ORIGINAL PROF-0-3262

CORONARY ARTERY DISEASE;
RELATIONSHIP OF BODY MASS INDEX AND SEVERITY OF CORONARY ARTERY DISEASE IN PATIENTS UNDERGOING CORONARY ANGIOGRAPHY.

1. MBBS, FCPS (Cardiology)
   Assistant Professor
   Department of Cardiology,
   Chaudhry Pervaiz Elahi Institute of
   Cardiology, Multan
2. MBBS, FCPS (Medicine)
   Assistant Professor
   Department of Medicine, Medical
   Unit-III
   Nishtar Medical University, Multan.
3. MBBS, FCPS (Medicine)
   Assistant Professor
   Department of Medicine
   Nishtar Medical University, Multan.
4. M.Phil
   Senior Research Officer
   PHRC, Research Centre
   Nishtar Medical University, Multan.
5. MBBS
   House Officer
   Nishtar Medical University, Multan.

Correspondence Address:
Dr. Shahzad Alam Khan
Assistant Professor
Department of Medicine
Nishtar Medical University, Multan.
shahzadalam17735@gmail.com

Muhammad Ikram Farid[1], Nasir Jamal Khan[2], Shahzad Alam Khan[3], Iqra Imtiaz [4], Sohail Safdar[5]

ABSTRACT… Objectives: To establish or refute any association between high Body Mass Index (BMI) and Coronary Artery Disease in South Punjab area of Pakistan. **Background:** Ischemic heart disease has a strong relation with high Body Mass Index (BMI). But still uncertainty persists about the association that exists between overweight (BMI 25-29.9 kg/m^2) or obese patients (BMI >30 kg/m^2). **Design:** Observational, Cross Sectional Study. **Setting:** Cardiac cath lab department of Multan Institute of cardiology Multan. **Duration of Study:** Six month tenure extending between January 2017 to June 2017. **Methods:** The study was conducted in cardiac cath lab department of Multan Institute of cardiology, Multan. Total of Four hundred and seventy eight patients (478) over a period of two months were included in the study. All patients were having a coronary angiography due to a medical indication. Their BMI was calculated by using standard formula. **Results:** Out of 478 patients 335 (70.1%) patients were having optimal weight. 123 (25.7%) were overweight, 12 (2.5%) were mildly obese, 8 (1.7%) were severely obese patients. Optimal weight patients had 12.5% normal coronary angiogram, 26.3 % had single vessel CAD, 20% had two vessel disease and 41.2% had severe triple vessel disease. Over weight patients had 17.9% normal coronary angiograms, single vessel CAD was seen in 26.8% patients, 21.9% patients had two vessel disease and 33.3% had severe triple vessel CAD. Mildly obese patients had 8.3% normal coronary angiograms, 50% had single vessel CAD, 25% had two vessel disease, and 16.7% had severe Triple vessel disease. Among severe obese patients 12.5% had normal coronary angiography, 25% had single vessel disease, 50% had two vessel disease, and 12.5% had severe triple vessel disease. **Conclusion:** Patients undergoing Coronary Angiogram in the region of south Punjab did not show any significant relationship between severity of CAD (Severe two vessels & severe Triple vessel disease) and BMI.

Key words: Body Mass Index, Coronary Artery Disease, Two Vessel Disease, Tripple Vessel Disease.

INTRODUCTION
Obesity is a disastrous problem worldwide. Its frequency has increased twofold since 1980. A survey done in 2005 estimated that 1.3 billion of world population is obese. It suggested 23% of adults more than 20 years to be overweight (BMI > 25) and 10% having obesity (BMI > 30).[1,2] According to World Health organization report approximately 1.9 billion adults are overweight. Out of these approximately 600 million are obese. In Chinese population sample the frequency of BMI above 25 has risen beyond 50% in men and women.[1] Explanations for this rapid trajectory are complex; they include modification in dietary habits, physical activity, and urbanization. Popkin

and Gordon-Larsen have identified that use of edible oils, caloric sweeteners, and animal source foods is showing up rise trend.

Although obesity is thought to be a potential risk factor for CAD, but many recent studies and published literature has indicated that its presence may have an inverse relationship with CAD. This finding of obesity paradox has been observed more in survival of patients of congestive cardiac failure and in patients following a coronary revascularization procedure. This finding has generated a lot of debate recently. This finding was never studied in the region of South of Punjab and we wanted to know whether this finding holds

good for our region or not.

