

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

The National Ribat University

Faculty of Graduate Studies

and Scientific Research

A radiographic Study of Prevalence of

Sesamoid Bones of the Hand

in Adult Sudanese

A thesis Submitted in Partial Fulfillment Required

For M.Sc in Human and Clinical Anatomy

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بِسْمِ اللّٰهِ الرَّحْمٰنِ الرَّحِیْمِ

قال تعالى:

(سَنُرِيهِمْ آيَاتِنَا فِي الْآفَاقِ وَفِي أَنْفُسِهِمْ حَتَّىٰ
يَتَبَيَّنَ لَهُمْ أَنَّهُ الْحَقُّ ۗ أَوَلَمْ يَكْفِ بِرَبِّكَ أَنَّهُ عَلَىٰ
كُلِّ شَيْءٍ شَهِيدٌ) سورة فصلت (53)

صدق الله العظيم

Dedication

To, My parents

&

My brothers

Acknowledgment

First and foremost, I would like to express my thanks and gratitude to my supervisor Dr. Yasser Seddeg Abdul-ghani for his guidance throughout the study. Also I would like to express my thanks and gratitude to Professor Tahir Osman, for his supports us during the study period.

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Abstract

This study aimed to examine the plain anteroposterior and oblique radiographs of the hands in adult Sudanese in Khartoum teaching hospital and Ribat University hospital in Khartoum State, in order to determine the prevalence of sesamoid bones and their distribution.

A total of 57 hand radiographs from 29 men and 28 females with age range between 15-60 years were examined.

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.

ملخص الدراسة

هدفت هذه الدراسة الى فحص الأشعة الأماميه الخفيه والمائله في أيدي السودانين البالغين في مستشفى الخرطوم التعليمي ومستشفى الرباط الجامعي في ولاية الخرطوم، وذلك لتحديد مدي انتشار العظام السمسيميه وتوزيعها .

تم فحص مجموعة 57 من أشعة الأيدي ضمت 29 رجلا و28 أنثى مع الفئه العمريه بين 15-60 سنه .

كانت العظام السمسيميه دائما حاضره في المفصل المشطي السلامي للإبهام بنسبة 100%، لوحظ وجود عظم سمسيمي واحد في مفصل بين سلاميات الإبهام في 7% من الحالات، وكان انتشار العظام السمسيميه في المفصل المشطي السلامي للسبابه ، الاوسط والخنصر بنسبة 47.36%، 7% و14% علي التوالي . لم يتم العثور علي العظام السمسيميه في المفصل المشطي السلامي للبنصر .

لا توجد فروق ذات دلالة احصائيه بين اصابع اليد اليمنى واليسري. لا توجد فروق ذات دلالة إحصائيه بين الذكور والإناث كما وجدت في الدراسات السابقه.

تمثل هذه الدراسة أول تقرير عن انتشار وتوزيع العظام السمسيميه في أيدي السودانين البالغين. إنتشار العظام السمسيميه في السودانين هو مختلف إلى حد كبير من الأفارقة والسكان العرب.

List of Tables

Table NO	Title	Page
Table 4.1	Distribution of sex among study population	14
Table 4.2	Distribution of ses.MCPJ (right)	15
Table 4.3	Distribution of ses.MCPJ (left)	16
Table 4.4	Distribution of ses.IPJ(right)	17
Table 4.5	Distribution of ses.IPJ (left)	18
Table 4.6	Distribution of appearance of ses (MCPJ)	19
Table 4.7	Distribution of appearance of ses (IPJ)	20
Table 4.8	Distribution of number of sesamoid	21
Table 5.1	Showed presents of sesamoid bones around MCPJs in different studied	24
Table 5.2	Showed present of sesamoid bones around IPJs in different studied	24

List of Figures

Fig NO	Title	Page
Fig 2.1	Fracture of the sesamoid of the index finger	11
Fig 4.1	Distribution of sex among study population	14
Fig 4.2	Distribution of ses.MCPJ (right)	15
Fig 4.3	Distribution of ses.MCPJ (left)	16
Fig 4.4	Distribution of ses.IPJ(right)	17
Fig 4.5	Distribution of ses.IPJ (left)	18
Fig 4.6	Distribution of appearance of ses (MCPJ)	19
Fig 4.7	Distribution of appearance of ses (IPJ)	20
Fig 4.8	Distribution of number of sesamoid	21
Fig 5.1	Anteroposterior radiographs of the left hand, showing appearance of sesamoid bones in adult Sudanese in the (MCPJ) of the thumb, index, middle and little finger.	25
Fig 5.2	Anteroposterior radiographs of the left hand, showing appearance of sesamoid bones in adult Sudanese in the IPJ of the thumb.	25

Abbreviations

Ses :	Sesamoid
MCPJ:	Metacarpophalangeal joint
IPJ:	Interphalangeal joint
MTPJ:	Metatarophalangeal joint
PIP	Proximal interphlangeal

Contents

	Title	page
	Dedication	I
	Acknowledgment	II
	Abstract	III
	Abstract (Arabic)	IV
	List of tables	V
	List of figures	VI
	Abbreviations	VII
	Contents	V111
	CHAPTER ONE Introduction and Objectives	
1.	Introduction and Objectives	1
1.1.	Introduction	1
1.2.	Objectives	3
1.2.1.	General objective	3
1.2.2.	Specific objectives	3
	CHAPTER TWO Literature Review	
2.	Literature review	4
2.1.	Over view:	4
2.2.	Types of bone	4
2.3.	Classification of bone	4

