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Estimation of Blood Glucose, Blood Urea, Serum Creatinine and Serum Cholesterol in Coronary Artery Disease Patients in a Tertiary Care Hospital: A Case Control Study

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***Abstract*: This paper presents a study on the estimation of blood glucose, blood urea, serum creatinine and serum cholesterol in coronary artery disease patients in a tertiary care hospital.**

***Keywords*: acute coronary syndrome (ACS), coronary artery disease (CAD), coronary heart disease (CHD), Cholestrol oxidase phenol-4-aminoantipyrine peroxidase (CHOD-PAP), Creatine Kinase-MB type (CK-MB), L-glutamate dehydrogenase (GLDH), High density lipoprotein (HDL), myocardial infarction (MI), Standard deviation (SD).**

1. Introduction

Coronary artery disease is a common heart condition. It is also called as coronary heart disease. CAD happens when the arteries that supply blood to heart muscle become hardened and narrowed. This is due to the buildup of cholesterol and other material, called plaque, on their inner walls. This buildup is called atherosclerosis [1]. As it grows, less blood can flow through the arteries. As a result, the heart muscle can't get the blood or oxygen it needs. This can lead to chest pain (angina) or a heart attack. Most heart attacks happen when a blood clot suddenly cuts off the hearts' blood supply, causing permanent heart damage [2].

Although health professionals frequently use both terms CAD and ACS interchangeably, as well as CHD, they are not the same. ACS is a subcategory of CAD, whilst CHD results of CAD. On the other hand, CAD is characterized by atherosclerosis in coronary arteries and can be asymptomatic, whereas ACS almost always presents with a symptom, such as unstable angina, and is frequently associated with MI regardless of the presence of CAD.[3]

Indians are known to have the highest coronary artery disease (CAD) rates. The prevalence of CAD in Indians living in India is 21.4% for diabetics and 11% for nondiabetics. The prevalence of CAD in rural parts of country is nearly half than that in urban population [4].

2. Aims and Objectives

- To assess the level of Blood Glucose, Blood Urea, Serum Creatinine and Serum Cholesterol in Coronary Artery Disease patients and compare them to normal controls.

3. Methodology

60 patients with coronary artery disease, who were diagnosed in the casualty and patients admitted in the ICU of the Goa Medical College, Bambolim. Then diagnosis of AMI was based on the history of prolonged chest pain and it was confirmed by typical ECG changes and Elevation in CK-MB and Trop-I levels (for Myocardial infarction). The age of the patients was between 25-60 yrs. Exclusion criteria from the study were previous history of CAD, Renal impaired patient, Patients taking lipid lowering drugs or corticosteroids. Pregnant and lactating females.

Informed consent was taken from all patients, who participated in the study and the study was approved by the Goa medical college ethical committee. Blood sample were taken at the time of admission or within 6 hours of onset of chest pain in plain bulb for urea, creatinine and cholesterol and Fluoride bulb for random blood glucose. All the investigations are carried out on the Fully automated Abbott Architect C8200 Analyzer. Random blood glucose level is assayed by Hexokinase method, Blood urea levels is assayed by Urease-GLDH method, serum creatinine by Jaffe's kinetics method and serum cholesterol by CHOD-PAP method.

4. Result

All results were expressed as Mean± SD. A total of 60 patients with coronary artery disease which fit the inclusion criteria were included in the study. Whereas 60 age and sex matched patients were recruited as controls for the study (1:1 cases:control).

The Mean age of the cases is 57.28±11.48 years, whereas in control group it is 57.18±11.01 years. The mean levels of

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random blood glucose, urea, creatinine and cholesterol are 190.21±45.43, 45.80±5.87, 1.86±0.37 and 301±38.20 mg/dl among the cases respectively. Whereas for controls the mean levels of random blood glucose, urea, creatinine and cholesterol is 110.25±20.21, 29.54±4.65, 0.91±0.25 and 182.50±29.35 mg/dl respectively. There was a statistically significant increase in mean levels of blood random glucose level, blood urea level, serum creatinine and serum cholesterol across the cases as compared to controls group.

