Blood Glucose Levels in Patients with Coronary Artery Disease.

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ABSTRACT

Introduction: Diabetes Mellitus is a potent risk factor for Coronary Artery Diseases, but Impaired Glucose Tolerance is increasingly known risk factor for Coronary Artery Diseases. The aim of this study was to correlate blood glucose level in the patients with Coronary Artery Diseases with Acute Coronary Syndrome and to determine the relationship of other risk factors.

Methods: This was a cross-sectional prospective study of consecutive patients admitted in coronary care unit of Bir Hospital and Shaid Gangalal National Heart Center, with diagnosis of Acute Coronary Syndrome.

Results: Total 209 patients were enrolled. 90.9% (190) had dyslipidemia, 78.5% were smokers with mean Standard Deviation of duration of smoking were 25.35 years. Abnormal waist to hip ratio in male and female are 56.3% and 76.1% respectively**.** 14.4 % (30) had Random Blood Glucose > 200mg%, 17.2 % had Impaired Fasting Glucose (110-126 mg% World Health Organization); 34.4% had Impaired Fasting Glucose (100-126 mg% American Diabetic Association) 28.2% had Impaired Glucose Tolerance (postprandial blood glucose 140-200mg %).19.1% were old diabetes, 21.3% had recent diabetes mellitus, 52.7% had impaired glycemia.93.1% of total patients had Glucose Intolerance of any form.

Conclusions: Almost all patients had diabetic or glucose intolerance of any form prior to coronary artery disease with acute coronary syndrome. This study consisted with Asian criteria of body mass index and Waist circumference for overweight or obesity.

Keywords: acute coronary syndrome, coronary artery disease, diabetes mellitus, dyslipidemia, obesity

INTRODUCTION

Cardiovascular disease, the major cause of mortality and morbidity in modern societies, is set to overtake communicable disease in developing world as the most common cause of death. The increasing prevalence of major and emerging cardiovascular risk factors account for the growing burden of cardiovascular disease in the world[1, 2].

Coronary Artery Disease (CAD) accounts for over 60 % of deaths in the people with diabetes, which is least twice that-off the non-diabetic population, in additional impaired glucose metabolism, comprising Impaired Glucose Tolerance (IGT) and Impaired Fasting Glucose (IFG) is also associated with increased risk of Coronary Artery Disease (CAD)[3].

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Although national data for incidence and prevalence of CAD is not available in Nepal, hospital based data in Kathmandu, showed a 40 fold increase in incidence of Myocardial infarction in the past 30 years[4]. A study shows that the prevalence of diabetes and impaired fasting glycemia in Urban Nepal are higher than that of rural Nepal[5]. Diabetes mellitus is potent risk factors for CAD, but impaired glucose tolerance is coming up indicators for CAD[6].

This study was designed to correlate blood glucose level in the patients with coronary artery disease with acute coronary syndrome and to determine the relationship of other risk factors.

METHODS

This is a cross-sectional prospective study of consecutive patients admitted in cardiac care unit (CCU) of Bir Hospital and ShahidGangalal Heart Center, with diagnosis of acute coronary syndrome (ACS).

The study was carried out from 16th July 2005 to 10th August 2006.

The total number of patients enrolled in this study was 209.

All the patients underwent a detail history, physical examination and routine investigations like Admission Random Blood Glucose (RBG), Fasting blood glucose (FBG), 2-hrs Postprandial Blood Glucose (PPBG) and fasting Lipid profile.

A demographic variable includes age, sex, marital status and occupation of patients. History of smoking, dyslipidaemia, hypertension, diabetes mellitus, obesity, physical activities and family history of CAD are used to characterize risk factors.

All patients aged more than 18 years with diagnosis of ACS (ST-elevation Myocardial infarction, unstable Angina and non ST-elevation Myocardial Infarction) were enrolled.

Admission RBG was estimated at the time of presentation in emergency department and other investigation like FBG, 2 hrs PPBG and Fasting Lipid Profile was carried out next day of admission.

