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Correlation of C-F PWV and CIMT with BMI in Young Healthy Adults

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Abstract: To find correlation of C-F PWV and CIMT with BMI in young healthy adults. Study comprised of 100 healthy subjects from society nearby Dr S. N. Medical College, Jodhpur. Both C-F PWV and CIMT increased with increase in BMI & both were found higher in males than females and were statistically significant. Increase in carotid-femoral pulse wave velocity (C-F PWV) and carotid intima-media thickness (CIMT) indicate the risk of atherosclerosis with increasing BMI and in male gender.
Keywords: Carotid-femoral pulse wave velocity (C-F PWV), carotid intima-media thickness (CIMT), atherosclerosis, body mass index (BMI)

INTRODUCTION

Atherosclerosis is a specific form of arteriosclerosis in which an artery wall thickens as a result of invasion and accumulation of white blood cells and proliferation of intimal-smooth-muscle cells creating an atheromatous (fibrofatty) plaque [1,2].

Various anatomic and physiological risk factors for atherosclerosis are known [3]. These can be divided into various categories: congenital vs acquired, modifiable or not, classical or non-classical. Risks multiply, with two factors increasing the risk of atherosclerosis four-fold [4]. Hyperlipidemia, hypertension and cigarette smoking together increases the risk seven times [4].

Obesity is a medical condition in which excess body fat has accumulated to the extent that it may have a negative effect on health [5]. People are generally considered obese when their body mass index (BMI), a measurement obtained by dividing a person's weight by the square of the person's height, is over 30 kg/m^2, with the range 25–30 kg/m^2 defined as overweight [5].

Obesity increases the likelihood of various diseases and conditions, particularly heart disease, type 2 diabetes, obstructive sleep apnea, certain types of cancer, osteoarthritis and depression[6,7], Body mass index correlates positively with total serum cholesterol and inversely with HDL level. Obesity is an independent risk factor although it is often associated with other adverse factor such as hypertension, diabetes and physical inactivity. Obesity has direct relationship with all coronary risk factors except smoking.

Body mass index is the standard metric for determining who is normal-weight, overweight and obese, but BMI is not an accurate measure of fat, and doesn't explain the causes of poor health, scientists argue in an editorial today in the journal Science. Aug 22, 2013

BMI	Classification
< 18.5	underweight
18.5–24.9	normal weight
25.0–29.9	overweight
30.0–34.9	class I obesity

MATERIAL AND METHOD

Present study was conducted in the Department of Physiology, Dr. S.N. Medical College, Jodhpur. Participants after understanding the study protocol and procedure were asked to give their written consents for the study.

INCLUSION CRITERIA

- Healthy individuals with no atherosclerotic risk factors like high BP, diabetes, smoking etc.
- Men and women of age 20- 60 years were included in the study.

Number of cases studied:- 100.

Data evaluation

This is an observational cohort study and the data was analyzed using student's t-test.

Evaluation on a preformed proforma history

Complete clinical examination, height, weight routine biochemical analysis, and Pulse wave velocity and Intima-media thickness are measured.

Method

Pulse wave velocity was determined by Periscope (M/S Genesis Medical Systems, Hyderabad, India) in an 8-channel real-time PC-based simultaneous acquisition and analysis system. CIMT was measured from outside the body, in larger arteries relatively close to the skin by ultrasound.

OBSERVATION

Table-1: Distribution of c-f PWV and CIMT according to BMI

Male	Female	BMI	Av C-F PWV Male	Av C-F PWV Female	Av CIMT Male	Av CIMT Female
16	12	<18.5	1321.7 ± 149.7	877.9 ± 508.8	1.01 ± 0.23	0.68 ± 0.19
10	17	18.5-24.9	1505.4 ± 365.9	1058.9 ± 293.8	1.16 ± 0.33	0.74 ± 0.2
12	10	25- 29.9	1524.9 ± 503.8	1099.6 ± 431.4	1.21 ± 0.38	0.76 ± 0.22
12	11	30- 34.9	1571.3 ± 508.9	1110.9 ± 391.7	1.22 ± 0.33	0.84± 0.22
50	50		1480.8 ± 382.0	1036.8 ± 406.4	1.15 ± 0.31	0.75 ± .20

Above table shows average C-F PWV and average CIMT according to BMI. As BMI increase, there was increase in C-F PWV that was statistically significant (p=<.0.001) & increase in CIMT that was also statistically significant (p=<.0.001). Both were found higher in males than females and was statistically significant.

DISCUSSION

Ludwig M *et al.* [8] multivariate linear regression models showed that male gender, age and blood pressure were independent determinants of both CIMT and PWV while body mass index and LDL-cholesterol were independent determinants of CIMT only.

Kobayashi K *et al.* [9] shown that Flow-mediated dilation (FMD) of the brachial artery, carotid intima-media thickness (IMT) and pulse wave velocity (PWV) were good surrogate markers of clinical atherosclerosis. One hundred and thirty-five consecutive subjects were enrolled, including 110 patients with risk factors for atherosclerosis, and 33 patients with atherosclerotic disease such as coronary heart disease, stroke or Arteriosclerosis obliterans.

Our study hold up by Akiko Seotani [10**]** *et al.* who in Japan assessed correlation between C-F PWV and obesity by dividing subjects into normal (18.5≤ body mass index (BMI) <25 n=120), overweight (25≤ BMI <30 n=164) and obese (BMI ≥30, n=69). C-F PWV and ASI was significantly higher in the obese group than in the overweight group. Ewa Pedlelka [11], who in Poland found that overweight and obesity correlate also supported it with stiffness of the arterial wall and correlation between parameters of large artery wall elasticity and BMI as revealed (r = –0.1303, p = 0.0060).

Irace C *et al*. [12] showed that body fatness and fat distribution are widely accepted as coronary heart disease risk factors. In this study, we have evaluated the contribution of generalized adiposity, assessed by body mass index (BMI), to carotid atherosclerosis, in participants with or without metabolic syndrome (MetS). The present findings suggest that increasing body weight favours the clustering of coronary heart disease risk factors. Overweight and obesity, however, do not independently associate with carotid atherosclerosis. MetS was more frequent among obese and overweight than normal-weight participants (51.7 vs. 21.5 vs. 9.8%, respectively). The prevalence of carotid atherosclerosis was 45.29% in participants with MetS, significantly higher than in participants without MetS (33.04%, p<0.0001), but it was similar across the three weight categories. Furthermore, in multiple regression analyses BMI was not significantly associated with carotid atherosclerosis.

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