitment and activation of lumbar multifidus and transversus abdominis relied strictly on the instructions of examiner and subject's ability to perform the desired action. This task involves considerable judgment of the examiner to determine the optimal contraction.[24]

Inconsistent performances might also explain the absence of correlation between lumbar multifidus and tranvsevsus abdominis activation and recruitment with low back pain.[25]

Table I: Body mass index BMI of subjects with and without low back pain:

	Mean	Standard deviation	Number of subjects
LBP			
Yes	21.28	2.53	68
No	21.65	2.93	34
Total			102

Table II: Description of Lumbar Multifidus and Transversus Abdominis activation and recruitment in students with and without low back pain.

Factors		Number of subjects with LBP	Number of subjects without LBP	Total	p-value
Right LM	activated	20	12	32	
	recruited	43	18	61	0.562
	Not activated	5	4	9	
Left LM	activated	20	14	34	
	recruited	43	16	59	0.291
	Not activated	5	4	9	
Right TrA	activated	21	9	30	
	recruited	47	23	70	0.125
	Not activated	5	2	2	
Left TrA	activated	16	10	26	
	recruited	51	22	73	0.342
	Not activated	1	2	3	

Conclusion

In this study low back pain was experienced by large number of physiotherapy undergraduates. But no association was found between activation and recruitment of lumbar multifidus and transversus abdominis with low back pain

LIMITATION: In this study the performance of physical assessment for the assessment of recruitment and activation of lumbar multifidus and transversus abdominis relied strictly on the instructions of examiner and subject's ability to perform the desired action.

One of the limitation of this study is difficulty in understanding the commands of physical assessment by some students to execute the desirable act.

RECOMMENDATION: It is recommended to include more institutions for taking data so that results can be generalized with higher reliability.

An early mediation system should be employed to distinguish earlier LBP and embrace proper steps to relieve the dangers of further development of LBP. So prevention of LBP should be more emphasized at undergrad level to decrease the incidence of LBP in graduate physiotherapists. Proper body mechanics and postural awareness programs should be conducted in the physiotherapy institutions to avoid the developments of muscular imbalances and mechanical disarrangements that lead to LBP. So that prevalence of LBP in PT students and PTs can be minimized.. It is sensible that training programs are offered to graduates of physiotherapy about occupational health and safety.