According to World Health Organization (WHO) Impaired Fasting Glucose (IFG) was defined as Fasting Blood glucose (FBG: 110-125 mg/dl) and Impaired Glucose Tolerance (IGT) as 2hr-Postprandial Blood Glucose (PPBG: 140-180 mg/dl). According to American Diabetic Association (ADA) IFG was defined as FBG (110-125 mg/dl)and IGT as 2hr-Postprandial Blood Glucose (140-180 mg/dl) Diabetes Mellitus (DM) was defined as FBG> 126mg/dl, PPBG>200mg/dl or symptom of diabetes with RBG >200mg/dl. Clinical Hypertension was defined as Systolic Blood Pressure (SBP) >140 mmHg/or Diastolic Blood Pressure (DBP)>90 mmHg. Standard 12 lead Electrocardiogram (ECG) was taken for evidence of ACS/CAD.

Height was measured with a stadiometer to the nearest cm; weight was measured in light clothing without shoes.

Waist Circumference was measured at narrowest diameter between costal margins and iliac crest or after locating the upper hip bone and top of the right iliac crest, placing the measuring tape in horizontal plane around the abdomen at the level of iliac crest.

Hip circumference was measured at the greatest diameter over buttocks.

Obesity (Overweight or Obese) was defined from Body Mass Index (BMI), which were analyzed according World Health Organization 2000 (WHO 2000) and The Steering Committee of Regional Office of Western Pacific Region of WHO 2000(WRPO2000 Asian) criteria. Normal Body Mass Index (BMI) 18.5-24.9kg/m^2 {WHO 2000} and 18.5-22.9 kg/m2 (WRPO2000 Asian) criteria; more than normal BMI was considered abnormal (i.e. Overweight or Obese).

Central or abdominal obesity was defined as Waist to Hip Ratio (WHR) i.e. WHR ≥ 0.95for male and WHR ≥ 0.85 for female. Waist Circumference (WC) was analyzed According to Asian Criteria (WC >90cm for male, WC >80cm for female) and WHO Criteria (WC >99cm for male, WC >88cm for female.

Adult Treatment Panel-III (ATP-III) classification criteria were used to classify all lipid profile; in this study Low Density Lipoprotein Cholesterol (LDL-C)> 100 mg%, High Density Lipoprotein Cholesterol (HDL-C)< 40 mg%, Total Cholesterol > 200 mg % and Triglycerides > 150 mg% were considered abnormal.

All analysis was carried out using SPSS 11.5. Analysis was taken with descriptive option for mean and standard deviation. Data was compared by using chi square analysis wherever feasible. p value <0.05 was considered as significant.

RESULTS

The total number of patients enrolled in this study was 209, out of that 142 (67.9%) was male as shown in figure 1. Patients with coronary artery disease Mean age were 57.91 ± 12.42 years.

The baseline demographic characteristic observed is shown in table 1. 90.9% (190) patient had dyslipideima,

87.6% were non-vegetarian; 78.5% (164) were smokers; the total hypertensive cases were 53.6%. 61.7% (129) were found to have sedentary workers.

Distributions of different presentation of Coronary Artery Disease (CAD) with Body Mass Index (BMI) are shown in Table no. 2 for Asian Criteria and in Figure 2 for World Health Organization (WHO) criteria. Total abnormal BMI were observed from WHO criteria were 45.5% and from Asian criteria were 67.9%. Study shows more obese patients in Asian criteria group as compare to WHO criteria. Abnormal waist to hip ratio in male and female are 56.3% and 76.1% respectively.

Guideline of American Diabetic Association (ADA) and World Health Organization (WHO) were used. 14.4% had Random Blood Glucose (RBG)> 200mg%, with mean Standard Deviation (SD) of RBG was 146.45 (67.95) with CI 137.18-155.72. Mean SD of Fasting Blood Glucose (FBG) was 119.17 with CI 113.43-124.91; Mean SD of Postprandial Blood Glucose (PPBG) was 159.19 with CI 150.26-168.11. Distributions of different presentation of CAD with FBG are shown in figure 3 for WHO and figure 4 for ADA guideline.

Distribution of different presentation of CAD with impaired glycemia(Impaired fasting glucose or impaired glucose tolerance without known diabetes) are shown in table 3.

Distributions of different presentation of CAD with recent diabetes mellitus and known diabetics are shown in table 4 and 5 respectively.

