

# The Relationship Between Age-Related Incidences of Heel Spur With Sex and Side

Relación entre la Incidencia del Espolón  
Calcáneo con la Edad, Sexo y Lado

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**SUMMARY:** Heel spur is an osteophytic protrusion larger than 2 mm that lies just anterior to the tuberosity of the calcaneus. Heel spur can be of two types: plantar heel spur and dorsal heel spur. The aim of this study was to evaluate the relationship between the heel spurs incidence with age, sex and side. A total of 2000 bilateral radiographs of 1000 patients (518 men and 482 women) aged 20-93 years who applied to Terme state hospital, Samsun, Turkey due to trauma were examined. Patients were grouped into 10 year age ranges (20-29 years; 30-39 years; 40-49 years; 50-59 years; 60-69 years and over 70 years). The incidences of plantar heel spur, dorsal heel spur, and both were evaluated according to age, sex and side relations. Plantar or dorsal heel spurs were detected in 32.6 % (326 patients) of the patients. The incidences of plantar heel spur, dorsal heel spur, plantar and dorsal heel spur were 26.0 %, 16.9 %, and 10.3 % respectively. According to sex, the incidence of plantar heel spur was higher in women in all age groups. Although the incidence of dorsal heel spur was higher in men in the 6th decade, it was more common in women in other age groups. The incidence of plantar heel spur was 2.615 times higher in the right foot and 2.810 times higher in the left foot in women. As the age increased, the risk of plantar heel spur increased 1.060 times in the right foot and 1.061 times in the left foot. The incidence of dorsal heel spur was 1.510 times higher in the right foot and 1.715 times higher in the left foot in women. As the age increased, the incidence of dorsal heel spur increased in both feet and this increase was 1.055 times in both feet.

**KEY WORDS:** Heel Spur; Plantar Heel Spur; Dorsal Heel Spur; Calcaneus.

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## INTRODUCTION

The term “heel spur” was first used by German surgeon Plettner in 1900 to describe the formation of exostotic bone that develops on the plantar side of the calcaneus (Açıköz *et al.*, 2020). This formation is an osteophytic growth greater than 2 mm and extending in front of the tuberosity of the calcaneus (Kose *et al.*, 2004; Kullar *et al.*, 2004). The top of these spurs, also called entesophytes, are embedded in the plantar fascia (Duvries, 1957), they occur in the insertion areas of the ligaments and tendons into the bone (Kullar *et al.*).

Heel spur is frequently seen in people who are engaged in activities such as jogging, ballet, or in jobs that require prolonged standing such as barbers, dentists, policemen, store employees, and trauma caused by the use

of unsuitable shoes (Von Lackum & Palomeque, 1930; Mcconkey, 1981; Bartold, 2004). It is more common in people with reduced plantar heel fat pad, obese people, older people and women. It depends on mechanical rather than infectious factors (Lewin, 1926; Menz *et al.*, 2008; Beytemür & Öncü, 2018). The incidence of spurs increases with rheumatoid arthritis, ankylosing spondylitis, osteoarthritis, psoriatic arthritis, reiter's syndrome and pes planus (Alatassi *et al.*, 2018).

Heel spur can be of two types: plantar heel spur and dorsal heel spur (Lourdes & Ram, 2016). Osteophytic bone formation, which extends in front of the tuberosity of the calcaneus, is called the plantar heel spur and osteophytic degeneration of the achilles tendon, where the calcaneus

inserts on the dorsal face, is called the dorsal heel spur (Kullar *et al.*). Plantar and dorsal heel spurs are usually seen together with plantar fasciitis and achilles tendinitis and can be very painful, but they can also exist without producing symptoms (Duvries; Johal & Milner, 2012; Beytemür & Öncü). However, 2-30 % of patients with heel spurs are asymptomatic (Alatassi *et al.*).

