

High Heels Footwear Causes Heel Pain and Back Pain: Myth or Reality?

N Venkatesh Kumar¹, Chandralingam Prasanna¹, V Shyam Sundar², Aakaash Venkatesan³

¹Associate Professor, Department of Orthopaedics, PSG Institute of Medical Sciences and Research, Coimbatore, Tamil Nadu, India,

²Professor, Department of Orthopaedics, PSG Institute of Medical Sciences and Research, Coimbatore, Tamil Nadu, India, ³Post-graduate Student, Department of Orthopaedics, PSG Institute of Medical Sciences and Research, Coimbatore, Tamil Nadu, India

Abstract

Introduction: Heeled footwear has been in use by women for centuries and has now become an integral part of the wardrobe not only in the west but also in India. Recent research suggests that up to one third of women suffer from permanent problems as a result of their prolonged wearing of heels. One in 10 women wear it at least for 3 days a week, and a recent survey found that one-third of them had permanent problems.

Purpose: Whether the high heel wear is the actual cause of back pain is not yet clear. Literatures vary in their results regarding the same. Hence, the present study was done to assess this cause and effect.

Methods: The study was conducted at the orthopedic outpatient department of a tertiary care hospital, from July 2014 to December 2014. 100 female patients who were using heeled shoes and who volunteered to participate in the study were included. The heel height was measured using measuring tape and were classified into three groups (<2.5 cm, 2.5-5 cm, >5 cm). A Proforma with a questionnaire was given to all the participants and their response were noted.

Results: Out of the 100 female volunteers, who participated in the study, 44 had complaints of heel pain regardless of the heel height, 56 had back pain, and many had both heel pain and back pain complaints, based on the questionnaire evaluation. We were further able to distinguish both heel pain and back pain, based on the heel height worn, duration of wear (in years) and duration worn/day.

Conclusion: There was a positive correlation between duration of wear and height of footwear with regards to both heel and back pain. However, a definitive cause and effect could not be established because of smaller sample size.

Key words: Back pain, Heel pain, Shoes, Statistical analysis, Women

INTRODUCTION

Walking is the most common form of human locomotion from a motor control perspective, human bipedalism makes the task of walking extremely complex. One condition known to compound the difficulty of walking is the use of heeled shoes, which alters the natural position of the foot-ankle complex.¹ This thereby produces a chain of reaction effects that travels up to the lumbar vertebrae.

High-heeled footwear is defined as the footwear having a heel that is higher than the toe. Throughout the history, this footwear is considered as a symbol of sexuality, class and gender. When the foot slants forward, a much greater weight is transferred to the ball of the foot and toes, which increases the likelihood of damage to the underlying soft tissues that supports the foot. When the wearer tips the foot forward, this in turn puts pressure on the lower back and hence causes back pain. This particular study on post-adolescent volunteers was aimed to study the correlation between heeled footwear and heel and back pain.

MATERIALS AND METHODS

The present study was conducted on 100 female patients who attended orthopedic outpatient department at institution during the period from July 2014 to December

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Corresponding Author: Dr. N Venkatesh Kumar, Department of Orthopaedics, PSG Hospitals, Peelamedu, Coimbatore -641 004, Tamil Nadu, India. Phone: +91-9842241304. E-mail: drven@rediffmail.com

2014. Patients were drafted into the study based on inclusion criteria which included:

- a. Age >15 years and <55 years
- b. Without any foot and spine deformities. Patients were explained about the study and only those who volunteered and gave their consent were included in this study. The procedures followed were in accordance with the ethical standards.

The evaluation was based on questionnaire which was given to all the participating volunteers and heel height was measured with the help of inch tape as illustrated in Figures 1-3. Appropriate information collected in the questionnaire was entered in data collecting sheet for the purpose of statistical analysis.

Patients were categorized based on their age group (18-25, 25-45, 45-55), occupation (student, staff, housewife), heel height (normal [<2.5 cm], low heel [$2.5-5$ cm] and high heel [>5 cm]), duration of wear in years (0-5 and 5-10 years) and in hours/day (0-5 and 5-10), type of sole (leather, wooden, rubber, plastic). The data collected were statistically analyzed by Chi-square test.

Observation

A total of 100 female patients were included in the study after obtaining their informed consent. There were 63 students, 28 staff, 9 housewives who participated as volunteers. There were 12 people wearing heels with height 2.5-5 cm, 4 people wearing heels with height >5 cm and 74 people wearing heels with height 0-2.5 cm. In our study, 67 people were using soft sole type and 33 people were wearing hard sole type. There were 36 people wearing heeled footwear for more than 5 years, and 54 people were using heeled footwear for 0-5 years. 15 people were wearing heeled footwear for 0-5 h/day and 85 people were wearing heeled footwear for more than 5 h a day. Regardless of heel height worn, the duration of footwear had a significant influence on heel and back pain (Table1) and similarly prolonged wear in a day had a significant influence on heel pain (Table 2).

