J. Expt. & Clin Anat. 1(1): 36 – 39 (2002

Sex Dimorphism In The Adult Stature Of A Nigerian Population

E. N. OBIKILI, S. P. SINGH[1]
Department of Anatomy, College of Medicine, University of Nigeria, Enugu Campus.
[1]Department of Human Anatomy, Ahmadu Bello University, Zaria. Kaduna State.

SUMMARY

The heights of 402 males and 268 females aged 20-28 years were measured. The absolute and relative sex differences were calculated and compared with data from various racial groups. The study showed that the relative sex dimorphism was lower than the values reported for Europeans and Asians but similar to those reported for sub-Saharan Africans. It also showed that the low sex dimorphism in adult stature was not primarily due to poor nutrition. Genetic factors appear to play an important role in the determination of sex dimorphism in stature. It will be inappropriate to use sex dimorphism in stature as an good index of the health status of a population

KEY WORDS: Stature. Sex dimorphism.

Adult males are on the average taller than adult females. The magnitude of the sex difference in stature is, however, not the same for every population. It is not known for certain whether this population variation is as a result of girls in one population growing taller, or the boys not growing as tall as they ought to or a combination of both (Everleth, - 1975). Hiernaux (1968) and Tobias (1972) reported that sub-Saharan Africans had a lower sex dimorphism than Europeans. They attributed the low sex dimorphism of Africans to poor nutrition and postulated that the degree of sex dimorphism might be a sensitive index of the health status of a population.

Eveleth (1975) tested this hypothesis and suggested that further investigations on other populations would have to be done before such postulation could be applied. The aim of the present study was to test the hypothesis in a Nigerian population.

METHODS AND MATERIALS

The subjects were students of the University of Nigeria, Enugu Campus. There were 402 males and 268 females aged 20 to 28 years. Height was measured with an Avery height and weight scale (Avery, Birmingham, England). The subjects stood erect, without shoes, with the eyes in the Frankfurt plane. The measurements were obtained from 1990 to 1991. The absolute and relative sex differences were calculated using the formulae below:

Absolute sex difference = male mean height(m1) – female mean height(m2)

$$\text{Relative sex difference} = \frac{m1-m2}{m1} \times 100$$

RESULT

Table 1 shows the mean heights, absolute sex differences and relative sex differences in the heights of males and females by age. At all the ages studied the mean heights of males were significantly higher than those of females ($p < 0.001$). The absolute sex differences in heights ranged from 9.6 to 10.6cm while the relative sex differences ranged from 5.5 to 6.0%.

Table 2 and Fig.1 are comparative data on mean heights, and absolute and relative sex differences in heights.

Table 1. Mean heights (cm), sex differences (cm) relative sex differences (%) in height of males and females by age

Age(yr)	Male			Female			Sex diff. m_1-m_2	Rel. sex diff. $\frac{m_1-m_2}{m_1} \times 100$
	No.	Mean (m_1)	S.D.	No.	Mean (m_2)	S.D.		
20	91	175.9	6.6	83	165.4	6.1	10.6	6.0
21	73	174.5	6.1	65	164.4	5.3	10.0	5.7
22	72	174.3	6.6	53	164.5	5.2	9.9	5.7
23	51	174.5	6.1	34	164.8	5.5	9.7	5.5
24-28	115	175.0	6.5	33	165.4	5.3	9.6	5.5
ALL	402	174.9	6.7	269	165.0	5.6	10.0	5.7

Table 2. Comparative data on mean heights(cm), absolute sex differences (cm) and relative sex differences (%).

Country	Author	Year	Height (cm)		Sex diff. (cm)	Rel. sex diff. (%)
			Male	Female		
United Kingdom	Rosenbaun & Skinner	1985	177.1	163.2	13.9	7.9
Spain	De la Puente et al.	1997	175.6	160.7	14.9	8.4
France	Kherumian & Shreider	1967	74.3	161.4	12.9	7.4
Norway	Bjelke	1971	177.9	165.9	12.0	6.7
Croatia	Prebeg et al.	1994	178.4	165.2	13.2	7.3
India	Kaur & Singh	1981	164.1	151.4	12.7	7.7
Japan	Nagamine & Suzuki	1964	167.2	155.3	11.9	7.1
Korea	Yun et al.	1995	170.1	157.9	12.2	7.1
Kenya	Jansen	1984	165.5	155.6	9.9	6.0
South Africa	Setyn et al.	1998	168.3	158.3	10.0	5.9
Nigeria	Johnson	1970	168.1	158.2	9.9	5.9
Nigeria	Present study	2001	174.9	165.0	9.9	5.7

