

Association of Non-specific Mechanical low Back Pain with Limited Ankle Dorsiflexion among Female Students

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Author's Contribution

^{1 2 5} Substantial contributions to the conception or design of the work for the acquisition, analysis or interpretation of data for the work, ^{3 6} Drafting the work or reviewing it critically for important intellectual content, ^{1 4} Final approval of the version to be published, ⁴ Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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Introduction

Mechanical low back pain is the pain in the lumbar area caused by aberrant stresses on the spine's vertebrae, ligaments, soft tissues, intervertebral discs, muscles and other soft tissues.¹ All age groups, from children to elders, are affected by low back pain, in which just a few are highly disabled.² Excluding non-mechanical medical conditions, the

A B S T R A C T

Background: Mechanical low back pain is the pain in the lumbar area caused by aberrant stresses on the spine's vertebrae, ligaments, soft tissues, intervertebral discs, muscles and other soft tissues

Objective: To determine the association between non-specific mechanical low back pain and limited ankle dorsiflexion among female students.

Methodology: This cross-sectional study was conducted at Agile Institute of Rehabilitation Sciences from November 2021-March 2022. A total of 133 female students of age 18-30 years were included in this study. Students wearing high heels were excluded. The data was collected using Numeric Pain Rating Scale questionnaire for low back pain and goniometry for measuring ankle dorsiflexion. Data was analyzed using Statistical Package for Social Sciences version 22.0 to create graphs and tables. Chi square test was used for statistical analysis to find the association between low back pain and limited ankle dorsiflexion.

Results: A total of 133 participants were screened for low back pain. Out of total, 61 (45.86%) participants with mechanical low back pain had limited ankle dorsiflexion range of motion (≤ 10 degree) on left side while 64 (48.12%) participants with mechanical low back pain had limited ankle dorsiflexion range of motion (≤ 10 degree) on right side ankle. P value of chi square association of low back pain and ankle dorsiflexion was 0.078 for right ankle and 0.114 for left ankle.

Conclusions: This study concluded that there was no association found between non-specific mechanical low back pain and limited ankle dorsiflexion range of motion.

Keywords: Ankle joint, Dorsiflexion, Mechanical Low Back Pain

other 97% shows mechanical reasons for back pain.³ Low back pain is believed to affect up to 84 percent of the population at some point in their lives, with chronic low back pain affecting roughly 23 percent of the population, and low back pain affecting 11–12% of the Population. Mechanical aspects such as lifting and carrying are unlikely to have a significant influence in pathology, but genetic makeup is crucial. ⁴

The lumbar vertebrae, muscles, thoracolumbar fascia, dura mater, epidural plexus, ligaments, sacroiliac joints, zygapophyseal joints, and lumbar intervertebral discs have all been found to have the capability to cause pain.⁵ Low back pain is caused by a wide variety of mechanical, physical, behavioral and psychological factors. Anthropometric characteristics, gender, smoking habits, computer use, school furniture, and ergonomic difficulties, especially sitting posture, are all risk factors for low back pain in students.⁶

The human body is built up of a large number of kinematic chains, which are made up of bones connected by joints or links. Any changes in the kinematics of one joint have an immediate influence on the kinematics of other joints.⁷ The kinetic chain of the lower limbs connects the foot with the lumbar region.⁸ The foot problems contribute to low back pain by changing body posture, equilibrium and gait patterns.⁹ With regards to the conclusion of previous studies, changes in alignment of foot and ankle joint could lead to back pain because of disturbances in force distribution from lower leg to spine.¹⁰ Moreover, the hyper dorsiflexion of ankle plays an important part in making the participants prone to have exaggerated back pain.¹¹

Pronation, which includes dorsiflexion, eversion and abduction of foot,¹² has also been linked to non-specific low back pain.¹³ The excessive foot pronation may cause back pain but it has no effect on increased level of dysfunction in individuals with back pain.¹⁴ One of the study showed that restricted dorsiflexion and plantar flexion particularly at 1st metatarsophalangeal joint and at ankle joint is not indicated as a contributing factor in causing persistent non-specific back pain.¹⁵

There was a need to conduct research on this topic of "Association of mechanical back pain with limited ankle dorsiflexion among females" as there is limited research available on this topic and there is no study conducted in Bahawalpur on this topic. The purpose of the research was to measure the association, increase awareness and reduce burden of disease by making preventive strategies and cost-effective management plan.

Methodology

This cross-sectional study was conducted at Agile Institute of Rehabilitation Sciences from November 2021 to March 2022. Ethical approval was taken from Institute Research Committee (IRC) of Agile Institute of Rehabilitation Sciences (Ref.No. AIRS-IRC/S-11). The convenient sampling technique was used to collect the data. The sample size was calculated with 5% margin of error, 95% confidence interval and response distribution 50% using the Raosoft sample size calculator. 133

Female students of age 18-30 years having acute or chronic non-specific low back pain were included in the study. The students with specific back pain, wearing high heels, history of injury or surgery of spine or lower extremity within last two months and students with any known pathology of spine or lower extremity were excluded. The data collection procedure started after the consent was given by the students. The procedure of the study was explained to all students. The students were asked to indicate the numeric value on the segmented scale that best describe their pain intensity on Numeric Pain Rating Scale (NPRS) questionnaire.¹⁶ The researcher measured the ankle dorsiflexion range of motion (ROM) by using goniometer¹⁷ following the code of ethics. Placement of goniometer and the procedure of taking ankle dorsiflexion measurements was done by following the procedure explained in the literature.¹⁸ Data was analyzed using Statistical Package for Social Sciences (SPSS) version 22.0. The chi-square test was used to find the association between mechanical low back pain and limited ankle dorsiflexion range of motion.

