Original Article

Hamstring Shortness among Undergraduate Students, Using Knee Extension Angle Test

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Abstract

Objective: To examine the causes and prevalence of hamstring tightness/shortness among undergraduate physical therapy students. It is a Cross-sectional study conducted at Institute of Physical Medicine & Rehabilitation, DUHS during the period of Jan 2019 to Jun, 2019.

Materials and Methods: The sample size (n=248) was estimated by open EPI software. Both male and female are included. Hamstring muscle shortness was assessed by a gold standard assessment tool i.e. passive knee extension angle test. Descriptive statistical analysis was done by using SPSS version 24.

Results: The hamstring muscle tightness was measured by using knee extension angle test. Results conclude that among (248) students (62.90%) had hamstring muscle tightness / shortness and (37.10%) did not show any muscle shortness. Out of (216) female participants (136) have hamstring shortness. On the other hand out of 32 male participants, twenty (20) had hamstring shortness out of total 248 students. It was also evident from the study that 27% of physiotherapy students having low back pain was because of clinical exposure and tight hamstrings muscles.

Conclusion: Hamstring tightness/shortness is very much prevalent among the undergraduate physiotherapy students. The reason might be the prolong study durations and lack of physical activities. The results showed statistically significant difference between hamstring muscle extensibility in both male and female.

Keywords: Extension Angle, Flexion, Contracture, Fasciitis.

Introduction

Hamstring play a key role in daily living activities such as walking, running, jumping and controlling some movements of trunk, hamstring muscles are combination of three muscles that are located on posterior aspect of thigh [1] During gait cycle , which muscles are injured in sports is unclear, long head of bicep femoris muscle is more prone to injury[2] .Hamstring flexibility is the prime component of health and quality of life [3] . The aim of this study was to examine the causes and incidence of hamstring tightness/shortness among undergraduate physical therapy students. Hamstring tightness is greater in college student due to lack of knowledge regarding the posture and training of hamstring muscle extensibility [4]. Physiotherapy students experience low back pain due to mobilization and treating patient during physiotherapy sessions. Prevalence of low back pain is high in physiotherapy students then other medical students, Low back pain is a common problem effects on muscles, nerve and bones of the back, it is leading cause of impairment that effects the quality of life and reduce functional activity with age group 25-34 years faced more low back pain than healthy young peoples with age ability to perform task[5]. Athletes are more prone to develop hamstring strain due to shortness of hamstring muscles[6]. Hamstring muscle is able to generate greater force through eccentric and concentric contraction because number of type 2 muscle fibers is increased in hamstring muscles. Hamstring muscle fibers are responsible for posture stabilization and pelvic control[7]. Hamstring strain is the most recurrent complaint due to tightness in hamstring muscle. Hamstring tightness is widely impact on changing in lumber pelvic rhythm[8]. There are certain physical abnormal conditions which develop due to tighten hamstring. Such as planter fasciitis, patella-femoral pain syndrome or patellar tendinopathy[9]. Dysfunctional motor control pattern, contribute in hamstring shortness. If the main function of prime mover alters then it may leads to changing in hamstring extensibility as it becomes tight [10]. Clinically hamstring muscles length is directly check by different physical test e.g. Straight leg raising (SLR), Sit and reach test (SR),toe touch test, Active knee extension test (AKE) and Knee extension angle test (KEA) with planter flexion is the gold standard for assessing hamstring muscle flexibility with the intra-tester reliability 0.99.[11]

Materials and Methods

The study was conducted after getting permission from the department of physical medicine and rehabilitation (IPMR). The data was collected from institute of physical medicine & rehabilitation, DUHS during the period of Jan 2019 to Jun, 2019. A sample size of 248 participants by measuring passive knee extension angle (PKEA) was collected. The sample size was calculated by open EPI method. A consent from was filled out by all the participant .Rationale of the study was describe clearly to all the participants. All subjects had right to withdraw any time from study without any formalities .We ensured the confidentiality of data to all participant's. All undergraduate physiotherapy students of DUHS were volunteered to participate in the study. Male and female both genders were include. Subjects with any history of lower limb fracture or musculoskeletal disorder / trauma , congenital deformity of lower limb, history of low back or lower limb surgery and road traffic accident (RTA) were excluded. Data was collected by passive knee extension angle (PKEA) test performed by the investigator and demographic details were also collected by self-design simple questionnaire. Hamstring muscle length was checked by using gold standard passive knee extension angle test performed at any leg of either limb right or left fig-1. The position of patient is supine lying on table with hip flexion upto 90* on the tested leg. The opposite limb / contra lateral limb was stated flat on the table and participant knee was passively extended until participant felt stretch and pain on the posterior aspect of thigh. The stationary arm of goniometer was placed at lateral epicondyle of the femur and the moving arm was placed

toward the lateral malleolus. Tightness of these muscles define when knee extension angle is more than 20 degree (knee extension angle is the degree of knee flexion from terminal knee extension) [11].

