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# COMPARISON OF ANTHROPOMETRIC MEASUREMENT AND TOTAL CHOLESTEROL IN CALCIFIC AORTIC STENOSIS

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**ABSTRACT:** *Background and objective: Changes in the lipid concentration can be reflected by anthropometric measurements. The present study is aimed to determine the relationship of anthropometric measurement and total cholesterol in calcific aortic stenosis. Methods: A case-control study in which 208 calcific AS patients were recruited from echocardiography department and OPD from NICVD and 208 age and gender matched controls were selected. Complete physical and medical examination was carried out including the demographic profile and anthropometric measurements. Total cholesterol was done in Biochemistry section of DDRRL, Ojha Campus. Statistical analysis was conducted on SPSS 21. Mean and standard deviation were calculated for all the continuous variables including age, WHR, BMI and total cholesterol.t-test was applied to compare the WHR, BMI and total cholesterol between cases and controls. Pearson correlation was used to see the leaner correlation of BMI and WHR to total cholesterol. Results: Mean age for the cases was 67.12 years ±5.08 and for controls was 66.74 years ± 3.71. There were 67.8% male and 32.2% female in the case group and 64.9% male and 35.1% female in control group.There was significant difference in BMI and WHR of cases and controls with significant p- value while total cholesterol showed insignificant difference. BMI shows significant but positive weak correlation with total cholesterol in cases as well as in controls. While WHR shows insignificant correlation in cases and control group indicates significant but positive weak correlation. Conclusion: Increase in total cholesterol may be an indicator of increase in BMI and WHR.*

**KEYWORDS**: calcific aortic stenosis, anthropometric measurements, total cholesterol, BMI, WHR.

## INTRODUCTION

Calcific aortic stenosis (AS) is a condition that develops as a result of a chronic inflammatory process that leads to valve degeneration. It necessitates aortic valve replacement in symptomatic patients.(1)Prevalence of aortic valve disease (AVD) increases with age and the incidence of calcific AS is on the rise as the general age of the population increases.(2, 3)Several lines of evidence suggest that the mechanism of aortic valve degeneration is similar to atherosclerosis, the

etiology of aortic valve disease has a similar pathophysiology to that of vascular atherosclerosis, and the treatment of this disease could be similar to that of chronic vascular atherosclerosis.(2)Traditional risk factors for AS include elevated LDL cholesterol levels, smoking, hypertension, diabetes mellitus,male gender and reactive oxygen species (ROS).(4-7) Individuals with familial hypercholesterolemia have increased risk of developing both atherosclerosis and calcific AS. Similarly adults with AS are more prone to death due to myocardial infarction (MI) and other cardiovascular causes.(8, 9).

As dyslipidemia is the risk factor for AS, the associations between overweight and many diseases have been established. Body-fat distribution could possibly identify subjects with the highest risk of disturbed lipid profile. Impaired lipid profile has always been related with cardiovascular diseases. Any change in lipid profile can be reflected by changes in anthropometric parameters in human body. (10)Intra-abdominal fat has been identified as being the most clinically relevant type of fat in humans. Body mass index, waist and hip circumferenceswere found to be useful anthropometric predictors for cardiovascular risk.(11). The aim of the present study was to compare the relationship of serum total cholesterol concentrations and anthropometric measures among calcific AS patients and controls.

**Material and methods:**

It is a case-control study conducted in the department of Physiology, IBMS, DIMC, DUHS in collaboration with National Institute of Cardiovascular Disease (NICVD). Patients were selected from echocardiography department and OPD from NICVD and total cholesterol was done in Biochemistry section of DDRRL, Ojha Campus. A detailed history was taken and subjects were included in the study on the basis of inclusion criteria. The study was approved from the Ethical Committee NICVD, Institutional review board (IRB) and board of advance scientific research (BASR).The patients were documented on the basis of their written consent on a detailed prescribed proforma. Echocardiographically diagnosed elderly patients of calcific aortic stenosis and age and gender match individuals without calcific AS were included as control. Patients who have severe aortic regurgitation, prosthetic valves, history of rheumatoid arthritis, endocarditis or rheumatic fever or rheumatic heart disease, and echocardiographic evidence of rheumatic valvular stenosis and taken lipid lowering drugs, patients of chronic renal failure and familial hypercholesterolemia (total cholesterol >300 mg/dL in adults) and cancer are also excluded from or study. Using open (epi) sample size calculator with 95% confidence and power (β) of 80 the calculated sample size was 416.

Non probability purposive sampling was performed. A detailed medical history including past medical and surgical history was taken on prescribed proforma. Complete physical and medical examination was carried out including the demographic profile and anthropometric measurements. Anthropometric measurements (height, weight, body mass index, waist and hip circumference and waist hip ratio) were done.

After data entry, statistical analysis was conducted on Statistical Package for Social Sciences (SPSS) 21. Mean and standard deviation were calculated for all the continuous variables including age, WHR, BMI and total cholesterol. . Mean and standard deviation were calculated for all the continuous variables including age, WHR, BMI and total cholesterol.t-test was applied to compare

the WHR, BMI and total cholesterol between cases and controls. Pearson correlation was used to see the leaner correlation of BMI and WHR to total cholesterol.

## RESULTS

Total 208 subjects were selected who agreed to participate and met the inclusion criteria were included as cases in the study. 208 age and gender matched controls were recruited for the study after fulfilling the ethical criteria.