There are different incidences of heel spur in the literature, ranging from 11.0 % to 55.1 % in different populations (Banadda *et al.*, 1992; Beytemür & Öncü). Plantar and dorsal heel spurs can occur together in the same person and they can be seen bilaterally (Lourdes & Ram). Usually the heel spur is present at certain stages of life, but does not show any symptoms; it is detected when patients apply to the hospital with complaints of heel pain (Lourdes & Ram). In studies conducted in the literature, the incidence of heel spurs was generally evaluated unilaterally and was not studied over both feet (Banadda *et al.*; Riepert *et al.*, 1995; Kullar *et al.*; Lourdes & Ram; Beytemür & Öncü). In our study, it was examined whether the incidence of heel spurs was observed in the radiographs of the right and left feet of all individuals. For this purpose, it was aimed to evaluate the relationship between age-related incidences of plantar and dorsal heel spurs with sex and side.

## MATERIAL AND METHOD

In this study, bilateral foot radiographs of men and women aged 20-93 years (Mean Age  $43.55 \pm 16.50$  years) were examined. X-rays of 1000 patients aged 20 years and over who applied to the emergency department and orthopedics outpatient clinics of the Terme state hospital, Samsun, Turkey with a history of trauma, whose lateral radiographs were taken on both feet, were evaluated retrospectively. The ages and sexes of the patients included in the study were obtained from the hospital registry system.

However, individuals with foot deformity, calcaneus fracture, without bilateral foot radiographs, with a history of foot surgery and under the age of 20 were not included in the study. A total of 2000 right and left lateral foot radiographs of 1000 patients were examined. Patients were grouped into 10 years age ranges (20-29 years; 30-39 years; 40-49 years; 50-59 years; 60-69 years and over 70 years). Due to the limited number of patients over 70 years of age, they were examined in a single group. The occurrence and incidence of plantar and dorsal heel spurs according to sex, age and side relations were evaluated on the radiographs of the patients (Fig. 1). Ethics committee approval was received for this study and its number is: 2021/13/17.

Statistical analysis of study data was analyzed using SPSS.IBM v23 (IBM Corp., Armonk, N.Y., USA). Analysis results were presented as Mean  $\pm$  Standard Deviation (SD) and Median (Minimum – Maximum) for quantitative data, and frequency (percent) for categorical data. The distribution of the variables was measured using the Kolmogorov-Smirnov test. Manne-Whitney u test was used for quantitative analysis of the data. Chi-square test, z test and multiple ratio comparisons were used to compare categorical variables by groups. Logistic regression analysis was used to examine the effects of age and sex on the formation of heel spurs. Significance level was taken as  $p < 0.05$ .

## RESULTS

This study was carried out by examining a total of 2000 foot radiographs of 1000 patients with lateral radiographs of both feet, 1000 right foot radiographs and 1000 left foot radiographs. The patients consisted of 518 men (51.8 %) and 482 women (48.2 %). The incidence of plantar heel spur was 26.0 % (260 patients), and the incidence of dorsal heel spur was 16.9 % (169 patients). Plantar and dorsal heel spurs were seen together in 10.3 % of the patients

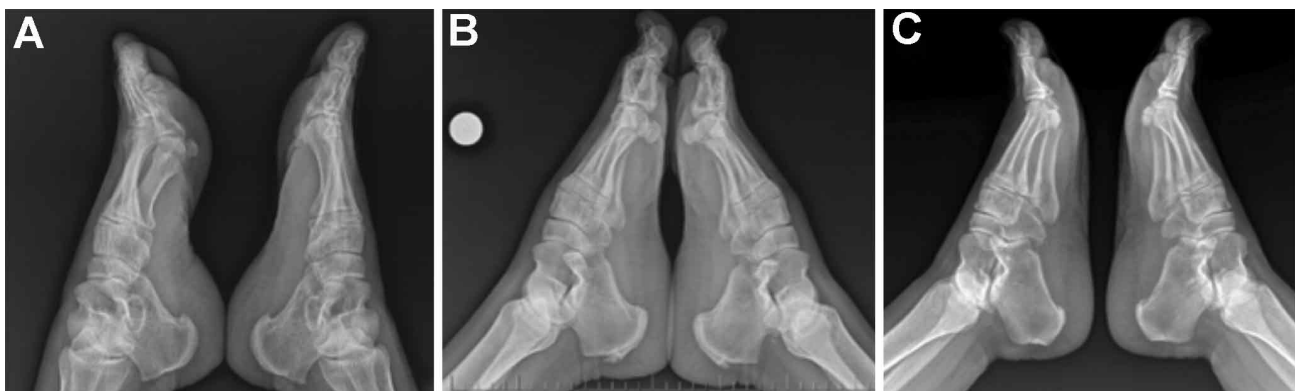


Fig. 1. (A) Plantar heel spur, (B) Dorsal heel spur, (C) No spur.

