



## A radiographic Study of Prevalence of Sesamoid Bones of the Hand in Adult Sudanese

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### ABSTRACT

**Aim:** this study aimed to examine the plain anteroposterior and oblique radiographs of the hands in adult Sudanese in hospitals in order to determine the prevalence of sesamoid bones and their distribution.

**Methods:** A total of 57 hand plain anteroposterior and oblique radiographs of the hands from 29 men and 28 females with age range between 15-60 years were examined to determine the presents of the sesamoids in the hand and to determine their number and to show any differences may exist between males and females.

**Results :** Sesamoid bones were always present at the metacarpophalangeal (MCP) joint of the thumb (100%). One sesamoid bone in the thumb interphalangeal (IP) joint was observed in 7% of the cases. The prevalence of sesamoid bones of the index, middle and little MCP joint were 47.36%, 7% and 14% respectively.

Sesamoid bones palmar to the MCP joints of the ring finger were not found. There were no significant differences between left and right hand digits. No significant differences were found between males and females as the previous studies found.

The present study represents the first report on the prevalence and distribution of sesamoid bones of the hand in adult Sudanese. The prevalence of sesamoid bones in Sudanese population is considerably different from the Africans and Arab populations.

### KEYWORDS :

#### Introduction

Sesamoid bones are small rounded masses embedded in certain tendons and usually related to joint surfaces. Their functions probably are to modify pressure, to diminish friction, and to alter the direction of a muscle pull. They are not developed to meet certain physical requirements in the adult is evidenced by the fact that they are present as cartilaginous nodules in the fetus, and in greater numbers than in the adult. Physical necessities probably come into play in selecting and in regulating the degree of development of the original cartilaginous nodules. Irregular nodules of bone may appear as the result of intermittent pressure in certain regions, eg, "rider's bone," which is occasionally developed in the adductor longus muscle of the thigh<sup>[1]</sup>.

Sesamoid bones are invested by the fibrous tissue of the tendons, except on the surfaces in contact with the parts over which they glide, where they present smooth articular facets<sup>[1]</sup>.

In the upper extremity the sesamoid bones of the joints are found only on the palmar surface of the hand. Two, of which the medial is the larger, are constant at the metacarpophalangeal joint of the thumb; one is frequently present in the corresponding joint of the little finger, and one (or two) in the same joint of the index finger. Sesamoid bones are also found occasionally at the metacarpophalangeal joints of the middle and ring fingers, at the interphalangeal joint of the thumb and at the distal interphalangeal joint of the index finger<sup>[1]</sup>.

Previous studies were done worldwide in different countries regarding the sesamoid bones of the hand, but data from Sudanese is lacking . So this study aimed to build data base of sesamoid bones among Sudanese population.

One study were done in Turkia by KOSE<sup>[2]</sup> , who found that two sesamoid bones (ulnar and radial) were always present at the

metacarpophalangeal (MCP) joint of the thumb (100%). One sesamoid bone in the thumb interphalangeal (IP) joint was observed in 21.3% of the cases. The prevalence of sesamoid bone of the index and little MCP joint were 36.6% and 53.2% respectively. Sesamoid bones palmar to the MCP joints of the middle finger and ring finger were rare; the incidence for these locations being 1.3% (12 hands) and 0.9% (8 hands), respectively. There were no significant differences between left and right hand digits<sup>[2]</sup>.

Another study done in black Malawians by Msamati<sup>[3]</sup>, who found all the hand films revealed one sesamoid bone at the interphalangeal joint and two at the metacarpophalangeal joint of the thumb. Occasional sesamoid bones were found at the metacarpophalangeal joint of the index finger only 4.8%<sup>[3]</sup>.

Also another study were done in an Bahrain by Dharap AS<sup>[4]</sup> , who found that all radiographs of the hand in the adult population showed two sesamoid bones in the thumb metacarpophalangeal (MCP) joint . Only 2.3% and 1.5% of hands showed sesamoids at the MCP joints of the middle and ring fingers respectively. Ossification commenced first in the thumb sesamoids, at the age of 10 years in females and 11 years in males and was completed by the age of 13 and 14 years, respectively<sup>[4]</sup>.

