

**Research Article****Reliability of Bregma-Lambda Length Measurements in Identification of Sex of Skull****Narasimhamurthy S.<sup>1</sup>, Dileep Kumar R.<sup>2</sup>, Manjunath T. H.<sup>3</sup>, Nagesh Kuppast<sup>4</sup>, Umesh S. R.<sup>5</sup>, ShradhaIddalgave<sup>6</sup>**<sup>1</sup>Assistant Professor, Department of Forensic Medicine and Toxicology, J. J. M. Medical College, Davangere, Karnataka, India<sup>2</sup>Assistant professor, Department of Forensic Medicine and Toxicology, Siddartha Institute of Medical Sciences and Research Center, Tumkur, Karnataka, India<sup>3</sup>Assistant Professor, Department of Forensic Medicine and Toxicology, Subbaiah Institute of Medical Science and Research Center, Shimoga, Karnataka, India<sup>4</sup>Assistant Professor, Department of Forensic Medicine and Toxicology, Karuna Medical College and Research Center, Palakkad, Kerala, India<sup>5</sup>Professor and HOD, Department of Forensic Medicine and Toxicology, M. R. Medical College, Gulbarga, Karnataka, India<sup>6</sup>Assistant Professor, Department of Anatomy, Karuna Medical College and Research Center, Palakkad, Kerala, India**\*Corresponding author**

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**Abstract:** Determination of sex from the skeletal remains is of medico legal importance for establishing the identity of an individual. The determination of deceased sex is first step in skeletal analysis since estimation of age at death, race, and stature depends on sex of the deceased. Total 100 adult human skulls (50 male and 50 female) of known sex available in department of anatomy and Forensic Medicine of M. R. Medical College and K. B. N. Medical College, Gulbarga were studied. Bregma-Lambda length was measured. The demarking point (D.P.) and identification point (I.P.) is calculated and then percentage of bones identified by D.P. and I.P. is recorded. The results were compared with the available literature. Considering the Identification point, 26% of female skulls can be sorted out by this single parameter that is bregma-lambda length alone and by considering the demarking point 2% of female skulls can be sorted out. Still further research studies are needed to validate the reliability of Bregma-Lambda length for sexing of adult crania.**Keywords:** Bregma, Lambda, Bregma-Lambda length, Demarking point, Identification Point, Sexing of cranium.

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**INTRODUCTION**

Identification of gender by the examination of skeleton has been used widely in forensic science. The determination of sex is essential since the other parameters like age, race, and stature depend on sex of deceased. Several forensic anthropologists have described qualitative sex differentiation using many bones, but sexing from single bone like adult skull, hip bone, sacrum are commonly studied. Sex determination using skull alone is still widely used because all the other human skeletons show variable degree of sexual dimorphism.

Different studies have been done earlier by many workers like Pearson [1], Washburn [2, 3], Krogman[4], Armitage [5], etc. Methods of sex determination of human skeletons include both traditional morphological and nontraditional metric methods.

Metric methods consist of:

- Pearson's univariate analysis
- demarking point [6]
- identification point
- use of various indices on the basis of significant measurements,
- multivariate discriminant function analysis technique of Armitage [5].

Since traditional method depends on morphology of bones which in is relies on nutrition, occupation, race and geography of the region. So the traditional method is not reliable in the study of bones.

There are studies on identification of gender by the examination of adult human skulls alone by many authors like Keen [7], Hong Wei Song *et al.* [8] and Deshmukh and Devarshi[9].

The present study is undertaken with a view to study the sex differences in skull of Hyderabad-Karnataka region of Karnataka.

**MATERIALS AND METHODS**

The study was done on 100 adult human skulls of known gender and Bregma-Lambda Length (distance between bregma and lambda) was measured using sliding caliper. Study was conducted in the Department of Forensic Medicine and Toxicology and Department of Anatomy of M. R. Medical College and K. B. N. Medical College Gulbarga, Karnataka. As the first part of the study Bregma-Lambda Length of both male and female skulls were obtained. All the values were tabulated and analyzed statistically by using SPSS software 13. The value of Range, Mean, Standard Deviation (SD), Calculated Range (mean ± 3SD), Demarking Point and Identification Point were obtained. Maximum value of female range was considered as identification point for male. Minimum value of male range was considered as identification point for female. Maximum value of female calculated range was considered as demarcation point for male. Minimum value of male calculated range was considered as demarcation point for female.