The age and gender distribution among two groups is presented in table 1. The mean age and standard deviation for the cases was 67.12 years ±5.08.The mean age and standard deviation for controls was 66.74 years ± 3.71.There were 67.8% male and 32.2% female in the case group and 64.9% male and 35.1% female were included in control group.

**Table 1: Demographic profile of study groups.**

| **Variables** | | **Cases** | **Controls** |
|---|---|---|---|
| **Age** | **Mean± SD** | **67.12±5.08** | **66.74±3.71** |
| | **Range** | **60 - 85** | **63 – 80** |
| **Gender** | **Males** | **141 (67.8%)** | **135 (64.9%)** |
| | **Females** | **67 (32.2%)** | **73 (35.1%)** |

SD: standard deviation, yr: years, Range: minimum-maximum, Percentage: %

The means of an anthropometric profile which include BMI and WHR of both cases and controls were measured. Independent sample t-test was applied for the comparisonof BMI and WHR in cases and controls. There was significant difference in BMI and WHR of cases and controls with the p- value of < 0.05. In the present study, we have used new Asian criteria for BMI classification and WHO criteria for WHR. (12, 13)

**Table 2: Descriptive statistics of anthropometric profiles of study groups.**

| **Variables** | | **Cases** | **Controls** | **P-value** |
|---|---|---|---|---|
| **BMI ($kg/m^2$)** | **Mean± SD** | **22.962±3.4469** | **21.985±3.6413** | **0.005** |
| | **Range** | **15.6-29** | **16.0-31.6** | |
| **WHR** | **Mean± SD** | **.8768±.07799** | **.9282±.08443** | **0.000** |
| | **Range** | **0.75-1.06** | **0.75-1.12** | |

SD: standard deviation, yr: years, Range: minimum-maximum, kg: kilogram,BMI: body mass index

Independent sample t-test was done to compare the means of the lipid profile in cases and controls and we observed insignificant difference.

**Table 3: Descriptive statistics of total cholesterol in study groups.**

| | Cases | Controls | P-value |
|---|---|---|---|
| **Total cholesterol** | **163.798±43.8946** | **166.370±46.4583** | **0.562** |

**Table 4: Correlation of total cholesterol with BMI and WHR in cases and controls**

| | BMI | | WHR | |
|---|---|---|---|---|
| | **Correlation(r)** | **P-value** | **Correlation (r)** | **P-value** |
| **Cases** | **0.239** | **0.001** | **0.037** | **0.591** |
| **Controls** | **0.373** | **<0.001** | **0.295** | **<0.001** |

BMI shows significant but positive weak correlation in cases as well as in controls. While WHR shows insignificant correlation in cases and control group indicates significant but positive weak correlation.

## DISCUSSION

Two hundred and eight calcific AS patients with minimum age of 60 years were seen in our study whereas in comparison to other studies in western world calcific AS was present in patients over 65 years of age this may be due to the fact that actual birth dates are quite often unknown because many individuals in Asia do not have an official record of their birth date(14-16)In our study calcific AS was shown to be more common in males (62%) as compare to females (38%) with a male to female ratio of 1.6:1(Table 4.1).This result was in accordance with studies conducted by Nkomo et al 2006 and Otto et al 2000(15, 17)this is because of the factthatmale gender is one of the risk factor for calcific AS.(18)

In our study the nutritional status of the patients was assessed by using new BMI criteria for Asian population.(12, 19) Mean body mass index in AS cases was 22.96 kg/m2 and in control group it was 21.98 kg/m2 with significant p value $< 0.05$ These results were in contrast with Ortlepp et al 2006 who found insignificant difference of BMI in cases and controls.(20)Mean WHR in cases and controls were 0.877 and 0.928 respectively. Significant difference was found between WHR in cases and controls with p value $< 0.05$. Association between Calcific AS and WHR was not reported previously which may be due to the fact that the prevalence of calcific AS associated with obesity may decrease with advancing age. This supports the fact that the risk of cardiovascular disease associated with BMI, waist circumference and waist-to-hip ratio is three to four times stronger between 40 to 59 years than at over 70 years of age.(21)

Mean total cholesterol was 163.79±43.89 mg/dl in cases and 166.37±46.45 mg/dl in controls with insignificant p-value >0.05.This finding is consistent with the findings of a study conducted by Ortlepp 2006 and in contrast to the study conducted by Peltier et al, who found that there is hypercholesteremia in patients of calcific AS.(6, 20)

In our study insignificant p-value for total cholesterol was due to the fact that the controls were already suffering from CAD in which dyslipidemia is a common finding. Another justificationis that, although hypercholesterolemia may initiate the beginning of AS, disease advancement may dependon other factors. (22)

We speculate in our study that total cholesterol displays positive correlation with BMI in cases and control group.This is in consistent with the finding of Brown CD et al who concluded that serum cholesterol levels increased with increasing BMI (23) this may be due to cumulative exposure to lower levels of activity resulting in the large effects observed in elderly people. For the identification of cardiovascular risk factors, BMI for men and WHR for women are appropriate indices,(24) in our study WHR shows significant positive correlation. However further researches are required to find out whether similar results hold for prediction of aortic stenosis and other cardiovascular disease.

## CONCLUSION

Our data demonstrate that some obesity parameters like BMI and WHR are important predictors to cardiovascular disease. Hypercholesterolemia may lead to increase in BMI and WHR even in elderly people of calcific AS and control group.

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