2.4.	Common sesamoid bones in the body	5
2.5.	Sesamoid bones of the hand	5
2.6.	Previous studies	6
2.7.	Clinical importance of sesamoid bones	9
2.7.1.	Reiter's syndrome	9
2.7.2.	Sesamoid arthritis	9
2.7.3.	Fractures of the sesamoid bones	10
2.7.4.	Sesamoiditis	11
	CHAPTER THREE Material and Methods	
3.	Material and Methods	12
3.1.	Study design	12
3.2.	Study area	12
3.3.	Study duration	12
3.4.	Inclusion criteria	12
3.5.	Sample size	12
3.6.	Methods of the study	12
3.7.	Data collection	13
3.8.	Data analysis	13
	CHAPTER FOUR Results	
4.	Results	14
	CHAPTER FIVE Discussion	
5.	Discussion	22

	CHAPTER SIX Conclusions & Recommendations	
6.	Conclusions & Recommendations	26
6.1.	Conclusions	26
6.2.	Recommendations	26
	CHAPTER SEVEN References	
7.	References	27
	Appendix	

1. Introduction and Objectives:-

1.1.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 occasionally 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 ^[1].

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 ^[1].

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 ^[1].

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^[2] , 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^[2].

Another study done in black Malawians by Msamati^[3] , 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%^[3].

Also another study were done in an Bahrain by Dharap AS^[4] , 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^[4].

1.2. Objectives:

1.2.1. General Objective:

This study aims to show data about sesamoid bones of the hand in normal adult Sudanese by using radiograph.

1.2.2. Specific Objectives:

- To show any differences may existing about sesamoid bones of the hand between males and females in Sudanese.
- To show common sites of sesamoid bones of the hand in Sudanese.
- To compare the results of this study about sesamoid bones around the hand and previous data available worldwide.

2. Literature review:-

2.1. Over view:

Bone, a living tissue, is a highly specialized, hard form of connective tissue that makes up most of the skeleton and is the chief supporting tissue of the body^[5]. Bones provide: protection for vital structures, support for the body, the mechanical basis for movement, Storage for salts (calcium) and continuous supply of new blood cells (produced by the marrow within many bones).

2.2. Types of bone:

There are two types of bone: compact and spongy. The differences between these types of bone depend on the relative amount of solid matter and the number and size of the spaces they contain. All bones have a superficial thin layer of compact bone around a central mass of spongy bone, except where the latter is replaced by a medullary (marrow) cavity. Within this cavity of adult bones, and between the spicules of spongy bone, blood cells and platelets are formed. The architecture of spongy and compact bone varies according to function. Compact bone provides strength for weight bearing. In long bones, designed for rigidity and attachment of muscles and ligaments, the amount of compact bone is greatest near the middle of the shaft (body) of the bone, where it is liable to buckle. Living bones have some elasticity (flexibility) and great rigidity (hardness)^[5].

2.3. Classification of Bones:

Bones are classified according to their shape in to ; Long bones are tubular structures (humerus in the arm; phalanges in the fingers), short

bones are cuboidal and are found only in the ankle (tarsus) and wrist (carpus), flat bones usually serve protective functions (those of the cranium protect the brain), irregular bones, such as those in the face, have various shapes other than long, short, or flat, and sesamoid bones (patella, or kneecap) develop in certain tendons. These bones protect the tendons from excessive wear and often change the angle of the tendons as they pass to their attachments ^[5]. They ossify generally soon after puberty ^[6].

2.4. Common sesamoid bones in the body:

Common sesamoid bones can be found on joints throughout the body, including ^[5]; in the [knee](#) , the [patella](#) (within the [quadriceps](#) tendon). In the [hand](#) two sesamoid bones are commonly found in the [distal](#) portions of the [first metacarpal bone](#) (within the tendons of [adductor pollicis](#) and [flexor pollicis brevis](#)). There is also commonly a sesamoid bone in distal portions of the [second metacarpal bone](#). In the wrist, the [pisiform](#) of the [wrist](#) is a sesamoid bone (within the tendon of [flexor carpi ulnaris](#)). In the [foot](#) , the [first metatarsal bone](#) usually has two sesamoid bones at its connection to the [big toe](#) (both within the tendon of [flexor hallucis brevis](#). In some people, only a single sesamoid is found on the first MTPJ ^[5].

2.5. Sesamoid bones of the hand:

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^[1].

2.6. Previous studies:

Previous studies were done worldwide in different countries regarding the sesamoid bones of the hand. Study done in Turkia by Kose^[2]. Who used 923 hand radiographs from 459 men and 464 women with a mean age (range, 18-85 years) were examined. Two sesamoid bones were always present at the metacarpophalangeal (MCP) joint of the thumb (100%). One sesamoid bone in the thumb interphalangeal (IP) joint was 21.3%. 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. The distribution of sesamoid bones in different locations between male and female subjects were statistically similar^[2]. Another study done in adult black Malawians by Msamati^[3], who used 255 radiographs from 85 men and 45 women aged 16-66 years were used; 126 of the hands and 129 of the feet. To study aradiographic appearance of sesamoid bones in the hands and feet. 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 joints of the index finger. Only 4.8% of the hands had sesamoid bones at the metacarpophalangeal joint of the index finger^[3].