BMI can be easily calculated by weight for height ratio. It's mentioned as a person's weight in kilograms divided by the square of height in meters (kg/m²). Any individual who has BMI of 25 or greater is overweight, and if his BMI is 30 or more that person is considered obese. This tool is best for population based studies for all ages and sex. High BMI is a disastrous factor for Cardiovascular diseases especially stroke and CAD.

Rising trend of obesity in childhood and sedentary living has already caused increased prevalence of Diabetes Mellitus and hypertension in younger age groups[,4,5] Diabetes, rheumatologic disorders specially osteoarthritis and some malignancies like breast, ovarian, endometrial, prostate, liver and gall bladder malignancies are also attributed to obesity. Our main objective was to determine the severity of CAD in obese patients presenting to Cardiac catheterization laboratory of Chaudhry Pervaiz Elahi Institute of Cardiology.

We divided the patients into one group of non-significant CAD patients who had no or minimal disease on Angiography. Single vessel disease, severe two vessel disease and severe triple vessel disease patients were categorized in different groups. For the sake of comparison we included patients of both two vessel and triple vessel disease in single category of severe CAD, while patients with minimal or no disease were kept in another group.

METHODS
The Observational, Cross Sectional study was conducted in cardiac cath lab department of Multan Institute of cardiology, Multan.

Data Collection Procedure
A proforma was made to note the findings of the patients. All the patients having ischemic heart disease (478), undergoing coronary angiography were enrolled from cath lab of Multan Institute of Cardiology Multan. Proper permission was issued by Institutional Ethical Committee to conduct this study. After taking proper informed consent from

each patient, that case was considered for this study and was properly informed about objectives of this study. All patients underwent a coronary angiography due to a medical indication. All patients' height and weight were recorded on the day of Coronary angiography and BMI was calculated. Patients were divided into subsets of Optimal weight (BMI<25kg/m2), Overweight (BMI 25-29.9kg/m2), mildly obese (BMI 30-34.9kg/m2) and severely obese (BMI >35kg/m2). Severity of Coronary Artery Disease (CAD) was also divided into Non significant CAD, Single vessel CAD, Two vessel CAD and Triple vessel CAD. All the data was recorded on a pre-designed questionnaire.

Data Analysis
Data was processed and analyzed by SPSS-20. Descriptive statistics were used for the calculation of mean and standard deviation for the patients age, height, weight. Frequencies were estimated for different BMI levels. Frequencies of various BMI subsets was also plotted against subsets of CAD severity.

RESULTS
Our study cohort comprised 103 female and 375 male. Mean age of patients was 48±9 with youngest patient 34 years old and eldest to be 69 years old. Of these 478 patients 335 (70.1%) patients were having optimal weight. 123 (25.7%) were overweight, 12 (2.5%) were mildly obese, 8 (1.7%) were severely obese patients.

Optimal weight patients had 12.53% normal coronary angiogram, 26.26% had single vessel CAD, 20% had two vessel disease and 41.2% had severe triple vessel disease.

Over weight patients had 17.9 % normal coronary angiograms, single vessel CAD was seen in 26.8% patients, 21.9% patients had two vessel disease and 33.3 % had severe triple vessel CAD.

Mildly obese patients had 8.3% normal coronary angiograms, 50% had single vessel CAD, 25 % had two vessel disease and 16.7% had severe triple vessel disease. Among severe obese patients 12.5% had normal coronary angiography, 25% had single vessel disease, 50% had two vessel

disease, and 12.5% had severe triple vessel disease.

When severe Two vessel and triple vessel disease was combined it was noted that 61.2% of optimal weight patients had it. In over weight patients it was 55.3%. Mildly obese patients severe two vessel & triple vessel disease was seen in 41.7%. In the category of severely obese patients severe two vessel and triple vessel disease was seen in 62.5%.

