

**Original Article****Malnutrition a risk factor for myocardial infarction in patients with type-2 diabetes**

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**ABSTRACT****Objective**

To observe the relationship between malnutrition and Myocardial Infarction (MI) in patients with type 2 diabetes.

**Methods**

This cross sectional comparative study was carried out among the population of Southern Sindh, Pakistan. The blood samples were collected from MI patients with type 2 diabetes and 30 samples were collected as control from the same age and gender. Plasma concentrations of total protein, albumin, globulin and A/G ratio level were used as a parameter of visceral protein stores. Fat stores were assessed from body fat and total plasma homocystein level was assessed for the deficiencies of vitamin B<sub>12</sub>, vitamin B<sub>6</sub> and folic acid. Patients having body mass index (BMI) less than 20 kg m<sup>-2</sup> were considered as malnourished

**Results**

Out of total of 70 patients, 48 were male and 22 were female. Age ranged from 45 to 60 years. BMI in controls was significantly higher (22.9 +/- 4.1 SD) as compared to patients (18.2 +/- 3.7 SD). Protein and homocystein levels also revealed significantly high values in controls than patients.

**Conclusion**

This seems to be a relationship between malnutrition and an increased risk of MI in patients with type 2 diabetes. (Rawal Med J 2010;35: ).

**Key Words**

Malnutrition, myocardial Infarction, diabetes mellitus.

**INTRODUCTION**

Dietary behaviors have long been established as risk factors for a number of chronic diseases. The most prevalent diet-related chronic diseases in Western countries are cardiovascular diseases (CVD) and cancer.<sup>1</sup> Malnutrition is mainly a deficiency of calories and proteins and affects mental and physical development and impairs productivity. A number of studies during the past few years have indicated a protective role of micro-nutrients against the development of cardiovascular disease (CAD).<sup>2,3</sup> While 'traditional' risk factors, such as hypertension, chronic heart failure, dyslipidemia, smoking and diabetes mellitus account for a large part of the increased cardiovascular disease, 'nontraditional', risk factors, such as inflammation, oxidative stress and malnutrition, may contribute to an increased cardiovascular mortality.<sup>4</sup> Pakistani people belong to the South Asian population which has the highest known rate of coronary artery disease (CAD).<sup>5</sup>

Hyperhomocysteinemia has been observed in Pakistani AMI patients.<sup>6</sup> High prevalence of deficiency of folate and vitamin B12 and vitamins B6 appears to be the major cause of hyperhomocysteinemia.<sup>7</sup> The deficiency of these vitamins could be due to malnutrition (lower intake of fresh fruits and vegetables) and due to overcooking of our food and a high prevalence of parasitic enteric infection (especially amebiasis and giardiasis) in our population.<sup>1,8,9</sup> The objective of this study was to investigate the link between malnutrition and AMI in patients with type 2 diabetes.

## **PATIENTS**

## **AND**

## **METHODS**

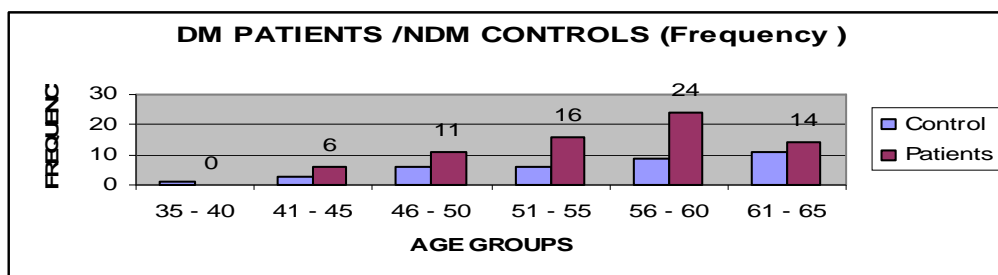
This cross sectional case control comparative study was carried out at Institute of Biochemistry, University of Sindh, Jamshoro during a two year period. The study population included 107 hospitalized 40 to 60 year old patients of AMI, 71 of them were diabetic and 36 patient (age and gender-matched) control, which were non-diabetic. Subjects with renal failure, having thyroid disorders, psoriasis, malignancy and megaloblastic anemia were excluded from the study. These patients were admitted in different hospitals of Hyderabad and adjoining area including Liaquat University Hospital Jamshoro, Wali Bhai Rajputana Hospital, Memon Charitable Hospital, Naseem Medical Center, Red Christian Hospital, Isra University Hospital, Hyderabad, District Hospital Mirpurkhas, Taluka Hospital Digri, District Hospital Umerkot and District Hospital Badin. The majority of patients as well as controls belonged to low socio-economic group and were residents of rural and suburban area of the southern Sindh. A verbal consent was obtained from each patient.

Clinical history included smoking habits, presence or absence of diabetes mellitus and hypertension. Smoking habits were defined as current smoker and non-smoking. Subjects were categorized as diabetic if they gave history of diabetes mellitus, with or without treatment and/or if they were found to have fasting plasma glucose >120 mg/dl. Physical examination included general physical examination and measurement of arterial blood pressure in the right arm in sitting posture. Average of two readings was used as the estimate of blood pressure. Patients were categorized as hypertensive if they were on anti-hypertensive treatment or if they had a systolic BP >140 mmHg and/or diastolic BP >90 mmHg. BMI was calculated using height and weight. A 10 ml fasting venous blood sample was collected in BD vacutainer and transported to the research laboratory of institute of biochemistry, university of Sindh. Serum lipid profile, total albumin and globulin, plasma glucose level was estimated by commercial colorimetric kits methods on semi-automated biochemistry analyzer (Micro lab 300) and CBC was done using automated blood analyzer (Sysmex K-4500).