Another study done in Bahrain by Dharap AS^[4], who used 549 radiographs in adults an Arab population from Bahrain , to study , the incidence and ossification of sesamoid bones in the hands and feet . All

radiographs of the hand and foot in the adult population showed two sesamoid bones in the thumb metacarpophalangeal (MCP) joint and in the hallucal metatarsophalangeal (MTP) joint, respectively. Only 2.3% and 1.5% of hands showed sesamoids at the MCP joints of the middle and ring fingers respectively^[4].

Also another study were done in japaneace by Seki Y^[7], to study the prevalence of sesamoid bones of the IP joint of the thumb and fingers, who used a retrospective review of radiologic views of the IP joints in the thumb or fingers was performed, including a total of 650 patients. The prevalence found in the IP joint of the thumb at 67% ,while the index, middle, ring, little fingers had sesamoid bones in the proximal interphlangeal (PIP) joint at 0% , 0.4% , 0.5% , and 1% , respectively. None of the four fingers had sesamoid bones in the distal IP joint^[7].

Also another study were done in Emirates hospital by Yammine K^[8], who, provide a better estimate of the frequency of hand sesamoids and its association with variables such as , gender, and side. Nineteen studies met the inclusion criteria. The pooled rates of the sensitive meta-analysis from large-sample studies in adults showed: true radiological rates of 99.9% for the radial thumb sesamoid, 99.6% for the ulnar thumb sesamoid, 47.8% for IP-I, 40% for MCP-II, 1.3% for MCP-III, 0.8% for MCP-VI, and 62.8% for MCP-V. There was a significant association with female gender at MCP-II, MCP-IV, and MCP-V. There was no significant association with hand side. The pooled rates of hand sesamoids in children aged 10-17 years were 92.7, 42.2, 33.8, 0.5, 0.3, and 36.5% for MCP-I, IP-I, MCP-II, MCP-III, MCP-IV, and MCP-V, respectively. The findings of this evidence-based anatomical review provide quantitative evidence that the incidence of sesamoid bones in human hands depends on genetic rather than functional factors^[8].

Also another study was done in India by Zariwala R ^[9], who used 592 subject of Ahmadabad. The commonest site at which sesamoid bone observed in hand was the ulnar side of head of first metacarpal bone (in 1001 boys and girls). The other sites in descending order of frequency were the radial side of head of 1st metacarpal bone (in 36% cases), head of 5th metacarpal bone (in 30% cases), head of 2nd metacarpal bone (in 14% cases) ulnar side of head of 1st phalanx of thumb (in 12.46% cases), The unusual sites were the head of 3rd and 4th metacarpal bones (in 3 girls only). The only sesamoid bone which followed definite age pattern was the one on the ulnar side of head of 1st metacarpal bone. The appearance of sesamoid bones was earlier in girls than boys by 3 to 4 years ^[9].

Also another study were done in Egypt in South Sinai Bedouin by Goldberg^[10], who used 100 hands and feet in 50 cadavers and in 1000 radiographs of the hands children to study anatomy and pathology of the sesamoid bones. The hand compared to the foot. Who found that the sesamoids of the metacarpophalangeal joint of the thumb and metatarsophalangeal joints of the hallux were always present in the dissections and radiographs. Other sesamoids were observed in the radiographs of the metacarpophalangeal joints of the index finger in 50% of the cases, the middle finger in 3%, the ring finger in 1% and the little finger in 70%. Sesamoids were also seen in 62% of the interphalangeal joints of the thumb. There are differences between the hand and the foot in relation to the occurrence of degenerative changes in the joints. In the thumb, the metacarpophalangeal joint is involved macroscopically in 75% of the cases, and only in 13% of the radiographs, with the pathological changes located in one or the other part of the joint ^[10].

And another study was done in Mediterranean populations by Amar. E ^[11], who used a retrospective review of 442 radiographs of adult patients, was performed in order to assess the incidence of sesamoid and accessory bones in the hands of a Mediterranean population. Who found that 99.5% sesamoid bones in the 1st metacarpophalangeal (MCP) joint, 42.3% in the 2nd MCP joint, and 41.1% in the 5th MCP joint. The incidence in the 1st interphalangeal joints was 26.2% ^[11].

2.7. Clinical importance of sesamoid bones:

The clinical importance of sesamoid bones of the hand are; Reiter's syndrome, sesamoid arthritis, fractures and sesamoiditis.

2.7.1. Reiter's syndrome:

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 ^[12].

2.7.2. Sesamoid arthritis:

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 ^[13].

2.7.3. Fractures of the sesamoid bones:

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. Sesamoids can also be bipartite because of a failure of fusion of the ossification centers, found in 0.6% to 6% of hands. The sesamoids contribute to the stability of the MCP joint, the ulnar sesamoid through the adductor pollicis, and the radial sesamoid through the flexor pollicis brevis. This feature caused Patel et al. to classify sesamoid fractures into two types: those with the palmar plate intact and those with the palmar plate ruptured ^[14, 15].