The clinical importance of sesamoid bones of the hand are; Reiter's syndrome, sesamoid arthritis, fractures and sesamoiditis. Sesamoid bones have been seen with periostitis in Reiter's syndrome. The medial sesamoid bone of the thumb metacarpophalangeal is frequently enlarged in acromegaly. The sesamoid bones of the thumb have been fractured or trapped inside the joint during injury to the thumb metacarpophalangeal joint<sup>[5]</sup>.

Sesamoid arthritis of the thumb is a relatively common condition, but the small size and the location of sesamoid bones make an accurate diagnosis difficult. Two sesamoid bones are embedded in

the fibrocartilaginous complex of the palmar plate. The ulnar sesamoid is found within the adductor pollicis brevis tendon; the articular surface of the sesamoid as it overlies the metacarpal head is broad and flat. The radial sesamoid is found within the flexor pollicis brevis; the articulation of the sesamoid is narrow and ridged, and as a result has a relatively unstable structure. Radial sesamoid arthritis is reported to be common. Most cases of sesamoid arthritis of the thumb are posttraumatic or idiopathic. Symptoms include pain and swelling on the volar side of the metacarpophalangeal joint, limitation of motion, and decreased pinch strength<sup>[6]</sup>.

Fractures of the sesamoid bones are associated with volar plate injuries at the MCP joint of the thumb. They are rare but are often associated with sports injuries caused by hyperextension of the thumb. Sesamoid fractures classified into two types: those with the palmar plate intact and those with the palmar plate ruptured<sup>[7,8]</sup>.

Fracture of the sesamoid bone of the index finger occurred because of a fall onto an outstretched hand and a resultant hyperextension force to the MCP joint of the index finger<sup>[9]</sup>.

Sesamoiditis is characterized by tenderness and pain over the flexor aspect of the thumb or, much less commonly, the index finger. The pain of sesamoiditis worsens with repeated flexion and extension of the affected digit. When the thumb is affected, it is usually on the radial side, where the condyle of the adjacent metacarpal is less obtrusive. Patients suffering<sup>[10]</sup>

This study aims to show data about sesamoid bones of the hand in normal adult Sudanese by using radiograph, to show; any differences may existing about sesamoid bones of the hand between males and females, common sites of sesamoid bones of the hand in sudanese, and to compare the results of this study about sesamoid bones around the hand and previous data available worldwide.

**Material and Methods:**

Descriptive cross sectional study design was taken in Khartoum teaching hospital and Ribat University hospital in Khartoum State, in time between March to May 2014. The sample group of this study about 57 individuals was selected randomly among Sudanese people of both sexes within ages range between 15 to 60 years. An anterioposterior and oblique views of plain radiographs were taken from the hands of each individual. This selected group was apparently free from diseases particularly the hands. Data was collected from registered radiographic plain by self-administered questionnaire and analyzed by SPSS version 15 (social package for statically science). The study was done after agreement of local ethical committee.

**Results:**

This study included 57 individuals (29 males and 28 females) in which both hands radiographs were taken to study the presens and distribution of sesamoid bones among small joints of hand (MCP,IPJ). Sesamoid bones of the metacarpophalangeal joints (MCPJ) in the right hand were 28 at first MCPJ (49.1%), 16 at the first and second MCPJ (28.1%), 3 at first,second &third MCPJ (5.3%), one at first, second, third & fifth MCPJ (1.8%) , one at first & fifth MCPJ (1.8%), 5 at first, second & fifth MCPJ (8.8%) and none in (5.3%). Table(1)