DISCUSSION

Heeled footwear has been in use by women for centuries but not all individuals wearing heels suffer from clinical problems. In ancient Egypt, wearing shoes may have served to set apart lower classes from the nobility as normal people walked around bare foot while the rich wore flat leather shoes. Moreover in ancient times, height would vary so that the higher the soles, higher the social status.

Research suggests that long-term heel use can both “compromise muscle efficiency and increase the risk of



Figure 1: Heel height being measured



Figure 2: Method of measuring heel height using measuring tape



Figure 3: Volunteers who participated in the study

injuries.” Heeled shoes slant the foot forward and down while bending the toes up, more the feet is forced into this position, more it may cause the gastrocnemius muscle to shorten.

Table 1: Relationship between heel height with back and heel pain (duration of wear in years)

Heel height	Heel pain			Back pain		
	0-5 years	>5 years	Significance	0-5 years	>5 years	Significance
0-2.5 cm (74 ⁿ)	14 ⁿ	28 ⁿ	0.017*	32 ⁿ	-	0.016*
2.5-5 cm (12 ⁿ)	3 ⁿ	6 ⁿ		3 ⁿ	Nil	
>5 cm (4 ⁿ)	1 ⁿ	1 ⁿ		1 ⁿ	1 ⁿ	

ⁿNumber of patients, *As analyzed by Chi-square test

Table 2: Relationship between heel height with back and heel pain (duration of wear in hours)

Heel height	Heel pain			Back pain		
	0-5 h	>5 h	Significance	0-5 h	>5 h	Significance
0-2.5 cm	6	36	0.053*	4	28	0.456
2.5-5 cm	3	6		3	-	
>5 cm	-	2		1	1	

*As analyzed by Chi-square test

When walking in high heeled shoes, a significant reduction in ankle plantar flexor muscle movement occurs, whereas increased work is performed by the hip flexor muscle during transition from stance to swing phase. Reduced effectiveness of ankle plantar flexors during late stance results in a compensatory enhanced hip flexor pull off. Large muscle movements and increased work at hip and knee occur while wearing high heels.²

Wearing high heels is thought to increase an individual's likelihood of experiencing a lateral Ankle sprain. The flexed and inverted posture of the plantar while wearing high heels may increase an individual's risk of experiencing a lateral ankle sprain.³

Foster *et al.*,³ found signs of increase in ankle sprains in patients wearing high heels for a prolonged duration. Esenyl *et al.*,² described changes in the biomechanics of walking like increase in plantar flexion in people using high heels. In the particular study, we werenot able to assess the changes in biomechanics of foot while wearing high heels as it is a purely observational study.

There is also a definitive change in subtalar joint axis while walking on a high heeled shoe in comparison to a normal shoe, hence wearing of high heel may cause foot and heel pain.⁴

High heeled shoes cause an increase in the lordotic curve of the lumbar spine.⁵ Increased ankle plantar flexion causes a kinetic chain of compensation up the lower extremity that ends with hypertonic psoas muscle, producing a lumbar hyperlordosis. A hyperlordotic lumbar spine in turn will lead to back pain.

Brent *et al.*,⁹ found alteration in biomechanics of the lumbar spine. In prolonged high heels wear, chain of

events around the ankle were observed, like increased ankle plantar flexion which in turn led to an increase in a lordotic curve.⁶

Eisenhardt *et al.*,⁵ measured pressure distribution under foot for bare feet versus heel height and found increase in distribution related to heel height. Opila-Correia *et al.*,⁷ studied the kinematics of high heeled walking and found that high heeled walking was associated with increased knee flexion in the stance phase. Kerrigan *et al.*,⁶ used biomechanical gait analysis and inverse dynamics to evaluate joint loadings during high heel walking and found that even moderate high heels would contribute to osteoarthritis of the knee.⁸

Electromyography analysis of the lower limb muscles in high heel users and regular footwear users showed significantly increased leg muscle activity.⁹

Based on the observations from our study done on 100 volunteers wearing heels who came to the orthopedic outpatient department for other problems, prolonged duration of wear in years/hours of wear per day resulted in heel pain that significantly affected their daily activities. Furthermore from this study, it was observed that prolonged wear of heels in due course, also resulted in back pain which again was found to be directly proportional to duration of wear in years.¹⁰

Even though we have derived certain conclusive results from the study, it does have few pitfalls, for instance its an observational study and results obtained were purely based on statistical analysis of the questionnaire reports. Most of the studies done on heeled footwear considered heel height more than 9 cm as high heel, whereas in our study low heel is considered <2.5 cm while heels between 2.5 and 5 cm are considered moderate and more than which is considered as high heels. Moreover, we couldnot have a definite discrimination of the type of sole worn and no changes in the final outcome with respect to the sole type worn.^{11,12}

The present study did prove it right that prolonged heels wear resulted in heel pain and back pain, but concrete justification couldn't be provided as the study was done on a small group of 100 volunteers.

CONCLUSION

This study was done with an intention to break the myth or confirm the reality that high heels footwear causes heel pain and back pain. We did succeed in obtaining a stastically significant correlation between the duration of heels wear in both hours/day and a number of year worn with heel and back pain. The pitfall of this study being the minimal sample size, and it was done as an observational study based on a questionnaire evaluation.

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