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 ^[16]. Fig (2.1)



Fig (2.1) ; Anteroposterior (A), lateral (B), and oblique (C) radiographs of the right hand on initial presentation to the emergency department. Fracture of the sesamoid of the index finger is clearly visualized on the oblique view (arrow). All images were initially interpreted as normal by the radiologist on call.

2.7.4 .Sesamoiditis:

Sesamoiditis is characterized by tenderness and pain over the flexor aspect of the thumb or, much less commonly, the index finger. When grasping something, the patient often feels that he or she has a foreign body embedded in the affected digit. 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^[17]

3. Material and Methods:

3.1. Study design:

Descriptive cross sectional study design

3.2. Study area:

Khartoum teaching hospital and Ribat University hospital in Khartoum State

3.3. Study duration:

In time between March to May 2014

3.4. Inclusion criteria:

The sample group of this study was selected randomly among Sudanese people of both sexes within ages range between 15 to 60 years. This selected group was apparently free from diseases particularly the hands.

3.5. Sample size:

Small group of about 57 individuals were selected randomly in order to make plain radiographs to their hands to determine the prevalence of sesamoid bones by routine X-rays.

3.6. Methods of the study:

An anteroposterior and oblique views of plain radiographs were taken from the hands of each individual.

3.7. Data collection:-

Data was collected from registered radiographic plain by self-administered questionnaire.

3.8. Data analysis:

Data was analyzed by SPSS version 19 (social package for statically science).

4. Results:

This study included 57 individuals in which both hands radiographs were taken to study the presens and distribution of sesamoid bones among small joints of hand (MCP.IPG).

The study included 29 males (50.9%) and 28 females (49.1%) from different regions and they belong to different tribes. Tables (4.1), and fig (4.1),

Table (4.1); Distribution of sex among study population

Sex	Frequency	Percent %
Male	29	50.9
Female	28	49.1
Total	57	100.0

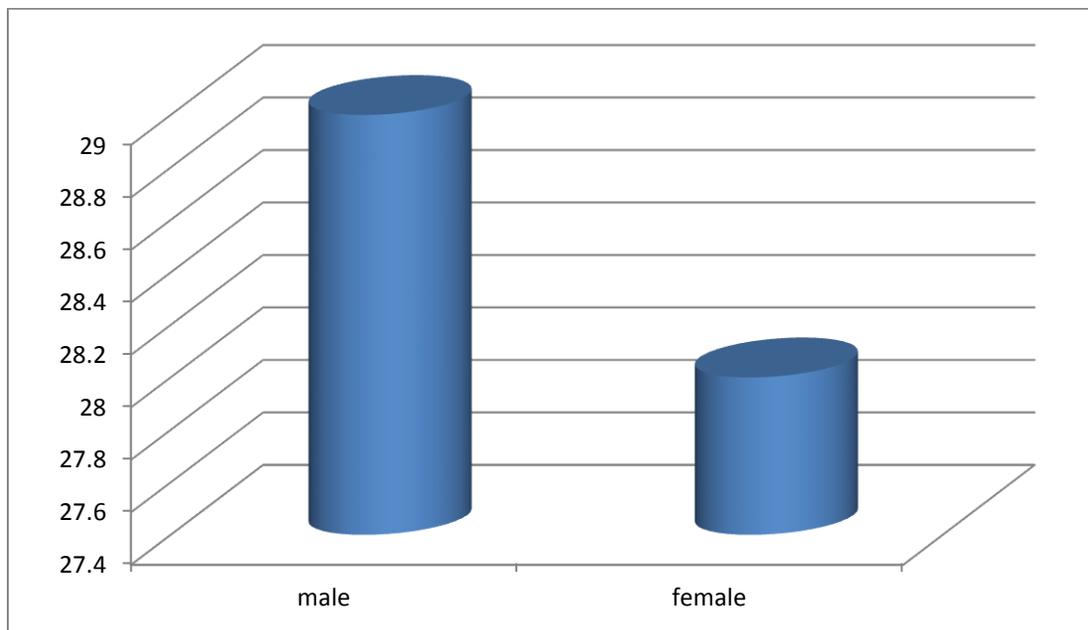


Fig (4.1); Distribution of sex among study population

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 (4.2) Fig (4.2)

Table (4.2); Distribution of ses.MCPJ (right)

