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CORRELATION OF HAEMATOLOGICAL PARAMETERS SUCH AS HAEMOGLOBIN, TOTAL AND DIFFERENTIAL LEUCOCYTE COUNT, PLATELET COUNT, MEAN PLATELET VOLUME, PLATELET DISTRIBUTION WIDTH IN RELATION TO GLYCATED HAEMOGLOBIN IN TYPE 2 DIABETES MELLITUS.

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ABSTRACT

Elevated blood glucose is a one among the other cause of unfavourable changes in biochemical and haematological indices due to uncontrolled hyperglycemia and is a major factor development of complications due to diabetes. The objective of the present study is to correlate Haematological parametres such as haemoglobin, Total and differential leucocyte Count, Platelet indices such as platelet count , mean platelet volume , platelet distribution width in relation to, glycated haemoglobin also called as HbA1c testing. This study was conducted on 100 Diabetic patients without hypertension, coronary artery disease & pregnancy. Blood samples of diabetic subjects were collected and analyzed for Glycated haemoglobin and haematological parametres .Result shows that Haemoglobin were significantly reduced in diabetic patients with high glycated haemoglobin, total leucocyte count were significantly increased in diabetic patients with relative neutrophilia (neutrophil count more than 80 %), relative lymphocytopenia (lymphocyte count less than 20 %) with high glycated haemoglobin and there no significant change in Platelet indices in diabetic patients with high glycated haemoglobin .

KEYWORDS: **Haematological parameters, Haemoglobin, Total leucocyte count, Differential leucocyte count, Platelet count, Mean platelet volume, Platelet distribution width.**

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INTRODUCTION

Diabetes mellitus is an essential disease characterized by either deficiency of insulin or its peripheral resistance resulting in hyperglycaemic state and nonenzymatic glycation of protein[1] Although poor glycemic control has been associated with cardiovascular disease, nephropathy and retinopathy, Cardio vascular diseases are the primary cause of mortality and morbidity in Type 2 DM patients; and other risk factors, including smoking, hypertension, and dyslipidemia, have been shown to accelerate the progression cardiovascular events[2].Furthermore, elevated urinary albumin excretion is associated with increased risk of Cardio vascular disease[3.] Diabetic nephropathy is one of the most common complications, and an important cause of renal failure[4]. Micro albuminuria is the earliest clinically detectable stage of diabetes induced damage to kidneys at which appropriate interventions can slow the progression, or even reverse, the process nephropathy[5] . Glycosylated haemoglobin is a useful index of mean glycaemia during the preceding 120 days[6]. It is also a predictor of complications as measures reducing HbA1c correspondingly reduce the risk of complications[7] . Obesity and type 2 diabetes are leading causes of morbidity and mortality, and their prevalence is increasingly rising in the younger population[8]. There is solid evidence to support low-grade inflammation as a key component in the pathophysiology of the metabolic syndrome and type 2 diabetes, linking adiposity and insulin resistance[9]. Inflammatory cells have been shown to infiltrate the adipose tissue in obese humans, associated with increased production and secretion of inflammatory cytokines that may contribute to whole-body inflammation[10,11] Chronic inflammation has been associated with an increased incidence of diabetes even in the absence of obesity [12,13.] such as in patients with rheumatoid arthritis and psoriasis, and treatment with anti-inflammatory medications in these conditions significantly decreased the rates of diabetes[14.] Total peripheral white blood cells (WBC) count, a nonspecific marker of inflammation, has also been suggested to be associated with diabetes risk in some cohorts[15], but observations were not consistent[16,17]. A recent meta-analysis of 20 studies including ~90,000 participants demonstrated a positive correlation between increased WBC level and diabetes risk[18]. However, most studies in this meta-analysis enrolled middle-aged participants and were based on cross-sectional data, with only partial adjustments for other diabetes risk factors. In addition, whether elevated inflammatory markers can predict the risk for diabetes independent of adiposity is not yet clear. The search for assessment tools to establish an early diagnosis of these complications is a challenge, but in recent years, several studies have highlighted the participation of platelets as one of the coagulation system elements involved in the genesis of these events[19-21]. In the process of atherogenesis, the activity of the platelets and their potential aggregation actively participate in the development of thrombi. Furthermore, the function of these cells seems to be related to their sizes. Some studies have shown that large platelets are most reactive and aggregatable, have high amounts of dense granules, and present increased thrombotic potential when compared with smaller and less active platelets[22-23]. These studies suggest that platelets with altered morphology could be associated with increased risk of vascular complications in diabetes[24-26].

