

# A Radiographic Study on Prevalence of Sesamoid Bones of Feet in residents of Rawalpindi/Islamabad

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## Abstract

**Objective:** The present study was conducted to evaluate distribution, prevalence, number, and the commonest site of the sesamoid bones of the foot in adult residents of Rawalpindi/Islamabad.

**Study Design:** Descriptive Observational Cross-sectional Study.

**Material and Methods:** A total of hundred patients were selected from the outpatient department of Radiology Holy Family Hospital Rawalpindi and SON-X Laboratory, Saidpur Road Rawalpindi. Fifty were male and fifty were females. Anteroposterior and lateral view of foot radiographs were taken and studied for the prevalence, number, and relationship of sesamoid bones to metatarsophalangeal joints in feet.

**Results:** 2 to 4 sesamoid bones were observed in a single foot. The total number in both feet ranged from 4 to 8 bones. Radiographs of male patients showed an increased number of sesamoid bones as compared to female patients. 34 out of fifty male patients (68%) had 4 bones. 14 (28%) had 5 bones. 4 (8%) had 6 bones 7 bones were observed in 1 (2%) subject, 1 (2%) male subject showed 8 sesamoid bones. However, none of the females had more than six bones. 44 (88%) had 4 sesamoid bones, 3 (6%) of the female had 5 and 3 (6%) had 6 sesamoid bones.

**Conclusion:** This is the first study to report the prevalence of sesamoid bones of the foot in adult residents of Rawalpindi and Islamabad. The results showed that sesamoid bones are more prevalent at the first metatarsophalangeal joint than other joints of the foot, moreover an increased number of sesamoids are observed in males. This study provides data that could assist orthopedic surgeons, radiologists, and neuro physicians in the diagnosis and treatment of sesamoid bone disorders, which are common in patients with discomfort and pain in their feet.

**Keywords:** Sesamoid bone, Radiographs, Metatarsophalangeal joints.

## Introduction

The sesamoid bones are isolated bones that lie within the tendon. These sesamoid bones have a unique structure with the dorsal concavity and the plantar convexity<sup>1</sup> and may develop as the result of intermittent pressure in certain regions. In the upper limb, sesamoid bones are restricted to the palmar aspect of hands and are frequently found at the metacarpophalangeal joint of the thumb, little finger, and index finger. In the lower limb patella is the largest sesamoid bone associated with the knee joint and develops in the tendon of the Quadriceps Femoris. The literature on human osteology shows the variation in the total number of bones in the human body. which is mainly due to the variable number of sesamoid bones. Regarding foot, sesamoid bones related to first MTP is a constant feature. Sesamoid bones at other MTP joints and interphalangeal joints are rarely seen.<sup>2</sup> Sesamoid bones also develop in tendons of upper and more frequently in lower limbs Their functions are a modification of pressure, limitation of friction, and to change muscle pull direction. Sesamoid bones can be a cause of foot pain due to their multiple pathologies, including trauma which is the most important cause. Occasionally Infections and inflammation and rarely degeneration of these bones can lead to foot pain and discomfort.<sup>3</sup>

The blood supply of the sesamoids associated with the big toe is derived from the sesamoid arteries, branches of the digital plantar arteries of the toe which arise from the medial plantar artery and the plantar arch. A number of sesamoid arteries feed the sesamoid bones and their number increases as bone increases in size. Literature regarding the anatomy of these vessels is a great help to the foot surgeons to understand avascular necrosis of sesamoid bones and may improve or develop surgical/technical aspects of the foot.<sup>4</sup>

Hallux sesamoids disorders can cause pain and disability. Management requires careful assessment and investigations. Surgical intervention should be considered if conservative treatment fails as unnecessary removal can further deteriorate symptoms.<sup>5</sup>

## Materials and Methods

**Study Design:** Observational Descriptive Cross-sectional Study.

The sample size was calculated by a convenient sampling frame. The study was conducted in Holy Family Hospital Department of Radiology and SON-X Lab Saidpur Road Rawalpindi in July 2020. 100 patients (fifty males and fifty females) were selected randomly from OPD, the age of the subjects ranged between 25 to 55 years.

### **Inclusion Criteria:**

1. Subjects Age from 25 to 55 Years
2. Residents of Rawalpindi/Islamabad
3. Nationality. Pakistani
4. Without apparent foot pathology

### **Exclusion Criteria:**

1. History of any fracture involving foot bones
2. Visible Foot deformity
3. Connective tissue disorders

Verbal consent was taken from the patients after explaining the objective of this study. The subjects were divided into two groups depending upon their age. This was done to evaluate the effect of increasing age on a number of sesamoid bones. Group A consists of patients who were between 25 to 40 years of age while the age of the patients in Group B ranges between 41-55 years. Every subject underwent X-rays (Anteroposterior and lateral view) of both feet. All radiographs, of 100 patients were studied and data regarding prevalence and number of sesamoid bones in single, and both feet were collected.

## Results

The study included 50 male and 50 female participants.