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

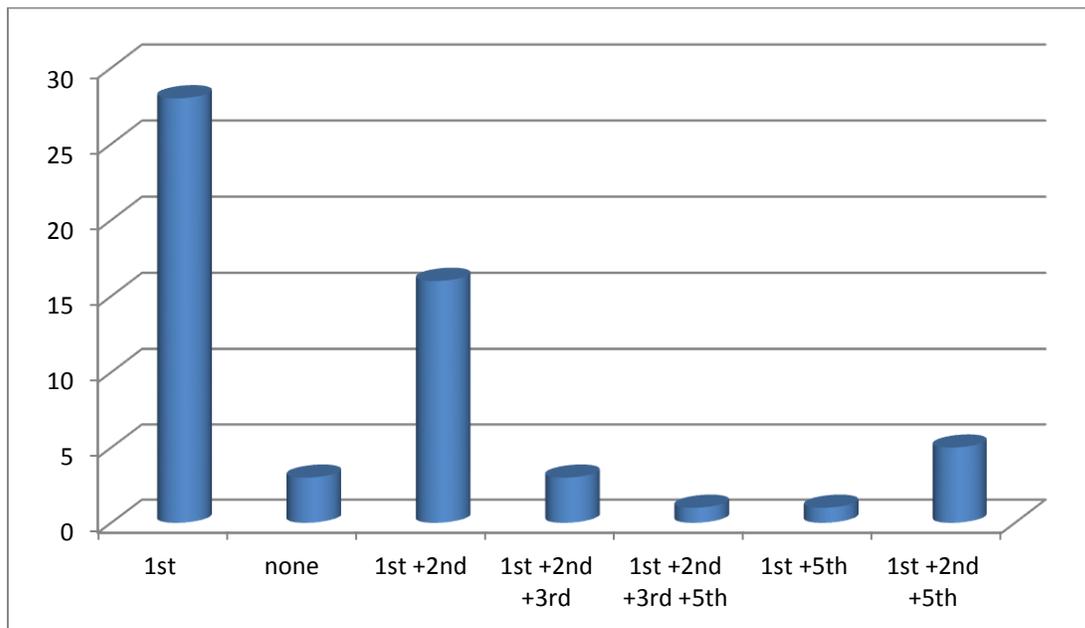


Fig (4.2); Distribution of ses.MCPJ (right)

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 (4.3) Fig (4.3).

Table (4.3); Distribution of ses.MCPJ (left)

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

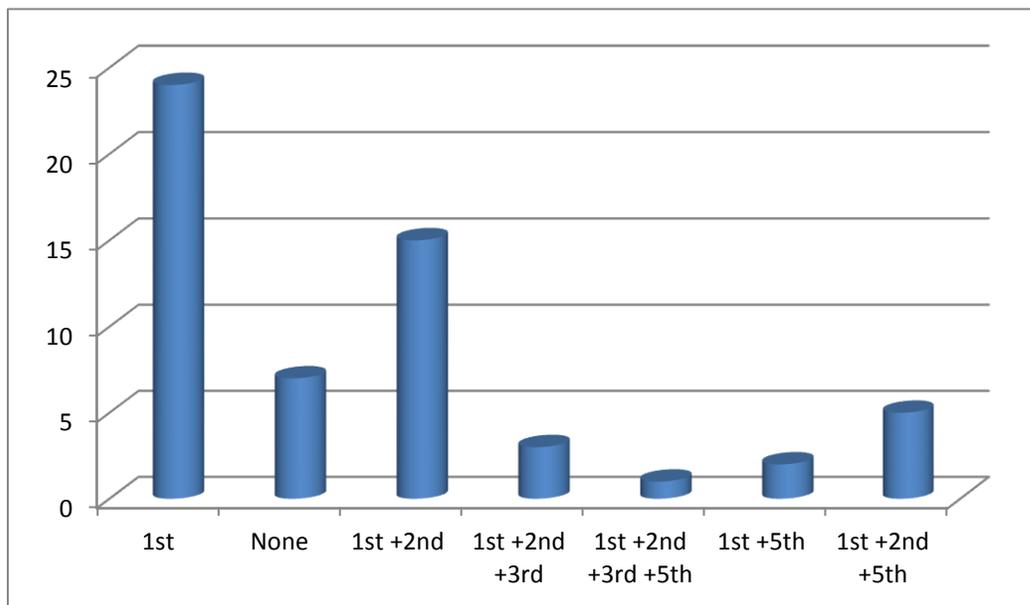


Fig (4.3); Distribution of ses.MCPJ (left)

Sesamoid bones of the interphalangeal joints (IPJ) in the right hand distributed as, 4 at the first IPJ (7%) and 53 none in (93%). Table (4.4) Fig (4.4).

Table (4.4); Distribution of ses.IPJ (right)

IPJ	Frequency	Percent %
1st	4	7.0
None	53	93.0
Total	57	100.0

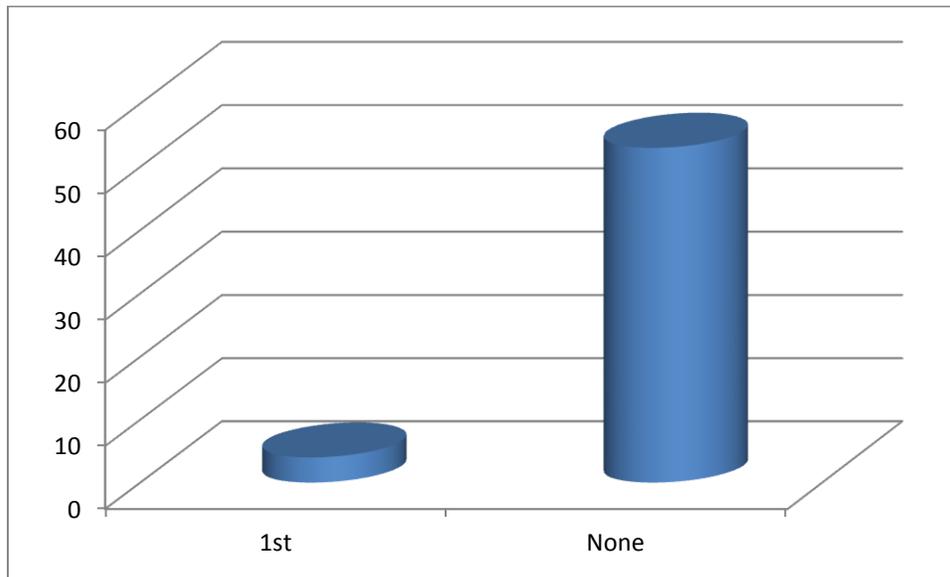


Fig (4.4); Distribution of ses.IPJ (right)

