

## High Heels and Low Back Pain in Young Female Students

Iqra Nadeem\*, Muhammad Kashif\*\*, Sidra Mushtaq\*, Rumaisa Hussain\*, Nimra Naseem\*,  
Haider Darain\*\*\* and Danish Khan\*\*\*\*

\*Department of Physical Therapy, Sargodha Medical College, University of Sargodha, Sargodha,

\*\*Riphah College of Rehabilitation Sciences, Riphah International University, Faisalabad Campus, \*\*\*IMPR,  
Khyber Medical University, Peshawar, \*\*\*\*Northwest Institute of Health Sciences, Peshawar

### Abstract:

**Objective:** Prolonged use of high-heeled shoes is considered a possible cause of low back pain in female students. The aim of study is to investigate the association between high heels and low back pain

**Methods:** A cross-sectional survey based on a standard self-reporting questionnaire was conducted among 50 female university students (aged 18-28 years) mean 21.1 years and mean height 5.1 feet using high heels of GCU Faisalabad. Purposive sampling technique was used to. Out of 50 students wearing high heels, 28 (56%) students were suffering from low back pain. Pearson Chi-Square test was applied.

**Results:** Statistical analysis showed significant association between high heel and LBP,  $p=0.001$ . Coefficient of contingency=0.567 indicated strength of association is intermediate.

**Conclusion:** This study also revealed that students who wear high heels for 2 or more years suffer from a bit of lower back pain and that the height of the heel increases the incidence and the intensity of pain increases as well.

**Keywords:** Low Back Pain, High Heel, Foot Wear, Fashion Heel

### Introduction

LBP is most common problem among university students and affecting their daily life and quality of life. The incidence of lower back pain in the general population has been studied in a number of studies and systematic reviews.<sup>1</sup> There are many factors that cause LBP in university students are age, class, using a computer, lack of lumbar support, life style habits, poor study habits, psychological factors and heel height.<sup>2</sup> However, high heeled footwear can damage the spine and feet if used excessively. They can change the alignment of the spine and feet can compromise muscle efficiency when walking, cause postural changes, lead to discomfort and muscle fatigue in the lower part of the back, legs and feet.<sup>3</sup> LBP occurred in approximately 80% of population around the world once in their life time experience. LBP is most commonly occurring musculoskeletal condition disrupts nearly 80% of the population in their lives.<sup>4</sup>

In different areas may cause different consequences of disability and others, in United States LBP is one of the most common condition that leads issues related to work, the level of activity, quality of life and is also the second most common neurological problem than headache. There are three types of pain may be acute, sub-acute and chronic pain based on duration or occurrence of pain. Previous studies show that up to 80 % of the population suffers from back pain during their lifetime.<sup>5</sup> Wearing high heels are not only deemed present fashion day and make the wearer feel taller, but also a passion, personal expression, source of authority, brand flaunt femininity, psychological empowerment and joy. It is a proven the body that causes health hazards, giving rise to a copy problem. High heel shoes put the foot in a plantar bending position, which increases the pressure in the forefoot (the ball of the foot and toes).<sup>6</sup> High heels cause several problems such as low back pain, over worked muscles or injured leg, knee osteoarthritis, plantar fasciitis. On wearing shoes with high heels, mostly with the two inches heel or above 2 inch, something that happens with the toes while wearing high heeled shoes is that you slip your feet inside of your shoes and next step that occurs is that you force your toes to move according to the shape of shoe's inside after this false redistribution of weight takes place. Body starts leaning forward after improper gain of weight in the

#### CORRESPONDENCE:

**Dr. Muhammad Kashif**

Assistant Professor, Riphah College of Rehabilitation  
Sciences, Riphah International University

