

## Pelvic Brim Index in South-South Nigerian Population

S.C. Okoseimiema and A.I. Udoaka  
Department of Human Anatomy, Faculty of Basic Medical Sciences,  
University of Port Harcourt, Nigeria

**Abstract:** This study was carried out to determine the average radiological pelvic brim index of the people in South-South Nigeria and to determine if there is sexual dimorphism and racial differences when compared with other races. Anterior posterior radiographs of adult pelvis (age range, 18-75 years) were evaluated. Five hundred and eighteen (518) radiographs (259 males and 259 females) were those of the South-South people of Nigeria. The parameters considered are: anterior posterior diameter, transverse diameter and pelvic brim index. The mean values of anterior posterior diameter, transverse diameter and pelvic brim index of males in South-South Nigerian people were  $115.33 \pm 13.53$  (mm),  $128.33 \pm 10.01$  (mm) and  $90.08 \pm 10.07$  respectively while those of their females were  $125.70 \pm 13.46$  (mm),  $141.44 \pm 10.51$  (mm) and  $89.10 \pm 9.49$  respectively. The mean anterior posterior diameter and transverse diameter of females was significantly higher than that of the males ( $p < 0.05$ ). There was no significant difference between the pelvic brim index of males and females in South-South Nigerians ( $p > 0.05$ ). When comparing our values with other works done by different authors, there were a racial difference. There was also, a strong positive correlation between pelvic brim index and anterior posterior diameter ( $p < 0.05$ ). Knowledge gained from this work will be useful to the obstetricians, physical and forensic anthropologists, Archeologist and radiologist for sex and race classification of human pelvis.

**Keywords:** Anthropologists, Nigerians, obstetricians, pelvic brim index, race, sex

### INTRODUCTION

The hip bone is the most reliable skeleton in sexual dimorphism (Ferembach *et al.*, 1980). The pelvic cavity of male is long and narrow because of more weight transmission and of female is wide and short for parturition (Doshi *et al.*, 2011). Pelvic measurements, however obtained have been analyzed by many anatomist, obstetricians, anthropologists and radiologist in an attempt to classify human pelvis. There have been many studies of the sexing of skeletal material, particularly hip bones from different populations: Australian Aborigines (Davivongs, 1963b), American Negroes, (Thieme and Schull, 1957; Schuller-Ellis *et al.*, 1983, 1985), English (Day and Pitcher-Wilmott, 1975), Austrian (Seidler, 1980) and Belgian and French (Segebarth-Orban, 1980). Pelvic brim index was an early attempt to define the shape of the pelvis (Turner, 1885), like the cephalic index, it's range is divided into steps, by which pelvis are classified as platypellic, mesatipellic, dolichopellic.

Heyns (1947) considered whether the pelvic brim index derived from X-ray pictures of the living subject is comparable with the true index measured directly on bone. The necessity for such an examination of the facts is demanded if inter- and intra-racial comparison is to be made. It is believed that malnutrition has certain

specific, unfavorable influences on the growth of the pelvis (Heyns, 1947).

Measurement of the pelvic cavity in pregnant females is important because the foetus passes through the narrower opening of the lesser pelvis at birth (Gerard and Sandra, 1996). Ince and Young (1940), used 500 female subjects to determine the Influence on Labour by the bony Pelvis. Jordan (1976), stated that there is a significant positive correlation between the brim index and the conjugate dimension. Holland *et al.* (1982) carried out an association study between pelvic anatomy, height and year of birth of men and women in Belfast. Despite the importance of pelvic brim index in child birth and forensic purpose, there is no documentation of this index in South-South Nigerians. This research is embarked upon to provide a documentation of pelvic brim index and pelvic brim class to which South-South Nigerians belongs to. It is also carried out to determine if there is sexual and racial differences when compared with other races. Finally, to show the relationship between pelvic brim index and conjugate diameter of South-South Nigerians.

### MATERIALS AND METHODS

Five hundred and eighteen normal, Standard pelvic anterior posterior radiographs (259 male and 259

female) aged between 18 and 75 years were used from their biometric data. This study was conducted in South-South of Nigeria between March, 2011 to November 2011. The following hospitals within South-South Nigerian States were used: University of Port-Harcourt Teaching Hospital, Rivers State, Braithwaite memorial Specialist Hospital, Port Harcourt, Rivers State; Federal Medical Centre, Yenagoa, Bayelsa State, University of Benin Teaching Hospital, Ugbowo, Benin city; Edo State and Rehoboth specialist hospital, D-Line, Rivers State.

The routine distance from which these radiographs were taken was 100 cm. All the radiographs were of anteroposterior view. All the radiographs were free from pathological changes and belonged to adults from the ages of 18 to 75 years. In taking these measurements the radiographs were placed on the horizontal surface of an illuminator and the following measurement were taken with the help of a vernier calliper. A marker was used to mark these points for clear visualization.

The measurements taken are the anterior posterior diameter (AB); transverse diameter (FG).