References

1. Rundell SD, Davenport TE, Wagner T. Physical therapist management of acute and chronic low back pain using the World Health Organization's International Classification of Functioning, Disability and Health. Physical Therapy. 2009;89(1):82-90.
2. Falavigna A, Teles AR, Mazzocchin T, de Braga GL, Kleber FD, Barreto F, et al. Increased prevalence of low back pain among physiotherapy students compared to medical students. European Spine Journal. 2011;20(3):500-505.
3. Ekstrom RA, Osborn RW, Hauer PL. Surface electromyographic analysis of the low back muscles during rehabilitation exercises. journal of orthopaedic & sports physical therapy. 2008;38(12):736-745.
4. West DJ, Gardner D. Occupational injuries of physiotherapists in North and Central Queensland. Australian Journal of Physiotherapy. 2001;47(3):179-86.
5. Cromie JE, Robertson VJ, Best MO. Occupational health and safety in physiotherapy: guidelines for practice. Australian Journal of Physiotherapy. 2001;47(1):43-51.
6. Nyland LJ, Grimmer KA. Is undergraduate physiotherapy study a risk factor for low back pain? A prevalence study of LBP in physiotherapy students. BMC musculoskeletal disorders. 2003;4(1):22.
7. Rozenfeld V, Ribak J, Danziger J, Tsamir J, Carmeli E. Prevalence, risk factors and preventive strategies in work-related musculoskeletal disorders among Israeli physical therapists. Physiotherapy Research International. 2010;15(3):176-184.
8. Lau PM-Y, Chow DH-K, Pope MH. Early physiotherapy intervention in an accident and emergency department reduces pain and improves satisfaction for patients with acute low back pain: a randomised trial. Australian Journal of physiotherapy. 2008;54(4):243-249.
9. Pengel LH, Herbert RD, Maher CG, Refshauge KM. Acute low back pain: systematic review of its prognosis. Bmj. 2003;327(7410):323.
10. Burger E, Myezwa H, Naidoo V, Olivier B, Rothberg A. Low back pain in physiotherapy students: Prevalence and the association with neuromuscular findings. South African Journal of Physiotherapy. 2013;69(4):29–35.
11. Klizienė I, Sipavičienė S, Imbrasienė D, Klizas Š, Inokaitis H. Effect of core stability exercise on cross sectional area of lumbar multifidus muscle and physical capacity. Educ Phys Train Sport. 2011;83:9-15.
12. Hoogenboom BJ, Voight ML, Cook G, Gill L. Using rolling to develop neuromuscular control and coordination of the core and extremities of athletes. North American journal of sports physical therapy: NAJSPT. 2009;4(2):70.
13. O'Sullivan P. Diagnosis and classification of chronic low back pain disorders: maladaptive movement and motor control impairments as underlying mechanism. Manual therapy. 2005;10(4):242-255.
14. Kiesel KB, Underwood FB, Mattacola CG, Nitz AJ, Malone TR. A comparison of select trunk muscle thickness change between subjects with low back pain classified in the treatment-based classification system and asymptomatic controls. journal of orthopaedic & sports physical therapy. 2007;37(10):596-607.
15. Allison GT, Morris SL. Transversus abdominis and core stability: has the pendulum swung? British journal of sports medicine. 2008;42(11):930-931.
16. Ferreira ML, Ferreira PH, Latimer J, Herbert RD, Hodges PW, Jennings MD, et al. Comparison of general exercise, motor control exercise and spinal manipulative therapy for chronic low back pain: a randomized trial. Pain. 2007;131(1-2):31-7.
17. Nyland LJ, Grimmer KA. Is undergraduate physiotherapy study a risk factor for low back pain? A prevalence study of LBP in physiotherapy students. BMC musculoskeletal disorders. 2003;4:22.
18. Campo M, Weiser S, Koenig KL, Nordin M. Work-related musculoskeletal disorders in physical therapists: a prospective cohort study with 1-year follow-up. Physical Therapy. 2008;88(5):608-19.
19. Panjabi M, Abumi K, Duranceau J, Oxland T. Spinal stability and intersegmental muscle forces. A biomechanical model. Spine. 1989;14(2):194-200.
20. Hebert JJ, Koppenhaver SL, Magel JS, Fritz JM. The relationship of transversus abdominis and lumbar multifidus activation and prognostic factors for clinical success with a stabilization exercise program: a cross-sectional study. Archives of physical medicine and rehabilitation. 2010;91(1):78-85.

21. Lee S-w, Chan CK-m, Lam T-s, Lam C, Lau N-c, Lau RW-l, et al. Relationship between low back pain and lumbar multifidus size at different postures. Spine. 2006;31(19):2258-2262.
22. Kiesel KB, Uhl T, Underwood FB, Nitz AJ. Rehabilitative ultrasound measurement of select trunk muscle activation during induced pain. Manual therapy. 2008;13(2):132-138.
23. Hides J, Stanton W, Mendis MD, Sexton M. The relationship of transversus abdominis and lumbar multifidus clinical muscle tests in patients with chronic low back pain. Manual therapy. 2011;16(6):573-577.
24. Koppenhaver SL, Fritz JM, Hebert JJ, Kawchuk GN, Childs JD, Parent EC, et al. Association between changes in abdominal and lumbar multifidus muscle thickness and clinical improvement after spinal manipulation. journal of orthopaedic & sports physical therapy. 2011;41(6):389-399.
25. Mannion A, Caporaso F, Pulkovski N, Sprott H. Spine stabilisation exercises in the treatment of chronic low back pain: a good clinical outcome is not associated with improved abdominal muscle function. European Spine Journal. 2012;21(7):1301-1310.