

# A Prospective Study to Appearances of Ossification Centers in the Carpal Bones in Girls of Age Group 5 Years to 12 Years in Western Rajasthan Jodhpur Region

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## ABSTRACT

**Background:** Age estimation in living as well as dead is one of the most important task for a forensic practitioner. Verification or determination of age is prerequisite for personal identification in living as well as dead. In the present study estimation of age in the individual of age varying between 5 year to 12 years will, be conducted using the appearance of ossification of carpal bones in girls of the western Rajasthan (Jodhpur) region.

**Materials & Methods:** The radiological prospective study of "appearances of ossification centers in the carpal bones in girls of age group 5 years to 12 years in western Rajasthan jodhpur region" was conducted in western Rajasthan jodhpur region studying in various schools of jodhpur district. The children were selected for the study in the age group of 5 to 12 years and are from the girls. All observation was noted on a common standard proforma and later the findings will tabulated to draw necessary conclusion.

**Results:** We found that triquetral appeared at age of 3-4 years and lunate at the age of 4-5 years. Trapezium, trapezoid and scaphoid carpals appeared between the age of 5 to 9 years.

**Conclusion:** We concluded that Triquetral and lunate carpals appear after capitate and hamate. Their appearance was slightly earlier in females than in males.

**Keywords:** Fusion, Appearance, Carpal Bones, Epiphysis, X-rays.

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## INTRODUCTION

In law the crime and punishment is entirely based on criminal responsibility, and this in turn is dependent on age of a person.

Under section 83 IPC, however, children between ages of 7 and 12 years will be held responsible for the offenses charged, if the trying court is satisfied that they have attained sufficient degree of maturity of understanding to judge the nature of consequences of their acts on that occasion and unless proved to the contrary. Under section 127-130 of Indian Railway Act, 1890, children even under 7 year (up to 5 years) of age are held liable for punishment if he/she does anything maliciously to wreck or attempt to wreck a train and passengers in it or railway property.

If a child below 10 years of age is removed from his or her lawful guardian for the purpose of robbing movable property from his or her body or possession, then it will amount to the offence of kidnapping.

Verification or determination of age is prerequisite for personal identification in living as well as dead. Age estimation in living as well as dead is one of the most important task for a forensic

practitioner. In developing countries like India because of illiteracy the birth are not registered or records of birth are not properly maintained. It is increasing important in criminal and civil matters. In fact, if doubt arises regarding the age of person in any legal inquiry, forensic age estimation is promptly requested by authorities to ascertain whether the person concerned has reached the age of imputability.<sup>1</sup> The time of appearance and fusion of ossification centers, as observed radio logically is being considered to be a reliable guide for the determination of age of an individual. The appearance of such centers of ossification is spread over a long time. The process of appearance and union has a sequence of time. As a rule, ossification begins centrally in epiphysis and spread peripherally as it gets bigger. Initially it is entirely morphous, rounded and pinhead size, as it grows it takes on the osteological details of bone.

The carpal bones are ossified endochondrally (from within the cartilage) and the ossification centers appear only after birth.<sup>2</sup> The formation of these centers roughly follows a chronological spiral

pattern starting in the capitate and hamate during the first years of life. The sesamoid pisiform arises in the tendon of the flexor carpi ulnaris after more than ten years. In the present study estimation of age in the individual of age varying between 5 year to 12 years will, be conducted using the appearance of ossification of carpal bones in girls of the western Rajasthan (Jodhpur) region.

**MATERIALS & METHODS**

The radiological prospective study of "appearances of ossification centers in the carpal bones in girls of age group 5 years to 12 years in western Rajasthan jodhpur region" was conducted in western Rajasthan jodhpur region studying in various schools of jodhpur district. The children were selected for the study in the age group of 5 to 12 years and are from the girls.

**Inclusion Criteria**

1. Girls of the age group 5 to 12 year were included in study.
2. Their age as stated by their parents will be considered along with date of birth certificate and further was confirmed by obtaining birth certificate of from school record.

**Exclusion Criteria**

1. Subject not consenting for skiagraphy
2. Subject not having valid documentation for proof of age / date of birth
3. All boys below 5 years and above 12 years
4. Female child with affecting the growth of bones appearance of fusion centers e.g. congenital deformities fracture cases, chronic illness or on chronic steroid therapy

**Methods**

While selecting the cases for study, priority was given to children of those parents who remember the exact date of birth of their child. In case of any confusion as regard the date of birth the various relevant document about the date of birth were examined. Only the healthy children i.e. those who were not suffering from any congenital or nutrition deficiency diseases were considered for the study.

