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RESEARCH ARTICLE

ANTHROPOMETRIC AND BIOCHEMICAL PROFILE OF DIABETES PATIENTS AND ITS RISK FOR CARDIOVASCULAR DISEASE

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Abstract

Diabetes mellitus (DM) is a major risk factor for the development of cardiovascular disease (CVD). Due to the ever increasing incidence of both DM and CVD were coexistence of these disorders, numerous agents have been developed over the years to target complications. The present study focuses on the anthropometric and biochemical profile of diabetes patients and its risk for cardiovascular disease. Seventy two study subjects were diagnosed as diabetes mellitus by American Diabetes Association's (ADA's) criteria and sixty healthy subjects without any chronic illness were selected as control for the present study. Levels of fasting blood glucose, cholesterol, LDL, triglycerides were found to be significantly high compared to controls and the levels of HDL were lower than that of the controls, thus constituting a risk factor for CAD. The correlation between anthropometric and biochemical profile shown the importance of CVD in subjects with diabetes. Early screening for DM and aggressive management of risk factors is important to optimizing the outcome of patents with DM. These results indicate the risk of developing CVD was higher in diabetic subjects than non- diabetic subjects.

Introduction:-

Diabetes Mellitus (DM) is a chronic disorder resulting from a number of factors in which an absolute or relative deficiency of insulin or its function. It is projected that by the year 2025, India alone would have 57 million diabetics mainly of type 2 diabetes constituting 90% of the diabetic population (Ramachandran et al., 2002). The prevalence of diabetes is rapidly rising all over the globe at an alarming rate. Type 2 diabetes is commonly associated with obesity, hypertension, CVD and lipid abnormalities. Glycated Hemoglobin (HbA1c) is a well known marker for long term glycemic control. It indicates mean blood glucose level and predicts the risk for developing complications in diabetic population (Mahato et al., 2011).

Cardiovascular disease (CVD) is the most threatening complication of diabetes. While the leading cause of mortality worldwide, it is three to four times more common in diabetics than non-diabetics individuals (Barr et al., 2007). The most common disorder that besets type 2 diabetic subjects is coronary heart disease (CHD). Irrespective of the ethnic background the risk for CHD among diabetic subjects is greater by a factor of 2 to 4 compared to non-diabetic subjects (Deepa et al., 2002).

Approximately 58% of diabetes and 21% of ischemic heart disease globally are attributable to a body mass index (BMI) above 21 kg/m^2 (WHO, 2002). An increase in body fat is generally associated with an increase in risk of metabolic diseases such as type 2 diabetes mellitus, hypertension and dyslipidaemia (WHO, 2007). In addition, many patients with these metabolic diseases are either overweight or obese (Bays et al., 2007). In 2008, more than 200 million men and approximately 300 million women were obese. Overweight and obesity is one of the leading

risk factors for mortality, estimated to account for 23% of the ischaemic heart disease burden (WHO, 2012). It results in the deterioration of the entire cardiovascular risk profile (NCEB, 2002).

General and central obesity are associated with CVD risk (Ryan et al., 2008; Satoh et al., 2010; Ying et al., 2010). Currently used general and central obesity anthropometric measures for assessing adiposity related risk include BMI, waist circumference (WC), hip circumference (HC), waist-to-hip ratio (WHR) and body adiposity index. BMI or WC is most commonly used to measure body fatness (Park and Kim, 2012).

Anthropometric parameters are commonly used as research tools to assess the noncommunicable disease risk factors in the populations as they are inexpensive and easy to monitor at the community level (Jaap et al., 2001). Various studies have shown that anthropometric parameters such as BMI, waist circumference (WC), waist hip ratio (WHR), and waist height ratio (WHtR) are useful indicators for predicting incidence of type 2 diabetes in populations (Stevens et al., 2001; Lincoln et al., 2002; Nahar et al., 2012; Sandhya et al., 2015).

