



## SIZE ANALYSIS OF THE SYMPHYSIS PUBIC IN A NIGERIA POPULATION

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### ABSTRACT

*The human pelvis has shown to hold varying degree of functions, thus this study is aimed at evaluating the role of pubic symphysis on sex estimation. Convenient sampling was done and a total of 1500 Anterior posterior pelvic radiographs were measured (703 males and 797 females between ages 25-45years). Samples were collected from Radiology Department of the University of Port Harcourt Teaching Hospital (UPTH), Braithwaite Memorial Hospital (BMH) Port Harcourt, Federal Medical Center (FMC) Yenagoa, Niger Delta University Teaching Hospital (NDUTH) Okolobiri Bayelsa State, University of Nigeria Teaching Hospital (UNTH) Ituku-Ozalla, Enugu State, National Orthopedic Hospital Igbobi Lagos, University of Abuja Teaching Hospital (UATH) Gwagwalada, FCT, Nigeria. Two horizontal lines were drawn at each pubic rami and the measured distance between them is the width of pubic symphysis. Two vertical lines were drawn one at the superior part of the pubic rami while the other at the inferior parts the rami. The distance between the two lines is the height of pubic symphysis. The results showed that the pubic symphyseal width for males and females are  $3.97 \pm 0.71$  and  $3.96 \pm 0.89$ . The pubic symphyseal height for males and females are  $28.53 \pm 3.53$  and  $25.88 \pm 3.77$  ( $p < 0.05$ ) thus sexual dimorphism exist. The demarking points were  $>37.19$  male and  $<17.94$  female. Sex could be ascertained of 2% male and 4% female.*

**KEYWORDS:** Sexual Dimorphism, Demarking Points.

### INTRODUCTION

The pubic symphysis is a cartilaginous joint in which the articular surfaces, covered by a thin layer of hyaline cartilage, are united by the interpubic disc, which consists of fibrocartilage and may contain a cavity. Movement is negligible. The interpubic disc becomes softer during pregnancy (O'Rahilly, 2008). The pubis bone is the most medio-anterior bone of the os coxa, on the medial side of the obturator foramen. The pubis bones of both os coxae articulate dorsally at the pubic symphysis. Sex determination is the first step of personal reconstruction phase of identification in forensic medicine (Murakami *et al.*, 2000). While the establishment of identity from intact fresh corpses is often obvious, the correct estimation of sex may be difficult after catastrophic events such as fires, high impact crashes and explosions and in criminal cases where highly decomposed bodies are found (Harvey, 1976). Problems of sex identification arise in cases where skeletal remains are fragmentary or are those of juveniles, infants or persons with alterations in genetic code; such as women with Y chromosome (Ferman *et al.*, 1995). Human beings differ in size from each other is

accredited to environmental factors. The Eskimos are a high latitude Arctic group, whereas the Klunk Mound individuals were inhabitants of the American Great Plains (Abrams 2009). The two populations are greatly removed spatially and environmentally, and have differing physiology (Katzmarzyk and Leonard, 1998). It should be noted pelvic girdle morphology is affected by nutrition (Greulich and Thoms 1938, 48-49; Hanna and Washburn 1953, 21-22; Tague 1992), adding yet more variables into the mix. Sex determination from an available skeleton is of great forensic importance and it is also a useful anthropological data. Krogman, 1946 showed that not more than 95% accuracy can be achieved even when all the bones of the human body are present. This makes the identification of sex from a single bone very difficult. Male bones are, however, generally longer, thicker and heavier, with more prominent areas of muscle attachment than those of females. These features are nevertheless subjective hence the need for measurable parameters that are expressed in appropriate scientific methods (Singh *et al.*, 1986). Using the visual method alone, it was shown in two separate studies by (Krogman 1946 and Stewart 1948) that sex

