Original Article

Epiphyseal Fusion of Radius and Ulna at Wrist Joint in Male and Female in the Population of Lahore – An Age Estimation Criterion

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ABSTRACT

Objective: To ascertain the age of maturity from x-rays of wrist joint in the population of Lahore.
Study Design: Observational / cross sectional Study
Place and Duration of Study: This study was conducted at the Postgraduate Medical Institute/Ameer ud Din Medical College in the Department of Forensic Medicine & Toxicology Lahore General Hospital, Lahore from Jan-Dec 2017.
Materials and Methods: One hundred (100) patients reporting to radiology department of LGH between age group of 13 years to 21 years were included in this study, and these x-rays were reported by a radiologist of the hospital regarding the state of union of epiphysis of lower end of radius and ulna bones.
Results: Most of the people belong to Muslim religion (97%) of the total 100 reported to the General Hospital, Lahore. In females, age group of 13-15 years consisted 24% of the total cases in which 9 cases reported at stage II in which center appeared but no union found and 3 cases has early union. In age group 16-18 years, one case recorded in stage II and 9 cases were recorded at stage III in which early union appeared and 6 cases were recorded at stage IV in which complete union appeared in age group 19-21 years, only one case placed in stage III and 21 cases were placed in stage IV in which complete union was found. In males, age group of 13-15 years consisted 20% of the total cases in which 5 cases reported at stage II in which center appeared but no union found and 3 cases has early union. In age group 16-18 years, one case recorded in stage II and 11 cases were recorded in stage III in which early union appeared and 5 cases were recorded in stage IV in which complete union appeared and age group 19-21 years, 23 cases were placed at stage IV in which complete union found.
Conclusion: This study proved that x-rays of wrist joint can be used as an important tool for maturity assessment in the your of Lahore and it is consistent with the previous studies.

Key Words: Epiphyseal Fusion, Age Estimation, Radiology Department, Lahore General Hospital

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INTRODUCTION

Age certification has always been a challenging task for forensic experts. It is required to be ascertained in certain legal / judicial cases. Precise estimation of age without proper documentation is not a simple task. It requires expertise of many specialists like anthropology, odontology and radiology, so in a broader scene, "age assessment" refers to an attempt to establish an individual's age including documentary evidence[1].

Maturity is not synonyms with calendar age, there are social, nutritional, racial and other biological variations. Females are almost always advance of males, maturity is also rapid in hotter climate[2].

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Skeletal maturity is most widely used for age assessment[3]. This examination is universally used due to its simplicity and availability of multiple ossification centers for evaluation of maturity. The formation of bone tissue is called ossification which proceeds in a systematic and organized manner[4].

Radiological examination of bone ends shows this process with accuracy till the ossification is completed in 22 years[5]. In dead bodies one can see the bone directly but in case of living it is not possible so x-rays are of much help[6]. The majority of current radiological standards are based upon Caucasian population. And growth standard deviation may be found in different nations which need more work[7]. The complete union of lower end of radius is seen in 100% boys at 20-21 years and is 100% in female at 19-20 years of complete union[8].

The average age of fusion of lower end ulna in female is 15-16 years and 18-19 years in males[9]. Study of epiphyseal union of bones is law all over the world therefore it is necessary to follow the latest data

available for a particular place for estimation of age of the population of that place.

MATERIALS AND METHODS

It was a cross-sectional study conducted in 2017 in Department of Forensic Medicine & Toxicology, PGMI/AMC in Lahore General Hospital, Lahore forensic medicine department in collaboration with radiology department. The inclusion criteria comprised (1) individual of age from 13-21 years, both sex. Irrespective of socio-economic status. Person with congenital bone deformity fracture of wrist joint on steroid therapy and pregnant women were excluded.
Patients were x-rayed for wrist joint after getting informed consent and age was assessed by some documentary evidences too. Sample size was 100 (50 of both sexes). These x-rays were reported by single Radiologist regarding state of epiphyseal fusion of lower end of radius and ulna and the data was analyzed.

RESULTS

These 100 subjects out of which male /female ration is 50/50 were x-rayed and the age range of 13-21 years for both sexes was strictly followed. 97% of the respondents were Muslims, 2% were Christian and one percent were from other religions. Occupation of the subjects were also recorded 2% were fine workers which are working in offices, 10% belongs to labourer category, 82% were student which was the highest numbers, 5% were house wives and 1% belonged to other occupations. Socio-economic status is also a major factor which was included in this research as 8% people belonged to upper class, 72% respondents were from middle class and 20% were from lower class.