Subjects were divided into 2 age groups Group A (25-40 years old) had 42 (42%) subjects, Group B (41-55 years old) included 58 (58%) subjects In Group A, a number of sesamoid bones in both feet were as follows: 32 subjects had 4 sesamoid bones, 7 subjects had 5 bones, 3 had 6 bones, and no one had 7, 8 or 9 bone In Group B, 47 patients had 4 bones, 8 subjects had 5 bones, 2 participants had 6 bones, 1 participant had 8 bones (Table 1, Figure 1) While considering gender, Radiographs of male patients showed an increased number of sesamoid bones as compared to female patients. 34 out of fifty male patients (68%) had 4 bones. 14 (28%) had 5 bones. 4 (8%) had 6 bones, 1 (2%) had 7 bones, 1 (2%) males had 8 bones However, none of the females had more than six bones. 44 (88%) had 4 sesamoid bones, 3 (6%) of the female had 5 and 3 (6%) had 6 sesamoid bones (Table 2, Figure 2)

All radiographs of the right foot of all subjects showed the presence of sesamoid bones at the first Metatarsophalangeal joint (100%). There were 6 subjects (12%) who showed the presence of sesamoid bones at the second Metatarsophalangeal joints. There were 9 participants (18%) who had sesamoid bone related to fifth Metatarsophalangeal joints. No subject had sesamoid bone related to third or fourth Metatarsophalangeal joints. All radiographs of the left foot showed sesamoid bones at the first Metatarsophalangeal joint (100%). There were 6 participants (12%) who showed sesamoid bones at the second Metatarsophalangeal joints. 11 subjects had sesamoid bones at the fifth Metatarsophalangeal joints. No sesamoid bone was found at the third or fourth Metatarsophalangeal joint (Table 3, Figure 3 & 4)

**Table 1: Number and Percentage of Sesamoid Bones in both feet according to age**

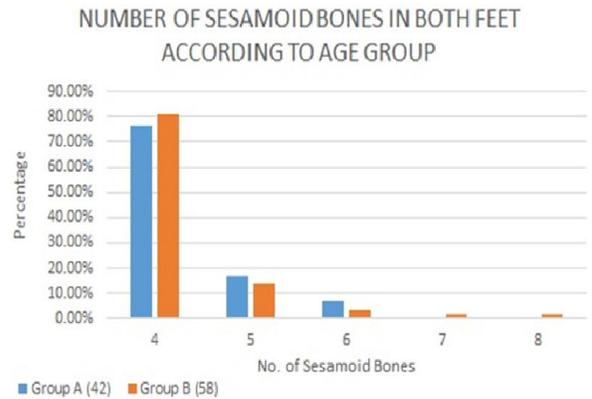
Number of sesamoid bones	Group A (42)	Group B (58)
4	32 (76.2%)	47 (81%)
5	07 (16.6%)	08 (13.7%)
6	03 (7%)	02 (3.4%)
7	none	01 (1.7%)
8	none	01 (1.7%)

**Table 2: Number and Percentage of Sesamoid Bones in both feet according to gender**

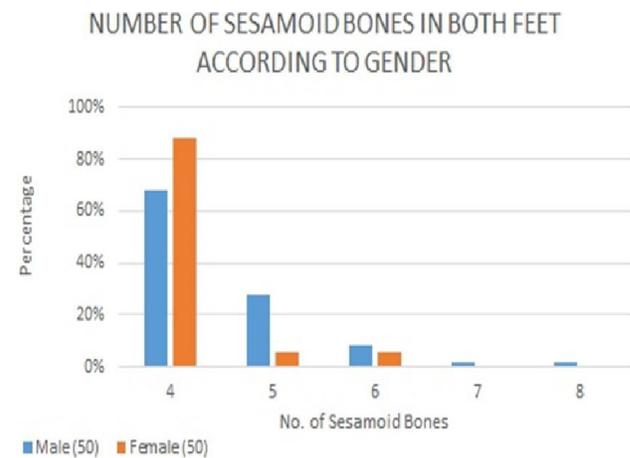
Number of sesamoid bones	Male (50)	Female (50)
4	34 (68%)	44 (88%)
5	14 (28%)	03 (06%)
6	03 (08%)	03 (06%)
7	01 (02%)	none
8	01 (02%)	none

**Table 3: Distribution and Percentage of Sesamoid Bones at Metatarsophalangeal Joints**

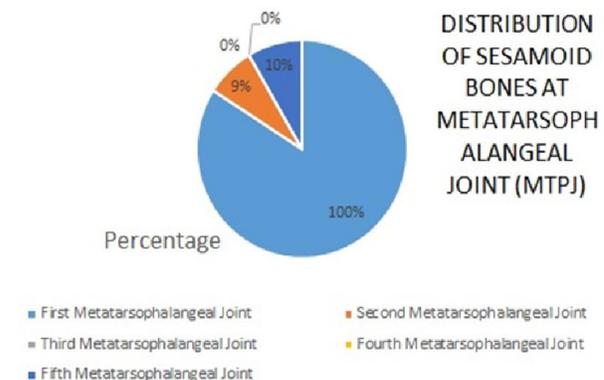
Metatarsophalangeal Joints	Percentage
First Metatarsophalangeal Joint	100%
Second Metatarsophalangeal Joint	09%
Third Metatarsophalangeal Joint	0%
Fourth Metatarsophalangeal Joint	0%
Fifth Metatarsophalangeal Joint	10 %



