

# Epidemiological profile of sesamoid disorders of the first metatarsophalangeal joint

## Perfil epidemiológico das desordens dos sesamoides da primeira articulação metatarsofalângica

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### ABSTRACT

**Objective:** The objective of this study is to describe the epidemiological characteristics of patients with sesamoid disorders in a sample of patients treated in the Brazilian public health system.

**Methods:** A retrospective study was performed by reviewing the electronic charts of foot and ankle outpatient consultations over the past 5 years, analysing variables such as sex, age, occupation, ethnicity, participation in sports, laterality, and affected sesamoid (medial or lateral).

**Results:** Abnormalities in hallux sesamoids occur more frequently in women (63/108), during the third decade of life (56/108), and in the medial sesamoid (74/108); 65.7% of the sample with these abnormalities participated in physical activity regularly. No significant relationship was observed with laterality or occupation.

**Conclusion:** The most commonly affected patients were females, with a mean age of 23.7 years, who participated in physical activity frequently; the right side and medial sesamoid bone were the most commonly affected sites.

**Level of Evidence IV; Prognostic Studies; Case Series.**

**Keywords:** Sesamoid bones; Metatarsophalangeal joint; Hallux.

### RESUMO

**Objetivo:** O objetivo do estudo é descrever as características epidemiológicas dos pacientes portadores de afecções nos sesamoides em uma amostra de pacientes do SUS.

**Métodos:** Estudo retrospectivo realizado através da revisão de prontuário eletrônico dos atendimentos ambulatoriais de pé e tornozelo, nos últimos 5 anos, analisando as variáveis como sexo, idade, profissão, raça, prática esportiva, lateralidade e identificação do sesamoide acometido (medial ou lateral).

**Resultados:** As anormalidades relacionadas aos sesamoides do hálux ocorrem com maior frequência no sexo feminino (63/108), na 3ª década de vida (56/108), mais comumente no sesamoide medial (74/108), e estão relacionadas a 65,7% de praticantes de atividade física regular, sem relação significativa com a lateralidade ou a profissão.

**Conclusão:** O sexo mais acometido foi o feminino, com média de idade de 23,7 anos, sendo mais comum no lado direito, no osso medial, em praticantes de atividade física frequente.

**Nível de Evidência IV; Estudos Prognósticos; Série de Casos.**

**Descritores:** Ossos sesamoides; Articulação metatarsofalângica; Hálux.

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## INTRODUCTION

The sesamoid bones were named by Galen in approximately 180 CE, due to their similarity to sesame seeds<sup>(1-4)</sup>. They are part of the metatarsophalangeal joint (MTPJ) of the hallux and are an important factor in the normal biomechanics of a bipedal gait<sup>(5,6)</sup>. The glenosesamoid complex is composed of seven muscles, eight ligaments, and two bones; the latter are surrounded by the flexor hallucis brevis<sup>(7)</sup>. The sesamoids have several functions. In addition to being part of the foot support and dispersing the impact on the metatarsal head, they also decrease friction and protect the flexor tendons of the hallux<sup>(1,2,5-14)</sup>.

In normal gait, sesamoids can transfer large forces over a small area, which with the foot bare corresponds to 0.8 times the body weight on the first MTPJ. This value increases to 200-300% of the body weight with athletic activity and can increase to 800% when running and jumping<sup>(1,2,5,10-12,15)</sup>. These data show that the capsular ligamentous sesamoid complex is critical for athletic function and indicate the importance of caring for this anatomical site<sup>(12)</sup>.

Abnormalities of the hallucal sesamoids are not rare conditions, although their frequency is often underestimated<sup>(5,10)</sup>. They include acute fracture, osteochondral lesions, bipartite sesamoids, sesamoiditis due to repetitive trauma or infection, and osteoarthritis<sup>(1-3,6,10,14,16,17)</sup>.

Some researchers suggest that women are more frequently affected, especially between the second and third decades of life<sup>(17)</sup>. However, there is consensus that such disorders are more frequent in professional athletes due to repetitive stress on the first MTPJ<sup>(17)</sup>. Dancing - especially ballet - running, jogging, and even excessive wearing of high-heeled shoes have also been suggested as risk factors for sesamoiditis<sup>(10,17-19)</sup>.

Due to the complex anatomy and numerous pain-sensitive structures in the region of the first MTPJ, the differential diagnosis can be challenging<sup>(13)</sup>. Moreover, if not diagnosed and properly treated, the injury may have detrimental effects on foot function in athletes<sup>(5,10)</sup>.

Inadequate diagnosis and treatment of these disorders can lead to poor results and a reduction in the individual's quality of life. Therefore, a complete understanding of the anatomy, pathophysiology, and clinical, laboratory, and imaging tests are essential for establishing a correct diagnosis and developing a therapeutic plan<sup>(20)</sup>.

Due to the lack of recent Brazilian studies on the epidemiological profile and current management of sesamoid-related pathologies, the aim of this study is to identify the epidemiological characteristics of these disorders.

