A comparative study of carotid artery intima media thickness in hypertensive smokers and non hypertensive smokers

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Abstract
Introduction: *Cardiovascular disease is the leading cause of death globally. In 2017-18, Non communicable diseases led to 38 million (68%) deaths out of a total of 56 million deaths worldwide. India is currently in the midst of this global Cardiovascular Disease epidemic.*
Method: *Case control study*
Aim of the Study: *To compare carotid artery intima-media thickness(cIMT) in Hypertensive smokers and smokers without Hypertension.*
Result: *In this study mean value of cIMT was found to be significant (P < 0.05) as mean of Case group (0.970) is significantly higher than that of Control group (0.735). Mean cIMT was highest in the study group i.e 1.114 mm in the population of age above 70 years, similarly Mean cIMT was highest in the control group i.e. 0.821mm in the population of age above 60 years.*
Conclusion: *The present study and its observations makes it imminent that Hypertension affects every cIMT measurement of the study subjects. cIMT measurement has as positive correlation with the increasing age.*
Keywords: *Hypertension, cIMT, Cardiovascular disease.*

Introduction

The world's major disease burden is contributed by noncommunicable diseases of which almost half is accounted for by atherosclerotic cardiovascular disease (CVD) alone.

India is currently in the midst of this global CVD epidemic.

Atherosclerosis starts in early childhood and advances over several decades.

The atherosclerotic disease becomes symptomatic only when there is hemodynamically significant narrowing of the vessels or when sudden thrombus formation occurs over a ruptured plaque.The slow, insidious progression of atherosclerosis allows an opportunity to detect the disease during its subclinical stage and to halt its progression through appropriate remedial measures.

Carotid artery intimal thickening is a marker of early atherosclerosis that can be assessed non invasively. Changes in arterial wall thickness indicate structural arterial changes resulting from arterial remodeling, most often due to the atherosclerotic process.Carotid ultrasound for the measurement of carotid intima-media thickness (cIMT) and plaque assessment is

one of the commonly used modalities for subclinical atherosclerosis assessment.cIMT is a well-validated research tool that has been translated into clinical practice [1,2].On the other hand, cIMT is related to coronary risk factors such as age, smoking, hypertension, and LDL cholesterol . In a number of recent studies, cholesterol lowering medications led to decrease in IMT . These studies suggest that IMT is of high value as a marker of atherosclerosis[3].

Materials and Methods

Setting: Study was conducted in smokers both hypertensive and non-hypertensive in out-patients and in patients in Department of Medicine, G.R. Medical College, Gwalior (M.P.).

Design of study: The study was a case control analytical study.

Period of study: *January 2018 to August 2019*

Ethical committee approval: Approval from the hospital ethical committee was obtained.

Consent: Informed consent was obtained from the subjects studied.

Inclusion Criteria: Cases are defined as smokers with hypertension above 18 years or equal.The subjects were poorly controlled hypertensive patients who defaulted or not compliant with medications. Controls were age and sex matched individuals who are smokers and non-hypertensive.

Exclusion Criteria: All patients below 18 years and who failed to give consent. All patients who have associated respiratory illness like Chronic obstructive pulmonary disease, asthma, pulmonary tuberculosis etc. All patients who are known cases of diabetics, dyslipidemia, coronary artery disease, stroke, valvular heart disease and cardiomyopathies.

Statistical Analysis

The data were managed on Microsoft excel spreadsheet (version 2007, Microsoft Corp., Seattle, Washington) and analyzed using SPSS for Windows (release 15.0, SPSS Inc., Chicago, IL, USA). Standard descriptive analysis was performed to analyze the baseline characteristics of the study population. Student's independent samples *t*-test was used for dichotomous risk factors and Pearson's correlation coefficient for continuous variables.