Figure 1: Passive knee extension angle test

SPSS version 24 was used for the data analysis. Descriptive statistics were explored using mean and standard deviation for quantitative variables like age, weight, height and BMI. Frequency and percentages were calculated for all qualitative variables. The chi-square test was applied to investigate association outcome with general characteristics such as age and BMI with hamstring shortness. The independent t-test was applied to investigate association between age and BMI in participants with and without hamstring muscle shortness. *P*-value <0.05 was consider to be statistical significant.

Results

Total 248 participants were recruited to check out the prevalence of hamstring.muscles.tightness/shortening. The knee extension angle test was used to find out the hamstring muscle tightness. In this study 27% of physiotherapy students having low back pain because off clinical exposure. Among 248 students, 62.90% had hamstring muscle shortness and 37.10 % did not have hamstring Shortness. The total participants were 248 out of 216 female participants 136 (62.9%) Hamstring muscle shortness was present in female students. On the other hand out of 32 male participants 20(62.5%) had hamstring tightness out of total 248 students. The incidence of hamstring muscle tightness was found to be equal to both male & female participants (table 2). Out of 248 participants 27 % participants are under-weight , 49.2% are categorized as normal weight , 10.5 are over-weight and 13.3% obese .We follow weight classification by BMI in Asian according to WHO [12] Under-weight <18.5,Normal 18.5-22.9, Over-weight 23-24.9, Obese 25-30).(See table 3)

The mean age participants with hamstring shortness same that of patient without hamstring shortness (22.28±1.37 vs 22.21±1.37 years *p*=0.690). Similarly the mean age of BMI participants was also same among participants with and without hamstring shortness (20.73±3.22 vs 21.24±3.82 kg/m2 *p*=0.269), table 4. Participants showing KEA +ve (156) reported no pain in the lower limb were (n=68, 43.58%), followed by slight pain (n=54, 34.61%), moderate pain (n=24, 15.38%), very severe (n=6, 3.84%), and fairly severe (n=4, 2.56%). Participants showing KEA +ve (156) reported no Muscle symptoms running on uneven ground were (n=67,42.94%), followed by slight pain (n=55,35.25%), moderate pain (n=21, 13.46%), fairly severe (n=9,5.76%) and very severe (n=4, 2.56%).Participants showing KEA +ve (156) reported Felt fatigue or low energy, majority had reported slight pain (n=72, 46.15%), followed by moderate pain (n=35,22.43%), no pain (n=32,20.51%), fairly severe (n=11,7.05%) very severe (n=6,3.84 %).Participants showing KEA +ve (156) reported Problem during physical activity(e.g: Walk or jogging) majority had reported no pain (n=72, 46.15%), followed by slight pain (n=46, 29.48%), moderate pain (n=25, 16.02%), fairly severe (n=8, 5.13%) and very severe (n=5,3.21%). (Table 4).

Table 1: Descriptive Statistics

	n	Range	Mean ± SD*
Age (years)		20 – 28	22.25 ±1.37
BMI(kg/m2)		12.86-31.22	20.92±3.46
Weight(kg)	248	34.50-93.00	55.25±10.83
Height(m2)		1.21-2.010	1.62±0.08

**standard deviation*

**p-value has been calculated by Chi-square test*

Table 2: Hamstring Muscle Shortness according to gender

Gender	Total	Hamstring Muscle		p-value*
		Normal [n(92)] N(%)	Short [n(156)] n(%)	
Male	32	12 (37.5%)	20 (62.5%)	0.495
Female	216	80 (37%)	136 (62.9%)	

Table 3: Hamstring shortness according to AGE & Body Mass Index (BMI)

	Degree Of Knee Extension Angle		P-Value*
	+ ve (>20) Mean±SD*	-ve (≤20) Mean±SD*	
Age in years	22.28±1.37	22.21±1.37	0.690
Body Mass Index	20.73±3.22	21.24±3.82	0.269

**Standard deviation*

**P-value has been calculated by Independent t-test*

Table 4: Effects of Hamstring shortness on Activity of Daily Living (n=156)