**Statistical Analysis**

All observation was noted on a common standard proforma and later the findings will tabulated to draw necessary conclusion. A predesigned proforma will fill up for every case, master chart was prepared.

**Table 1: Distribution of age**

Age Group In Years	Total No Cases	Percentage
5-6 Years	7	8.23%
6-7 Years	11	12.94%
7-8 Years	8	9.41%
8-9 Years	10	11.76%
9-10 Years	15	17.64%
10-11 Years	20	23.52%
11-12 Years	14	16.47%
<b>Total</b>	<b>85</b>	<b>100%</b>

**Table 2: Incidence of appearance of various carpal bones in female children in the age group of 5 to 6 years**

Total Case Examined	Total Number Of Female Children Showing Appearance Of Various Carpal Bone							
	Capitate	Hamate	Triquetral	Lunate	Trapezium	Trapezoid	Scaphoid	Pisiform
7	7	7	7	7	6	4	2	0
<b>Percentage</b>	100%	100%	100%	100%	85.71%	57.14%	28.57%	0%

**Table 3: Incidence of appearance of various carpal bones in female children in the age group of 6 to 7 years**

Total Case Examined	Total Number Of Female Children Showing Appearance Of Various Carpal Bone							
	Capitate	Hamate	Triquetral	Lunate	Trapezium	Trapezoid	Scaphoid	Pisiform
11	11	11	11	11	10	11	10	0
<b>Percentage</b>	100%	100%	100%	100%	90.90%	100%	90.90%	0%

**Table 4: Incidence of appearance of various carpal bones in female children in the age group of 7 to 8 years**

Total Case Examined	Total Number Of Female Children Showing Appearance Of Various Carpal Bone							
	Capitate	Hamate	Triquetral	Lunate	Trapezium	Trapezoid	Scaphoid	Pisiform
8	8	8	8	8	8	8	8	0
<b>Percentage</b>	100%	100%	100%	100%	100%	100%	100%	0%

**Table 5: Incidence of appearance of various carpal bones in female children in the age group of 8 to 9 years**

Total Case Examined	Total Number Of Female Children Showing Appearance Of Various Carpal Bone							
	Capitate	Hamate	Triquetral	Lunate	Trapezium	Trapezoid	Scaphoid	Pisiform
10	10	10	10	10	10	10	10	1
<b>Percentage</b>	100%	100%	100%	100%	100%	100%	100%	10%

**Table 6: Incidence of appearance of various carpal bones in female children in the age group of 9 to 10 years**

Total Case Examined	Total Number Of Female Children Showing Appearance Of Various Carpal Bone							
	Capitate	Hamate	Triquetral	Lunate	Trapezium	Trapezoid	Scaphoid	Pisiform
15	15	15	15	15	15	15	15	3
<b>Percentage</b>	100%	100%	100%	100%	100%	100%	100%	20%

**Table 7: Incidence of appearance of various carpal bones in female children in the age group of 10 to 11 years**

Total Case Examined	Total Number Of Female Children Showing Appearance Of Various Carpal Bone							
	Capitate	Hamate	Triquetral	Lunate	Trapezium	Trapezoid	Scaphoid	Pisiform
20	20	20	20	20	20	20	20	18
Percentage	100%	100%	100%	100%	100%	100%	100%	90%

**Table 8: Incidence of appearance of various carpal bones in female children in the age group of 11 to 12 years**

Total Case Examined	Total Number Of Female Children Showing Appearance Of Various Carpal Bone							
	Capitate	Hamate	Triquetral	Lunate	Trapezium	Trapezoid	Scaphoid	Pisiform
14	14	14	14	14	14	14	14	14
Percentage	100%	100%	100%	100%	100%	100%	100%	100%

**Table 9: Average age of appearance of carpal bone in female children examined.**

Carpal Bone	Appearance In Year
Capitate	Below 5 Years
Hamate	Below 5 Years
Triquetral	Below 5 Years
Lunate	Below 5 Years
Trapezium	5 To 6 Years
Trapezoid	6 To 7 Years
Scaphoid	6 To 7 Years
Pisiform	10 To 11 Years

**RESULTS & DISCUSSION**

Keeping in view that the time of appearance of various carpal bones in a human being varies with geographic distribution and that it is possible to determine the approximate age of a child by radiological examination of the wrist joint till adolescent age and that the survey committee (1964)<sup>3</sup> on medicolegal practice in India, had recommended to Government, for encouraging zone-wise study of the problem of determination of age. In the study 85 female child were randomly selected, whose age was 5 year to 12 years and who attend the Dr. S.N. Medical College and Associated Group of Hospitals, Jodhpur for various purposes.