Faisalabad Campus

Email.kashif.shaffi@gmail.com

feet as a result of compensatory mechanism of our body, body leans backward and on the back an arch is formed consequently a position is formed in which stress increases on lower limbs including hips and knees and lower part of back as well Weight.<sup>6</sup> High heels exerts additional biomechanical stresses and raise the level of distress in women.<sup>7</sup> High heeled shoes can be detrimental to the spine because wearing high heels bioelectrical activity of the erector spinae muscle increases and ground reaction forces increases, both of these effect spine and lower limb. Regular wearing of High heels is harmful for the spinal column and further causes long standing weakness of the muscles along the spine. One of the studies showed that EMG activity of erector spinae muscle increases in young and middle age women with High heels, due to which muscle fatigued and biomechanical changes occur and causing backache in females.<sup>8</sup> There are more studies on the gait and the high heels, but very few investigate on the LBP and the high heels. Some studies explain that high heels cause low back pain based on biomechanical changes when using high heels, while one study showed that heel height has no effect on low back pain.<sup>9</sup> Aggarwal, et al. (2013) studied the risk factors in college students and explained major causes of low back pain are psychological factor, lifestyle changes and poor study style. According to this study there is no relation in high heels and low back pain.<sup>10</sup> Lee, et al. (2011) conducted a study in young females having age between 20 to 30 years. All the women were wearing shoes with high heel for more than a year and they were giving them response about what they feel while putting high heels whether they feel comfortable or not this study observed consequences of increasing heel heights, angle of torso bent had reduced noticeably. Likewise, the anterior tibial EMG, during walk in shoes with raised heel, electromyography of the lumbar region and upright motion of middle of body weight were greater noticeably. This must be discouraged to use shoes with raised heels because of above mentioned additional strains and pressure.<sup>11</sup> Pain in the lower back through the use of high heels is the general perception of some women and they complain about it. A large number of physiotherapists and general practitioners seem to think that high heels that cause back pain cause alterations in the lower part of the spine. The lumbar curve becomes hyperlordotic because pain is generated in the lower back.<sup>12</sup> This is such a controversial topic so we want to see the association between high heels and LBP.

## Patients and Method

The study was conducted at Government College University Faisalabad. The ethical approval was taken from Institution Review Board of the University. The study population is female students of age 18 to 28 years wearing high heels 2 inch or more. We selected sample size of 50 students for our study by convenient sampling method. The informed consent was taken from the subjects who participated in the study Data was collected from those students wearing high heels (2 inch or more). Study Population was screened prior to data collection and Questionnaire has not been given to students who are married or had any gynecological problem. Inclusion criteria were female students of age 18-28 years wearing high heels (2 inch or more), who were willing to participate in study and female students available in university timing (8am - 4 pm). Exclusion criteria were married Females, females with systemic illness, presence of gynecological problems and neurological problem (sciatica). Pain was measured with Visual Analogue Scale scoring from 0 to 10 with no pain participant mark the (0) according to her pain and severe pain mark (10). To measure the heel height a measuring scale was given to participants, so that proper height of heel should be measured. Self-made questionnaire was used to collect data. Data was analysed by using SPSS version 15. Research was ethical to do and consent from Institute and students taken. There were no ethical issues related to topic and population.

## Results

Out of 50 female students having mean age 21.1 years and mean height 5.1 feet using high heels, 28 students (56%) are suffering from low back pain. Statistical analysis showed significant association between high heel and LBP,  $p=0.001$  and strength of association is intermediate, coefficient of contingency=0.567. 64% students feeling uncomfortable and 35% students feeling comfortable while wearing heels. 44% students wear heel for female beauty, 18% for looking taller, 4% to draw attention and 34% to enhance confidence. Most students wear heel for female beauty. Most commonly used high heel is 2 inches. Out of 50, 19 are using 2-inch heel out of which 3 having pain while 16 having no pain, 17 are using 3-inch heels out of which 12 having pain and 5 having no pain, 13 subjects are using 4-inch heel out of which 12 having pain, 1 having no pain while only one subject is using 5 inch and suffering from LBP. Data suggest those using heel 3 inch or more suffering more from LBP

**Table-1: Frequency of Low Back Pain**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	28	56%	56%	56%
	No	22	44%	44%	100%
	<b>Total</b>	<b>50</b>	<b>100</b>	<b>100</b>	

**Table-2: Frequency of Hindrance in Activities Of Daily Living Due To Low Back Pain**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	12	42.9%	42.9%	42.9%
	No	16	57.1%	57.1%	100%
	<b>Total</b>	<b>28</b>	<b>100</b>	<b>100</b>	

This frequency table shows in 42% students LBP affecting their ADLs while in 57% LBP is not affecting their ADLs.

**Descriptive Statistics**

	N	Minimum	Maximum	Mean	SD
Height (feet) of Subject	50	4.5	5.7	5.12	0.27052
Age (years) of Subject	50	18	23	21.1	1.30368

This table shows mean height of the female students is 5.1 inch with standard deviation 0.27052. Mean age of the students is 21.1 years with standard deviation 1.30368.