Spearman's rank correlation was used for assessing the statistical significance of CIMT trend across the age-groups. Multiple regression analysis was used for determining the relative strength of association between various CVD risk factors and CIMT. A *P* value <0.05 was considered statistically significant for all the analysis performed.All the data were analyzed using IBM SPSS Ver. 20 software. Data were expressed as percentage and mean±SD. The data was analyzed with "the independent samples t-test." This was significant if the p-value is <0.05.
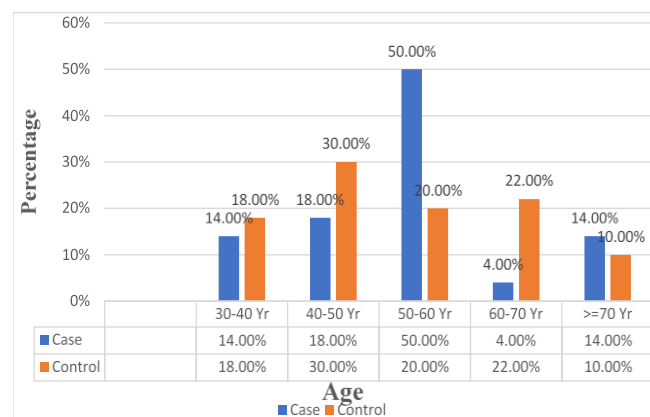
Results

The data for this study was collected from 100 in-patients and out-patients who met the inclusion criteria. The results were organized as follows:-

Table 1 : Association between Patient Group and their Age Group

Age Group		GROUP		Total
		Case	Control	
30-40 Yr	Count	7	9	16
	%	14.0%	18.0%	16.0%
40-50 Yr	Count	9	15	24
	%	18.0%	30.0%	24.0%
50-60 Yr	Count	25	10	35
	%	50.0%	20.0%	35.0%
60-70 Yr	Count	2	11	13
	%	4.0%	22.0%	13.0%
>=70 Yr	Count	7	5	12
	%	14.0%	10.0%	12.0%
Total	Count	50	50	100
	%	100.0%	100.0%	100.0%

Chi Square Test = 14.743, df =4, P Value = 0.100 Non Significant

Graph 1 : Age wise distribution of patients

	30-40 Yr	40-50 Yr	50-60 Yr	60-70 Yr	>=70 Yr
Case	14.00%	18.00%	50.00%	4.00%	14.00%
Control	18.00%	30.00%	20.00%	22.00%	10.00%

The above table shows the association between Patient group and Age group of the patient which was non-significant (P < 0.05).

Table 2 : Sex Distribution of Cases And Controls

Sex		GROUP		Total
		Case	Control	
Female	Count	20	20	40
	%	40.0%	40.0%	40.0%
Male	Count	30	30	60

Both the cases and controls have equal number of males and females in our study

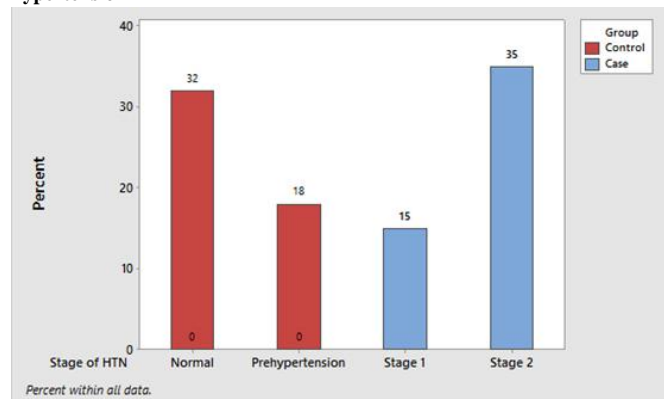**Graph 2 : Percentage Distribution of patients in different stages of hypertension**

Table 3 : Comparison of Mean Value of cIMTin Different Groups

cIMT(mm)	GROUP	N	Mean	Std. Deviation
cIMT	Case	50	0.9706	0.209
	Control	50	0.7352	0.180
Right cIMT	Case	50	0.943	0.237
	Control	50	0.723	0.191
Left cIMT	Case	50	0.998	0.255
	Control	50	0.746	0.178

The difference in mean value of cIMT was found to be significant ($P < 0.05$) as mean of Case group (0.970) is significantly higher than that of Control group (0.735).The difference in mean value of Right cIMT was found to be significant ($P < 0.05$) as mean of Case group (0.943) is significantly higher than that of Control group (0.723).