19.1% were known DM, 21.3% had recent DM and 52.1% had impaired glycemia 93.1% of total patients had Glucose Intolerance of any form.

Figure 1. Gender distribution (n=209)

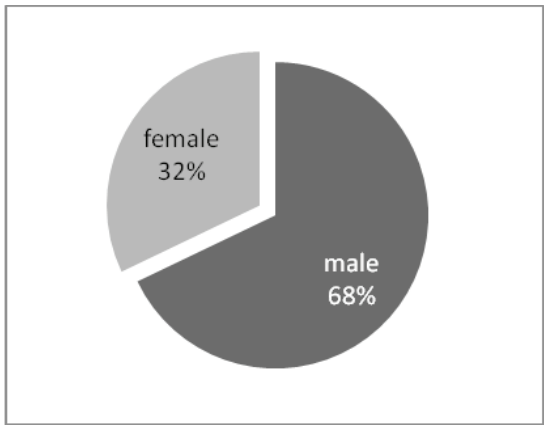

Table 1. Baseline Demographic characteristic (n=209)

Baseline Demographic Characteristic	Percentage
Dyslipidemia	90.9
Non-Vegetarian	87.6
Smoker	78.5
Total hypertension	53.6
Sedentary Workers	61.7

Table 2. Distribution of different presentation of Coronary Artery Disease (CAD) with Body Mass Index(BMI) (Asian Criteria**)**

BMI kg/m² Asian Criteria	ST-T waves Changes			Total
	NSTEMI*	STEMI**	UA***	
< 18.5 (n=11)	3	8	0	11
	27.3%	72.7%	0%	100%
18.5 - 22.9 (n=56)	10	22	24	56
	17.9%	39.3%	42.9%	100%
23.0 - 24.9 (n=47)	8	22	17	47
	17.0%	46.8%	36.2%	100%
25.0 – 29.9 (n=80)	9	44	27	80
	11.3%	55.0%	33.8%	100%
≥30 (n=15)	1	6	8	15
	6.7%	40.0%	53.3%	100%

*NSTEMI-Non-ST Elevation Myocardial Infraction, **STEMI-ST Elevation Myocardial Infraction, ***UA: Unstable Angina.

Figure 2. Distribution of different presentation of Coronary Artery Disease (CAD) with Body Mass Index (BMI) (WHO Criteria**)**

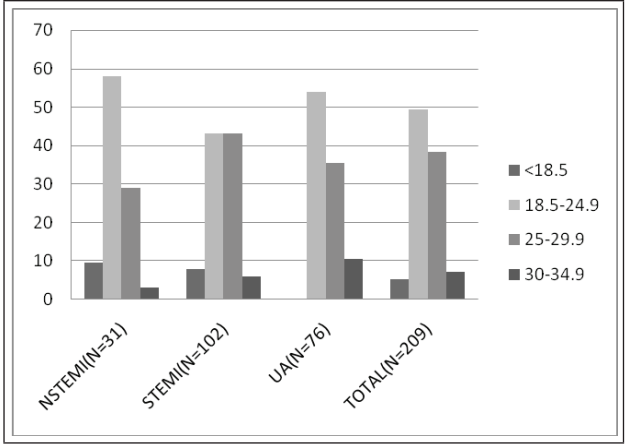

Figure No 3. Distribution of different presentation of Coronary Artery Disease (CAD) with Fasting Blood Glucose (WHO Criteria)

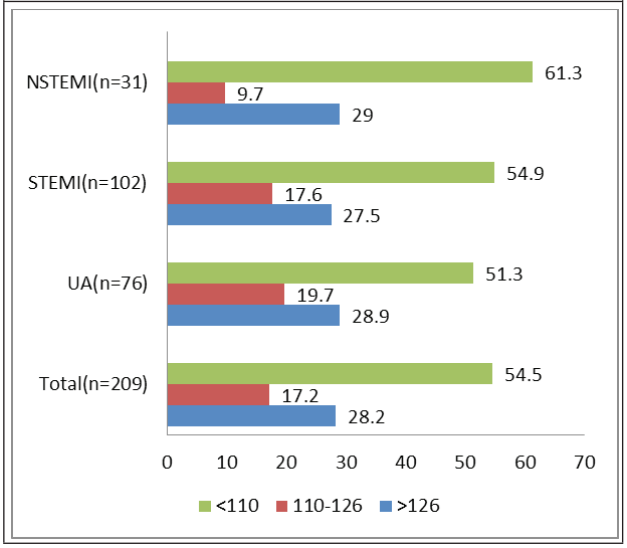

Table 3. Distribution of different presentation of Coronary Artery Disease (CAD)with Impaired Glycemia (impaired fasting glucose or impaired glucose tolerance without known diabetes)

