

## A Prospective Study to Evaluate the Age Estimation on the Appearance of Pisiform Bone

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### Abstract

**Background:** The human skeleton bones are pre-formed in the form of hyaline cartilage. In most of the countries, the proof of a child being under or over the age of legal matters is needed for various legal decisions and processes. The aim of present study is to Evaluate the Age Estimation on the Appearance of Pisiform Bone. **Materials and Methods:** The present descriptive cross-sectional study was performed at the department of Forensic Medicine. Children above the age of 15 years were excluded from the study. X-rays with congenital anomalies or indicating fractures were also excluded from the study. All the data thus obtained was arranged in a tabulated form and analysed using SPSS software. **Results:** Amongst 7-8 years, 8-9 years and 9-10 years age group, there were no males that showed the presence on pisiform bone. The bone did not appear in any of the children. Amongst 13-14 years and 14-15 years of age, all the males showed presence of pisiform bone. **Conclusion:** In our study, the ossification begins at 10 years of age amongst males and 9 years of age amongst the females. By 13 years of age all the cases showed ossified bone.

**Keywords:** Congenital, Ossification, Pisiform, Hyaline.

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### Introduction

The human skeleton bones are pre-formed in the form of hyaline cartilage. This cartilage model is slowly converted into hard tissue by the process of osteogenesis that mostly begins from the centre, from which the process spreads to periphery, until the complete bones are ossified[1]. There changes are age dependent and there may be imbalance between bones from different areas of the same child. In most of the countries, the proof of a child being under or over the age of legal matters is needed for various legal decisions and processes. If there is any confusion about the age of child, authorities and courts normally request a medical age certificate issued by experts[2]. The evaluation of bone age is most commonly done on the basis of X-rays of the hand and wrist, that are compared to similar reference atlases provided by Greulich and Pyle (GP) and Tanner and Whitehouse[3, 4]. Pisiform bone is ossified between the age of 9 to 13 years as shown in different studies[5,6] The aim of present study is to Evaluate the Age Estimation on the Appearance of Pisiform Bone.

### Materials and methods

The present descriptive cross-sectional study was performed at the department of Forensic Medicine. A total of 190 X-rays were studied amongst which 100 were those of males and 90 were those of females. A age was categorised over a period of 1 year. The study was approved by the institutional ethical board. The X-rays were taken for different orthopaedic and surgical issues. Children above the age of 15 years were excluded from the study.

X-rays with congenital anomalies or indicating fractures were also excluded from the study. The presence of ossification centre was categorised as Appeared and otherwise classified as not appeared. The X-rays were analysed by two different radiologist to eliminate human error. All the data thus obtained was arranged in a tabulated form and analysed using SPSS software. P value of less than 0.05 was regarded as significant.

### Results

The study enrolled 190 children amongst which 100 were males and 90 were females. All the subjects were aged between 7-15 years of age.

Table 1 shows the Age of appearance of Pisiform in males. Amongst 7-8 years, 8-9 years and 9-10 years age group, there were no males that showed the presence on pisiform bone. The bone did not appear in any of the children. Amongst 10-11 years of age group, the bone appeared amongst 40% of the subjects and was not seen in 60% of the subjects. Amongst 11-12 years of age group, the bone appeared amongst 20% of the subjects and was not seen in 80% of the subjects. Amongst 13-14 years and 14-15 years of age, all the males showed presence of pisiform bone. Table 2 shows the Age of appearance of Pisiform in females. Amongst 7-8 years and 8-9 years age group, there were no females that showed the presence on pisiform bone. The bone did not appear in any of the children. Amongst 9-10 years of age group, the bone appeared amongst 30% of the subjects and was not seen in 60% of the subjects. Amongst 10-11 years of age group, the bone appeared amongst 66.7% of the subjects and was not seen in 33.3% of the subjects. Amongst 11-12 years and 13-14 years of age group, the bone appeared amongst 50% of the subjects and was not seen in 50% of the subjects. Amongst 14-15 years of age, all the females showed presence of pisiform bone.