(103 patients). Plantar or dorsal heel spurs was detected in 32.6 % (326 patients), and there was no heel spur in 67.4 % of the patients (674 patients) (Table I).

The incidence of plantar heel spur, dorsal heel spur, both, only plantar heel spur and only dorsal heel spur were statistically significantly higher in women than in men ( $p < 0.001$ ). the incidence of plantar and dorsal heel spurs by sex is given in Table II.

When both sexes were considered together, the incidence of heel spurs increased with age ( $p < 0.001$ ). after the 6th decade, the incidence of heel spurs, especially plantar heel spur, increased with age. when compared in terms of age groups, the incidence of heel spurs was statistically significant with the increase in all age groups. the differences in the 5th and above decades were not statistically significant among themselves (Table III).

According to sex, the incidence of plantar heel spur was higher in women in all age groups. The most common age group for plantar heel spurs was 70 years and older in men and women. Although the incidence of dorsal heel spur was higher in men in the 6th decade, it was more common in women in other age groups. The most common age group with dorsal heel spur was 6th decade in men and 7th decade in women. The incidence of plantar and dorsal heel spurs in men and women according to age groups are shown in figures 2 and 3.

Table I. Results of present study.

	Number	%
<b>Sex</b>		
Male	518	51.8 %
Female	482	48.2 %
<b>Age groups</b>		
20-29	234	23.4 %
30-39	203	20.3 %
40-49	193	19.3 %
50-59	169	16.9 %
60-69	137	13.7 %
70+	64	6.4 %
<b>Heel Spur</b>		
Plantar Heel Spur	260	26 %
Dorsal Heel Spur	169	16.9 %
Plantar and Dorsal Heel Spur	103	10.3 %
Only Plantar Heel Spur	157	15.7 %
Only Dorsal Heel Spur	66	6.6 %
Plantar or Dorsal Heel Spur	326	32.6 %
No Heel Spur	674	67.4 %
<b>Plantar Heel Spur</b>		
Right Foot +	245	24.5 %
Left Foot +	241	24.1 %
<b>Dorsal Heel Spur</b>		
Right Foot +	163	16.3 %
Left Foot +	152	15.2 %
<b>Plantar and Dorsal Heel Spur</b>		
Right Foot +	94	9.4 %
Left Foot +	96	9.6 %

Table II. Comparison of heel spur types by sex.

	Men	Women	Total	Test statistic <sup>1</sup>	p
Heel Spur	n(%)	n(%)	n(%)		
Plantar and Dorsal	32 (6.2) <sup>b</sup>	71 (14.7) <sup>a</sup>	103 (10.3)		
Only Plantar	49 (9.5) <sup>b</sup>	108 (22.4) <sup>a</sup>	157 (15.7)	62.365	<0.001
Only Dorsal	33 (6.4) <sup>a</sup>	33 (6.8) <sup>a</sup>	66 (6.6)		
No Heel Spur	404 (78.0) <sup>b</sup>	270 (56.0) <sup>a</sup>	674 (67.4)		
Plantar	81 (15.7) <sup>a</sup>	179 (37.1) <sup>b</sup>	260 (26.0)	62.364	<0.001
Dorsal	65 (12.6) <sup>a</sup>	104 (21.5) <sup>b</sup>	169 (16.9)	56.590	<0.001

Chi-square test statistic, a-b: No difference between lines with the same letter, n: number.

Table III. Comparison of heel spur types by age groups.