could be assigned to not more than 13% and 23% of cases, respectively. Several studies have been carried out to determine sex from measurements of femoral heads by many workers (Singh and Singh 1972, Singh *et al.*, 1986 Dwight, 1905., Thieme 1957, Javadekar 1961 and Asala, 1998). These authors did not report uniform values for all the races studied from different countries. This is because the measurements might have been affected by racial variations necessitated by diet, heredity, climate and other geographical factors (Luo, 1995). Current studies on sex determination tend to use discriminant function analysis using various bones like the patella, pubis and lateral radiographic cephalometry, respectively (Luo, 1995., Introna *et al.*, 1998 and Hsiao, 199). Steyn and Iscan, 1997 used this method to determine sex from the femur and tibia in a South African white population. It has been shown, however, that the accuracy of these methods range from 83.3% in patella measurements to 100% in lateral radiographic cephalometry. It must be noted that these methods are more cumbersome and require more sophisticated equipment. Nonetheless, the simple methods by Jit and Singh 1966, of identification (IP) and demarking points (DP) for sex determination are less cumbersome, require less measurements and appear to give 100% accuracy consistently. Partuition is another salient function of the pelvis. The two clinical measurements most uniformly taken in detecting abnormalities which could interfere with normal childbirth are the diagonal conjugate, which measures the distance from promontory of sacrum down the lower margin of symphysis pubis, and the measure of distance between the ischial spines, this latter measurement being known by several names as the tuberischii diameter or T.I., outlet transverse diameter, bi-ischial distance, or intertuberous diameter (Nicholson, 1956). Assessment of symphysis and subpubic arch during antenatal ultrasonography of pregnant women can be done to diagnose congenital widening of the symphysis or absence of symphysis altogether (Haque *et al.*, 2016). It has been stated by Berker *et al.*, 2010 that there is a little movement under physiological condition and up to 2mm shift 1 degree rotation occur in the symphysis pubis.

## MATERIALS AND METHODS

Materials used for this research include Electronic digital steel sliding caliper (for linear measurements), marker pen, HB pencil, meter rule, x-ray viewing box and 1500 AP pelvic radiographs of Nigerians.

### Research Design

This is a prospective study of pelvic parameters from patients investigated in Radiology department of seven (7) University teaching hospitals in Nigeria.

### Population for The Study

A total of 1500 Anterior posterior pelvic radiographs were measured (703 males and 797 females) which were distinguished as either male or female based on the basis

of the names of the subjects that is recorded on the radiographs and reinforced by gender details which was in the patient information card. Radiographs were viewed with the help of an x-ray viewing box on which radiographs was placed before any measurement.

### Nature and Source of Data [Study Area]

Samples were collected from radiology department in University of Port Harcourt Teaching Hospital, Braithwaith Memorial Hospital (BMH) Port Harcourt, Federal Medical Centre (FMC) Yenagoa, Niger Delta University Teaching Hospital Okolobiri, University of Nigeria Teaching Hospital Ituku-Azala Enugu, National Orthopedic Hospital Igbobi Lagos, University of Abuja Teaching Hospital. Across the four main geopolitical zones (Southern, Eastern, Western and Northern, parts of Nigeria).

### Inclusion Criteria

1. Only radiographic films that showed the complete pelvis were used
2. Radiographic films used were free from disease conditions and break in the continuity of the pelvis and sacrum.
3. Only radiographs showing completely ossified pelvic were used.

### Exclusion Criteria

Fractured, not completely ossified pelvic radiographs were excluded.