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**Table 1: Age of appearance of Pisiform in males**

Age(years)	Appeared numbers	Not appeared number	Total
7-8	0	10(100%)	10
8-9	0	8(100%)	8
9-10	0	12(100%)	12
10-11	4 (40%)	6(60%)	10
11-12	6(20%)	24(80%)	30
12-13	0	0	0
13-14	15(100%)	0	15
14-15	15(100%)	0	15

**Table 2: Age of appearance of Pisiform in females**

Age(years)	Appeared numbers	Not appeared number	Total
7-8	0	11(100%)	11
8-9	0	7(100%)	7
9-10	3(30%)	6(60%)	10
10-11	8 (66.7%)	4(33.3%)	12
11-12	5(50%)	5(50%)	10
12-13	5(50%)	5(50%)	10
13-14	17(100%)	0	17
14-15	13(100%)	0	13

### Discussion

A huge number of ossification centres are first observed in embryonic life, some of them appear much later during their prenatal life, and others after birth. Some bones are calcified from a single center, like, carpus and tarsus. Majority bones are ossified from different separate centres, one of which Most appear near the middle of the future ossification. This center is related with progressive ossification towards the ends of bone. Age estimation is determined by the observation of various parameters. The age of ossification of the Pisiform bone can be a crucial evidence to support for the estimation of age between the range of 9 to 14 years. The hand – wrist area consists of various small bones that have a predictable and scheduled way of appearance of centres of ossification and union of the epiphysis from birth of the child to maturity. Hence, this area is one of the crucial parts to be examined for the estimation of age[6]. The helpfulness of carpal bones in judgment of age has been shown in other studies also[7-10]. In our study, amongst males, 7-8 years, 8-9 years and 9-10 years age group, there were no males that showed the presence on pisiform bone. The bone did not appear in any of the children. Amongst 10-11 years of age group, the bone appeared amongst 40% of the subjects and was not seen in 60% of the subjects. Amongst 11-12 years of age group, the bone appeared amongst 20% of the subjects and was not seen in 80% of the subjects. Amongst 13-14 years and 14-15 years of age, all the males showed presence of pisiform bone. Amongst females, 7-8 years and 8-9 years age group, there were no females that showed the presence on pisiform bone. The bone did not appear in any of the children. Amongst 9-10 years of age group, the bone appeared amongst 30% of the subjects and was not seen in 60% of the subjects. Amongst 10-11 years of age group, the bone appeared amongst 66.7% of the subjects and was not seen in 33.3% of the subjects. Amongst 11-12 years and 13-14 years of age group, the bone appeared amongst 50% of the subjects and was not seen in 50% of the subjects. Amongst 14-15 years of age, all the females showed presence of pisiform bone. Srivastav et al[11] did a radiographic study on pediatric subjects of Rajasthan, India between the birth to 12 years of age amongst both the sexes. It ossified at the age of 10 years in all the subjects. As studied by Patil et al[5] the minimum age of ossification of Pisiform was 8 years in both sexes, amongst the children of Vijaypur, India.

### Conclusion

In our study, the ossification begins at 10 years of age amongst males and 9 years of age amongst the females. By 13 years of age all the cases showed ossified bone. The information can be used for the forensic matters and during the legal matters.

### References

1. Reddy KSN. The Essentials of Forensic Medicine and Toxicology. Om Sai Graphics, Hyderabad, India: 32<sup>nd</sup> edition; 2013.
2. Schmeling A, Rudolf E, Vieth V, Geserick G. Forensic Age Estimation. Dtsch Arztebl Int. 2016;113(4):44-50.
3. Greulich WW, Pyle SI. Radiographic atlas of skeletal development of the hand and wrist. Stanford University Press, Stanford, 1959.
4. Tanner JM, Healy MJR, Goldstein H, Cameron N. Assessment of skeletal maturity and prediction of adult height (TW3 method). Saunders, London, 2001.
5. Patil RC, Magi A, Mugadlimath A, Hiremath R. Age estimation based on appearance of pisiform bone: a radiographic study from North-Karnataka. Indian Journal of Forensic and Community Medicine. October- December 2016;3(4):240-4.
6. Singh G. Textbook of Orthodontics. Jaypee publishers: 2nd edition; 2007:135.
7. Cameriere R, Ferrante L. Age estimation in children by measurement of carpals and epiphyses of radius and ulna and open apices in teeth: a pilot study. Forensic Sci Int. 2008n ;174 (1):60-3.
8. Dogaroiu C, Capatina CO, Gherghie EV, Avramoiu M. The importance of the ossification centre morphology in the left hand-wrist bones for age evaluation. Rom J Leg Med. 2014; 22:105-8.
9. Cameriere R, Ferrante L, Mirtella D, Cingolani M. Carpals and epiphyses of radius and ulna as age indicators. Int J Legal Med. 2006;120(3):143-6.
10. Ashutosh A, Anupam J, Mathur RK. Estimation of Age in Pediatric Age Group by Wrist Ossification Centers. Indian Journal of Forensic Medicine & Toxicology. 2016;10(2):163-7.
11. Srivastav A, Saraswat PK, Agrawal SK, Gupta P. A study of wrist ossification for age estimation in pediatric group in central Rajasthan. JIAFM. 2004;26(4):132-5.

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