

# A Study of Length and Width of Foramen Magnum in North India

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**Abstract:** *Introduction: Anthropometric study is very important in the identification of sex especially when the body has been destroyed as a result of physical injury. The aim of this study, therefore, is to determine the presence of sexual dimorphism in the foramen magnum of skulls of North India region.. The sample comprised 96 skulls, of these skulls 50 are males and 46 females. The result obtained demonstrated that significant sexual dimorphism is present in the cranial base of the said population.*

**Keywords:** Anthropometry, foramen magnum, Opisthion, Basion

## 1. Introduction

The foramen magnum is a three dimensional aperture in central region of the occipital bone. The anterior border of the foramen magnum is formed by basilar process of the occipital bone, the lateral border by the left and right ex-occipitalis and posterior border is formed by the supraoccipital part of the occipital bone [1]. The location of the foramen magnum plays a crucial role in our understanding of human evolution. Usually, the location of the foramen magnum is linked to bipedal behavior or the lack thereof. Due to its relatively protected anatomical position, this area of the skull tends to withstand both physical insults and inhumation somewhat more successful than many other areas of the cranium [2]. Measurement including the length of the foramen magnum achieved on accuracy of almost 85% correct prediction utilizing a cape "coloured" population[3] Hercera [4] indicated that sagittal and transverse dimensions of the foramen magnum were significantly higher in men's skulls.

## 2. Material & Methods

Skull samples were obtained from the department of anatomy. The sample comprised 96 skulls, of these skulls 50 are males and 46 females. Vernier caliper was used to measure the antero-posterior (length A-B) and transverse (width C-D){FIGURE-1} dimensions of the foramen magnum. Statistical descriptions were calculated from the measurements, the mean, standard deviation (SD) and differences were analyzed using T-test and a value of  $P < 0.05$  was considered significant. Study shows significant difference in the length(FML) and width (FMW) of foramen magnum of both sexes.



**Figure1:** A-B =FML, C-D =FMW

**Table 1:** Measurements of foramen magnum

Parameter	mm	SD	T-test	P-value
Length (Male)	35.22	2.17	0.00398	<0.0001
Length (Female)	33.1	2.03		
Width (Male)	27.6	2.26	0.10672	<0.0001
Width (Female)	26.71	1.76		

## 3. Results

The results of the descriptive statistics for 96 crania shows the differences between the male and female variable. Variable under investigation showed statistically significant differences ( $P < 0.0001$ )

**Table 2:** The table showing comparison with previous studies

	Routel et al [8]	Murshed et al [10]	Catalina et al [4]	Gapert et al [9]	Suazo et al [11]	Ukoha U et al [12]	Present study
FML Males	35.5±2.8	37.2±3.2	36.2±2.60	35.91±2.41	36.5±2.6	36.26±2.3	35.22±2.17
FML Female	32.0±2.8	34.6±3.16	34.30±2.04	34.71±1.91	35.6±2.50	34.39±3.88	33.1±2.04
FMW Males	29.6±1.9	31.6±2.99	31.1±2.60	30.51±2.60	30.6±2.5	30.09±2.5	27.60±2.26
Fmw Female	27.1±1.6	29.3±2.99	29.6±1.53	29.6±1.53	29.5±1.9	28.16±1.9	26.71±1.76

## 4. Discussion

Sex determination in the human cranium is generally based.

on size differences and robustiaty [5], These differences are unique to each population and thought to be influenced by genetic, environment and socio-economic factors [6]. The

cranial base has been noted for its ability to remain intact in case where the rest of the cranium has been compromised and researchers have made use of that fact by analyzing sexually significant dimorphic trait for this anatomic region [2,7]. The result in this study demonstrated statistically significant differences between male and female skulls within the studied population. The degree of sexual dimorphism within the foramen magnum may be explained by its development compared to many other skeletal elements. The foramen magnum reaches its adult size rather early in childhood and is therefore unlikely to respond to significant secondary sexual changes.

Population differences are also important in defining sexual differences in the cranium. Therefore sexual differences in the foramen magnum have been studied in various populations. The length and width of the mean foramen magnum of the males in present study are comparable to European[8,9,10,11]and African [12] countries. These variables of foramen magnum are a useful indicator of sex, and comparison to values from other populations demonstrates similar results among some of the populations. It can be argued that due to the limit of expression of methods, involving this anatomical landmark should not be recommended in a situation of complete cranium. It is necessary to know the source population of any unidentified skull and adopt a method based data from that population or a population with similar expression of sexual dimorphism. It can be argued that due to the limit of expression of methods, involving this anatomical landmark should not be recommended in a situation of complete cranium.

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