### Sample and Sampling Technique

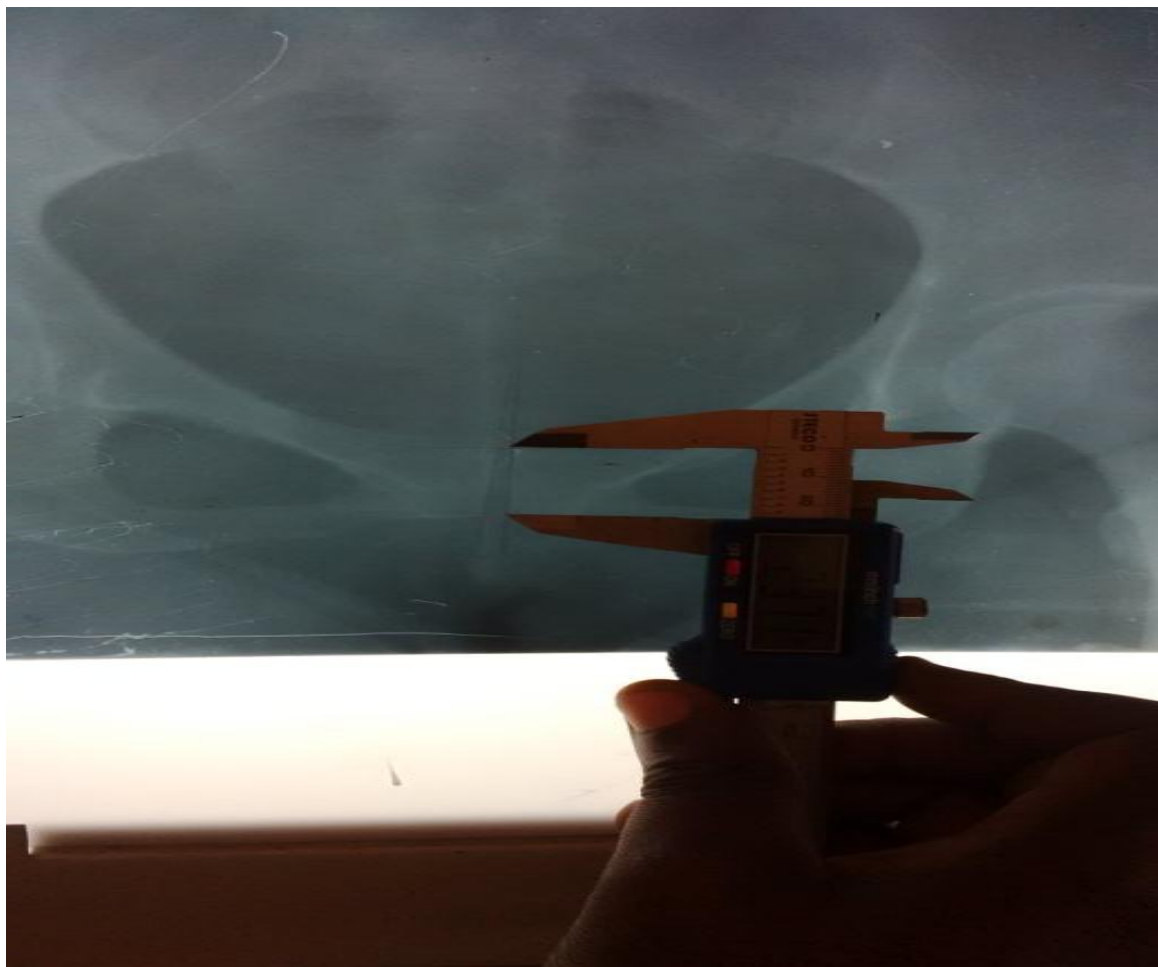
Convenient sampling technique was used. Minimum sample size was calculated using (Moazzam, 2014 formula).  