Sesamoid bones of the interphalangeal joints (IPJ) in the left hand distributed as, 3 at the first IPJ (5.3%) and 54 none in (94.7%). Table (4.5) Fig (4.5).

Table (4.5); Distribution of ses.IPJ (left)

IPJ	Frequency	Percent %
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1st	3	5.3
none	54	94.7
Total	57	100.0

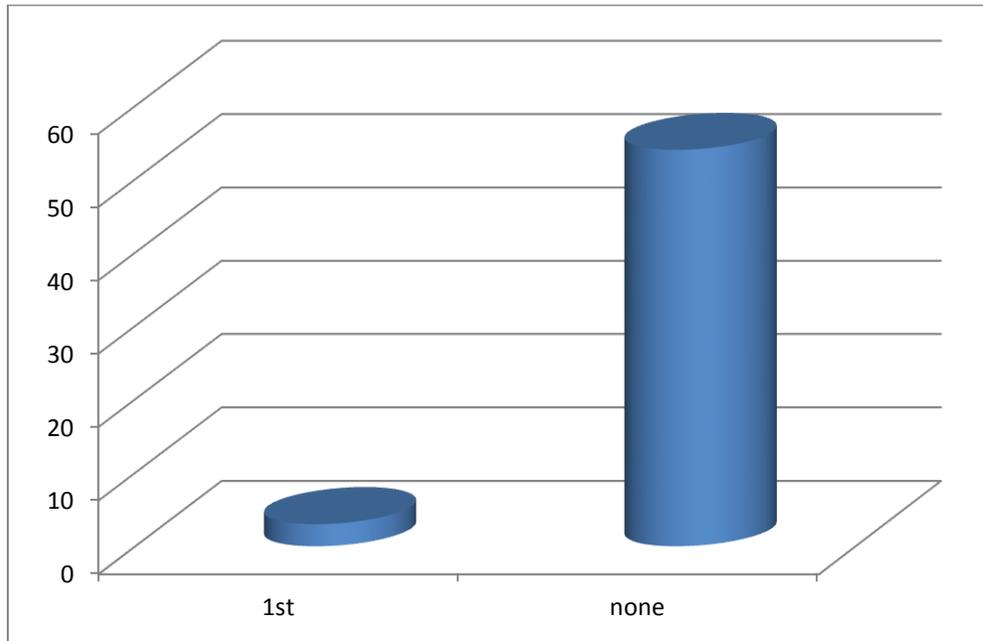


Fig (4.5); Distribution of ses.IPJ (left)

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 (4.6) Fig (4.6).

Table (4.6); 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

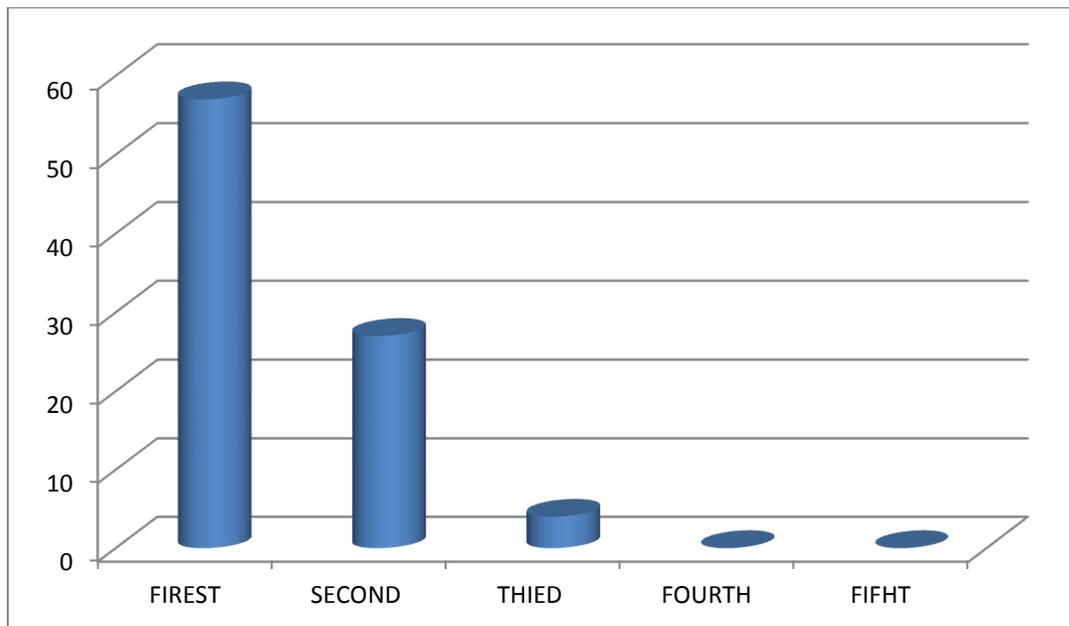


Fig (4.6); Distribution of appearance of ses (MCPJ)

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 (4.7) Fig (4.7).