**Table (1); Distribution of ses.MCPJ (right)**

MCPJ	Frequency	Percent %
1 <sup>st</sup>	28	49.1
none	3	5.3
1 <sup>st</sup> +2 <sup>nd</sup>	16	28.1
1 <sup>st</sup> +2 <sup>nd</sup> +3 <sup>rd</sup>	3	5.3
1 <sup>st</sup> +2 <sup>nd</sup> +3 <sup>rd</sup> +5 <sup>th</sup>	1	1.8
1 <sup>st</sup> +5 <sup>th</sup>	1	1.8
1 <sup>st</sup> +2 <sup>nd</sup> +5 <sup>th</sup>	5	8.8
Total	57	100.0

Sesamoid bones of the metacarpophalangeal joints (MCPJ) in the left hand were 24 at MCPJ (42.1%), 15 at the first and second MCPJ (26.1%), 3 at first, second & third MCPJ (5.3%), one at first, second, third & fifth MCPJ (1.8%), 2 at first & fifth MCPJ (3.5%), 5 at first, second & fifth MCPJ (8.8%) and none in 7 (5.3%). Table (2)

**Table (2); Distribution of ses.MCPJ (left)**

MCPJ	Frequency	Percent %
1 <sup>st</sup>	24	42.1
None	7	12.3
1 <sup>st</sup> +2 <sup>nd</sup>	15	26.3
1 <sup>st</sup> +2 <sup>nd</sup> +3 <sup>rd</sup>	3	5.3
1 <sup>st</sup> +2 <sup>nd</sup> +3 <sup>rd</sup> +5 <sup>th</sup>	1	1.8
1 <sup>st</sup> +5 <sup>th</sup>	2	3.5
1 <sup>st</sup> +2 <sup>nd</sup> +5 <sup>th</sup>	5	8.8
Total	57	100.0

Sesamoid bones of the interphalangeal joints (IPJ) in the right hand distributed as, 4 at the first IPJ (7%) and 53 none in (93%). And in the left hand distributed as, 3 at the first IPJ (5.3%) and 54 none in (94.7%).

Appearance of Sesamoid bones of the metacarpophalangeal joints (MCPJ) in the hand were 57 at MCPJ (100%), 27 at second MCPJ (47.36%), 4 at third MCPJ (7%), 8 fifth MCPJ (14%) and no sesamoid bone around the fourth finger. Table (3)

**Table (3); Distribution of appearance of ses (MCPJ)**

Number of ses	Frequency	Percent %
First	57	100
Second	27	47.36
Third	4	7
Fourth	0	0
Fifth	8	14

Appearance of Sesamoid bones of interphalangeal joints (IPJ) in the hand, only found around the first finger in 4 (7%), other fingers have no sesamoid bone in IPJ. Table (4)

**Table (4); Distribution of appearance of ses (IPJ)**

Number of ses	Frequency	Percent %
First	4	7
Second	0	0
Third	0	0
Fourth	0	0
Fifth	0	0

Out of the 57 individuals, 26 (45.6%) have one sesamoid bone, 19 (33.3%) have tow sesamoid bones, 11 (19.3%) have three sesamoid bones, and 1(1.8%) have four sesamoid bones. Table (5).

**Table (5); Distribution of number of sesamoid**

Number of ses	Frequency	Percent %
One	26	45.6
Two	19	33.3
Three	11	19.3
Four	1	1.8
Total	57	100.0

**Discussion**

Sesamoid bones variations are common in their sites, size and their time of appearance according to previous studies worldwide<sup>[2,3, and 11]</sup>.

This study under focused the sesamoid bones around distal hand joints (MCPJ+IPJ) in different gender, subpopulations in Sudan and different age groups.

In this study, the sesamoid bones were found to be more common

around first metacarpophalangeal (100%) and second metacarpophalangeal joint (47.36%).

This result agrees with study done in Turkia by Ozkan Kose [2] who found 100% and 36.6% of sesamoid bone around the first and second metacarpophalangeal joints respectively.

Other sites of sesamoid bone around the third and fifth metacarpophalangeal joints were less common, and no sesamoid bone were found around fourth metacarpophalangeal joint in this study.