$$n = Z^2 (P q) / d^2$$

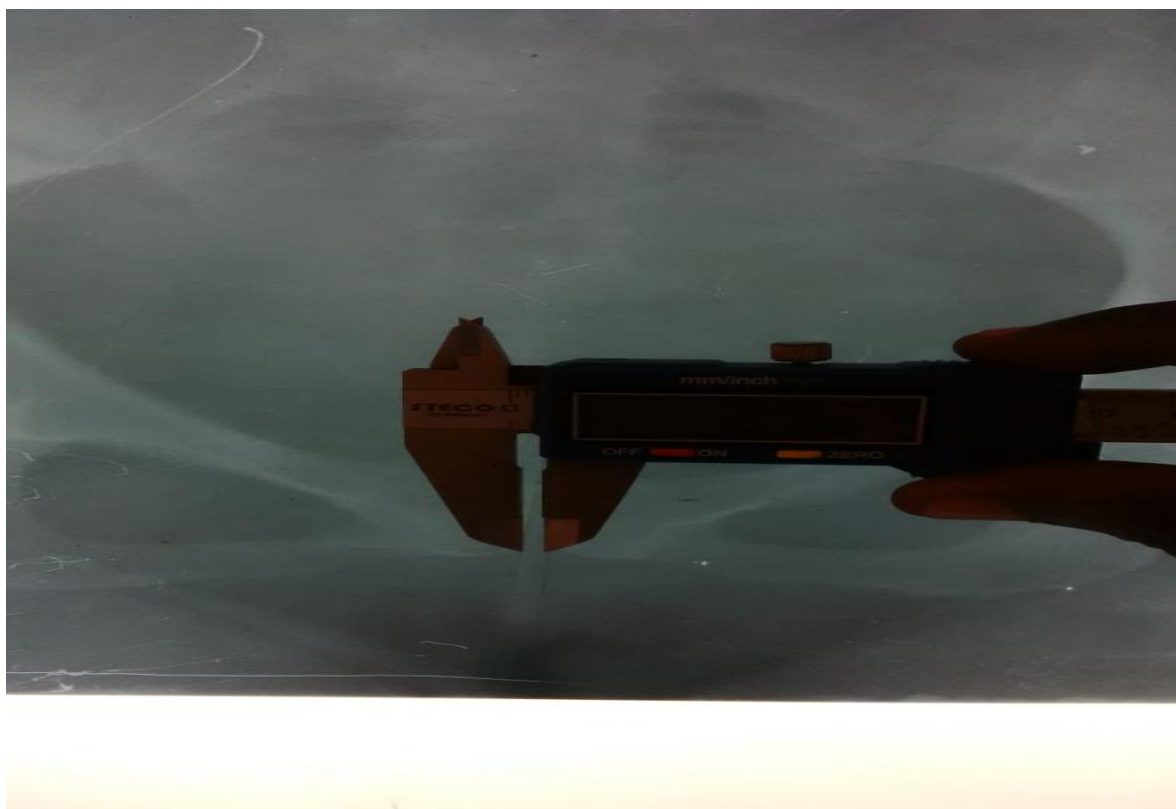
Where,  
 n= minimum sample size  
 Z= the standard normal deviate (Standard Error) at 95% confidence level =1.96  
 p= proportion of the target population (estimated percentage of the population), if no estimate set as 0.5  
 q= 1-p  
 d or e= absolute precision or accuracy (acceptable sample error); set as 0.05  
 n=384

### Measured Parameters

1. **Pubic Symphyseal Width (mm):** Two horizontal lines were drawn at each pubic rami and the measured distance between them is the width which is shown in (figure 1).
2. **Pubic Symphyseal Heights (mm):** Two vertical lines were drawn one at the superior part of the pubic rami while the other at the inferior parts the rami. The distance between the two lines is the height which is shown in (figure 2).



**Figure 1: Measurement of pubic symphyseal height.**



**Figure 2: Measurement of pubic symphyseal width.**

**Methods of Data Analysis**

All data collected for this study were analyzed with Descriptive statistics and Z -test using Statistical Package for Social Science (SPSS) 20.0 version.

Z -Test was considered for the comparison of mean values for each pelvic parameter; when the significant value is at  $P < 0.05$ .

