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Hemodynamic Features of IHD in Overweight Patients

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Abstract: Excessive body weight in both men and women adversely affects each and every organ system and most affected is the cardiovascular system. It is associated with atherosclerosis and hyperlipidemia. As well as increased lipolysis forming Plaque and Emboli (can be septic also). Problems are exacerbated by other co morbidities like hypertension, Diabetes, calcification of the vessels. IHD will undoubtedly lead to Acute Coronary Syndrome.

Keywords: Ischemic heart disease, hyperlipidemia, hs-CRP, obesity, heart rate, hypertension.

INTRODUCTION

Macro and microcirculation of heart can be described as the large Epicardial coronary arteries (>400 μm), small arteries (<400 μm), arterioles (100 μm) and capillaries (<10 μm). Epicardial vessels have the major function of transport, while the microcirculation of heart has the function of maintaining blood pressure, vasomotion of arterial segments in response to stimuli (pressure and metabolites) for regulation and at the same time is the main cause for resistance to flow. We have different determinants of O_2 demand and O_2 supply:

Table 1: Oxygen demand and supply determinants.

Determinants of O_2 demand	Determinants of O_2 supply
Systolic Blood pressure	Coronary artery resistance/ diameter
Heart Rate	Heart rate
Myocardial contractility	Perfusion pressure
Myocardial wall stress	

It is evident from this that heart rate is a determinant of both O_2 demand and as well as supply. Ischemic heart disease or Coronary artery disease precedes the Acute Coronary Syndrome, i.e. ACS which can be further sub classified into ACS with ST elevation seen on Electrocardiogram (STE-ACS/ STEMI) and ACS without any ST elevation visible on Electrocardiogram (NSTE-ACS). So, to simply state it is adequate to state that Ischemic heart disease is improper perfusion of myocardial tissue which can be due to following different causes:

- Plaque formation
- Emboli
- Spasm (Prinzmetal Angina)
- Vasculitis (Takayasu in adults and Kawasaki in children).

Let's mention the risk factors for plaque formation:

≥70% plaques in vessels are usually considered significant.

1. Cigarette smoking.

2. Hyperlipidemia

a) High LDL cholesterol (small sense LDL/ oxidized LDL)

b) Low HDL levels.

c) Highly sensitive CRP (hs-CRP)

d) Lipoprotein (a)

e) Lipoprotein Phospholipase A2 (Lp-PLA2)

There are no methods to measure small dense LDL and oxidized LDL, therefor single most important parameter is highly sensitive CRP levels to assess the hyperlipidemia.

CRP levels:

- <1mg/dL: most advisable
- 1-3mg/dL: Slightly high.
- >3mg/dL: Very high.

Statins work minimally on small dense LDL.

3. Hypertension:

- Alters the architecture of vessels,
- Endothelial dysfunction in vessels.
- LVH, high oxygen demand.

4. Diabetes:

- Associated with centripetal obesity and insulin resistance.
- Changes receptors from α to β_3(increases lipolysis)

5. Family history

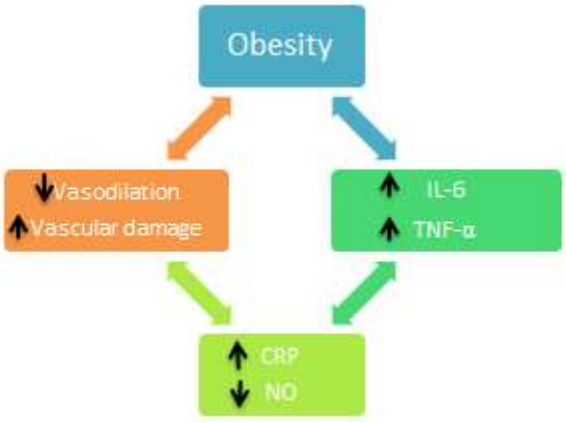
6. Calcification in vessels.

7. Lifestyles.

Smoking: most crucial yet preventable risk factor for IHD.

Indications for Statins:

- LDL cholesterol >190 mg/dL (target <100)
- DM in patient with age 40- 75 years (moderate statin- 10 to 20 mg of Rosuvastatin).
- Clinical atherosclerosis.



Purpose of the study:

The following study is performed to analyze the hemodynamic features of IHD in patients with excessive weight and notice the prevalence of atherosclerosis in fast moving world with less time for maintaining physical health.

