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Serum Cardaic Specific Troponin T: A Cardiovascular Risk Index In Type 2 Diabetes Mellitus Subjects

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ABSTRACT

Diabetes mellitus is a disease considered as metabolic with endocrine origin and has been linked to cardiovascular disease. Troponin T is a skeletal and cardiac muscle protein which is elevated in myocardial injury. Hence this study aims to evaluate cardiac troponin T in type 2 diabetics. A total of three hundred volunteers consisting of one hundred and eighty diabetics and one hundred and twenty healthy individuals with sex and age matched were recruited for the study. Anthropometric variables were measured and blood glucose and troponin T were evaluated using standard methods. There was a significantly higher body mass index, blood glucose and troponin T in diabetes mellitus than in control individuals. It is therefore pertinent to state that troponin T is raised in diabetes mellitus which may expose them to cardiac injury.

1.0 INTRODUCTION

Diabetes mellitus (DM) is a metabolic disorder of multiple etiologies that is characterized by chronic hyperglycemia and impaired carbohydrates, lipids, and proteins metabolism caused by complete or partial insufficiency of insulin secretion and/or insulin action [1]. Diabetes mellitus subjects has been observed to have a greater risk for cardiovascular disease probably due to nature of pathogenesis and coexisting cardiovascular risk factors such as hypertension, obesity and dyslipidemia [2] . Selvin et al. [3], opined that people with pre-diabetes and diabetes have a substantially elevated risk for cardiovascular disease. Whelton et al. [4] in their study observed that diabetes mellitus has elevated high sensitivity cardiac specific troponin T.

Troponin is a complex of three protein subunits – troponin C (the calcium-binding component), troponin I (the inhibitory component) and troponin T (the tropomyosin-binding component). About 94% - 97% of troponin is found in the myofibrils primarily while 3%-6% are found in the cytoplasm. During injury, troponin is released from its site into circulation and this can be measured to assess a medical situation of such an individual. Cardiac-specific troponin T (cTnT) and troponin I (cTnI) isoforms have been identified [5]. Cardiac-specific troponin T (cTnT) has separate genes encoding for cardiac and skeletal isoforms with 11-amino acid sequence that gives this marker cardiac specificity. However, skeletal muscles and diseased muscles produce small amounts of cardiac-specific troponin T (cTnT) and have been found in skeletal muscle specimens obtained from individuals with muscular dystrophy, polymyositis, and chronic renal disease[6]. Evidence from previous studies have shown that diabetes mellitus subjects are at high risk of cardiovascular disease [7], and since troponin T is cardiac specific, there is need to evaluate this substance in diabetes mellitus. Yiu et al., [8] observed that increased level of high sensitivity troponin level is a pointer to myocardial injury. Therefore, the aim of this study is to assess serum cardiac specific troponin T in type 2 diabetes mellitus subjects.

2.0 MATERIALS AND METHODS

Study area

The Diabetic Clinic at University of Benin Teaching Hospital, Benin-City, Nigeria was used for this study with duration of March to August 2020. This tertiary hospital is located in Benin City and serves states of Edo, Delta and Ondo.

2.1 Sample Size

The sample size was calculated to be 249 with 10% attrition using 8% prevalence of diabetic mellitus as reported in southern Nigeria by Arugu and Maduka [9] and formula of Araoye [10] was adopted.

2.2 Study population

Three hundred (300) volunteers were recruited for this study which consists of one hundred and eighty (180) diabetic subjects and one hundred and twenty (120), sex and age matched healthy subjects used as control. Institutional ethical clearance was obtained from the hospital ethical committee and verbal informed consent was obtained from the participants after adequate explanation of the procedures. All diabetics of both gender without any

underlying disease was the inclusion criteria while exclusion criteria are those who did not meet the above inclusion criteria.

2.3 Sample Collection

Six (6) milliliters of blood was collected after an overnight fast with aseptic precautions from each subjects into plain container and fluoride oxalate containers. The blood in plain containers was allowed to clot and spun to harvest the serum, and kept frozen at -20°C until ready for analysis. Blood glucose level was estimated immediately with sample in the fluoride oxalate containers to confirm diabetes mellitus status of the subjects.

2.4 Biochemical analysis

Fasting blood glucose was analysed using Glucose Oxidase Peroxidase method [11]. The Sandwich-ELISA method described by Bodor et al. [5] was used for the analysis of Troponin T. Manufacturer's instructions was adhered to strictly to ensure accurate results.