**RESULT**

**Table 1: Mean Values of Male Pubic symphyseal width and height.**

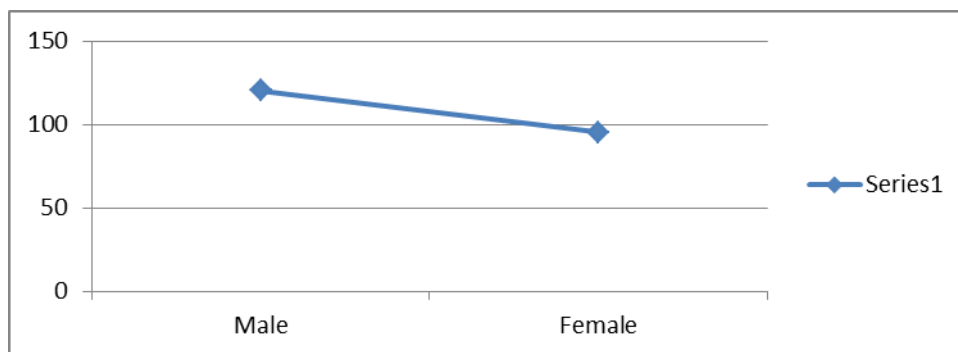
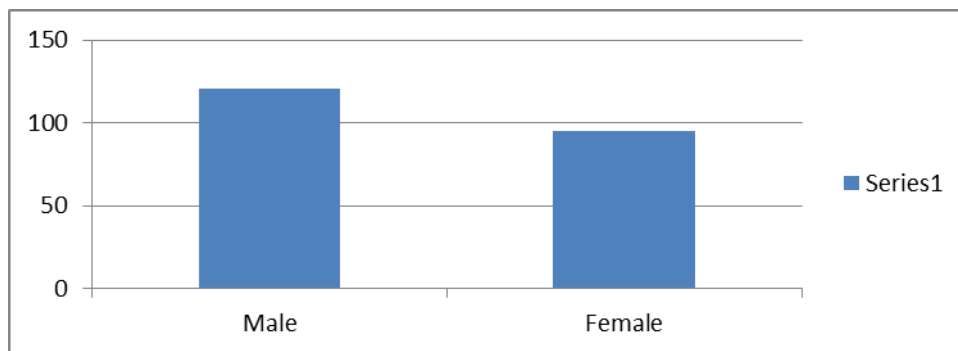
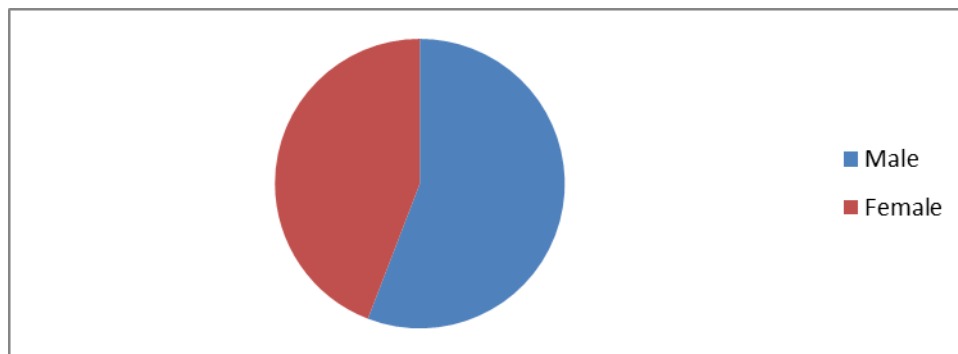
PARAMETER	Males	Females
Pubic Symphyseal Width	3.97± 0.03	3.96± 0.03
Pubic Symphyseal Heights	28.53±0.13	25.88± 0.13

