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REVIEW ARTICLE

Recent population studies on the prevalence and bilaterality of the fabella

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The fabella is a sesamoid bone found in the gastrocnemius muscle that is present in about 10-30% of all humans. There are however strong variations between different ethnics groups. The current review summarizes the literature regarding the prevalence and laterality of the fabella in recently published population studies. Six eligible population studies published in 2020 and 2021 were identified that investigated the prevalence of the fabella in Chinese, Korean, Nigerian, Omani and Turkish populations. The fabella prevalence rate in the included studies ranged from 11.1 to 57.2%. However, like in past research, there were significant variations between different populations in recent studies. Unfortunately, only a selected number of the recently published studies reported on the percentage of fabellae that present uni- or bilaterally. The percentage of cases that showed a bilateral fabella ranged from 27.1 to 78.8%.

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Sesamoid bones are small bones that have an important role in supporting the joints. Despite there being still a lot to be discovered about their embryology, one study identified that several sesamoid bones arose from Sox9- and Scx-positive chondroprogenitors.1 The authors state that sesamoid bones can develop independent from long bones and that the induction of their development is not dependent on the mechanical load. They concluded that several genetic and mechanical regulation mechanisms interplay in sesamoid bone development.

The fabella is a sesamoid bone found in the gastrocnemius muscle. One hypothesis about its function is that it plays a role in stabilizing the medial femoral condyle and the associated muscles and ligaments of the posterolateral corner of the knee.[2,3] In humans, in the majority of cases, the fabella presents bilaterally.[4,5] There also does not seem to be a difference in prevalence between males and females.[5,6] Several studies also reported that there was no relationship with the age of an individual [5,6], whilst other do see a difference.[7,8]

The bone is present in about 10-30% of all humans.[5,8] However, there are strong variations between different ethnics groups. The prevalence in Asian populations has been described to be higher than in other populations.[9,10] The prevalence has been also been described to have increased in the last 150 years.[5]

Several studies have investigated, amongst others, the prevalence of the fabella in different populations.[4,6,7,9-12] Additionally, two systematic

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reviews were published that described the prevalence, clinical implications, differential diagnoses and other aspects of the entity.[5,8] These reviews describe several aspects of the entity from studies published between 1875 and 2020. A large number of studies were identified in these reviews. Therefore, it can be assumed that since 2020, several other populations studies have been published. To investigate these more recent publications, the objective of the current paper is to summarize the results regarding the prevalence and bilaterality of the fabella in recent population studies.

METHODS

The MedLine database (through PubMed) and Google Scholar were searched with the keyword "Fabella" until and including March 2022. Additionally, the indices of Journal of Anatomy, Anatomical Record and Journal of Morphological Sciences were manually searched for articles potentially eligible for inclusion. Based on titles and abstracts, papers were selected for potential inclusion. The full text of the selected publications were read and included if they:[1] described a study of the fabella in a specific population,[2] at least mentioned the prevalence in this population and[3] were published in 2020, 2021 or (before April) 2022. The references of the included publications were searched to identify further potentially eligible literature.

IDENTIFIED LITERATURE

Eight eligible population studies published in 2020,2021 and early 2022 were identified. They investigated the prevalence of the fabella in Chinese, Korean, Nigerian, Omani and Turkish populations.[7,13-21] The data extracted from these studies are shown in Table 1. All studies had a retrospective design and used either radiography or MRI to assess the presence of the fabella. The average number of subjects ranged widely from 377 to 2126. Several publications also mentioned the number of knees that were investigated, this ranged from 119 to 4,252.

Table 1 *Data from the included studies*

Reference	Population	Detection Method	Number of subjects/knees	Prevalence	Laterality
Adedigba et al, 2020	Nigerian	Radiography	377 subjects	45 / 377 (11.94%)	32 / 45 (72.2%) bilateral
Akdeniz et al, 2021	Turkish	MRI	531 subjects	59 / 531 (11.1%)	Not known
Akkoc et al, 2022	Turkish	Radiography	2035 subjects	605 / 2035 (29.7%)	351 / 2035 (17.2%) bilateral
		MRI	121 subjects	47 / 121 (38.8%)	
Al Matroushi et al, 2021	Omani	Radiography	813 knees	196 / 813 (24.1%)	Not known
Al Matroushi et al, 2021	Omani	MRI	119 knees	24 /119 (20.2%)	Not known
Hur et al, 2020	Korean	Radiography	2126 subjects 4252 knees	1215 / 2126 (57.2%) 2172 / 4252 (51.1%)	78.8% bilateral
Sari et al, 2021	Turkish	Radiography	1000 subjects	243 / 1000 (24.3%)	56.38% bilateral
Unluturk et a., 2021	Turkish	MRI	1000 subjects	155 / 1000 (15.5%)	27.1% bilateral
Xu et al, 2020	Chinese	MRI	732 subjects 833 knees	48.38%	Not known
Zhong et al, 2022	Chinese	MRI	979 subjects 1011 knees	402 / 1011 (39.8%)	Not known

PREVALENCE AND LATERALITY

The fabella prevalence rate in the included studies ranged from 11.1 to 57.2%. However, like in past research, there were significant variations between different populations in recent studies.

The prevalence in the Nigerian population was 11.94%.[13] This is a significant result, because in contrast with other regions, relatively little research has been done into the prevalence of the fabella in African populations.[5,8] The identified prevalence rate is however similar to the 9.8% identified in a West-African population and 15.07 - 17.65% in South Africa.[18, 22, 23]

Two studies in the Turkish population yielded a very similar prevalence, namely 11.1 and 15.5%.[14,16] These results are broadly in line with a 2017 study that reported a prevalence of 19%.[24] Another included study, published in 2022, yielded a higher prevalence of 29.7 and 38.8% using radiography and MRI, respectively.[20] This is more in line with another recent study that estimated a higher prevalence of 24.3%.[19]

A 2021 study assessed the fabella's prevalence in the Omani population in two separate ways, yielding prevalence rates of 24.1 and 20.2%. Unfortunately, no previous studies in this population were identified to allow for a comparison.

A study into the Korean population identified a prevalence of 57.2%.[15] This is more than an older study that reported a 31% prevalence rate.[25] However, a recent study found a very similar prevalence of 52.83%.[5]

Finally, two studies in the Chinese population found a prevalence rate of 48.38% and 39.8%.[17,21] This percentage is supported by another study that reported a very similar high prevalence rates in Chinese participants of 48.6%.[26]

Unfortunately, only a selected number of the recently published studies reported on the percentage of fabellae that present uni- or bilaterally. The percentage of cases that showed a bilateral fabella ranged from 27.1 to 78.8%. However, the in all but one study, the majority of cases presented bilaterally. This is in line with previous observations.[2]

CONCLUSION

Based on the number of studies identified, it is clear that fabellar prevalence rate in specific populations is still a research domain of interest. In the recently published studies included in the current review, additional data was generated for populations previously investigated. For the Chinese, Omani and Korean populations, the new studies confirm the prevalences that previous research established. For the Turkish population, mixed results were obtained. Further research should be conducted to identify potential causes for this variation in results.

The recent studies have also generated new data in populations that were previously understudied, such as the African population. Further research is needed to confirm these findings.

In general, the recent studies support the conclusion that the fabella is more prevalent in Asian populations. There was a lot of missing data in several studies regarding the laterality of the fabella. Dedicated studies should be conducted to further assess the (bi)laterality in different populations and contributing factors.

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