Years	20-29	30-39	40-49	50-59	60-69	70+	Test statistic <sup>1</sup>	p
	n(%)	n(%)	n(%)	n(%)	n(%)	n(%)		
Plantar and Dorsal HS	0 (0.0) <sup>a</sup>	7 (3.4) <sup>a</sup>	25 (13.0) <sup>b</sup>	31 (18.3) <sup>b</sup>	29 (21.2) <sup>b</sup>	11 (17.2) <sup>b</sup>		
Only Plantar HS	4 (1.7) <sup>a</sup>	23 (11.3) <sup>b</sup>	33 (17.1) <sup>bc</sup>	44 (26.0) <sup>c</sup>	32 (23.4) <sup>c</sup>	21 (32.8) <sup>c</sup>	231.464	<0.001
Only Dorsal HS	1 (0.4) <sup>a</sup>	8 (3.9) <sup>ab</sup>	13 (6.7) <sup>bc</sup>	16 (9.5) <sup>bc</sup>	20 (14.6) <sup>c</sup>	8 (12.5) <sup>c</sup>		
Control Group	229 (97.9) <sup>a</sup>	165 (813) <sup>b</sup>	122 (63.2) <sup>c</sup>	78 (46.2) <sup>d</sup>	56 (40.9) <sup>d</sup>	24 (37.5) <sup>d</sup>		
Plantar HS	4 (1.7) <sup>a</sup>	30 (14.7) <sup>b</sup>	58 (18.4) <sup>c</sup>	75 (44.3) <sup>c</sup>	61 (44.6) <sup>c</sup>	32 (50.0) <sup>c</sup>	225.453	<0.001
Dorsal HS	1 (0.4) <sup>a</sup>	15 (7.3) <sup>b</sup>	38 (19.7) <sup>c</sup>	47 (27.8) <sup>cd</sup>	49 (35.8) <sup>d</sup>	19 (29.7) <sup>cd</sup>	229.344	<0.001

1 Chi-square test statistic, a-d: No difference between columns with the same letter in each row, n: number, HS: Heel spur

It was detected that female sex and increased age were risk factors for plantar heel spur formation in both feet ( $p < 0.001$ ). The incidence of plantar heel spur in women was 2.615 times higher in the right foot and 2.810 times in the left foot than in men. As the age increased, the risk of plantar heel spur increased 1.060 times in the right foot and 1.061 times in the left foot. In dorsal heel spur formation, female sex was

found to be a risk factor in the right foot and left foot ( $p < 0.05$ ). The incidence of dorsal heel spur in women was 1.510 times higher in the right foot and 1.715 times in the left foot than in men. As the age increased, the incidence of dorsal heel spur increased in both feet ( $p < 0.001$ ). This increase was 1,055 times in both feet. Table IV shows the logistic regression analysis of the incidence of heel spurs by age and sex.

Table IV. Logistic regression analysis of the incidence of heel spurs by age and sex.

		OR (%95 CI)	p
Plantar heel spur right	Women	2.615 (1.879 – 3.639)	<0.001
	Age	1.06 (1.048 – 1.071)	<0.001
Plantar heel spur left	Men	2.81 (2.009 – 3.93)	<0.001
	Age	1.061 (1.049 – 1.072)	<0.001
Dorsal heel spur right	Women	1.51 (1.048 – 2.174)	0.027
	Age	1.055 (1.042 – 1.067)	<0.001
Dorsal heel spur left	Men	1.715 (1.174 – 2.503)	0.005
	Age	1.055 (1.042 – 1.068)	<0.001
Plantar and dorsal heel spur right	Women	2.206 (1.372 – 3.548)	0.001
	Age	1.05 (1.035 – 1.064)	<0.001
Plantar and dorsal heel spur left	Men	2.028 (1.272 – 3.234)	0.003
	Age	1.052 (1.038 – 1.067)	<0.001