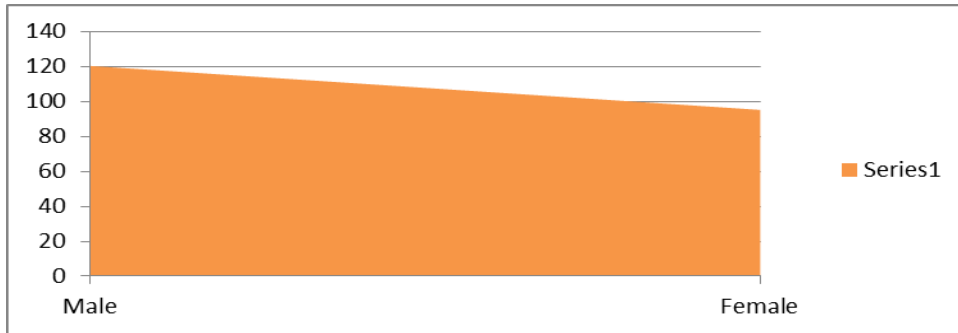
**Table 2: Statistical test for significance.**

PARAMETER	CALCULATED "Z"	TABULATED "Z"	LEVEL OF SIGNIFICANCE	INFERENCE
Pubic Symphyseal Width(mm)	0.21527	1.96	$p > 0.05$	Insignificant
Pubic Symphyseal Height(mm)	-13.9868	1.96	$P < 0.05$	Significant difference

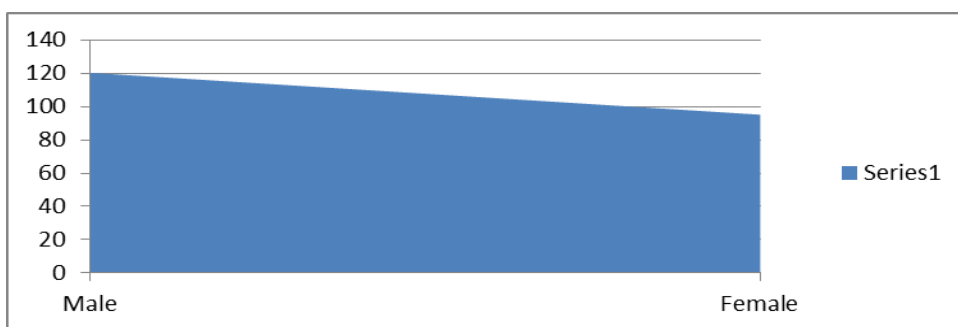
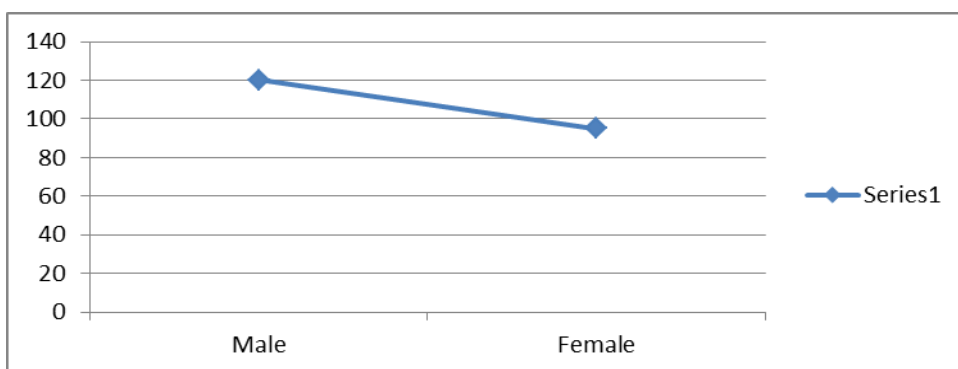
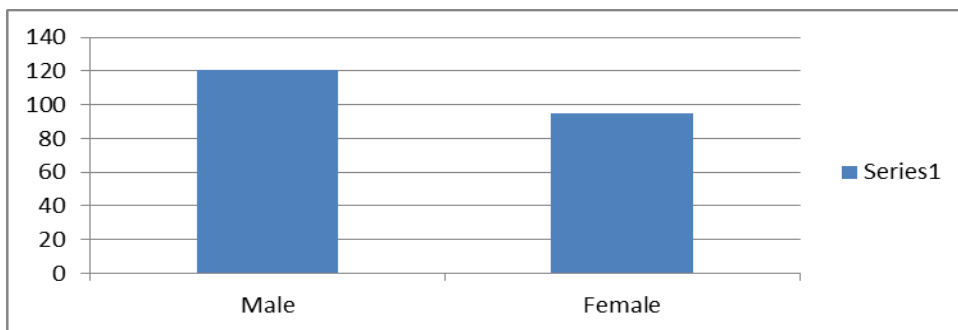
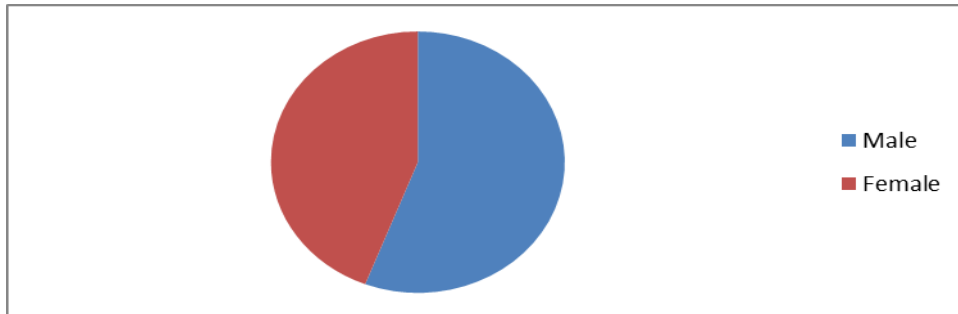
**Table 3: Demarking Points and Percentages of Nigerians Pelvic Parameter Using (Jit and Singh, 1966 Formula).**