Table 1
Results of this study among cases and controls

Test	Groups	Mean±S.D	P value
Random Blood Glucose level (mg/dl)	**Cases** Controls	**190.21±45.43** 110.25±20.21	<0.01
Blood Urea (mg/dl)	**Cases** Controls	**45.43±5.87** 29.54±4.65	<0.01
Serum Creatinine (mg/dl)	**Cases** Controls	**1.86±0.37** 0.91±0.25	<0.001
Total Cholesterol (mg/dl)	**Cases** Controls	**301±38.20** 182.50±29.35	<0.001

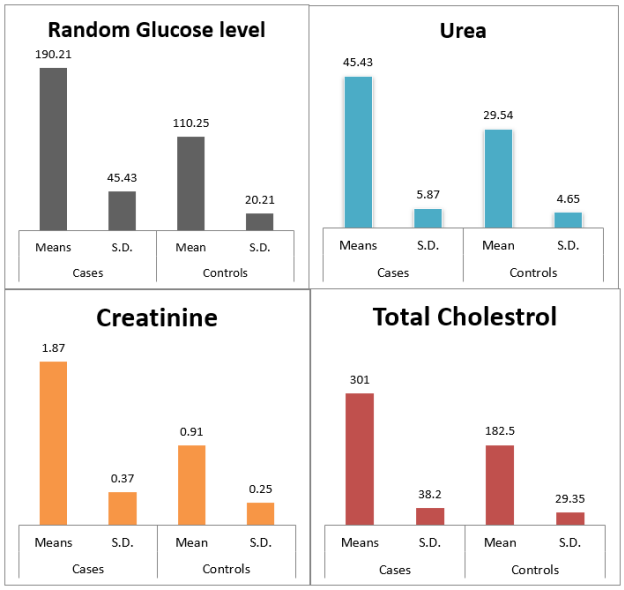

Fig. 1. Mean level of the glucose, urea, creatinine and cholesterol among cases and controls

5. Discussion

There are many risk factors which can lead to the development of the coronary artery disease like smoking, diabetes, hypertension, dyslipidemia, psychological stress, obesity, hyperuricemia, hyperuremia etc. [9].

In this study the population was in goa, so there is more consumption of alcohol, which contribute to high blood pressure increase the chance of a stroke. Alcohol can directly harm cardiac muscle, weakening the heart (alcoholic cardiomyopathy) and increasing the risk of heart failure [10].

Fig. 2. Risk factors of the coronary artery disease

Most Diabetics have insulin resistance, hyperinsulinemia, and vascular calcification Diabetes Mellitus is a prothrombotic and hypercoagulable condition that increases the risk of thrombus formation, platelet thrombin production, and impaired fibrinolysis which increases the formation of atherosclerosis [11]. Study by Viswanathan Mohan showed that the prevalence rates of CAD were 9.1%, 14.9% and 21.4% in those with NGT, IGT and diabetes, respectively [8]. In this study there are high level of Blood glucose which is significant $p<0.01$ among cases as compared to control groups.

It is commonly known that Asian Indians have low HDL cholesterol levels, which may be a risk factor for developing coronary artery disease (CAD) [12]. Study by Viswanathan Mohan showed that the prevalence rates of CAD increase with an increase in total cholesterol [8]. In this study there are high level of Total cholesterol which is highly significant $p<0.001$ among cases as compared to control groups, which can predispose to the development of CAD.

The muscle is an important source of serum creatinine and an insulin target organ. Hence, it is suggested that the serum creatinine level may be a useful indicator for diabetes and CAD [13]. The risk for cardiovascular disease is increases in all stages of the renal impairment. A study by Babak Bagheri shows a significant association of creatinine with prevalence [odds ratio of 1.79, $p<0.001$] and severity of CAD. In this study there are high level of Creatinine which is highly significant $p<0.001$ among cases as compared to control groups.

Blood urea nitrogen is an independent predictor of CAD in middle aged and elderly people. A study by Feng Liu elevated blood urea nitrogen to creatinine ratio (UCR) was associated with higher risk of CAD [15]. In this study there are high level of serum Urea which is significant $p<0.01$ among cases as compared to control groups.

6. Conclusion

Patient with higher baseline blood glucose levels have a significant risk for development of CAD as compared to people having normal blood glucose level.

There is significant association has been found between Serum creatinine & blood urea and Presence of CAD. The measurement of serum creatinine and urea level might provide significant prognostic benefits in terms of global cardiovascular risk and management of the patients.

High level of cholesterol is associated with CAD, Hypercholesterolemia is an autosomal dominant disease characterized by high levels of cholesterol and high incidence CAD.

Drawbacks of this study, only biochemical parameters are considered, other history and anthropometrical parameters are not considered. Coronary artery disease causes are multifactorial, so we can't pinpoint a single biochemical factor which is responsible for the incident of coronary artery disease. Also, we can't predict the exact cause of CAD in that patient, for that we need a detailed cross-sectional study on a larger population.

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