

Association between Diameter of Heart and Cardio-Thoracic Size with the Body Habitus: An Observational Study

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ABSTRACT

Background: Heart size in the absence of skeletal abnormality or any lung disease is assumed to be related with the habitus of the patients. Tendency to estimate the heart size has flagged a very objective methodology for clinical diagnosis, serial determination and population studies on heart size, even with of its limitations. The present study was conducted with the aim to estimate the association of heart diameter and cardio-thoracic ratio (CTR) with the body habitus.

Materials and Methods: The subjects between 25-70 years of age and without having any cardiac etiology, lung disease or any other heart problem were included in the study. The weight of the subjects was estimated without footwear. A posterior antero chest X-ray was taken with a focus distance of approximately 1.8 m with erect posture of the person and normal inspiration. All the data thus obtained was arranged in a tabulated form and analysed using SPSS software.

Results: The CTR amongst males less than 30 years of age was 43.2 and females was 45.8. The CTR amongst males between 30-40 years of age was 44.4 and females was 46.4. Females with BMI more than 30 had CTR of 48.2 and males with BMI less than 24 had CTR of 47.2.

Conclusion: From the above results it can be concluded that the diameter of heart has a strong interrelation with the body measurements as compared to the cardio thoracic diameter.

Keywords: Correlation, Diameter, Thoracic, Heart.


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INTRODUCTION

Chest radiographs are a simple, rapid and inexpensive tool for estimating the transverse thoracic diameter, supreme diameter of heart and Cardio-thoracic ratios, which enables us to have an approximate idea of heart size. A large heart may specify underlying heart disorder; compared to a normal heart does not elaborate any absence of cardiac disease.¹ But any abnormality in heart size compared to age, sex and body habitus may indicate any initial signs of the underlying cardiac disease in routine Chest X-rays.² Heart size in the absence of skeletal abnormality or any lung disease is assumed to be related with the habitus of the patients.^{3,4} Studies from past have shown racial variation as associated with body structure.⁵ Researches have also shown that variation in size of heart in different racial groups. The cardiac expansion can also be checked by maximum diameter in transverse aspect of heart and cardio-thoracic ratios.⁶ The standard values that are followed are HD>15.5 cm. and CTR 0.5

in the postero-anterior Chest radiographs when performed with standard techniques. Tendency to estimate the heart size has flagged a very objective methodology for clinical diagnosis, serial determination and population studies on heart size, even with of its limitations. The present study was conducted with the aim to estimate the association of heart diameter and cardio-thoracic ratio with the body habitus.

MATERIALS AND METHODS

The present observational study was performed in the Department of General Medicine along with Department of Radiology, Rama Medical College Hospital & Research Centre, Hapur, Uttar Pradesh (India) for a period of 2 years. The subjects between 25-70 years of age and without having any cardiac etiology, lung disease or any other heart problem were included in the study. Both males and females were enrolled in the study. A total of 1000

patients were examined amongst which 550 were males and rest were females. Radiographic machines, weighing devices and height estimating device were taken in the study. The weight of the subjects was estimated without footwear. A postero-anterior chest X-ray was taken with a focus distance of approximately 1.8 m with erect posture of the person and normal inspiration. The

Transverse Thoracic Diameter was estimated from the right dome of diaphragm and the transverse diameter of heart was obtained by the sum of maximum projection along with the right and left borders of heart. The BMI of the patients was obtained by weight divided by height in square meter. All the data thus obtained was arranged in a tabulated form and analysed using SPSS software.