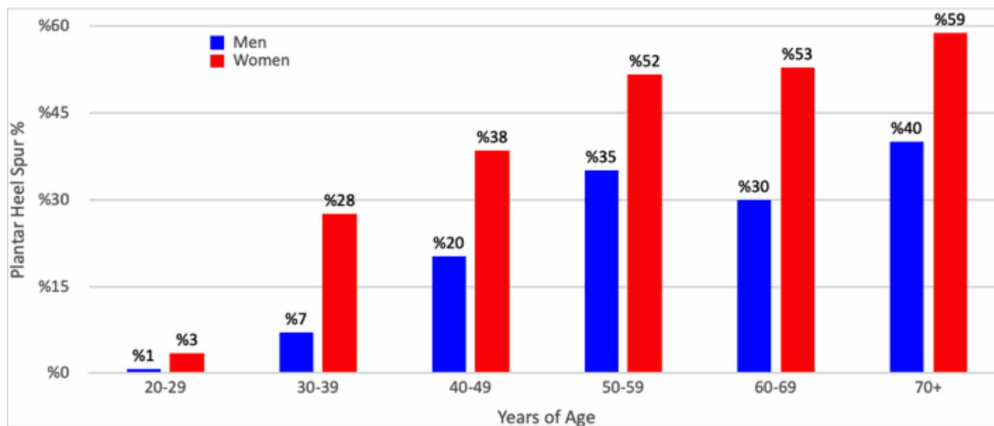


Fig. 2. Percentage of frequency of plantar heel spur by years of age.

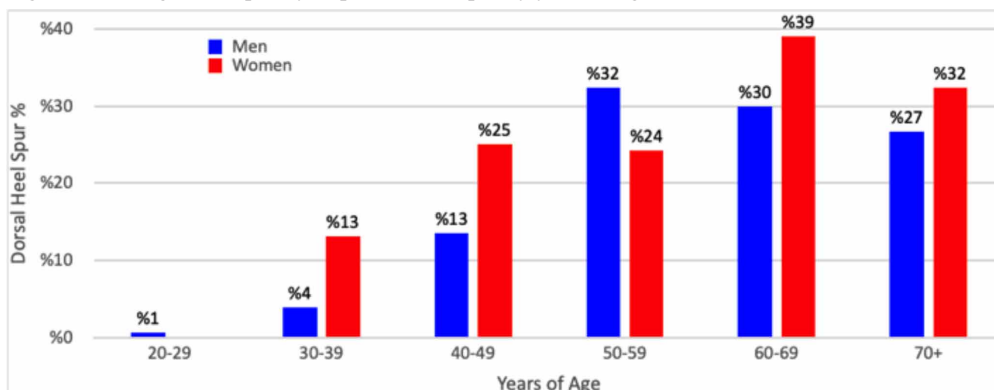


Fig. 3. Percentage of frequency of dorsal heel spur by years of age.

**DISCUSSION**

Heel spur is an osteophytic bone formation which is common with heel pain or asymptotically (Alatassi *et al.*). Its etiology is complex and multifactorial and still controversial (Toumi *et al.*, 2014). Although there are studies indicating that spurs are formed as a result of proliferation in the osteogenetic layer of the periosteum (Lewin) and endochondral ossification (Smith *et al.*, 2007), there are two generally accepted hypotheses regarding their pathophysiology (Menz *et al.*). According to Bergmann (1990), inflammation from the retraction of the plantar fascia into the calcaneus and the result of tractions resulting in reactive ossification of the enthesis. However, Kumai & Benjamin (2002) stated that heel spurs develop in response to repetitive compressions rather than traction, and they formed their vertical compression hypothesis. The incidence of heel spurs is increasing with advanced age, obesity, women, type 2 diabetes mellitus, gout, osteoarthritis, and heel pain (Bassiouni, 1965; Menz *et al.*; Duran *et al.*, 2021). Kose *et al.* reported the total incidence of heel spurs to be 60.2 % for patients who applied to the hospital with heel pain, and 8.3 % for patients who applied for reasons without heel pain. Bassiouni reported the total incidence of heel spurs in patients with rheumatoid arthritis, osteoarthritis and control group as 21.6 %, 81.0 % and 16.2 %, respectively. Lourdes & Ram reported that the incidence of plantar or dorsal heel spurs in patients presenting with heel pain was 59.0 %, 60.0 % of them were women, and the most affected age group was 40-50 years old.

There were different incidence results of heel spurs in normal populations in the literature (Banadda *et al.*; Bassiouni; Resnick *et al.*, 1977; Riepert *et al.*; Menz *et al.*; Toumi *et al.*; Kullar *et al.*; Beytemür & Öncü). The incidence of plantar or dorsal heel spurs in these studies was quite variable (Table V).