Figure-1

	Freq	%age	Cummu %
Optimal Weight: BMI< 25 kg/ m2	335	70.1	70.1
Overweight: BMI 25-9.9 kg/m2	123	25.7	95.8
Mildly Obese: BMI 30-34.9 kg/m2	12	2.5	98.3
Severely Obese: BMI> 35 kg/m2	8	1.7	100.0

Table-I
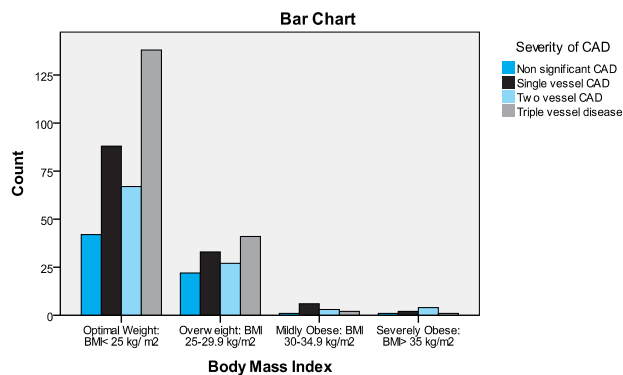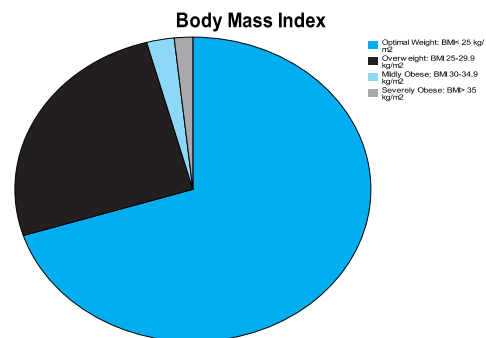
Figure-2

		Severity of CAD				Total
		Non-significant CAD	Single Vessel CAD	Two Vessel CAD	Triple Vessel Disease	
Body Mass Index	Optimal Weight: BMI< 25 kg/ m2	42	88	67	138	335
	Overweight: BMI 25-29.9 kg/m2	22	33	27	41	123
	Mildly Obese: BMI 30-34.9 kg/m2	1	6	3	2	12
	Severely Obese: BMI> 35 kg/m2	1	2	4	1	8
Total		66	129	101	182	478
Body Mass Index & Severity of CAD						

DISCUSSION

The novel and important aspect of this study was that no association was established between high BMI with severity of CAD in our study population set. Double & Triple vessel disease (2VD & TVD) was equally common in obese patients as it was in normal weight patients. Positive relationship between incremental rise in BMI and worsening severity of CAD could not be ascertained in our study.

Although obesity has strong relation with metabolic syndrome with resultant increase in insulin resistance and high BP, yet we could not identify any significant differences when it came to studying the coronary angiograms of these patients.

The mechanisms which explain any relation between obesity and CAD severity are yet to be determined and open for discussion. Inflammation, metabolic syndrome & hyperlipidemia are all

thought to be increased in obese patients and may be a causative agent, still in our obese patients subset it did not resulted in untoward effects in causing the coronary anatomy.

Recent data has spoken volume of an "Obesity Paradox", meaning that obese patients who undergo coronary revascularization have a better short term outcomes and survival in certain subsets of patients. In particular, obese patients with congestive cardiac failure had a better outcome. "Obesity Paradox" in CAD has few understandable explanations. These obese patients with CAD usually come to notice at an earlier age with a lower plaque load.[6-8] It may be because of a referral bias where only the healthiest obese patients who may have lower disease severity are included in cohorts demonstrating the obesity paradox. The follow-up intervals may also be of shorter length to capture the long-term negative influences of obesity.[9] Another limiting factor may be how we quantify adiposity by BMI. For example 'normal weight' is defined as BMI range of 18.5–24.9 kg/m2 which may be too broad and the lower end of this classification may actually be indicative of unhealthy levels of decreased body mass. But recently few more investigations showed that the obesity paradox exists for both BMI and body fat, with higher body fat being an independent predictor of better survival.[10-12]

CONCLUSION

We failed to establish any significant relationship between severity of CAD (Severe two vessels & severe Triple vessel disease) and BMI. However due to limitation of time and loss of follow up was a major constraint in establishing "Obesity Paradox".

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
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Impossible is a **word** to be found
only in the **dictionary** of fools.

"Napoleon Bonaparte"

AUTHORSHIP AND CONTRIBUTION DECLARATION

Sr. #	Author-s Full Name	Contribution to the paper	Author=s Signature
1	M. Ikram Farid	Concept, Planning, Data collection.	
2	Nasir Jamal Khan	Data collection and analysis.	
3	Shahzad Alam Khan	Data analysis.	
4	Iqra Imtiaz	Coordinator & Proof reader.	
5	Sohail Safdar	Proof reading, Statistical review.	