## **RESULTS**

The study group was divided into two subgroups: MI patients with type 2 diabetes and Non-diabetic MI patients.

**Fig 1. Comparison of DM-MI and NDM-MI Frequency in different years of age groups.**



Out of 71 patients of MI with type 2 diabetes, 51 were male and 20 were females. The average age was 56.4 +/- 5.3 years. Highest frequency was observed in 56-60 years of age. Out of 36 Non-diabetic patients of MI, (controls) 24 were male and 12 were female. The highest frequency was observed in age group between 51-55 and 56-60.

**Table 1. Demographic and clinical characteristics of patients.**

	Control (n = 36) (mean+/-SD)	Frequency (%)	Patients (n = 71) (mean+/-SD)	Frequency (%)
Age (Years)	56.4 +/- 6.16		53.76 +/- 7.6	
Male		24 (66.6)		51 (71.8)
Female		12 (33.3)		25 (35.2)
BMI	22.9 +/- 4.1		18.2 +/- 3.7	
<b>Smoking Status</b>				
Smokers		16 (44.44)		39 (54.92)
Nonsmokers		20 (55.55)		32 (45.07)
<b>Diet</b>				
Vegetarian		03 (8.33)		06 (8.45)
Non-vegetarian		33 (91.66)		65 (91.5)
<b>Hypertension</b>				
Yes		19 (52.77)		49 (69.01)
No		17 (47.2)		22 (30.98)
<b>Hypercholesterolemia</b>				
Yes		23 (63.8)		26 (36.61)
No		13 (38.1)		45 (63.38)
<b>Glucose (Fasting)</b> (60 – 115 gm/dl)	86.4 +/- 14.32		196 +/- 27.52	
Total Protein	8.3 +/- 2.1		6.5 +/- 2.9	
Albumin	4.8 +/- 1.6		3.8 +/- 1.9	
Globulin	3.5 +/- 0.5		2.7 +/- 1.0	
Total lipid	739.6 +/- 89.3		676.1 +/- 43.8	
Total Cholesterol	212.6 +/- 28.6		198.6 +/- 24.4	

(200 – 240 mg/dl)				
Triglyceride	188.0 +/- 69		218.7 +/- 87	
HDL-Cholesterol	33.1 +/- 10.1		29.3 +/- 9.6	
LDL-Cholesterol	106.1 +/- 29.4		121.5 +/- 32.1	
Homocystein level	13.9 +/- 1.2 μmol/L		21.3 +/- 1.8 μmol/L	

Figure 1 compares the frequency of DM-MI and non-diabetic patients with MI.

**Table 2. Comparison of risk factor between patients and controls.**

<b>Risk Factor</b>	<b>Degree</b>	<b>DM-MI</b>	<b>NDM-MI</b>	<b>p-Value</b>
BMI	High	22	24	<0.04
	Low	49	12	<0.01
Smoking	Smoker	39	16	<0.001
	Non-smoker	32	20	<0.002
Hypercholesterolemia	Present	26	19	<0.003
	Absent	45	11	<0.04
Low HDL	Present	41	21	<0.029
	Absent	30	15	<0.02
Hypertension	Present	49	19	0.3(NS)
	Absent	22	17	0.2(NS)
History of MI	Present	40	24	<0.04
	Absent	31	12	<0.02
Obesity	Present	19	20	0.20(NS)
	Absent	52	16	<0.001

NS = Not significant

Demographic and clinical characteristics of patients are listed in Table 1. BMI in controls was significantly high 22.9 +/- 4.1 SD as compared to patients 18.2 +/- 3.7 SD Table 2).

## **DISCUSSION**

Pakistan is facing a huge challenge in combating CVD.<sup>10,11</sup> According to the most careful estimates based on scientific studies, nearly 100,000 individuals suffered from an AMI in Pakistan in the year 2002.<sup>5,12</sup> Significantly low BMI in MI patients having type 2 diabetes

mellitus in present study suggest relationship between nutritional deficiency and the development of CAD. Over the past three decades, the association between elevated serum levels of homocysteine and risk of cardiovascular disease has grown much obscure hypothesis to this major current topic in preventing cardiology problems.<sup>12</sup>

In a meta-analysis of 14 case control studies, Boushey et al<sup>12</sup> found that an increase of 5  $\mu\text{mol/L}$  in basal total homocysteine level is associated with a 60% increase in the odds of CAD among male and an 80% increase in the odds of CAD among female. An increase risk of CAD is much as 20 mg/dl increase in cholesterol concentration. In another prospective cohort study involving 14,915 male US Physicians without prior MI, found that those physicians having serum homocysteine 12% above normal has a 3-fold increased risk of MI as compared to those who have lower levels even after adjustment of traditional common risk factors.<sup>7,13 14</sup> It was observed that mean of total number of BMI of patients in DM-MI was significantly higher, these results / findings show close relationship between malnutrition and ischemic heart disease.<sup>15</sup> Elevated homocysteine level was found raised in patients of DM-MI as compared to patients of NDM-MI. This difference may be attributable to concurrent covert vitamin deficiencies much more common in Asia. 15

## CONCLUSION

Present study shows a close relationship between malnutrition, hyperhomocysteinemia and myocardial infarction in patients with type-2 diabetes.

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