Accumulation of fatty deposits lead to the narrowing of blood vessels (e.g., atherosclerosis) obstructing blood supply to the vital organs like brain, heart etc (Kolodgie et al., 2003) and causing stroke, cardiac failure etc. Lipid changes can cause deposits of fatty plaque in arteries and results in the CVD (Reaven et al., 2004). Nevertheless, glucose plays a crucial role by glycating the proteins in whole body including LDL. Therefore, any disturbance in the normal metabolism of glucose and/or glycation, particularly that resulting from altered insulin functionality has serious consequences (Nosheen et al., 2012).

Patients with type 2 diabetes mellitus associated dyslipidemia remain exposed to a high residual risk of CVD complications, even if they are treated with current standards of care, making this one of the major unmet needs in the treatment of patients with diabetes. An understanding of the complex interplay of how treating dyslipidemia reduces the risk for CVD events in patients with type 2 diabetes mellitus and an ability to assess at risk patients is necessary to ensure the most appropriate treatment strategies are implemented (Katamreddy et al., 2013). Along with dyslipedimia, elevated HbA1c was regarded as risk factor for CVD. In diabetic population for every 1% increase in absolute HbA1c risk of CVD was increased by 18% (Selvin et al., 2004).

As the prevalence of DM is rising, it will be a major contributory risk factor of increased CVD events. Measurement of surrogate markers of CVD is of utmost importance for circumventing CVD end-points, especially in diabetic subjects (Tabatabaei et al., 2014). Anthropometric and biochemical parameters have evolved into reliable indicators for predicting the incidence of cardiovascular disease as they are inexpensive and easy to monitor. The present study describes anthropometric and biochemical profiles of Diabetes Patients and its risk for Cardiovascular Disease.

Material and Methods:-

Seventy two study subjects were diagnosed as diabetes mellitus by ADA criteria and sixty healthy subjects without any chronic illness were selected as control for the present study. The study was conducted at Diabcare India Ltd, Calicut, Kerala. After taking descriptive history, demographic and anthropometric characters were recorded using a profoma. Four ml of fasting venous blood was collected after obtaining proper written consent from the subjects. One ml of blood sample transferred to a fluoride tube and performed the blood sugar estimation and, HbA1c is estimated using the Biorad D10 HPLC analyser. The remaining 3 ml blood transferred to a plain tube and allowed to clot, the serum was used to estimate the lipid profile using Beckman AU 480 analyser. HbA1c is estimated using the Biorad D10 HPLC analyser. Biorad quality control materials were used for monitoring the quality.

Results:-

Table 1: Anthropometric and biochemical characteristics among subjects:-

Parameters	Study subjects	Control subjects
BMI (kg/m^2)	27.4±4.44	24.67±3.36
FBS (mg/dl)	129.57±11.97	98.91±12.28
HbA1c (%)	9.42±5.15	6.06±1.52
TC (mg/dl)	210.84±37.31	202.94±26.02
HDL (mg/dl)	36.76±16.51	40.10±15.53
LDL (mg/dl)	148.60±29.80	131.36±33.61
TG (mg/dl)	161.76±26.16	143.72±35.04

Among the seventy two study subjects, 51.92% (n=37) were males and 48.08% (n=35) were females. In the case of sixty control subjects 68.06% (n=40) were males and 31.94% (n=20) were females. The age of the study subjects ranged from 30 to 72 years with a mean age of 58.90. The age of the control subjects ranged from 38 to 65 with a mean age of 53.48.

Majority of the study subjects belonged to rural area (69.23%) (n=50), 21.15% (n=16) belonged to urban area and the rest belonged to coastal area (7.69%) (n=6). Majority of the study subjects belonged to average socioeconomic status (73.07%) (n=53). History of infertility/subfertility was reported by 7.69% (n=6) of study subjects. 61.53% (n=44) of the study subjects reported history of chest pain in early years.