**Table showing chi-Square Test:**

	Value	df	Asymp. Sig. 2 sided
Pearson Chi square	23.637 <sup>a</sup>	6	0.001
Likelihood ratio	26.115	6	0.001
Linear by linear association	11	1	0.001
N of valid cases	50		

P = 0.001, Chi Square =23. 637, results are significant 19 subjects were using 2-inch heel out of which 16 had no pain, 1 had mild pain, 2 having moderate pain and no one having unbearable pain. 17 subjects were using 3-inch heel, out of which 5 having no pain, 2 having mild pain, 10 having moderate pain and no one

having unbearable pain. 13 subjects are using 4-inch heel out of which 1 having no pain, 6 having mild pain and 6 having moderate pain and no one having unbearable pain. Only one subject was using 5 inch heel having moderate pain. Data suggested those using heel 3 inch or more having more pain intensity (moderate) while no one having unbearable pain. Out of 28 students suffering from LBP 18 were those wearing heel 4-5 times in a week, 7 are those using heel 2-3 times in a week, 2 were those wearing 2-3 times in a month and 1 using 4-5 times in a month. This shows those wearing heel more frequently suffering more from LBP. Out of 28 students having LBP, 8 students are those wearing heel for 2-4 hours 4 having mild and 4 having moderate pain, 13 using heel for 4-6 hours out of which 2 having mid and 11 having moderate pain, 7 using heel for more than 6 hours out of which 3 having mild and 4 having moderate pain. This shows there is association between heel wearing hours and intensity of pain. Out of 28 students suffering from LBP 2 are those using heel from less than 6 months, 7 are those using heel from 6-12 months, 7 are those using from 1-2 years and 12 are those using more than 2 years. From this it is concluded those using high heels from long time period are suffering more. Out of 50 subjects 22 subjects having no pain, 16 subjects are considering back pain is due to prolong standing and 12 subjects considered back pain is due to high heels, while no one is considering LBP is due to bending or any other factor. In 42% students LBP is affecting their ADLs. Out of 28, 22 students were with intermittent pain and 6 having constant pain. Out of 56% suffering from LBP 28% having pain for 0-1 hour, 26% for 2-4 hours and only 2% for more than one day while no one having pain duration 4-6 hour. Out of 56% students suffering from LBP 38% students were with LBP once in a week, 10% once in a month and 8% every day. This shows most students using high heels having LBP once in a week. This data also shows standing hour is also contributing in LBP.

**Discussion**

In this study we establish that the point prevalence of low back pain in students with average age (SD) of 21.1 years and average height of 5.1 feet in high heels was 56%. In this study we included 50 students wearing high heels of 2 inches or more between the ages of 18 to 28 years and analysed how many wearing high heels suffering from low back pain with a questionnaire. From the analysis of the data it

appeared that 54% of the students suffered from low back pain. This finding can be reinforced by a study in which the percentage of women suffering from low back pain due to the use of high heels is more. Results of that study showed 58% females of early and mid-twenties complain of LBP using high heels.<sup>11</sup>

In the current study, a significant association between high heels and lower back pain was investigated and, as heel height increased, the presence and intensity of lower back pain was greater. These findings are supported by the study conducted by Mika in 2013 that high heels alter EMG activity of back and hip muscles and causing musculoskeletal problems [13]. This study indicated earlier onset EMG activity of erector spinae than Gluteus maximus muscles with high heels. Moreover, this result is supported with one other study in which EMG activity of erector spinae and rectus abdominis muscles were measured in three different heel heights, barefoot, 3cm and 7cm heel height and result of this study suggest EMG activity increases as heel height increases so chances of presence and intensity of LBP is more.<sup>14</sup> Furthermore, above mentioned finding is in agreement with eletromyographic activity of erector spinae muscle that suggested EMG activity of back muscles increases significantly with 8cm heels than 1-4cm.<sup>14,15</sup>

Our study finds that those students who wear high heels for a prolonged period and more often suffer more from LBP. Similar to this, a study had shown that wearing high heels for long periods can cause the spine to become hyperlordotic. A hyperlordotic spine is one that has too much curvature in the lumbar spine of the vertebra or in the cervical regions of the spine. This can be painful due to tension in the lower back and legs which is a possible cause of LBP.<sup>15</sup>