In the studies conducted in the 20th century, lower incidence values were reached (Bassioun; Banadda *et al.*;

Resnick *et al.*; Riepert *et al.*). We think that this is due to the younger age group and the high number of male patients. In the studies of Banadda *et al.*, 3.7 % of the patients were over 50 years old, and the rate of male patients was 66.4 %. Although the mean age of the study groups of Riepert *et al.* was 33 years, there were only 5 men and 41 women over the age of 70. Resnick *et al.* formed a study group of 70 men and 5 women. Bassiouni formed a study group with 33.75 % of patients over 40 years of age and 3.75 % of patients over 60 years of age. Although our rate of patients over 50 years old was 37.0 %, our total male and female patient rates in our study group were 51.8 % and 48.2 %, respectively.

Higher incidences of heel spurs have also been reported in other studies conducted in the 21st century (Kullar *et al.*; Toumi *et al.*; Beytemür & Öncü). Menz *et al.* reported the incidences of plantar and dorsal heel spurs in their patients aged 62-94 years in Australia as 55.0 % and 48.0 %, respectively. Although their work is not a random sample, it does not generalize to large populations. Present study, we found the incidence of plantar and dorsal heel spurs over 60 years of age to be 46.2 % and 33.8 %, respectively. In their recent study, Toumi *et al.* and Beytemur & Öncü reached heel spur incidences of 38.0 % and 33.0 %, respectively. The participation rates of patients over 50 years of age are higher in their studies and these rates are quite similar to our study.

It has been reported that the incidence of heel spurs increases with age in all studies (Beytemur & Öncü; Riepert *et al.*; Toumi *et al.*). Banadda *et al.* reported that the incidence of heel spur peaks after the 5th decade, 20.0 % of patients with heel spurs are younger than 31 years of age, and the incidence of heel spurs is higher in men in this younger age group. We think that these results are due to the young age average and the high number of male patients.

Toumi *et al.* suggested that it would be important to perform a statistical analysis among age groups because of the frequency of spurs increases with age. Present study, although the incidences of plantar and dorsal heel spurs between the 20-29, 30-39 and over 40 age groups were

Table V. Comparison of the frequency of heel spurs in the normal population in different studies.

Researchers (year)	Country	N	Plantar HS (%)	Dorsal HS (%)	Both (%)	Total (%)
Present Study (2021)	Turkey	2000	26.0	16.9	10.3	32.6
Beytemür & Öncü (2018)	Turkey	1335	32.2	13.1	9.8	33.0
Toumi <i>et al.</i> (2014)	Wales	1080	-	-	11.0	38.0
Kullar <i>et al.</i> (2014)	India	200	6.5	15.5	4.5	26.5
Menz <i>et al.</i> (2008)	Australia	216	55.0	48.0	-	55.1
Riepert <i>et al.</i> (1995)	Germany	1027	11.2	9.3	-	15.7
Banadda <i>et al.</i> (1992)	Zimbabwe	1228	-	-	-	14.6
Resnick <i>et al.</i> (1975)	United States	75	16	11	4.0	22.0
Bassiouni (1965)	Egypt	80	-	-	-	16.2

significant, the incidences of the 40 years and older age groups were not significant among themselves. While the incidence of plantar heel spur was highest in men and women aged 70 years and over, the incidence of dorsal heel spur was highest in the 50-59 age group in men and in the 60-69 age group in women. Similar to previous studies, there was a statistically significant relationship between increasing age and increased incidence of heel spurs in our study ( $p < 0.001$ ).

According to the results of our logistic regression analysis, the incidence of plantar heel spurs increased 1.060 and 1.061 times in the right foot and left foot, respectively, as age increased. The incidence of dorsal heel spurs increased 1.055 times in both feet. The incidence of both spurs increased 1.050 and 1.052 times in the right foot and left foot, respectively.