Methods and Materials:

The study involved young men and women with an average age of 35-45 years. A total of 68 people (32 men and 36 women) suffering from suspected IHD and obesity of different degrees were examined. The examination was carried out by questionnaire (MIEF in men). Subjective and objective investigation of patients followed by Angiography was performed. The diagnosis of Ischemic Heart disease was made on the basis of American Heart Association guidelines. MSCT with contrast was performed and patients with ≥ 70% plaque in vessels were with IHD. But with less of blockages were kept under observation for the risk of plaque which is far more dangerous than the plaque. Patients firstly underwent normal including, Height, Weight, Chest and BMI (Body Mass Index) to the formula.

$$\text{BMI} = \frac{\text{Weight (Kg)}}{\text{Height } (m^2)}$$

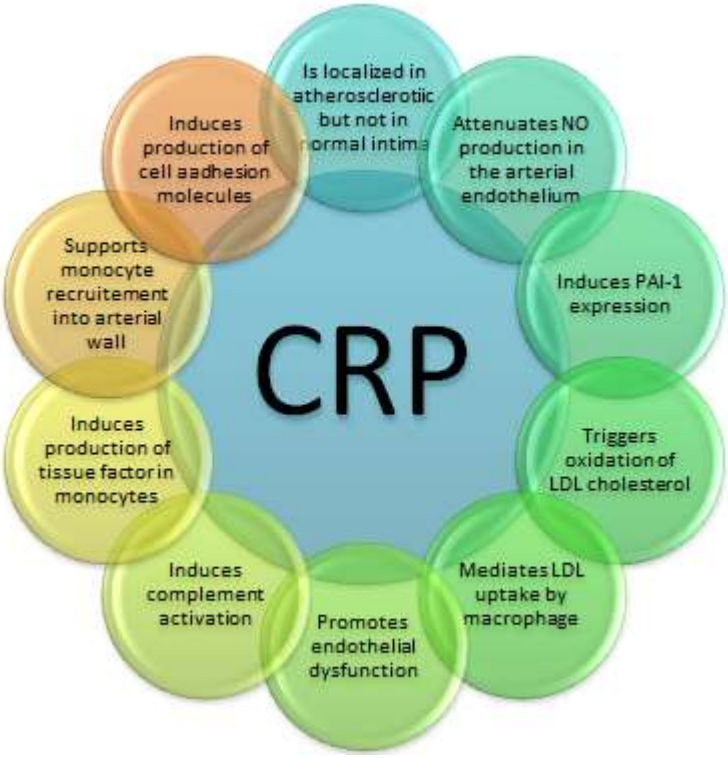
It is the ratio of body weight (in kilograms) to height (in meters) squared. WHO developed a classification of overweight and obesity based on BMI? (See table 2 for data).

Table 2:

Classification	BMI (kg/m^2)
Severe underweight	<16
Underweight	16-18,49
Normal	18,5-24,99
Overweight (Obesity)	25-29,99
Obesity stage I	30-34,99
Obesity stage II	35-39,99
Obesity stage III	>40

RESULTS:

In our study, Ischemic heart disease established by CT Angiography. 54% of patients (36) are at risk of developing Acute coronary syndrome, out of which 20 are men and 16 are women. It was interesting to note that out of these 36 patients, 10 patients were suffering from Obesity class I (BMI= 30-34.99), 12 patients were suffering from Obesity class II (BMI= 35-39.99) and 14 were Obese Class III (BMI >40). Noticeable observation was that all these patients were having sedentary lifestyle and all were on Statins to reduce their cholesterol levels. On a positive note, 47 patients (70%) started improving their lifestyles and followed dietary recommendations and came to visit their Cardiologists on regular basis and other specialists Endocrinologists, Dieticians and Physiotherapists.



DISCUSSION:

Having excessive weight is a highly unhealthy and negative phenomenon, but the fact is that many people have a hereditary tendency to gain excess weight, and they themselves are not to blame for it. Moreover modern fast moving life, the lifestyle of work and the fast food itself already contribute to obesity. With numerous issues on body and normal physiological functioning of body it certainly has a pronounced effect on cardiovascular system. It affects the healthy coronaries and leads to formation of plaque and emboli. On further degradation of the vessels, acute coronary syndrome develops. Obesity is the leading cause of co morbidity as Hypertension which itself causes IHD.

CONCLUSION:

From the clinical aspects and based on the results of our study, we can recommend patients with IHD and at least degree 1 obesity not to neglect consultations with Cardiologist and follow the diet recommendations:

- Salt intake <6g/ day.
- Protein intake: 15% (1g/Kg/day).
- Dietary cholesterol: <200mg/ day.
- Soluble fiber: >10-25g/ day.
- Saturated fat: <7%.

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