

## Original Article

# Radiological Study of the Appearance and Fusion of Ischial Tuberosity in the Bikaner Region in the 14-22 Years Age Group

Indubala Mathur<sup>1\*</sup>, Bhavesh Bohra<sup>2</sup>, Yogesh Sharma<sup>3</sup>, Ashok Kumar Jain<sup>4</sup>, Vijaypal Khanagwal<sup>5</sup>

<sup>1</sup>Assistant Professor, <sup>4</sup>Professor and HOD, Department of Forensic Medicine & Toxicology, Chirayu Medical College & Hospital, Bhopal, Madhya Pradesh, India

<sup>2</sup>Assistant Professor, Department of Forensic Medicine & Toxicology, Jhalawar Medical College, Jhalawar, Rajasthan, India

<sup>3</sup>Associate Professor, Department of Forensic Medicine & Toxicology, S.P. Medical College and Hospital, Bikaner, Rajasthan, India

<sup>5</sup>Professor, Department of Forensic Medicine & Toxicology, PGIMS Rohtak, Haryana, India

Corresponding author email id: \*dr.ibmthur@gmail.com; <sup>2</sup>drbhaveshbohra@yahoo.co.in; <sup>4</sup>anushokjain@gmail.com;

<sup>3</sup>dryogeshsharma958@yahoo.com; <sup>5</sup>drvijaykhanagwal@yahoo.co.in

## ABSTRACT

Correct age determination is of great relevance in legal prosecution. The principal means that enable one to form a fairly accurate opinion about the age of an individual are general physical development, dentition, secondary sex characters and ossification of bones. Among them, radiological examination of the ossification process is most accurate than any other method, up to the age of 20 years. This study involves radiological examination of the pelvis (Antero-posterior view) of 169 individuals to study the age-related appearance and fusion of ossification centre of ischial tuberosity in both male and female subjects aged 14-22 years at the SP Medical college, Bikaner, Rajasthan.

**Keywords:** Age estimation, Ischial tuberosity, X-Rays Appearance, Fusion, Ossification centres

## INTRODUCTION

Estimation of reasonably accurate age plays a pivotal role in civil/criminal cases, like personal identification, fixing of criminal responsibility, judicial punishment, i.e. in cases of rape, kidnapping, criminal abortion, attempted or evident murder, theft, burglary or dacoity, and in various schemes of the social welfare department, i.e. employment, attainment of majority, marriage contract, etc.

The Survey Committee,<sup>[1]</sup> while reporting on the medico-legal practice in India, recommended the government to encourage zone-wise study to solve the problem of determination of age. As various workers suggest, there is a variation in age estimation, not only from country-to-country but also in different states of India.

## MATERIAL AND METHODS

This study was carried out in the Department of Forensic Medicine and Toxicology in association with the radio

diagnosis department of the SP Medical College and Hospital, Bikaner, Rajasthan. The subjects were selected randomly from various schools; from the neighbourhood of various faculty members and staff; as well as from cases attending the Door Patients of the Forensic Medicine Department at the PBM Hospital, Bikaner, Rajasthan. The persons selected for study were grouped as per their stated age, viz: 14-15, 15-16, 16-17, 17-18, 18-19, 19-20, 20-21 and 21-22 years. Here, age 14-15 years meant person of 14 years or more but below 15 years. Age, as stated by them, is further confirmed by secondary school certificate, any document reflecting their exact age or entry in their school record.

Radiological data of appearance and fusion of ossification centre of the ischial tuberosity were accumulated in the form of table of various age groups. Finally, the data thus obtained were analysed and compared with the published works of various Indian and foreign workers.

**OBSERVATION**

**In Boys**

The appearance of the ossification centre of ischial tuberosity was observed earliest at the age of 15 years, 8 months and 26 days in our study. The appearance of the ossification centre of ischial tuberosity was observed in 89.47% of the cases in the age group of 18-19 years and in 100% of the cases in the age group of 19-20 years and above. Average age of appearance of ischial tuberosity in boys was observed at 18-19 years in our study. Complete fusion of ischial tuberosity was observed earliest at the age of 17 years and 28 days in the present study. Complete fusion of ischial tuberosity was observed in 81.82% of the cases in the age group of 20-21 years. In boys, the average age of fusion of ischial tuberosity was found to be 20-21 years in our study. The age of the oldest subject not showing complete fusion of ischial tuberosity was 21 years, 9 months and 21 days in our study. (Table 1)