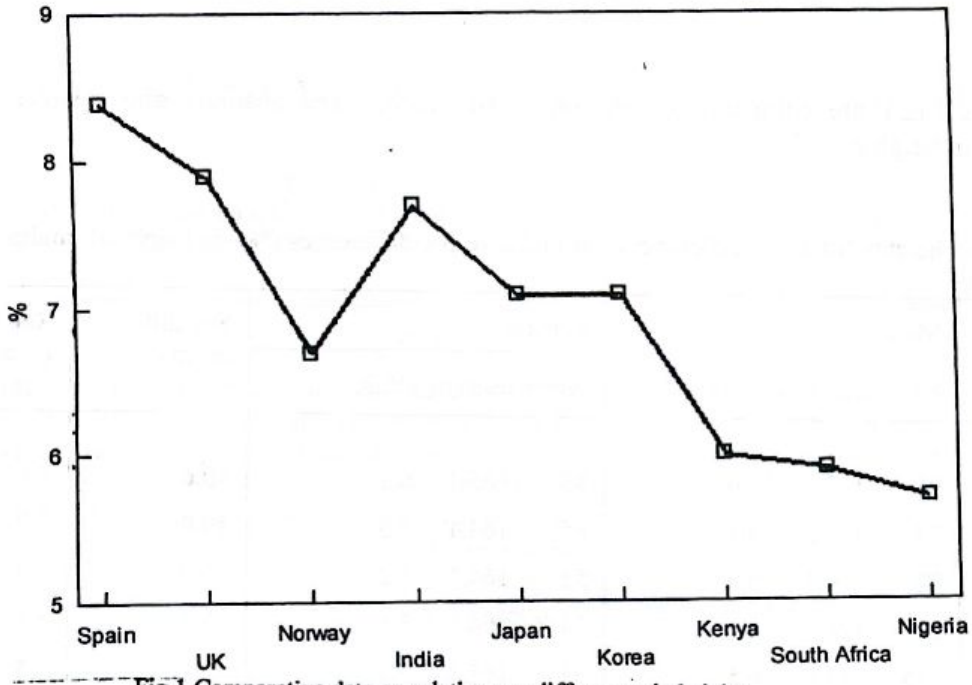

Fig 1 Comparative data on relative sex differences in heights

DISCUSSION

The relative sex dimorphism in the adult stature of the subjects of the present study was 5.7%. Johnson (1970) in a study of adult urban Nigerians in Lagos, reported a relative sex difference of 5.9%. The study of Jansen (1989) on a Kenyan population showed a relative sex difference of 6.0% while that of Setyn et al.(1998) on an urban black South African population was 5.9%.

The low sex dimorphism in comparison with the values reported for Europeans and Asians is in keeping with the findings of Hiernaux(1968) and Tobias(1972). They showed that in sub-Saharan Africans, the sex dimorphism was on the average lower than the Europeans values. They considered the low sex dimorphism of Africans to be due to the better resistance of girls to adverse conditions during growth. Male children growing up under adverse conditions such as war are more affected than females (Tanner, 1972; Kimura & Kitano 1959; Greulich et al., 1953). Hiernaux (1968) and Tobias (1972) had reasoned that if males were not able to attain their height potential, their mean height would be closer to that of the females and consequently the sex dimorphism would be low. Having stated that better nourished populations tended to have a higher sex dimorphism than poorly nourished populations, they postulated that sex dimorphism might be a sensitive index in the assessment of the health status of a population.

Eveleth (1975) in an analysis of data from various ethnic groups noted that sex dimorphism in the adult stature of the sub-Saharan Africans was lower than that of Europeans, Asians and South American Indians. He also observed that South American Indians had a higher sex dimorphism than Europeans. The sex dimorphism of adult American Indians ranged from 5.9 to 11.2% but was commonly between 7-9%. Since it is a known fact that South American Indians are not better nourished than Europeans, their higher sex dimorphism could not have been due to a better nutrition. This observation implies that nutrition is not the main factor that determines the magnitude of sex dimorphism in the adult stature. Eveleth (1975) also pointed out that although Tokyo University students were significantly taller than Japanese fishing and farming populations they had similar sex differences as the farmers and the fishers. He concluded that the use of sex dimorphism as an index of environmental health status could lead to many errors.