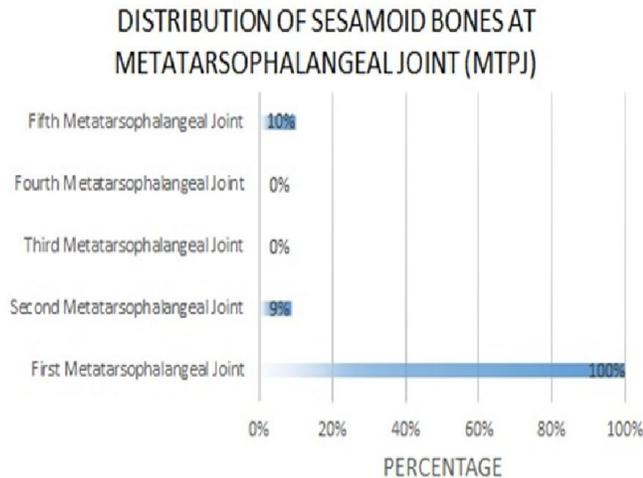
**Figure 1: Number and Percentage of Sesamoid Bones in both feet according to age group**



**Figure 2: Number and Percentage of Sesamoid Bones in both feet according to the gender group**



**Figure 3: Distribution and Percentage of Sesamoid Bones at Metatarsophalangeal Joints (MTPJ)**



**Figure 4: Distribution of Sesamoid Bones at Metatarsophalangeal Joints (MTPJ)**



**Figure 5: Showing two sesamoid bone related to First MTP Joint (left foot)**



**Figure 6: Showing two sesamoid related to bone at First MTP Joint (Right foot)**

## Discussion

Sesamoid bones are a common and frequent finding in foot and ankle radiographs. Most of the time they are

not considered to be related to patient complaints. But they can cause pain, undergo degenerative changes, and simulate fractures.<sup>6</sup> Variation in the site, size of foot sesamoid bones is evident in international research and literature. This study was conducted to evaluate the prevalence of sesamoid bones in foot joints of the Pakistani population. In this study, it was found that sesamoid bones at the first metatarsophalangeal joint were present in 100% of subjects with decreasing prevalence in other metatarsophalangeal joints.

Vijaiand M and Ravichandran Doraiswamy<sup>7</sup> in their study found that the incidence of hallux sesamoids was 100%. This is in line with this study Bipartism in sesamoids associated with the big toe was noted to be 4.3%. Hallucal sesamoids of the interphalangeal joint were 15.2%. Which is not consistent with our study. The presence of Sesamoid at the fifth metatarsophalangeal joint was 6.5%. The shape of all sesamoids was semioval.

TAO SuN et al<sup>8</sup> reported the presence of sesamoid bone related to first MTP joints in 99.96% of cases, the second MTP prevalence rate was 3.08%, and at the interphalangeal joint was 59.22%, they also observed morphological variation in hallux sesamoids 12.08% of feet, and classified them into three types depending upon the size of the bone and its number of ossification centers.

Abubaker Elsiddig Talha<sup>9</sup> in their study included fifty-seven subjects. Forty out of 57 were male (70.2%) and 17 (29.8%) were female. In their study, they observed that in a single foot number of bones was between 2 to 7. However, when bones in both feet were counted they ranged from 4 to 9 bones, In line with our study, they also found that males had more sesamoid bones, where (57.5%) of the males had 4 bones, 10% of the male had 5 bones. 20% of the males had 6 bones, 2.5% of males had 7 bones, 2 (5%) males had 8 bones and 2 (5%) males had 9 bones.. most of the females 88.2% had 4 sesamoid bones. 5.8% of the females had 5 sesamoid bones in females none had 7, 8, or 9 bones.

Kaissar Yammine<sup>10</sup> did review many studies to provide a better insight into the frequency of foot sesamoids and their relation with, sex, genetic make-up, and symmetry. Thirty-seven studies were evaluated for sensitivity and meta-analyses. They witness the presence of hallux sesamoids at first metatarsophalangeal joints in almost all cases This study also provides evidence for the genetic basis of the prevalence and association of sesamoids with different metatarsophalangeal joints among the different population.

The small sesamoid bones of the foot have great clinical significance. But the practice is contrary to this fact and very little importance is given to them. The present study highlights the prevalence of the sesamoids of the feet in the Pakistani population. We further recommend studies using imaging techniques considering age and gender with larger samples in the future.

## Conclusion

This is the first study to report the prevalence of sesamoid bones of the foot in adult residents of Rawalpindi and Islamabad. The results showed that sesamoid bones are more prevalent at the first metatarsophalangeal joint than other joints of the foot, moreover an increased number of sesamoids are observed in males. This study provides data that could assist orthopedic surgeons, radiologists, and neuro physicians in the diagnosis and treatment of sesamoid bone disorders, which are common in patients with discomfort and pain in their feet.

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