Table 1: Relationship between the values obtained in the study

	Sex	Age (yrs)						Height (m)			BMI			BSA (m ²)		
		<30	30-40	41-50	51-60	61-70	71-80	1.1-1.3	1.4-1.6	1.7-1.9	<24	24-30	>30	<0.03	0.03-0.05	>0.05
CTR	Male	43.2	44.4	45.1	46.1	46.7	46.2	42.1	49.9	44.9	45.4	43.9	44.8	44.8	48.1	46.9
	Female	45.8	46.2	46.4	47.9	48.2	48.2	42.9	53.3	46.2	47.2	46.6	48.2	48.9	45.7	47.7
HD (cm)	Male	11.9	16.4	14	14.3	14.3	14.2	11.8	11.9	12.3	12.9	13.4	12.9	13.7	13.2	13.4
	Female	11.7	11.4	11.7	12	12.3	12.8	11.3	11.8	12.1	11.6	13	12.1	13.3	13.2	13.2

RESULTS

The present study consisted of 1000 subjects with the mean age of 57.41+/-4.43 years. There were more number of males compared to females.

Table 1 indicates the relationship between the height, body mass index and body surface area. The CTR amongst males less than 30 years of age was 43.2 and females was 45.8. The CTR amongst males between 30-40 years of age was 44.4 and females was 46.4. The CTR amongst males between 41-50 years of age was 45.1 and females was 46.4. The CTR amongst males between 51-60 years of age was 46.1 and females was 47.9. The CTR amongst males between 61-70 years of age was 46.7 and females was 48.2. The CTR amongst males between 71-80 years of age was 46.2 and females was 48.2. As per the height, maximum CTR was 49.9 amongst males with the height of 1.4-1.6 and amongst females was 53.3 of the same height. Females with BMI more than 30 had CTR of 48.2 and males with BMI less than 24 had CTR of 47.2. The HD amongst males was maximum of 16.4 amongst males between 30-40 years of age and amongst females it was 12.8 between 71-80 years of age.

DISCUSSION

The results illustrated by different researches made it clear that the heart size in normal patients is dependent upon a large number of parameters like body habitus.⁷

As the size of body changes through the influence of a mixture of genetic, racial and environmental factors, the heart size also alters with them as it is dependent on them⁸, like strong decrease in transverse diameter with advancing age in females⁹ whereas the reduction of transverse diameter with age amongst male is a gradual process. According to Anyawu GE et al¹⁰ the size of heart predictable by body values, such as horizontal diameter is a great predictor in comparison to CTR. As per a study by Obermann² illustrated that there is a strong correlation between diameter of heart and weight. As per our study, the CTR amongst males less than 30 years of age was 43.2 and females was 45.8. The CTR amongst males between 30-40 years of age was 44.4 and females was 46.4. The CTR amongst males between 41-50 years of age was 45.1 and females was 46.4. The CTR amongst males between 51-60 years of age was 46.1 and females was 47.9. The

CTR amongst males between 61-70 years of age was 46.7 and females was 48.2. The CTR amongst males between 71-80 years of age was 46.2 and females was 48.2. As per the height, maximum CTR was 49.9 amongst males with the height of 1.4-1.6 and amongst females was 53.3 of the same height. Females with BMI more than 30 had CTR of 48.2 and males with BMI less than 24 had CTR of 47.2. The HD amongst males was maximum of 16.4 amongst males between 30-40 years of age and amongst females it was 12.8 between 71-80 years of age. Diameter of heart has strong inter relation with the body habitus like weight of body weight and height, area and body mass index; these aspects of body habitus are further dependent upon the body framework in different ethnic groups, while cardio-thoracic ratio designates a poor association with the parameters of body. Cardio-thoracic ratio is least changed by the body habitus; so it is superior pointer while prediction of cardiac enlargement. It is least exaggerated by the variation in the body habitus So indicates better consequence and is less changes by the alterations of body built. The advent of digital radiology and computerized operators simplified the methodology to determine both the 1-dimensional and 2-D cardiothoracic ratios. According to Comeau and White¹¹ the Body and heart dimensions in twins lead to a strong association between size of heart and size of body. Only racial variances were presented because body size.

As per Smith and Bloeder¹² the surface area of body is a more dependable index instead of values of weight and height. Body mass index and surface area, are resultant from weight and height have strong association with diameter of heart.

CONCLUSION

From the above results it can be concluded that the diameter of heart has a strong interrelation with the body measurements as compared to the cardio thoracic diameter. This alteration should be given consideration while evaluating patients of different ethnic and racial origins.

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