**Table 1: Appearance and fusion of the centre of ischial tuberosity in boys**

S.No.	Age	No. of cases	Appearance		Partial fusion		Fusion	
			No.	Percentage	No.	Percentage	No.	Percentage
1.	14-15	7	-	-	-	-	-	-
2.	15-16	10	2	20	-	-	-	-
3.	16-17	17	6	35.29	1	5.88	-	-
4.	17-18	25	16	64	1	4	2	8
5.	18-19	19	17	89.47	3	15.79	7	36.84
6.	19-20	10	10	100	1	10	6	60
7.	20-21	11	11	100	2	18.18	9	81.82
8.	21-22	12	12	100	2	16.67	10	83.33

**In Girls**

The appearance of the ossification centre of ischial tuberosity was observed earliest at the age of 15 years, 1 month and 1 day in our study. The appearance of the ossification centre of ischial tuberosity was observed in 94.74% of the cases aged 17-18 years and in 100% of the cases aged 19-20 years and above. The average age of appearance of ischial tuberosity in girls was 17-18 years in our study. Complete fusion of ischial tuberosity was observed earliest at the age of 15 years, 2 months and 3 days. Complete fusion of ischial tuberosity was observed in 100% of the cases in the age group of 20-21 years and

in 75% of the cases in the age group of 21-22 years. The average age of fusion of ischial tuberosity in girls was 20-21 years in our study. The age of the oldest subject not showing complete fusion of ischial tuberosity was 21 years, 9 months and 13 days in the present study (Table 2).

**Table 2: Appearance and fusion of the centre of ischial tuberosity in girls**

S.No.	Age	No. of cases	Appearance		Partial fusion		Fusion	
			No.	Percentage	No.	Percentage	No.	Percentage
1.	14-15	2	-	-	-	-	-	-
2.	15-16	4	4	100	2	50	1	25
3.	16-17	6	4	66.67	3	50	-	-
4.	17-18	19	18	94.74	7	36.84	2	10.53
5.	18-19	10	9	90	-	-	3	30
6.	19-20	5	5	100	2	40	3	60
7.	20-21	4	4	100	-	-	4	100
8.	21-22	8	8	100	2	25	6	75

**DISCUSSION**

In our study, we observed that the average age of appearance of ossification centre of ischial tuberosity in males was 18-19 years. The finding in our study was consistent with the observation of the study of Flecker<sup>[2]</sup> (Australia) and Grant’s Anatomy.<sup>[3]</sup>

In our study, we observed that the average age of fusion of the ossification centre of ischial tuberosity in males was 20-21 years, which was consistent with the age stated by Rao,<sup>[4]</sup> Reddy,<sup>[5]</sup> Krishanan<sup>[6]</sup> and Pillay<sup>[7]</sup> in their textbooks.

In our study, we observed that the average age of appearance of ossification centre of ischial tuberosity in females was 17-18 years, which was higher than the observations of Singi *et al.*<sup>[8]</sup> (India), Abdulla and Bhasharaheel<sup>[9]</sup> (Yemen) and Tailor *et al.*<sup>[10]</sup> (Surat), wherein it was seen at 15-16 years of age.

In our study, we observed that the average age of the fusion of the ossification centre of ischial tuberosity in females was 20-21 years. The finding of our study was consistent with the findings of Rao,<sup>[4]</sup> Reddy<sup>[5]</sup> and Pillay<sup>[7]</sup> as stated in their textbooks. The finding of our study was also consistent with the observations of Tailor *et al.*<sup>[10]</sup> (Surat) and Sangama *et al.*<sup>[11]</sup> who studied the girls of

the north-eastern region of India and noted it in females aged 21 years. (Table 3)

**Table 3: Appearance and fusion of ossification centre of ischial tuberosity as reported by different workers and authors**

Fusion		Appearance		Ossification of ischial tuberosity
Male	Female	Male	Female	
20-21	20-21	17-18	18-19	Present study
20	20	14-16	16-18	Galstaun <sup>[12]</sup>
20	20	14-16	16-18	Bhaisora and Choudhary <sup>[13]</sup>
20	20	14-15	15-17	Apurba Nandy <sup>[14]</sup>
19-21		15-17		Krishan Vij <sup>[15]</sup>
20		15	17	Alok Kumar <i>et al.</i> <sup>[16]</sup>
20	20	14-16	16-18	Bardale Rajesh <sup>[17]</sup>
19-20	20-21	15-17	16-18	Krishanan <sup>[6]</sup>
-	-	15-16	16-17	Singj <sup>[8]</sup> <sup>[20]</sup> <sup>[2]</sup>
21-22	15-16	17-18		Nagi Abdul Wahab Abdulla <sup>[9]</sup> (2008)
-	20	16	19	Flecker <sup>[2]</sup> (1932)(Australians)

## CONCLUSION

The findings of our study give strength to the reports of other workers and of the survey committee, as they suggest the government to encourage zone-wise studies to solve the problem of determination of age. This study is an attempt which can be a valuable aid for a forensic practitioner to give the approximate age certificate in medico-legal cases.

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