## Conclusion

High heels have a significant association with the presence of low back pain. The different heights of high heels are associated with the presence and intensity of low back pain. The hours of heel use, frequency and duration of use of high heels are also related to the presence and intensity of low back pain. The data show that the most suitable height for high heels is 2 inches that has very little effect on the back. The data also suggests that more than half of students felt uncomfortable while wearing heels

**Conflict of Interest:** The authors declared no conflict of interest

**Source of Funding:** None

**Editor's Comments:** *The study population is too small to derive valid conclusions. Pain is very subjective; its assessment requires strict objective parameters. This study may be considered as a pilot study and requires new study with these things in mind.*

## References

1. Mika, A., et al., Changes of bioelectrical activity in cervical paraspinal muscle during gait in low and high heel shoes. *Acta Bioeng Biomech*, 2011. 13(1): p. 27-33.
2. Cronin, N.J., R.S. Barrett, and C.P. Carty, Long-term use of high-heeled shoes alters the neuromechanics of human walking. *Journal of Applied Physiology*, 2012. 112(6): p. 1054-1058.
3. Noormohammadpour, P., et al., Low back pain status of female university students in relation to different sport activities. *European spine journal*, 2016. 25(4): p. 1196-1203.
4. Taspinar, F., et al., Determining the pain-affecting factors of university students with nonspecific low back pain. *Journal of physical therapy science*, 2013. 25(12): p. 1561-1564.
5. Cassidy, J.D., et al., Incidence and course of low back pain episodes in the general population. *Spine*, 2005. 30(24): p. 2817-2823.
6. La Touche, R., K. Escalante, and M.T. Linares, Treating non-specific chronic low back pain through the Pilates Method. *Journal of Bodywork and Movement Therapies*, 2008. 12(4): p. 364-370.
7. Gu, Y., et al., Plantar pressure variation during jogging with different heel height. *Applied Bionics and Biomechanics*, 2013. 10(2-3): p. 89-95.
8. Greensword, M.A., *Biomechanical Evaluation of Modified Track Shoes*. 2010, Louisiana State University.
9. Bird, A.R., A.P. Bendrups, and C.B. Payne, The effect of foot wedging on electromyographic activity in the erector spinae and gluteus medius muscles during walking. *Gait & Posture*, 2003. 18(2): p. 81-91.
10. Zhang, X., et al. The influence of heel height on ankle kinematics during standing, walking, jogging and sidestepping in children. in *ISBS-Conference Proceedings Archive*. 2016.
11. Aggarwal, N., et al., Low back pain and associated risk factors among undergraduate students of a medical college in Delhi. *Education for Health*, 2013. 26(2): p. 103.
12. Lee, C.-M., E.-H. Jeong, and A. Freivalds, Biomechanical effects of wearing high-heeled shoes. *International Journal of Industrial Ergonomics*, 2001. 28(6): p. 321-326.
13. Franklin, M.E., et al., Effect of positive heel inclination on posture. *Journal of Orthopaedic & Sports Physical Therapy*, 1995. 21(2): p. 94-99.
14. Lamoth, C.J., et al., Effects of chronic low back pain on trunk coordination and back muscle activity during

walking: changes in motor control. European Spine Journal, 2006. 15(1): p. 23-40.

15. Casarin, C., et al., Relation between Wearing High-Heeled Shoes and Gastrocnemius and Erector Spine

Muscle Action and Lumbar Lordosis\_2014. Vol. 55. 2014. 71-16

HISTORY	
Date Received:	23-07-2018
Date Sent for Reviewer:	15-08-2018
Date Received Reviewers' Comments:	20-08-2018
Date Received Revised Manuscript:	30-08-2018
Date Accepted:	02-09-2018

CONTRIBUTION OF AUTHORS	
Author	CONTRIBUTION
Iqra Nadeem	A,B,C,D,F
Muhammad Kashif	A,B,C,D
Sidra Mushta	B,C,D,E,F
Rumaisa Hussain	A,C,E
Nimra Naseem	B,D,E,F
Haider Darain	C,E,F
Danish Khan	D,E,F

**KEY FOR CONTRIBUTION OF AUTHORS:**

- A. Conception/Study Designing/Planning
- B. Experimentation/Study Conduction
- C. Analysis/ Interpretation/ Discussion
- D. Manuscript Writing
- E. Critical Review
- F. Facilitated for Reagents/ Material/ Analysis