The Anterioposterior diameter AB is a line extending from the middle of the sacral promontory to the pubic symphysis. The transverse diameter FG is a line extending across the greatest width of the superior aperture from the middle of the brim on one side to the same point on the opposite side.

The radiological pelvic brim index was obtained as follows:

$$\text{Brim index} = \frac{\text{Anterior posterior diameter} \times 100}{\text{Transverse diameter}}$$

These parameters were obtained from the available literature.

All linear measurements were in millimeters for each parameter. The Data on the measured parameters were analyzed using the z-test to determine the sex differences and (p<0.05) was taken as being statistically significant. The actual range for the male and female sexes were found out. A pie chat was used for percentage classification of the pelvic brim index for males and females. A correlation study was also carried out between the pelvic brim index and anterior posterior diameter.

## RESULTS

The result of the mean, standard deviation and range of all radiographic measurements in the Pelvic brim In South-South Nigerian population are shown in

Table 1. The mean anterior posterior diameter where 115.33±13.53 (mm) for males and 125.70±13.46 (mm) for females. The anterior posterior diameter which was described in Fig. 1 and 2 was sexually dimorphic. The mean anterior posterior diameter of the females was significantly higher than that of the males (p<0.05). The mean transverse diameter were 128.33±10.01 (mm) for males and 141.44±10.51 (mm) for females. The transverse diameter which was described in Fig. 1 and 3 was also sexually dimorphic. The Mean transverse diameter of the females was significantly higher than that of the males (p<0.05). The pelvic brim index of males and females were 90.08±10.07 and 89.10±9.49. There was no significant difference in the pelvic brim index between males and females (p>0.05).

The percentage classification of pelvic brim index for South-South males and females is presented in Fig. 4 and 5. It was observed in Fig. 4 that 55.98% of South-South Nigerian males were platypellic, 28.96% were dolichopellic and 15.06% were mesatipellic. It was also observed in Fig. 5, that 51.35% of South-South Nigerian females population were platypellic, 38.22% were mesatipellic and 10.42 % were dolichopellic.

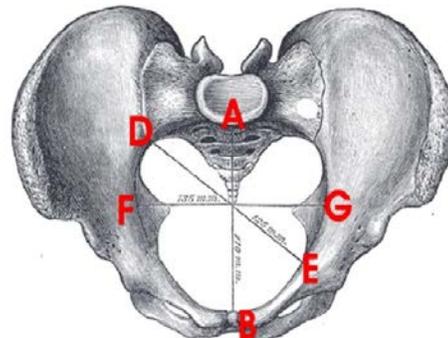


Fig. 1: Diagram showing anterior posterior diameter (AB) and transverse diameter (FG) (Gray, 1918)



Fig. 2: An anterior posterior radiograph showing anterior posterior diameter of one of the subjects

Table 1: Showing mean, standard deviation and range of values in parameters measured in the pelvic brim

Parameter	N	Male mean±S.D.	Female mean±S.D.	p	Range for males	Range for females
Anterior posterior diameter	259	115.33±13.53 (mm)	125.70±13.46 (mm)	p<0.05	78.96-151.00	80.24-172.02
Transverse diameter	259	128.33±10.01 (mm)	141.44±10.51 (mm)	p<0.05	90.09-155.00	97.70-178.88
Pelvic brim index	259	90.08±10.07	89.10±9.49	p>0.05	59.12-124.58	53.98-123.50

S.D.: Standard deviation; N: Sample size

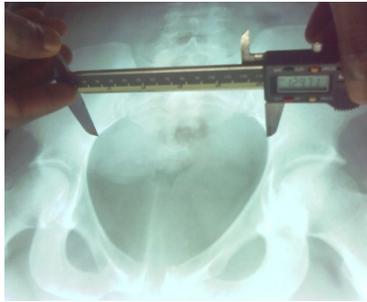


Fig. 3: An anterior posterior radiograph showing transverse diameter of one of the subjects

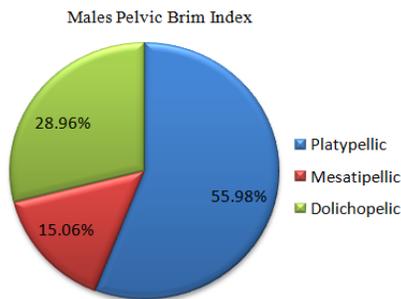


Fig. 4: A pie chart showing percentage classification of pelvic brim index of males in South-South Nigerians

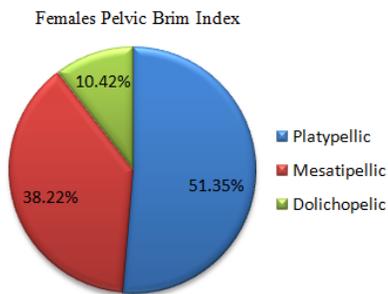


Fig. 5: A pie chart showing percentage classification of pelvic brim index of females in South-South Nigerians