Results

The study included 133 female students with low back pain. Most participants (76.7%) were aged 18–22 years, followed by 18% aged 23–26 years, and 5.3% aged 27–30 years (Table I).

Table I: Demographic data of Participants.

Variables	N	%
Age	18-22	102
	23-26	24
	27-30	7
Total	133	100

In this study, 64 individuals with mechanical low back pain had limited ankle dorsiflexion (≤ 10 degree) in the right foot in which 19 were ranged from 1-5 degree of ankle dorsiflexion and 3 students had mild pain, 7 had moderate pain and 9 had severe pain while the other 45 students were ranged from 6-10 degree of ankle dorsiflexion and 10 had mild pain, 15 had moderate pain and 20 had severe pain on NPRS scale.

There were 61 individuals with mechanical low back pain that had limited ankle dorsiflexion (≤ 10 degree) in their left foot. Out of these 61 participants, 19 were ranged from 1-5 degrees of ankle dorsiflexion and 4 had mild pain, 8 had moderate pain and 7 had severe pain while the other 42 participants were ranged from 6-10 degrees with 9 students had mild pain, 15 had moderate pain and 18 had worst of the pain. (Table II)

Table II: Right & Left Ankle Dorsiflexion (limited) Cross Tabulation With NPRS					
Ankle	Dorsiflexion	NPRS			Total
		Mild	Moderate	Severe	
Right Ankle	1-5 degrees	3	7	9	19
	6-10 degrees	10	15	20	45
Total		13	22	29	64
Left Ankle	1-5 degrees	4	8	7	19
	6-10 degrees	9	15	18	42
Total		13	23	25	61

A total of 64 students with low back pain had limited ankle dorsiflexion in their right foot and 61 students with low back pain had limited ankle dorsiflexion in their left foot. (Table III)

Table III: Two ways Classification Table for Chi Square Test.			
Right Ankle	Limited Ankle Dorsiflexion (<10)	Normal Ankle Dorsiflexion (>10)	Total
Patients with Mechanical Low Back Pain	64	69	133
Left Ankle	Limited Ankle Dorsiflexion (<10)	Normal Ankle Dorsiflexion (>10)	Total
Patients with Mechanical Low Back Pain	61	72	133

However, no association has been found between mechanical non-specific low back pain and limited ankle dorsiflexion for right as well as left ankle (p-value=0.078 and p-value=0.114 respectively). (Table IV)

Table IV: Chi-square Test between Mechanical Low Back Pain And Limited Ankle Dorsiflexion.				
		Value	Df	Asymp. Sig. (2-sided)
Right Ankle	Pearson Chi-Square	0.750a	2	0.078
	Likelihood Ratio	0.802	2	0.670
	Linear-by-Linear Association	0.492	1	0.138
	N of Valid Cases	64		
Left Ankle	Pearson Chi-Square	0.761a	2	0.114
	Likelihood Ratio	0.766	2	0.682
	Linear-by-Linear Association	0.231	1	0.631
	N of Valid Cases	61		

Discussion

This study involved 133 females and no significant association found between non-specific low back pain and limited ankle dorsiflexion (p-value was >0.05). These results are similar to a study conducted by Babaei on 83 individuals consisting of 35 males and 48 females. According to their findings, the correlation between back pain and feet dimension

and short gastrocnemius was not found.⁹ In this study, neither right foot limited dorsiflexion nor left foot limited dorsiflexion was found to be associated with non-specific mechanical back pain with a p value =0.078 and p value =0.114 respectively. In contrast to these results, another study conducted on 85 participants, 37 individuals had non-contact back pain. Their results showed that there was an association between hyperdorsiflexion of non-dominant side of leg and non-specific back pain with a p value <0.05 while opposite findings were found between ankle dorsiflexion of dominant side leg and back pain having p value >0.05.¹¹

Regarding age, adult age group was included in this study. In early adults, few of them had mild pain, majority of them had moderate pain and some of them had severe pain, while in middle adult age group, few had mild pain, some had moderate pain and no one had severe pain. These findings were consistent to those of another study, which included people of adult age group, some of them belongs to early adults, most of them belongs to middle adult age group and few of them belongs to late adults. The association between persistent mechanical low back pain and ankle dorsiflexion was not discovered.¹⁵

Limitations: This study was conducted on a single setting involving small population and only female students. It is recommended to conduct further studies on this topic on large sample size involving multiple settings and both genders while considering factors like older age group, life style (sedentary or active), prospective study design, and use of an inclinometer which may show an association between mechanical low back pain and ankle dorsiflexion.

Conclusion

Our study concluded that there was no association between mechanical low back pain and limited ankle dorsiflexion. However low back pain was reported in students with limited ankle dorsiflexion. It is concluded that mechanical low back pain may be associated with psychological factors, ergonomic factors, prolonged sitting hours, lifestyle or unrecognized pathology.

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