Table No.1: Frequency of Ethnicity Variables among Study Subjects

		Frequency	%age
Religion	Muslims	97	97%
	Christians	2	2%
	Others	1	1%
Occupation	Fine Workers	2	2%
	Labourers	10	10%
	Students	82	82%
	House Wives	5	5%
	Others	1	1%
Socio-economic Status	Upper Class	8	8%
	Middle Class	72	72%
	Lower Class	20	20%
Mother Tongue	Punjabi	75	75%
	Urdu Speaking	16	16%
	Pashto	5	5%
	Saraiki	4	4%
	Others	0	0%

Different languages are being spoken in this country so mother tongue has also great importance in this region and education level of the people is not so high also. That's why mother tongue is included in this study.

Table No.2: Frequency and extent of fusion of wrist joint in different age Groups in Females

Age Group (years)	Age	Stage 1 Center not	Stage II Center	Stage III Early Union	Stage IV Complete
13-15 Years (24%)	13	--	4	--	--
	14	--	3	--	--
	15	--	2	3	--
16-18 Years (32%)	16	--	1	3	--
	17	--	--	6	--
	18	--	--	--	6
19-21 Years (44%)	19	--	--	1	8
	20	--	--	--	7
	21	--	--	--	6

Table No.3: Frequency and extent of fusion of wrist joint in different age Groups in Males

Age Group (years)	Age	Stage 1 Center not	Stage II Center	Stage III Early	Stage IV Complete
13-15 Years (20%)	13	--	2	--	--
	14	--	4	--	--
	15	--	1	3	--
16-18 Years (34%)	16	--	1	5	--
	17	--	--	6	--
	18	--	--	--	5
19-21 Years (46%)	19	--	--		10
	20	--	--	--	8
	21	--	--	--	5

Table No.4: Frequency of Complete Union Versus Age

Age Group (years)	Age	Total No.of Cases (%age)	Total No. of cases in males (%age)	Total No. of cases in females (%age)
13-15 Years	13	--	--	--
	14	--	--	--
	15	--	--	--
16-18 Years (11%)	16	--	--	--
	17	--	--	--
	18	11 (11%)	5 (5%)	6 (6%)
19-21 Years (44%)	19	18 (18%)	10 (10%)	8 (8%)
	20	15 (15%)	8 (8%)	7 (7%)
	21	11 (11%)	5 (5%)	6 (6%)

This study is conducted in Lahore and it is the land of Punjabi speaking that's why a huge chunk which is 75% subjects were Punjabi speaking, 16% were **Urdu** speaking, 5% were belonged to pushto language, 4% respondents were saraiki speaking.

Regarding frequency and extent of fusion of wrist joint in different age groups from 13-15 year age group complete union occurred in zero % of cases. In males out of total 7 cases none got complete union. In 16-18 years total males were 17 and only 5 got complete union and 19-21 years total 28 cases were seen and all got complete union.

In female, 12 cases were from group 13-15 years, none got complete union, from age 16-18, out of 16 cases 6 got complete union and all 22 cases of age group 19-21 years got complete union, so it is evident from the data that females are faster in getting maturity than males.

DISCUSSION

This study was cross-sectional in nature and conducted at Department of Forensic Medicine & Toxicology, PGMI/AMC/LGH, Lahore, consent was taken in every case and x-rays were done of wrist joint on CR system. There was reported by single radiologist and it reflected that in male and female at 15 years wrist joint did not completely ossify[10]. It is proved that radiology can be used as a best tool to calculate the age in medicolegal and medical cases[11].

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CONCLUSION

This study drew the following scientific conclusion based on the observations and discussion. A number of participants did not report their correct age. In this study it was identified that 100% complete union at lower end of radius was 18-21 years in males and this age was 18-20 years in female[12]. In lower end of ulna bone it was seen at the age of 16-18 years in males and in female at the age of 15-17 years[13].

In females the fusion occurred 1-2 years earlier than males. It was also established by the study, that the epiphyseal fusion is a reliable scientific and economical tool in forensic radiology.

These findings will help in medicolegal cases where the courts will want to know the actual age of some person in both civil and criminal cases.

Author's Contribution:

Concept & Design of Study:	Syed Zia Uddin
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Data Analysis:	Naghmana Bashir, Pervaiz Zarif
Revisiting Critically:	Syed Zia Uddin, Pervaiz Zarif
Final Approval of version:	Syed Zia Uddin

Conflict of Interest: The study has no conflict of interest to declare by any author.

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