Not at all n (%)	Slightly n (%)	Moderate n (%)	Fairly Severe n (%)	Very Severe n (%)
Q.1 Pain in lower limb?				
68(43.58)	54(34.61)	24(15.38)	4(2.56)	6(3.84)
Q.2 Felt anxious or low because of muscle symptoms?				
47(30.)	67(65)	29(67.4)	11(64.7)	2(66.7)
Q.3 How well you understand muscle symptoms?				
35(22.93)	50(23.04)	53(35.97)	15(9.61)	3(1.92)
Q.4 How to manage your muscle pain (e.g. changing life style or medications)?				
28(17.94)	36(23.04)	56(35.89)	25(9.61)	11(0.705)
Q.5 How much muscle symptoms bothered you overate?				
57(36.53)	50(32.05)	39(25)	7(4.48)	3(1.923)
Q.6 Muscle pain during putting shoes or socks?				
115(73.71)	29(18.58)	9(5.769)	2(1.282)	1(0.641)
Q.7 Muscle symptoms to getting into or out of car?				
126(80.76)	19(12.17)	5(3.205)	4(2.564)	2(1.282)
Q.8 Muscle symptoms during running on uneven ground?				
67(42.91)	55(35.25)	21(13.46)	9(5.769)	4(2.564)
Q.9 Need help from others because of muscle symptoms?				
119(76.28)	21(13.46)	10(6.410)	3(1.923)	3(1.923)
Q.10 Felt fatigue or low energy?				
32(20.51)	72(46.15)	35(22.43)	11(7.051)	6(3.846)
Q.11 Muscle symptoms interfered with work?				
69(44.23)	47(30.127)	28(17.94)	9(5.769)	3(1.923)
Q.12 Problem during physical activity (e.g. walking or jogging)?				
72(46.15)	46(29.48)	25(16.02)	8(5.128)	5(3.205)
Q.13 Muscle pain and stiffness during night?				
82(52.56)	42(26.92)	15(9.615)	12(7.692)	5(3.205)
Q.14 Muscle pain and stiffness during day?				
72(46.15)	60(38.46)	16(10.25)	7(4.487)	1(0.641)

Discussion

This study was designed to examine the causes and prevalence of hamstring tightness/shortness.among.undergradu-ate physical therapy students. The gender distribution was male participants 12.90% and female participants 87.10%. In this study 60.90 % participants had hamstring shortness and 37.10% did not have shortness. Hamstring shortness was measured by gold standard assessment tool knee extension angle test through goniometer.

In present study mean was (22.25±1.37). Another study conducted in 2016, they recorded separately mean age for male (21.0±1.4), for females (19.6±1.5)[12.] Tightness of hamstring muscle was one of the leading causes of low back pain[13].It was also documented that If hamstring shortness persist it might develop low back pain[14]. An experimental study by Radwan *et al* shows that there was association between hamstring shortness and low back pain. Increased shortness of hamstring muscle also increased the frequency of low back pain[15].The current study shows restriction in participant's daily living activities (ADL) due to muscle tightness. Thirteen participants face severe difficulty, 31 marked as fairly severe and 98 face moderate difficulty and pain in activity of daily living. Some participants reported musculoskeletal dysfunction like pain in lower limb and low back pain etc. Twenty five participants recorded very severe symptoms, 62 participants feel fairly severe and 201 moderately face pain or musculoskeletal dysfunction. A parallel study by Yıldırım *et al* also reveals that hamstring muscle shortness reduce the range of motion like forward flexion and pelvis motion. Tightness and stiffness in any muscle changes the biomechanics of spine and alter the accessory movement of spine and in all proximal nearby joints from spine [16]. Another study concluded that knee extension angle in physically fit students is decrease but he found positive association between knee extension angle and isokinetic knee extensor muscle strength[17]. Ranasinghe *et al* also conducted research on physiotherapy students to check physical inactivity and result showed only 15.9 % students were in highly active group and 48.7% physiotherapy students were in inactive group. Parents and teacher should encourage the children since child hood to participate in sports tournaments and physical activity to increase their physical fitness. These types of activities helped in adult life to continue sports and physical activity [18]. Hamstring shortness can be prevented by regular stretching of muscles especially in those groups who have short hamstring muscles [19.] In this research hamstring tightness was not classified by studying year and clinical exposure of students. There was unequal ratio of male and female to measure hamstring shortness. Future studies should include large sample size with equal ratio of male and female to find out the association of hamstring tightness in LBP participants with or without clinical exposure.

Conclusion

This study shows high prevalence of hamstring shortness among physiotherapy students due to the poor posture during the mobilization and treating patient during physiotherapy sessions. This study also explored the gender association with muscle tightness which is found out independent in male and female. The association between hamstring tightness with age and BMI was not statically significant.

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