MATERIALS AND METHODS

The study was conducted on 100 diabetic patients (Type-2) , both males (n=46) and female (n=54) between age groups of 30-85 years who were registered at the Hospital of Saveetha Institute Of Medical And Technical Sciences, Saveetha university, Chennai, India. Informed consent of the patient was taken. All patients who were diagnosed diabetes mellitus of type -2 using the ADA criteria of fasting blood glucose (FBG) OF > 126MG/DL were included in the study. The patients with any recent critical illness were excluded from the study. The blood samples were collected in non vacuum tubes with EDTA as anticoagulant and analyzed within 2 hours of venepuncture for haemoglobin, Total and differential Leucocyte counts, Platelet indices such as platelet count, mean platelet volume, platelet distribution width and HbA1c. Samples for fasting blood glucose estimation was collected in non vacuum fluoride tubes and is estimated by glucose oxidase method. Haematological parametres were obtained using SYSMEX XN 1000 Automated analyzer. The urine Albumin was measured using URODIP 10A reagent strips .The values were obtained and charted in Microsoft excel and descriptive analysis was done (FIG-1 to 4).

RESULTS

Among the one hundred diabetic patients with the glycated haemoglobin level more than 6.0 and less than 13.5 with 36 out of 54 female patients showing haemoglobin value of less than 12.0 and 30 out of 46 male patients showing haemoglobin value of less than 13.0. Among the 100 diabetic patients, 66 patients showed less haemoglobin value and 54 patients showed presence of albuminuria of varying degree. Total leucocyte count is elevated in about 18 of 46 Male and 22 of 54 Female patients – 40 as a total. Among the 18 male diabetic patients who had elevated total leucocyte count, 11 patients have elevated neutrophil count and low lymphocyte count and among the 22 female diabetic patients who had elevated total leucocyte count, 10 patients had elevated neutrophil count and low lymphocyte count. Thus total of 21 patients had neutrophilia with relative lymphocytopenia. There were no much variations in eosinophil, monocyte and basophil count. Platelet count is raised in about 03 of 46 Male and 06 of 54 Female patients – 09 as a total. Platelet count is decreased in 01 of 46 Male and 0 of 54 Female patients – 01 as a total. Mean platelet volume is raised in about 04 of 46 Male and 10 of 54 Female patients – 14 as a total. Platelet distribution width is reduced in about 08 of 46 Male and 06 of 54 female patients and increased in 0 male patients and 02 of 54 female patients.