Although the subjects of the present study and those studied by Johnson (1970) were both urban Nigerians, the significantly higher mean height of the subjects of the present study indicated that they were better nourished than the subjects studied by Johnson (1970) (see Table 2). If nutrition were the key factor in the determination of the magnitude of sex dimorphism, the sex difference in the stature of the subjects of the

present study would have been higher than that of the subjects he studied. Genetic factors appear to play a greater role than nutrition in the determination of the magnitude of the sex dimorphism in the adult stature. It will therefore be inappropriate to use sex dimorphism in the adult stature as an index of the health status of a population.

ACKNOWLEDGEMENT

We wish to express our gratitude to Mr. U. Aligwekwe, Ms T. B. Akpan, Dr L.O Nwoye, and Prof. B. C. Ibe for their comments on the manuscript. We are also grateful to Prof. P. O. Okonkwo for providing us with some of the materials we used,

REFERENCES

Bjelke E (1971). Variation in height and weight in the Norwegian population. Brit. J. Prev. Soc. Med., **25**:192-202.

De la Puente ML, Canela J, Avarez, J, Salleras L, Vicens-Calvet E (1997) Cross-sectional growth study of the child and adolescent population of Catalonia (Spain). Ann Hum Biol. **24**:435-452.

Eveleth PB (1975) Differences between ethnic groups in sex dimorphism of adult height. Ann Hum Biol. **2**:35-39.

Greulich W W, Crismon C S and Turner M L (1953). The physical growth and development of children who survived the atomic bombing of Hiroshima or Nagasaki. J. of Paed. **43**:121-145. (cited by Eveleth 1975).

Hiernaux J (1968) Variabilite du dimorphisme sexuel de la stature en Africque subsaharienne et en Europe. In: *Anthropplogie und Humangenetik*, Stuttgart: Gustav Fischer, 1968; 42-50. (cited by Eveleth 1975)

Jansen A A J (1984). Weight, height, weight-for height and Quetelet's index of Akamba school children and adults. E. Afr. Med. J. **61**:273-282.

Johnson T O (1970). Height and weight patterns of an urban African population sample in Nigeria. Trop. Geogr. Med. **22**:65-76.

Kaur D P and Singh R (1981). Parent-adult offspring correlations and heritability of body measurements in a rural Indian population. Ann Hum Biol. **8**:33-339.

Kherumian R and Schreider E (1963). Repartion departmentale de la stature du poics et de la circonference thoracique en France Metroplitaine. Biotypdogie, **24**:1-27.

Kimura K and Kitano S (1959). Growth of the Japanese physiques in four successive decades before World War II. Zinruigaku Zassi, **67**:141-150.

Nagamine S and Suzuki S (1964). Anthropometric and body composition of Japanese young men and women. Hum Biol. **36**:8-15.

Prebeg Z, Juresa V and Kujundzic M (1995). Secular growth changes in Zagreb school children over four decades 1951-91. Ann. Hum Biol. **22**:99-110

Rosenbaum, S & Skinner RK (1980). A survey of heights and weights of adults in Great Britain, Ann Hum Biol. 1985; **12**:115-127.

Setyn K, Bourne L, Jooste P, Fourie J M, Rossouw and Lombard C (1998). Anthropometric profile of a black population of the Cape peninsula in South Africa. E. Afr. Med. J. **75**:35-40.

Tanner J M (1962). *Growth at Adolescence*. Oxford: Blackwell Scientific Publications.

Tobias PV (1972) Growth and stature in Southern African populations. In *Human Biology of Environmental Change*, ed. Vorster DJM, London. International Biological Programme, 96-104. (cited by Eveleth 1975).

Yun D J, Yun D K, Chang Y Y, Lim S W, Lee M K and Kim SY (1995). Correlations among height, leg length and arm span in growing Korean children. Ann Hum Biol. **22**: 443-458.