Impaired Glycemia	ST-T waves Changes			Total
	NSTEMI*	STEMI**	UA***	
No	13	41	27	81
	59.1%	44.6%	49.1%	47.9%
Yes	9	51	28	88
	40.9%	55.4%	50.9%	52.1%
Total	22	92	55	169
	100%	100%	100%	100%

*NSTEMI-Non-ST Elevation Myocardial Infraction, **STEMI-ST Elevation Myocardial Infraction, ***UA: Unstable Angina.

Table 4. Distribution of different presentation of Coronary Artery Disease (CAD) with Recent Diabetes Mellitus.

Recent Diabetes Mellitus	ST-T waves Changes			Total
	NSTEMI	STEMI	UA	
No	18	70	45	133
	81.8%	76.1%	81.8%	78.7%
Yes	4	22	10	36
	18.2%	23.9%	18.2%	21.3%
Total	22	92	55	169
	100%	100%	100%	100%

Table 5. Distribution of different presentation of Coronary Artery Disease (CAD)with Known Diabetic.

Recent Diabetic	ST-T waves Changes			Total
	NSTEMI	STEMI	UA	
No	22	92	55	169
	13.1%	54.4%	32.5%	100%
Yes	9	10	21	40
	22.5%	25%	52.5%	100%
Total	31	102	76	209
	14.8%	48.8%	36.4%	100%

DISCUSSION

This study shows 48.8% were STEMI, 36.4% UA and 14.8% were NSTEMI. In this study, the incidence of CAD was twice high in male than that of female. The conclusion of Hadjadj S Coisne D, Mauco G et al[10], Copenhagen City Heart Study[11] and Framingham Heart Study[12] has similar results.

In this study, mean age of CAD patient was 57.91 yrs. The mean age of patients was 58.6 years found in both INTERHEART study[13] and CREATE-ECLA Randomized controlled trail[14], which were as nearly same to this study.

In Framingham Heart Study, 60% of patients with CAD were smokers where as in this study 78.5 % patients were smoker. 87.6% of enrolled patients were non-vegetarian; the Oslo Diet-heart study and Lyon Diet –Heart study demonstrated 65% reduction in CAD over 4 years period of follow-up.

According to Joint National committee (JNC)-VII guidelines 35.4% had SBP> 140 mm Hg and 41.6% had DBP > 90 mm Hg. 90.9% had Dyslipidemia which is similar to the South Asian Population[15] and Framingham Heart Study.

Observed BMI in both classifications are as follows: 67.9 % (142) in WRPO (2000 Asian) had BMI ≥ 18.5 – 22.9 kg/m^2 (p=0.141) and 45.5 % (95) in WHO BMI ≥18.5-24.9 kg/m^2 (p=0.071). the mean SD of BMI was 24.4 9 kg/m^2 and similar study conclude by Ismail J, Jafar TH, Jafary FH et al, revealed mean of BMI was 24.9 (p=0.097) [16]. 14.4% had higher than 200mg% Admission RBG which is similar in study done by Norhammar A, Ryden L, Malmberg K[17]. In meta-analysis of 20 studies that included almost 100000 people, there was a curvilinear increase risk for CAD event with increasing glucose intolerance[18]. Study done by Nilsson G, Tenerz A, Norhammar A et al [19] showed that there is increase risk for CAD in patients with known DM and IGT.

CONCLUSIONS

In this study, the relation between impaired glucose tolerances is correlated and found high association of CAD/ACS. With the help of the study, other risk factors like hypertension, dyslipidemia, smoking, obesity are also correlated and findings suggested of high prevalence of CAD/ACS.

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