Similarly, the difference in mean value of Left cIMT was found to be significant ($P < 0.05$) as mean of Case group (0.998) is significantly higher than that of Control group (0.746).
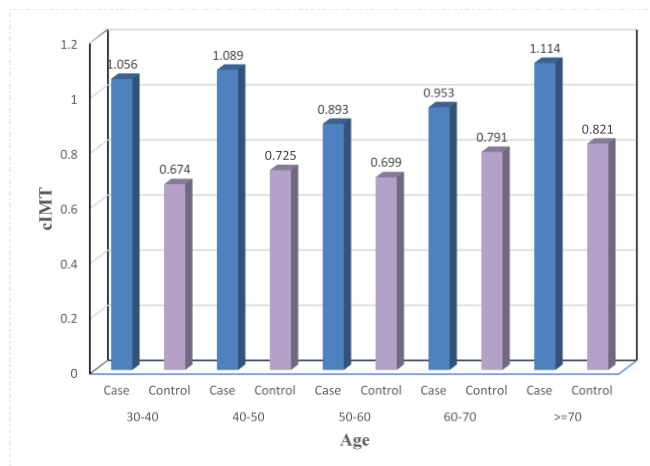
Graph 3 : Mean cIMT Vs Age Groups

Table 4 : Comparison of Mean Value of cIMT Parameter of Different Groups based on Gender

Gender	Group	N	Mean cIMT(mm)	Std. Deviation
Female	Case	20	.9725	.21366
	Control	20	.7303	.16610
Male	Case	30	.9687	.20991
	Control	30	.7375	.19147

The difference in mean values of cIMT for Females was found to be significant ($P < 0.05$) for cases in comparison to controls. Similar results were seen in males. But cIMT values for males and females were statistically non significant.

Discussion

Total 100 cases were included in this study from IPD as well as OPD.100 patients undergoing study were subjected to duplex scanning and color Doppler flow imaging followed by 2D echocardiography. All the cases and controls were investigated for lipid profile and other blood investigations.

In our study difference in mean value of Age was found to be non-significant ($P > 0.05$), mean age of Case group (53.32) was higher than that of Control Group (52.06), but the difference is statistically non-significant.

Patients in the Case group had higher percentage 50% for 50-60 years of age group while, show the lowest percentage 4% for 60-70 years of age group. Similarly, in Control group, patients show the higher

percentage 30% for 40-50 years of age group while, show the lowest percentage 10% for above 70 years of age group.

This was a small study where only 100 patients were screened as compared to the other studies where the sample size was more as in The British Regional Heart Study by Shah Ebrahim et al[4].

The difference in mean cIMT values of most of the Age groups was found to be significant (P < 0.05) as mean cIMT for Case group (1.114) is significantly higher than that of Control group (0.821). This association is in concordance with Studies done by J Ahmad et al[5], Hamma S et al[6], Ratnakar Sahoo et al[7] which also showed that CIMT increases with age. Henceforth, increasing age was statistically significant and comparable with previous studies.

There were 60 Males and 40 Females in our study. cIMT values were significantly higher in both females and males case group as compared to controls. Although in our study mean cIMT was significantly more in males as compared to females but the value is statistically not significant. In our study, gender was not found to be an independent risk factor for cIMT in contrast to previous studies done by Łoboz-Rudnicka M et al[8] and Mohamed M et al[9]

The difference in mean value of cIMT was found to be significant (P < 0.05) for Case group (0.970mm), is significantly higher than that of Control group (0.735mm).Maximum mean cIMT (1.114mm) was for the Study population of above 70 years of age group. The difference in mean value of Right cIMT was found to be significant (P < 0.05) as mean of Case group (0.943mm) is significantly higher than that of Control group (0.723mm).Similarly, the difference in mean value of Left cIMT was found to be significant (P < 0.05) as mean of Case group (0.998mm) is significantly higher than that of Control group (0.746mm).As compared with the previous studies our findings were similar i.e. cIMT was significantly more in the study group which signifies that hypertensives are more prone to increased atherogenesis and subsequently increased cIMT. This result was comparable with the other previous study done by Costan G. Magnussen[10]

Although major limitation in our study was that effect of other risk factors such as smoking, diabetes could not be studied.

Conclusion

The present study and its observations makes it imminent that Hypertension affects every cIMT measurement of the study subjects. The association between increased cIMT and the hypertensive state persisted after accounting for the known predictors of carotid IMT, i.e., sex, age, smoking. cIMT measurement has as positive correlation with the increasing age.cIMT can be considered as a reliable marker for early atherosclerosis.

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