PARAMETER	Sex	Mean± SD	Mean± 3SD	D.P	%	
Pubic Symphyseal Height(mm)	M	17.94	39.12	28.53±3.53	>37.19	2%
	F	14.57	37.19	25.88±3.77	<17.94	4%





**Fig. 3: Male and female mean values of Pubic Symphyseal Width (mm).**



**Fig. 4: Male and female mean values of Pubic Symphyseal Height(mm).**

### Data Analysis

The mean and standard deviation of the pubic symphyseal width for male and female is  $3.97 \pm 0.71$  and  $3.96 \pm 0.89$  shown in table 3.

The mean and standard deviation of the pubic symphyseal height for male and female is  $28.53 \pm 3.53$  and  $25.88 \pm 3.77$ .

### DISCUSSION

The mean width of the pubic symphysis in male is greater than that of the female but their difference is not statistically significant ( $p > 0.05$ ). Thus, the width of pubic symphysis could not use as a tool to determine sex for Nigerians; as demonstrated in (table 2). Ines *et al.* 2014; gave 10.1mm -2.6mm as values for the width of the pubic symphysis for women. The mean height for pubic symphysis is higher in males than females with values  $28.53 \pm 3.53$  and  $25.88 \pm 3.77$ . The difference is statistically significant ( $p < 0.05$ ) thus sexual dimorphism exist. The demarking points were  $>37.19$  male and  $<17.94$  female. Sex could be ascertained of 2% male and 4% female. This results indicates that the height of pubic symphysis is a good separator of sex with clear demarking points between Nigerian males and females. This result revealed that pubic symphysis is not a needed tool in the determination of sex, for medicolegal instances, but age can be determined.

The normal value for pubic symphyseal width is 3-5mm, this increase to 2-3mm during pregnancy, a function of relaxin (Wikipedia. org, 2015). The mean values of the present study fall in this range.

### CONCLUSION

The symphyseal pubis is not a good indicator of sex in a Nigerian population for medico- legal issues. It has shown that birthing processes tend to have a profound effect on the pubic symphysis in women, taking emphasis on this premise, findings from this study provides normative reference values for clinical and forensic examination of this pelvic parameter.

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