## METHODS

The study was approved by the Research Ethics Committee and registered in the Brazil Platform (Plataforma Brasil) under CAAE number 83798018.9.0000.5362.

This is a retrospective study conducted by reviewing electronic charts of patients examined at the foot and ankle outpatient clinic who were diagnosed with sesamoiditis and acute or stress sesamoid fractures from 1 February 2013 to 31 January 2018. The exclusion criterion was an incomplete record in the electronic charts, i.e., charts lacking information regarding the variables to be analysed. When this criterion was applied, 27 patients were excluded.

The variables analysed, measured, and collected were sex, age, occupation, participation in sports, laterality, and affected sesamoid (medial or lateral). The data collected during the study were tabulated and stored in an Excel database, and a descriptive analysis (frequency of variables and measures of tendency) was subsequently performed.

## RESULTS

After reviewing the medical records that were consistent with the inclusion and exclusion criteria, data on 108 patients examined over the proposed period were collected. Table 1 shows the epidemiological characteristics of the patients with sesamoid disorders in a sample of patients examined at an orthopaedic reference hospital that is part of the public health system (known as SUS) in a city in southern Brazil.

Among the various occupations reported, the three most common were housekeeper/janitor (29), student (23), and salesperson (16). Of the patients characterised as sports practitioners, only 22 claimed to participate in competitive sports (professional or amateur).

## DISCUSSION

No sufficient reports exist in the literature that corroborate the increased prevalence of sesamoid disorders among women observed in this study, which suggests that gender may be not a significant factor for the occurrence of such disorders.

The data obtained regarding age showed an increased prevalence of sesamoid disorders in individuals 20 to 30 years of age. This information is also divergent in several studies on the subject. Some studies suggest that the highest prevalence of disorders occurs between 15 and 20 years of age, especially for sesamoiditis<sup>(11)</sup>. However, it is important to note that the hospital where the present study

**Table 1.** Epidemiological data

	Frequency	%
Sex		
Female	63	58.3
Male	45	41.7
Age (years)		
<10	0	0
10-20	19	17.59
20-30	56	51.85
30-40	17	15.74
40-50	11	10.18
>50	5	4.62
Laterality		
Right	54	50.00
Left	45	41.67
Bilateral	9	8.33
Sesamoid		
Medial	74	68.5
Lateral	34	31.5
Participation in sports		
Yes	71	65.7
No	37	34.3

**Source:** Prepared by the author based on the results of the study.

was conducted only treats orthopaedic outpatients above the age of 16 years, which certainly influenced our results.

Regarding laterality, no reports in the literature have shown greater susceptibility of either foot. Therefore, our finding of a slightly higher number of cases involving the right foot - which did not surpass 50% - is insufficient for a final conclusion on the matter. Reports are also lacking for

bilaterality, which is discussed in many articles in regard to sesamoid bipartism but not in regard to sesamoid disorders in general<sup>(10,13-16)</sup>.

A greater concordance exists among studies regarding tibial sesamoid lesions. In the present study, the rate of tibial sesamoid involvement was twice as high as the rate of involvement of other structures, which is consistent with the literature<sup>(3,9,11)</sup>.

Another consensual factor in the literature is the effect of participation in sports on injuries to the first MTPJ<sup>(7,17-19)</sup>. According to our results, 65.7% of the sample participated in physical activity regularly, with a minimum of 1 hour of exercise daily. Although this variable was not found to have a significant influence on the development of the disorders discussed, this finding is consistent with the literature in that the majority of cases occur in athletes (dancers, runners, and jumpers)<sup>(7,17,19)</sup>.

The occupation of patients was not reported in the studies included in our bibliographic review. We evaluated this variable in our study, but no significant differences in the frequency of sesamoid disorders were found among occupations, indicating that this variable has no influence on the pathological outcomes.

## CONCLUSION

We conclude that females with a mean age of 23.7 years are more frequently affected by sesamoid-related pathologies, which are more common on the right side and in the medial sesamoid. Thus, these pathologies should be suspected mainly in patients who frequently participate in physical activity and in athletes.

**Authors' contributions:** Each author contributed individually and significantly to the development of this article: MRH <sup>\*</sup>(<https://orcid.org/0000-0001-6740-5617>) conceived and planned the activities that led the study, interpreted study results, wrote the manuscript, approved the final version; SM <sup>\*</sup>(<https://orcid.org/0000-0002-1536-0266>) interpreted the study results, wrote the manuscript; ABD <sup>\*</sup>(<https://orcid.org/0000-0002-6946-0027>) conceived and planned the activities that led the study, participated in the review process; AK <sup>\*</sup>(<https://orcid.org/0000-0002-6662-2721>) interpreted the study results, participated in the review process; LMC <sup>\*</sup>(<https://orcid.org/0000-0001-8317-904X>) conceived and planned the activities that led the study, participated in the review process; CCB <sup>\*</sup>(<https://orcid.org/0000-0003-2024-6860>) conceived and planned the activities that led the study, participated in the review process. <sup>\*</sup>ORCID (Open Researcher and Contributor ID).

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