Table (4.7); 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

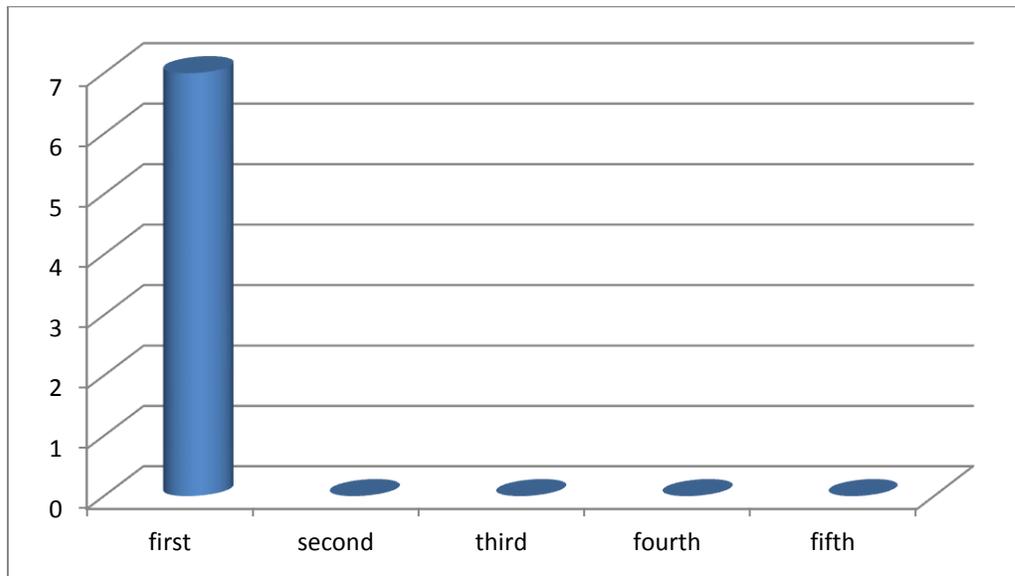


Fig (4.7); Distribution of appearance of ses (IPJ)

Out of the 57 individuals, 26 (45.6%) have one sesamoid bone, 19 (33.3%) have two sesamoid bones, 11 (19.3%) have three sesamoid bones, and 1 (1.8%) have four sesamoid bones. Table (4.8), fig (4.8).

Table (4.8); 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

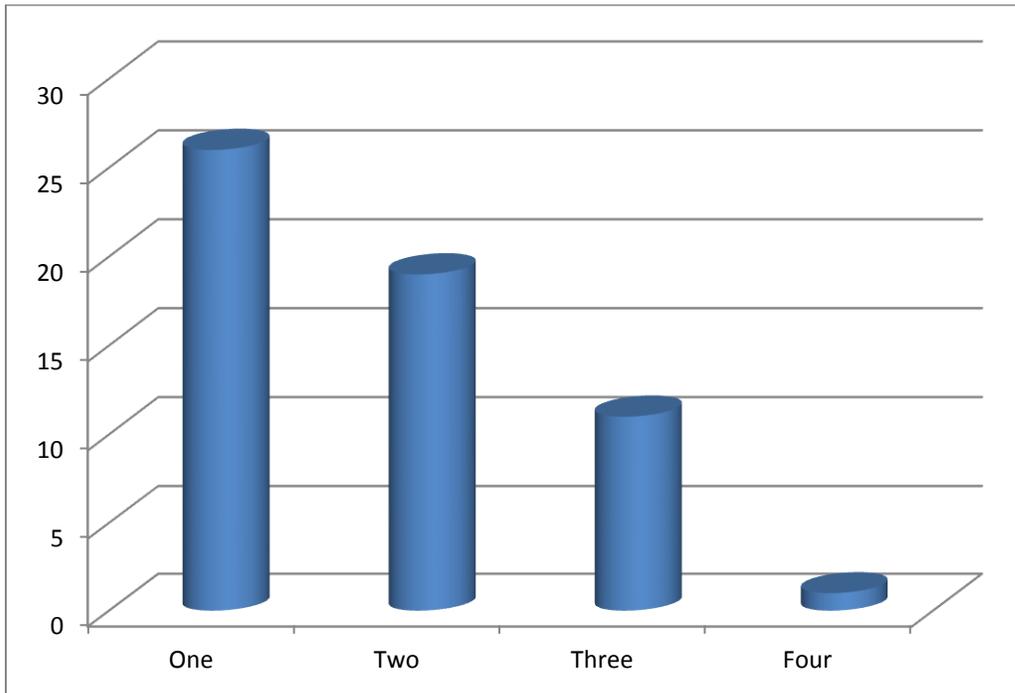


Fig (4.8); Distribution of number of sesamoid

5. Discussion

Sesamoid bones variations are common in their sites, size and their time of appearance according to previous studies worldwide [2, 3, and 9].