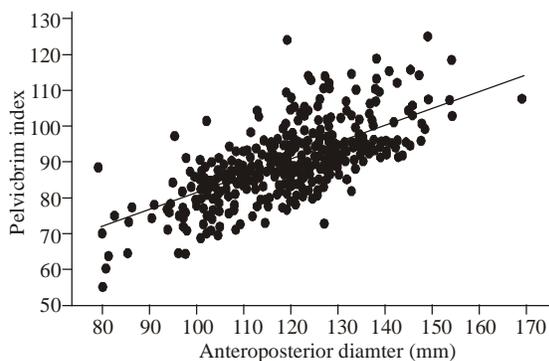


Fig. 6: Showing correlation between pelvic brim index and anterior posterior diameter in South-South Nigerians  
 Pelvic brim index: Anterior posterior diameter (mm);  
 $r = 0.682$ ;  $y = 34.0507 + 0.4619 * x$

Table 2: Showing pelvic brim index classification of males in different races or people

Authors	Dolichopellic	Mesatipellic	Platypellic
Turner (1885)	Australians	Negros	British
Turner (1885)	Bush men	Tasmanians	French
Turner (1885)	Hottentots	New caledonians	Europeans generally
Turner (1885)	Kaffirs		Mongolians generally
Turner (1885)	Andamans		American Indians
Present study		South-South Nigerians	

The correlation between pelvic brim index and anterior posterior diameter was shown in Fig. 6, where both sex were combined. It was observed that there was a positive correlation between the pelvic brim index and the anterior posterior diameter ( $p < 0.05$ ).

Racial grouping of pelvic brim index of Males were shown in Table 2. It was observed that there were racial differences with respect to pelvic brim index.

### DISCUSSION

The Hip bone is an ideal bone for sex determination because it not only reflects the general differences between the two sexes but also the special adaptation of female hip bone for child bearing. Turner (1885) measured the brim index in Europeans, six males and the mean transverse diameter was 127 mm and a mean conjugate 98 mm, with a brim index 77; and of eleven females with a mean transverse diameter of 137 mm, and a mean conjugate diameter of 109 mm, with a brim index 79. The mean brim index in three female Sandwich Islanders was 83 (Turner, 1885).

Our result shows a racial difference. The mean transverse diameter for South-South Nigerian males was  $128.33 \pm 10.01$  (mm) which is higher than that of the European males.

The value for our mean conjugate diameter for males was  $115.33 \pm 13.53$  (mm) which is higher than that of European males. The pelvic brim index of Nigerian males was  $90.08 \pm 10.07$ . This value is higher than that of European males pelvic brim index. With respect to the mean transverse diameter for females recorded by Turner (1885). The value for our mean transverse diameter was  $141.44 \pm 10.51$  (mm). This is higher than that of European females transverse diameter. Our conjugate diameter was  $125.70 \pm 13.46$  (mm), this is higher than that of European females conjugate diameter. The mean pelvic brim index of South-South Nigerian females was  $89.10 \pm 9.49$ . This value is higher than the recorded value for European females and female Sandwich islanders.

From the research carried out by Turner (1885), he stated that the males are dolichopellic in Australians and Andaman Islanders, whilst the females are mesatipellic. In the Bush race the males are

dolichopellic, the females platypellic (Turner, 1885). In the Negroes and New Caledonians the males are mesatipellic, the females are platypellic (Turner, 1885). Amongst the Europeans generally with a platypellic male index the females are still more platypellic (Turner, 1885). In the South American Indians, however, whilst the males are platypellic, the females are on the verge of being mesatipellic. Our result is in keeping with the result of Turner (1885) with respect to the Negroes. The mean of South-South Nigerian males was  $90.08 \pm 10.07$  which shows that they are mesatipellic. The mean for South-South Nigerian females was  $89.10 \pm 9.49$  which shows that they are platypellic. In a Standardized radiological pelvimetry conducted by Holland *et al.* (1982), it was observed that out of the Seven indices of pelvic size and shape which were measured from X-rays on each individual together with social and biological factors including age, height and year of birth, The Pelvic indices for men and women of similar stature were significantly different, with the exception of the Pelvic brim index. Our result is in keeping with this as there was no significant difference between the pelvic brim index of males and females in South-South Nigerians. From our result it is shown that the transverse diameter of the pelvic brim is wider in females than that of the males.

In a research carried out by Jordan (1976), it was observed that there was a strong positive correlation between the pelvic brim index and anterior posterior diameter. Our result is in keeping with this as there was a strong positive correlation between the pelvic brim index and anterior posterior diameter of South-South Nigerians. It was observed that the conjugate diameter was significantly higher for the higher brim index of South-South Nigerians than for the lower brim index group. This shows that brim index is a function of the conjugate diameter rather than of the transverse diameter.

### CONCLUSION

This is the first research work carried out on pelvic brim index on South-South Nigerians. Other works on pelvic brim index should be carried out in other parts of Nigeria. This work is therefore recommended to obstetricians, physical and forensic anthropologists, Archeologist and radiologist for sex and race classification of human pelvis.

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