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Body Habitus And Abdominal Aortic Sizes Among Southeast Nigerians.

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ABSTRACT

Abdominal aortic diameters were determined at the level of celiac axis, renal aretery and bifurcation with the use of abdominal ultrasound.
A total of one hundred and twenty-six (126) healthy Nigerians of both sexes were randomly selected for this study. The diameter figures for females are generally smaller, while the weight of the subjects show a significant positive correlation up to the 86 – 95kg weight range, we however note no correlation between subject height and aortic diameters.

Key Words: Body Habitus, "Normal" Abdominal Aortic Diameter.

Body habitus i.e. weight, height and body surface area (BSA) are known to affect abdominal aortic sizes (Liddington & Heater, 1998: Pearce et al., 1993; Pedercon et al., 1993). These variables are partly dependent upon age and has been shown to be an independent predictor of abdominal aortic size (Dahnett & Dubis, 1990). While normal measurement range for abdominal aortic diameter among whites is readily available (Lanne et al., 1992a; Lanne et al., 1992b; Horejs et al., 1998) no values are available in the literature for Nigerian blacks. Normal values are important baseline data that serve to help in detecting abnormal range, thus making for closer monitoring and early intervention (Molony et al., 1997; Nevitt et al., 1984).

Though no established normal values of abdominal aortic size is available, abdominal aortic dilatation is being detected with increasing frequency within the last decade in Nigeria (Mgbor S.O, personal communication) .

The aim of this study therefore is to establish values for abdominal aortic sizes in healthy adults from Southeast Nigeria. The established values will be compares with body habitus to determine if any relationship exists.

MATERIAL AND METHODS

This one-year prospective study was carried out between April 2000 and March 2001. The study was undertaken at a referral-radio diagnostic centre in Enugu, Enugu State Nigeria. This referral centre has a very wide catchment area, which includes the entire Southeast, part of Midwest and middle belt geographical zones of Nigeria and beyond.

One hundred and twenty six (126) healthy volunteers of both sexes aged between 18 – 75 yrs were randomly selected into the study. Inclusion and exclusion criteria used were viz:

(a) subjects without any history of cardiovacular or renal diseases
(b) subjects not on any anti hypertensive therapy or any other medication at the time of study.
(c) subjects with serial blood pressure measurements below 140/90 mmHg
(d) pregnant women and very obese subjects were excluded

Subjects' sex and age in years were noted. Height, measured in centimeters with "Tape against-the-wall". Weight, in kilogram, measured with "Hanson Brand" weighing scale.

Ultrasound measurement of abdominal aortic diameters were performed by single examiner and hence intra observer variability (IOV) was eliminated. The same linear-array ultrasonographic scanner (Philips Sterling) with Transducer of 3.5 mHz (very efficient for diameter was measured in millimeters (mm) at three levels viz:

(a) Level of the coeliac axis
(b) Level of the renal artery

(c) Level of the aortic bifurcation.

RESULTS

One hundred and twenty six (126) volunteers 57 (45%) females and 69 (55%) males took part in the study mean weight for males is 68.22kg and that for females 61.47kg. The mean aortic diameters at these levels show that the female values were generally smaller than corresponding male values (Table 1). Table II shows the relationship between weight and aortic diameters at the 3 levels measured. The subjects weighted between 36kg – 115kg with a mean weight of 68.17kg 12.48SD. The lowest weight range recorded the smallest dimensions and thereafter the dimensions increased up to the 86 – 95kg group and thereafter declined. Table III shows relationship that exists between the height of subjects and the aortic diameter at the three points measured. This does not establish any clear relationship between height of subjects and abdominal aortic diameters at any level.

TABLE 1: Mean aortic Diameters at the coeliac axis (a) renal artery (b) and at the bifurcation (c) for males and females.

	a	b	c
Male	17.2mm	15.7mm	14.9mm
Female	16.33mm	14.9mm	13.6mm

Table II Relationship Between Weight Range And Mean Aortic Diameters At Coeliac Axis (A), Renal Artery (B) And At The Bifurcation (N=126).

Wt.(kg)	N	AD (mm)		
		a	b	c
36-45	3	14.25 ± 0	13.22±0.0	13.32±0.0
46-55	26	17.47±0.9	15.15±0.2	13.32±0.5
56-65	43	15.38±0.3	15.08±1.1	13.86±0.5
66-75	33	16.86±0.7	15.56±0.3	14.69±0.8
76-85	13	16.92±0.9	15.93±0.4	15.22± 0.6
86-95	6	18.88±0.9	17.32±0.4	15.71± 0.8
96-11	2	16.15±0.0	15.75±0.0	14.8 ± 0.0

N = No. of subjects. AD = Aortic diameter.