Statistical analysis

Statistical package for social sciences, version 23.0 was used to compare the means ±SD using student "t" test. Confidence interval was at 95% and significance difference was <0.05.

3.0 RESULTS

Figure 1 shows diabetic subjects to be 60% while control subjects are 40% .

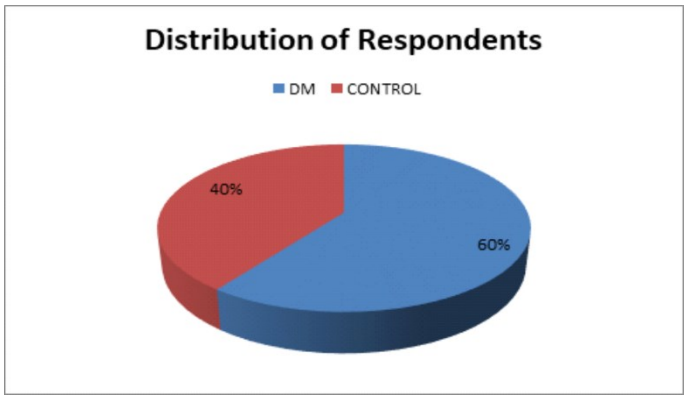

Fig.1: Distribution of participants in the study

Figure 2 shows that male subjects consist of 41.67% and female 58.33%.

No significant difference (p>0.05) in age and height of diabetic subjects when compared with control individuals. However, diabetic subjects show a higher weight, body mass index, fasting blood sugar and troponin T than control individuals when compared as shown in the table below.

Fig. 2: Gender distribution of participants in the study

PARAMETER	Diabetics (n=180)	Control (n=120)	t value	Significant
Age (Years)	48.70±0.75	50.20±0.96	-1.243	. . . . .
Height (m)	1.62±0.01	1.60±0.01	1.320	0.190t
Weight (Kg)	82.17±0.95	64.05±0.97	12.879	0.000*
BMI (Kg/m^2)	31.83±0.56	25.26±0.55	8.035	0.000*
FBS (mmol/l)	15.37±0.79	2.60±0.06	13.205	0.000*
Troponin T(ng/ml)	26.30±0.19	21.57±0.68	7.838	0.000*

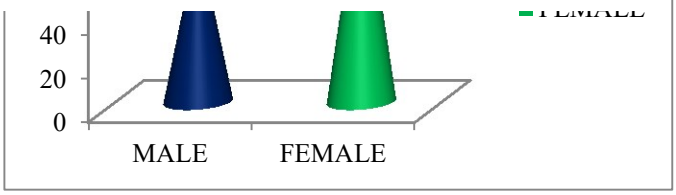

Table 1: Mean ±SEM of some anthropometric and other variables of respondents

4.0 DISCUSSION

The high mortality and morbidity of diabetes mellitus has been attributed to cardiovascular risk of which they are exposed. Cardiac troponins have been recognized as an important predictor of mortality [8. 12]. Khan et al.,[13] opined that troponins have emerged as reliable indicator of cardiovascular risk in end stage renal disease. The results of our study show no difference in age and height of diabetes mellitus and control subjects when compared. This is due to the fact that both age and sex of respondents were matched. However, body mass index of diabetic individuals was observed to be significantly higher than control individuals when compared. This is in accordance with earlier reports from previous authors with similar results in their studies [14.15]. The higher body mass index may be attributed to improper metabolism of carbohydrates in diabetes mellitus which results in excess weight. Ogbera et al., [16] in their study observed that 40% of diabetes mellitus subjects are obese while 34% are overweight as a result of increased body mass index.

There is significantly higher fasting blood glucose in diabetes mellitus than control individuals. This is in accordance with previous work of Adu [14,17] that had similar findings. Blood glucose has been recognized as a traditional biomarker in the assessment of diabetes mellitus. This study observed a significantly higher cardiac troponin T among diabetic subjects when compared with control individuals. This is in accordance with Mahmud et al., [18] that did similar work on troponin. Yiu et al., [8] attributed this elevated troponin level as an indicator of myocardial injury. Cohn et al., [19] observed that people with diabetics have high prevalence of silent myocardial ischemia.

In conclusion, troponin T is significantly increased in diabetes mellitus subjects and can be used as a cardiac biomarker in these diabetics' subjects. We therefore advocate that troponin T should be added as one of the routine test for diabetic subjects in order to nip cardiovascular complication.

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