Identification point / Demarcation point for female and identification point / demarcation point for male was calculated and subsequently ‘t’ test was applied.

**RESULTS**

The mean bregma-lambda length of male skull was 124.12 mm ranging between 112-136 mm. The mean bregma-lambda length of female skull was 119.66 mm with the values ranging between 100-141 mm. The identification point of male skull was >141 mm and of female skull was <112 mm and percentage of skull identified by IP alone was 0% of male and 26% of females. The SD for male and female were 7.42 and 10.13 respectively. The calculated range of mean ± 3SD in males and females was 101.85-146.39 mm and 89.28-150.04 mm respectively. The demarking point for males was > 150.04 mm and for females it was <101.85 mm, and the percentage of skull identified by DP alone was 0% of male and 2% of females. ‘t’ test was significant with p < 0.05.

The Range, Mean, Calculated Range, Demarking Points (DP) and Identification Point (IP) and the percentage of bones in which sex could be identified by them, are given in Table 1.

**Table 1: Details of measurement**

Details of measurement	Male (mm)	Female (mm)
Mean	124.12	119.66
SD	7.42	10.13
Range	112-136	100-141
Identification Point (IP)	>141	<112
Percentage of skulls identified by IP	0%	26%
Standard error	1.05	1.43
Calculated range (Mean ± 3SD)	101.85-146.39	89.28-150.04
Demarking Point (DP)	>150.04	<101.85
Percentage of skull sexed correctly by DP	0%	02%



**DISCUSSION**

Forensic anthropology is a branch of Forensic Sciences concerned with the application of general anthropological knowledge and methods to the process of law [10, 11]. The female skull retains the gracile

attributes seen in prepubescent skull. Male cranium becomes markedly rougher in adulthood, the differentiating features of sex become more prominent after puberty, again towards old age there occurs blurring of sexually dimorphic traits. So the

determination of sex from bones should ideally be limited to 15-55 years of age[12]. Krogman WM [13] analyzed 750 skeletons and came to a conclusion that the determination of sex is possible with accuracy of about 100% if whole skeleton is available, 92% when skull alone and 98% when both pelvis and skull are available. Harihara studied Japanese skulls by discriminant analysis using measurements like maximum length of skull, maximum breadth of skull, height of skull with 89.7% accuracy [14]. A great number of measurements of the skull have been proposed and used by different investigators during the

past [13,15-19]. Martin and Saller used eighty one measures; Howell described seventy; Hrdlicka lists thirty two; Bass gives twenty three[14]. Cotton F in their study of cranial sutures and craniometric points suggests standardizing the distances with regard to age, sex and body size, in order to decrease the variability of the measurement [20]. In the present study, Bregma-lambda length was studied in hundred skulls of known sex and the results were statistically significant (<0.05). The results were compared with those of previous workers(Table 2).

**Table 2: Results were compared with those of previous workers**

Sl. No.	Name of worker	Male				Female				SS P
		N	M	R	SD	N	M	R	SD	
1	Keen [7]	50	126.5	112-136	6.7	50	121.7	100-145	9.1	--
2	B M Margretts[21]	70	128.39	114-144	6.76	33	121.76	105-147	9.28	<0.001
3	Hong wei Song [8]	30	124.4	--	9.8	30	117.6	--	8.5	<0.001
4	Deshmukh[9]	40	125	108-135	7.96	34	120	90-134	8.86	<0.05
5	Present study	50	124.12	112-136	7.42	50	119.66	100-141	10.13	<0.05

**CONCLUSION**

In this present study considering the identification point of the Bregma-Lamda length 0% of males and 26% of females can be sorted out. By considering demarking point 0% of males and 2% of the female skulls were sorted out. Authors conclude that Bregma-Lamdalength alone can be used to determine the sex of the skull. Still further research studies are needed to validate the reliability of Bregma-Lamda length for sexing of adult crania.

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