The observed mean BMI of the study subjects was 27.4 kg/m^2 and the control subjects showed a mean BMI of 24.67 kg/m^2. The mean FBS of the study subjects was 129.57±11.97 mg/dl and that of the control subjects was 98.91±12.28 mg/dl ($p<0.001$). The mean HbA1c of the study subjects shown 9.42±5.15 and that of the control subjects shown 6.06±1.52 ($p<0.001$). The mean TC level of the study subjects was 210.84± 37.31 mg/dl and that of control subjects was 202.94±26.02 mg/dl. This shows a slight difference among the study and control subjects but this difference was not statistically significant ($p=0.142$). The mean value of HDL was 36.76 ± 16.51 mg/dl in study subjects and the mean value of HDL was 40.10 ± 15.53 mg/dl in control subjects ($p<0.001$). Similarly the mean value of LDL was 148.60 ± 29.80 mg/dl and 131.36 ± 33.61 mg/dl in study and control subjects respectively. No statistically significant difference was shown between the study and control subjects regarding the mean LDL level ($p=0.021$). The study subjects shown a mean triglycerides value of 161.76 ± 26.16 mg/dl and control subjects showed a mean triglycerides value of 143.72 ± 35.04 mg/dl ($p<0.001$):Table1.

Discussion:-

The diabetic condition contributes for initiation and progression of micro and macro vascular complications in diabetics (Maritim et al., 2003). Of all, cardiovascular complications are the leading cause of mortality and morbidity in diabetics. Framingham heart study (1974) demonstrated a direct association between diabetes and heart failure (Saxena, 2002). Epidemiological studies published in recent years suggest that postprandial blood glucose might be an independent risk factor of cardiovascular disease (Bonora and Muggeo, 2001). In the present study the fasting blood glucose levels were higher in majority of patients constituting a risk factor for CAD.

The most important risk factors contributing to the development of CHD include lipid disorders. Elevated levels of cholesterol, LDL and triglycerides as the risk factors in diabetes have been demonstrated in several studies (Castelli, 1988; Mckeique e al., 1989; Gopinath et al., 1994; Surekha Rani et al., 2005). In the present study the estimated levels of cholesterol, LDL, triglycerides were found to be significantly high compared to controls and the levels of HDL were lower than that of the controls.

Rural populations who consume low fat and high carbohydrate diets have low HDL cholesterol and high triglyceride levels (Gupta et al., 2002). Gupta et al., (2009) has shown that total cholesterol and triglycerides were higher while HDL levels were lower in individuals with ischemia heart disease (IHD) than in those without IHD. A higher prevalence of low HDL cholesterol and an elevated triglyceride level was found in the rural than in the urban

population by Chadha et al., (1997). The findings of the present study agree with those of Gupta et al., (2009) and Panwar et al., (2011) who reported high cholesterol and triglycerides, with low HDL in their study subjects.

The results of the United Kingdom Prospective Diabetes Study (UKPDS) showed a significant association between increased risk of CVD in diabetics with hyperlipidemia and increased HbA1c levels (Turner, 1998). In the present study, it was observed that the mean HbA1c level of the study subject was 9.42 ±5.15 and in control subject the mean value was 6.06 ± 1.52.

In the present study, anthropometric measurements (Height, Weight, BMI) showed a significant level of risk for CVD. The available data from the present study also suggest a significant cardiovascular burden in patients with diabetes.

Conclusion:-

In short, the present study has shown that diabetes is correlated with higher serum lipid concentrations, which indicates increased cardiovascular risk. The correlation between anthropometric and biochemical profile shows the importance of CVD in people with diabetes. In order to achieve this, it is necessary to define specific anthropometric cutoff points. Furthermore, it is essential that serum lipids be monitored if adequate metabolic control is to be achieved and maintained. The present data confirm that a high degree of CVD risk factors were prevalent in patients with diabetics, as shown by anthropometric and biochemical variables. Therefore, the current study suggests that these parameters to be integrated in regular assessment to determine various CVD risks.

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