Capitate, Hamate, Triquetral & Lunate bones appears at birth in two out of three Bengal girls & one out of three Bengal boys (Galstaun 1937).<sup>4</sup> Galstaun had further reported that this bone generally appears some time during the first year and even earlier in girls. We observed, on the time of appearance of this carpal bone as in the literature the appearance of this carpal bone is very early, and much earlier to the 5-6 years age group of the children. Similar results to that of Flecker (1942)<sup>5</sup> on one hand. Much later appearance of this bone so much of never before 6 years in the U.P. female children have been reported by Hasan and Narayan (1963).<sup>6</sup> When the results of this present study are compared with the studies of past workers, it may be stated that the present finding are in the line of the observations of Hasan and Narayan in the children of U.P. in both sexes.

The time of appearance of scaphoid is 6 to 7 year in Jodhpur girls which was almost similar to the findings of earlier workers of different provinces. As regards the appearance of scaphoid in Jodhpur boys the appearance is somewhat late by a year or so to the children of other provinces.

The time of appearance of Pisiform is 10 to 11 years amongst the girls of Jodhpur region and is in the line with that of Paterson (1929)<sup>7</sup> in English girls, Flecker (1942)<sup>5</sup> in Australian girls, Galstaun (1937)<sup>4</sup> in Bengalese girls and M. Hasan and D. Narayan (1963)<sup>6</sup> in U.P. girls.

**Table 10: Comparison of various studies**

Studies	Total Number Of Female Children Showing Appearance Of Various Carpal Bone							
	Capitate	Hamate	Triquetral	Lunate	Trapezium	Trapezoid	Scaphoid	Pisiform
Paterson (1929) <sup>7</sup> England	6 months	6 months	2-3 years	3-4 years	4-5 years	4-5 years	6 years	9-10 years
Flecker (1942) <sup>5</sup> Australia	6 months	10-11 months	3-4 years	3 years	5 years	6 years	4 years	10years
Galstaun (1937) <sup>4</sup> Bengal	6 months	8-14 months	2-3 years	5 years	5-6 years	5-6 years	6 years	9-12 years
Hasan & Narayan (1963) <sup>6</sup> U.P.	Within 6 months	Within 6 months	3 years	6 years	6 years	6 years	7 years	11 years
Present Study, Jodhpur (Raj.)	Below 5 years	Below 5 years	Below 5 years	Below 5 years	5 – 6 years	6 – 7 years	6-7 years	10-11 years

**CONCLUSION**

We concluded that Triquetral and lunate carpals appear after capitate and hamate. Triquetral appeared at the age of 3-4 years

and lunate at the age of 4-5 years. Trapezium, trapezoid and scaphoid carpals appeared between the age of 5 to 9 years. Their appearance was slightly earlier in females than in males.

## REFERENCES

1. Davies, D.A. and Parson (1927): F.H.: JI. Anatomy 62: 58.
2. Goel and Saraswat (1996): Manual of medicolegal practice, 1 st Ed. pg. 112-117.
3. Survey Committee (1964): Survey Committee report on Medicolegal Practice in India, Director General of Health Services. Ministry of Health, New Delhi.
4. Galstaun G. A study of ossification as observed in Indian subject. Indian Journal Medical Research 1937; 25, 267-324.
5. Flecker H. Time of appearance and fusion of ossification centers as observed by roengetographic methods: American Journal of Roengetology; 1942,47,97-159.
6. Hasan, M. and Narayan, D. (1964), Radiological study of the postnatal ossification of the upper end of Humerus in U.P. Indians. J. Anat. Soc. India, 13: 70-75.
7. Paterson RS. Some factors influencing epiphyseal growth and union. January 18, 1929:691-95.

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