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 ^[11], 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 ^[18], and 21.3% in Ozkan Kose ^[2] study and 67% in SekiY study ^[7]. 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 ^[10], 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 (5.1) and (5.2) below show comparison of sesamoid bones in different studies.

Table (5.1); Showed presents of sesamoid bones around MCPJs

populations	1 st MCPJ	2 nd MCPJ	3 rd MCPJ	4 th MCPJ	5 th MCPJ
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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%	-----	-----	-----
Mediterranean populations	99.5%	42.3%	-----	-----	41.1%
Sudan(present study)	100%	47.36%	7%	0%	14%

Table (5.2); showed present of sesamoid bones around IPJs in different studied

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

Figures (5.1) and (5.2) below show the appearance of sesamoid bones in adult Sudanese.



Fig (5.1); Anteroposterior radiographs of the left hand, showing appearance of sesamoid bones in adult Sudanese in the (MCPJ) of the thumb, index, middle and little finger.



Fig (5.4); Anteroposterior radiographs of the left hand, showing appearance of sesamoid bones in adult Sudanese in the IPJ of the thumb.

6. Conclusions & Recommendations

6.1. Conclusions:-

- This study included 57 individuals in which both hands radiographs.
- 100% sesamoid bone of metacarpophalangeal joint of the thumb , 47.36% sesamoid bone of metacarpophalangeal joint of index, 7% sesamoid bone of middle, 14% sesamoid bone of metacarpophalangeal joint of little and 7% sesamoid bone in the interphalangeal joint of the thumb.
- No sesamoid bone in the ring finger.

6.2. 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.
- Larger study is needed to determine the prevalence and ossification of sesamoid bones of the hand.

7. References

- 1. Henry Gray (1821–1865). Anatomy of the Human Body2008. 20 editions. (3) 250-256.**

2. **Kose, O; Guler, F.; Turan, A.; Êcanbura, K. & Akalin, S.** Prevalence and distribution of sesamoid bones of the hand. Radiographic study in Turkish subjects. *Int. J. Morphol.*, **30(3):1094-1099, 2012.**
3. **Msamati BC, Igbigbi PS.** Radiographic appearance of sesamoid bones in the hands and feet of Malawian subjects. *Clin Anat.* **2001 Jul; 14(4):248-53.**
4. **Dharap AS, Al-Hashimi H, Kassab S, Abu-Hijleh MF.** Incidence and ossification of sesamoid bones in the hands and feet: a radiographic study in an Arab population. *Clin Anat.* **2007 May;20(4):416-23.**
5. **Moore, Keith L.; Agur, Anne M. R.** Essential Clinical Anatomy **2007**, 3rd Edition. **(1)11**
6. **Chummy S. Sinnatamb .** Last's anatomy regional & applied **1999**, 10 edition .**(2)104.**
7. **Seki Y , Hoshino Y, Kuroda H,** Prevalence of sesamoid bones in the interphalangeal joint of the thumb and fingers: A radiographic study. *Clin Anat.* **2012 Dec 17. doi: 10.1002/ca.22201**
8. **Yamine K.** The prevalence of the sesamoid bones of the hand: A systematic review and meta-analysis. *Clin Anat.* **2014 Feb 25. doi: 10.1002/ca.22378.**
9. **Zariwala R.C., Patel D.S., Mehta T.J., Bhise R.S.** Pattern of appearance and age from sesamoid bones in hand In Ahmedabad population. *Indian Journal of Forensic Medicine & Toxicology* : **2010, Volume : 4, Issue : 2.**
10. **Goldberg, I. & Nathan, H.** Anatomy and pathology of the sesamoid bones. The hand compared to the foot. *Int. Orthop.*, **11(2):141-7, 1987.**
11. **Amar. E.; Rozenblat, Y. & Chechik, O.** Sesamoid and accessory bones of the hand - an epidemiologic survey in a Mediterranean population. *Clin. Anat.*, **24(2):183-7, 2011.**
12. **Virchel E. Wood** . The sesamoid bones of the hand and their pathology, *The Journal of Hand Surgery: British & European Volume, Volume 9, Issue 3, October 1984, Pages 261–264.*

- 13. Ji Yeong Kim, MD; Jung Hwan Sung, MD; Jeong Gook Seo, MD.** Sesamoid Arthritis Mimicking Trigger Thumb, *Orthopedics*. [March 2011 - Volume 34 · Issue 3: 228](#).
- 14. Shaw M, Lyburn I, Torreggiani W, Watura R.** Comminuted fracture of the ulnar sesamoid of the metacarpophalangeal joint of the thumb: an uncommon injury. *J Emerg Med*. **2003;24:437-9**.
- 15. Dong PR, Seeger LL, Shapiro MS, Levere SM;** Fractures of the sesamoid bones of the thumb. *Am J Sports Med*. **1995 May-Jun;23(3):336-9**.
- 16. Karin L. Ljungquist, MD and Hisham Awan, MD ;** Fracture of the Sesamoid Bone of the Index Finger. *JBJS Case Connect*, **2012 Mar 14;2(1):e9**.
- 17. Steven D. Waldman:** atlas of common pain syndroms, **3edition (56) available** in URL:
- 18. Joseph , J.** The sesamoid bones of the hand and the time of fusion of the epiphysis of the thumb. *J. Anat.*, **85(3):230-41, 1951**.