Table III Relationship Between Height Range And Mean Aortic Diameters At Coeliac Axis (A) Renal (B) And At The Bifurcation. (N = 126).

Ht (cm)	N	AD(mm)		
		a	b	c
146-150	4	15.78±1.8	13.0±1.6	12.8±1.1
151-155	9	18.45±2.0	5.95±1.2	13.45±0
156-160	15	17.27±0.0	16.02±0.0	13.6±0.0
161-165	28	16.93±0.7	15.04±0.0	14.2±0.2
166-170	32	16.14±0.6	14.77±0.7	14.03±0.7
171-175	22	17.25±0.3	15.88±0.4	14.6±0.9
176-180	8	15.5±2.5	14.09±2.4	14.45±2.2
181-195	8	16.45±0.0	15.57±0.0	15.75±0

Body Surface area (BSA)

Maltiregression analysis of the relationship between abdominal aortic diameter and BSA sows that relationship is age dependent.

(a) In the age range 15-30 yrs there is a statistically significant positive correlation between BSA and abdominal aortic size ($p<0.01$).

(b) There exists no significant relationship between BSA and abdominal aortic size in the age range 31-50 yrs.

(c) In subjects above 50 yrs there is a negative correlation between BSA and mean aortic diameter.

DISCUSSION

The mean aortic diameters determined by this study were 17.22mm, 15.7mm and 14.9mm for males at the level of the coeliac axis, renal artery and bifurcation respectively. The corresponding values for females are 16.33mm, 14.9mm and 13.6mm respectively. Though male values tend to be higher, it is statistically significant only at the level of bifurcation ($p<0.05$). Sonnesson at al. (1994), observed similar variations in aortic diameter values between males and females, though these variations were not significant when other variables like BSA were corrected for. Pederson (1993) however noted a statistically significant difference between male and female aortic diameter at all levels even after correcting for other variables. While Pederson (1993) observed that aortic diameters in males was between 2.5mm and 2.04mm greater than the corresponding

values in females, this study however gives a difference of between 1.3 and 0.83mm at corresponding levels.

Dahnut & Dubis (1990) correlated BSA, weight, height and bone size with aortic diameter. Despite this correlation, they still suggest direct measurement of aortic diameter instead of using predictive values. We were however able to establish weight to be a significant predictor of aortic size at the level of coeliac axis (Pearson's correlation 0.99). We could not establish any correlation between subject heights and aortic diameter at any of the 3 levels measure.

Body surface are (BSA) is a function of subject height and weight. Sonesson et al. (1994) found a correlation between BSA, And aortic diameter at any of the three levels measured.

Body surface area (BSA) is a function of subject height and weight. Sonesson et al (1992b) found a correlation between BSA, weight as well as height with the abdominal aortic diameter. In our study however, the correlation between BSA and abdominal aortic diameter is age dependent. There is a positive correlation between BSA and abdominal aortic size $p< 0.01$ for those within the 15 – 30 years age range. No correlation is established in those of 31-50 years age range.

This study notes a negative correlation between BSA and mean aortic diameters in subject above 50 years. Pederson & Vic (1993) on the other hand found no correlation between BSA and aortic diameter. Their was on those referred for abdominal ultrasound and not on the general population. Liddington & Heater (1998) screened subjects aged between 65 and 74 years and found only a weak correlation weight as well as height with the abdominal aortic diameter. In our study however, the correlation between BSA and abdominal aortic diameter is age dependent. There is a positive correlation between BSA and abdominal aortic size $p <0.01$ for those within the 15.30 years age range. No correlation is established in those of 31-50 year age range.

However this study notes a negative correlation between BSA and mean aortic diameters in subjects above 50 years. Pederson & Vic (1993), on the other hand found no correlation between BSA and aortic diameter. His study was on those referred for abdominal ultrasound and not on the general population. Liddington & Heater (1998) screened subject between aortic diameter and height but none with weight and BSA.

The predictive value of weight in determining the abdominal aortic diameter is limited. As in our study this value is lost after the 86-95kg weight range. Sonesson et al. (1994) also stated that in individuals that are over weight, the correlation between the weight and aortic diameter, and BSA and aortic diameter becomes unreliable because of weight factor. Liddington & Heater (1998) suggest that lean body mass though more complex and more difficult to determine may be a more sensitive predictor of abdominal aortic diameter.

CONCLUSION

From this study, we have established "normal" abdominal aortic diameter values for Southeast Nigeria and their relationship with B.S.A. We however suggest a more broad based study to determine a more acceptable Nigeria value.

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