Also this result agrees with the study done in Bahrain by Dharap AS [4] who found sesamoid bone in all hand in the metacarpophalangeal joint of the thumb, and only 2.3% and 1.5% of hands showed sesamoids at the MCP joints of the middle and ring fingers respectively.

Also this result agrees with the study done in South Sinai Bedouin by Goldberg [12], who found The sesamoids of the metacarpophalangeal joint of the thumb were always present in the dissections and radiographs. Other sesamoids were observed in the radiographs of the metacarpophalangeal joints of index finger in 50% of the cases, middle finger in 3%, ring finger in 1% and the little finger in 70%.

The prevalence of sesamoid bone in the thumb IP joint showed great variation among different studies. The prevalence of sesamoid bones in the thumb IP joint has been reported to be 100% in two studies Msamati [3] and Joseph, 1951 [13], and 21.3% in Ozkan Kose [2] study and 67% in SekiY study [14]. In this study the present, only 7% of sesamoid bones were found around the thumb IPJ, which was lowest value comparison to previous studies. Some previous studies used cadavers to assess sesamoid bones [15], others used radiographs.

In this study, radiograph (X-rays), were used to evaluate the sesamoid bones, which is accurate method to assess bones locations but note size because of magnification effect of (X-rays). So CT scan with three dimension images is needed in further studies. No significant differences were found between males and females as the previous studies found [3,4].

Also the effect of tribes on presentations of sesamoid bones and their variation were not significant because Sudan is large country with the high percent of in retail marriages.

No sesamoid bones were found around ring finger. With different variation of sesamoid bones around other digits.

From this study and previous ones, surgeons, orthopedic surgeons, radiologist and anatomist should keep in their minds the sesamoid bones variations in size, sites around distal hand joint. For accurate diagnoses of fractures and pathology of the hand.

The tables (6) and (7) below show comparison of sesamoid bones in different studies. and Figures (1) and (2) below show the appearance of sesamoid bones in adult Sudanese.

**Table (6); Showed presents of sesamoid bones around MCPJs**

populations	1 <sup>st</sup> MCPJ	2 <sup>nd</sup> MCPJ	3 <sup>rd</sup> MCPJ	4 <sup>th</sup> MCPJ	5 <sup>th</sup> MCPJ
South sina	100%	50%	3%	1%	70%
Turkia	100%	36.6%	1.3%	0.9%	53.2%
Bahrain	100%	-----	2.3%	1.5%	-----
Emirates	100%	43.4%	1.47%	0.6%	67.7%
Malawi	100%	4.8%	-----	-----	-----
Mediterranea n populations	99.5%	42.3%	-----	-----	41.1%
Sudan(presen t study)	100%	47.36%	7%	0%	14%

**Table (7); showed present of sesamoid bones around IPJs in different studied**

populations	1 <sup>st</sup> IPJ	2 <sup>nd</sup> IPJ	3 <sup>rd</sup> IPJ	4 <sup>th</sup> IPJ	5 <sup>th</sup> IPJ
South sina	62%	-----	-----	-----	-----
Turkia	21.3%	-----	-----	-----	-----
Bahrain	-----	-----	-----	-----	-----
Emirates	53%	-----	-----	-----	-----
Malawi	100%	-----	-----	-----	-----
Mediterranean populations	26.2%	-----	-----	-----	-----
Sudan(present study)	7%	-----	-----	-----	-----



**Fig (1); Anteroposterior radiographs of the left hand, showing appearance of sesamoid bones in adult Sudanese in the (MCPJ) of the thumb, index, middle and little fingers.**



**Fig (2); Anteroposterior radiographs of the left hand, showing appearance of sesamoid bones in adult Sudanese in the IPJ of the thumb.**

**Recommendations:-**

Surgeons, orthopedic surgeons, radiologist and anatomist should keep in their minds the sesamoid bones variations in size, sites and variation of presence around distal hand joints. For accurate diagnoses of fractures and pathology of the hand. More studies should be done to demonstrate the rarely occurring ones that did not appear in this study. And larger study is needed to determine the prevalence and ossification of sesamoid bones of the hand.

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