There are studies in the literature indicating that there is no significant difference in the incidence of plantar heel spur between the sex (Bassiouni; Beytemür & Öncü). However, there are also studies reporting higher incidence rates in women (Banadda *et al.*; Resnick *et al.*). There is no consensus on the relationship between the incidence of dorsal heel spur and sex (Riepert *et al.*; Toumi *et al.*). Banadda *et al.* reported that the incidence of heel spurs is more common in women in all age groups and found that 13.0 % of men and 17.7 % of women had heel spurs. Toumi *et al.* found that the incidence of plantar and dorsal heel spurs was higher in female patients under the age of 50, and they did not detect a sex difference over the age of 50. Beytemür & Öncü detected the incidence of dorsal calcaneal spur in women was significantly higher than in men and stated that there was no significant relationship between the incidence of plantar, plantar and dorsal, plantar or dorsal heel spurs and sex. Riepert *et al.* reported that plantar heel spur was significantly higher in women, dorsal heel spur was more common in men up to the age of 70, but there was no significant difference between sexes. In present study, we found that the incidence of plantar, dorsal, plantar and dorsal, plantar or dorsal heel spurs was higher in women than in men). In all age groups, the incidence of plantar heel spur was higher in women. The incidence of dorsal heel spur was higher in all age groups except 20-29 and 50-59 age groups in women (Figs. 2 and 3).

In our study, in which a total of 2000 foot radiographs of 1000 people were examined and we did not find a higher study group in the literature. Foot radiographs examined in previous studies are unilateral. We included only patients with bilateral foot radiographs in our study. Thus, the absolute evaluation of patients with heel spurs on only one foot was carried out.

In terms of the side relationship, the frequency of the right or left foot was similar in both men and women. When we evaluated the effect of sex and age on the formation of plantar or dorsal heel spurs by logistic regression analysis, we found that female sex and increased age were risk factors for the formation of plantar or dorsal heel spurs in both feet. According to these results, we think that the formation of heel spurs occurred in the following decades. The high incidence of heel spurs in women may be related to the use of high-heeled shoes. In addition, we think that it may cause higher incidences in women due to the fact that rheumatological diseases are more common in women and the incidence of heel spurs increases with rheumatological diseases.

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**RESUMEN:** El espolón calcáneo es una protuberancia osteofítica de más de 2 mm que se encuentra por delante de la tuberosidad del calcáneo. El espolón calcáneo puede ser de dos tipos: espolón calcáneo plantar y espolón calcáneo dorsal. El objetivo de este estudio fue evaluar la relación entre la incidencia de espolón calcáneo con la edad, el sexo y el lado. Se examinaron un total de 2000 radiografías bilaterales de 1000 pacientes (518 hombres y 482 mujeres) de 20 a 93 años de edad que fueron solicitadas en el hospital estatal de Terme, Samsun, Turquía debido a un traumatismo. Los pacientes se agruparon en rangos de edad de 10 años (20-29 años; 30-39 años; 40-49 años; 50-59 años; 60-69 años y mayores de 70 años). Las incidencias de espolón calcáneo plantar, espolón calcáneo dorsal y ambos se evaluaron de acuerdo con la edad, el sexo y lados. Se detectaron espolones calcáneos plantares o dorsales en el 32,6 % (326 pacientes) de los pacientes. Las incidencias de espolón calcáneo plantar, espolón calcáneo dorsal, espolón calcáneo plantar y dorsal fueron del 26 %, 16,9 % y 10,3 %, respectivamente. Según el sexo, la incidencia de espolón calcáneo plantar fue mayor en mujeres en todos los grupos de edad. Aunque la incidencia del espolón calcáneo dorsal fue mayor en hombres en la sexta década, era más común en mujeres en otros grupos de edad. La incidencia de espolón calcáneo plantar fue 2,6 veces mayor en el pie derecho y 2,8 veces mayor en el pie izquierdo en mujeres. A medida que aumentaba la edad, el riesgo de espolón calcáneo plantar aumentaba 1,06 veces en el pie derecho y 1,061 veces en el pie izquierdo. La incidencia de espolón calcáneo dorsal fue 1,510 veces mayor en el pie derecho y 1,715 veces mayor en el

pie izquierdo en mujeres. A medida que aumentaba la edad, la incidencia de espolón calcáneo dorsal aumentaba en ambos pies y este aumento era de 1,055 veces en ambos pies.

**PALABRAS CLAVE: Espolón calcáneo; Espolón calcáneo plantar; Espolón calcáneo dorsal; Calcáneo.**

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