Figure 1
CORRELATION OF HAEMATOLOGICAL INDICES WITH HIGH GLYCATED HAEMOGLOBIN

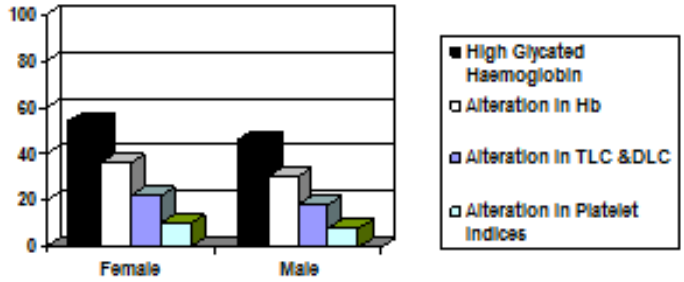


Figure 2
CORRELATION OF HAEMOGLOBIN WITH HIGH GLYCATED HAEMOGLOBIN

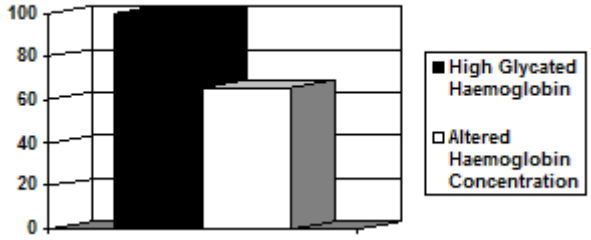


Figure 3
CORRELATION OF TLC WITH HIGH GLYCATED HAEMOGLOBIN

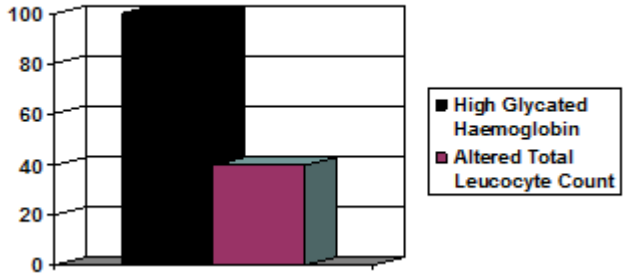
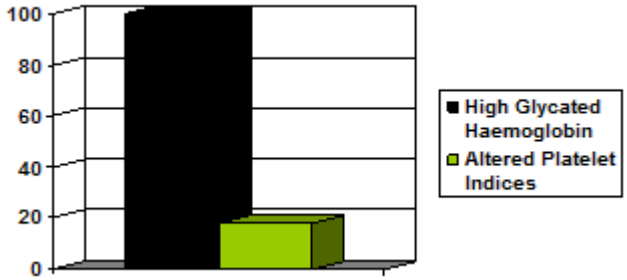


Figure 4
CORRELATION OF PLATELET INDICES WITH HIGH GLYCATED HAEMOGLOBIN



DISCUSSION

Hyperglycemia induced variation in haematological parameters has been reported by several studies. Elevation in glucose concentration is one of the major factor that effects erythrocyte morphology i.e. the severity in the change of erythrocyte shape depend upon plasma glucose level. This in tur, affects their flow properties through alteration and deformation at individual level and aggregation at collective level (Singh and Shin, 2009). There is frequently a reduction or change in blood viscosity which predisposes a pearson's system in reacting inadequately to insulin. Significant reduction in haemoglobin was observed in

both male and female diabetic patients. Among the 100 diabetic patients, 66 patients showed less haemoglobin value and 54 patients showed presence of albuminuria of varying degree in patient with high glycated haemoglobin and low haemoglobin. The reduction in haemoglobin may be due to one among the many complication of diabetes mellitus – diabetic nephropathy, affecting the kidneys resulting in decreased production of erythropoietin resulting in low haemoglobin level. The study also demonstrated that the total and differential leukocyte counts were significantly altered in patients with hyperglycemia. Patients with Uncontrolled type II Diabetes had higher counts of total WBCs or leucocytes - neutrophils but lower counts of lymphocytes which is relative lymphocytopenia due to increased neutrophil count . Automated measurement of the leukocyte indices has many advantages, such as a lower price and more convenient application from a technical perspective. Clinicians should pay more attention to leukocyte spectrum when diabetic patients presents with any complaints or general follow up .This study demonstrated the significant alteration of total and differential leukocyte counts in diabetic patients characterized by the total leucocyte count elevated more than 10000cells / cumm and differential leucocyte count elevated more than 75 % and lymphocyte count less than 20 % indicating neutrophilia with relative lymphocytopenia which is confirmed by peripheral smear examination stained with leishman's stain along with automated analysis result of the same sample and there were no demonstrable difference in monocyte , eosinophil and basophil counts .The platelet counts , mean platelet volume and platelet distribution width were not significantly altered in patients with hyperglycemia . Most of the patients with Uncontrolled type II Diabetes had a normal platelet count , mean platelet volume and platelet distribution width while very few had altered platelet count , mean platelet volume , platelet distribution width . Although automated measurement of the platelet indices has many advantages, such as a lower price and more convenient application from a technical perspective , Clinicians should pay more attention to other parameters such as Haemoglobin , leukocyte spectrum when diabetic patients presents with any complaints or general follow up .

CONCLUSION

Poor glycemic control causes in alteration in several haematological parameters such as haemoglobin , total leucocyte count, differential leucocyte count with no significant alteration in platelet count ,mean platelet volume, platelet distribution width . Although several studies stated that Platelet indices especially mean platelet volume would be a useful prognostic marker of cardio-vascular complications in diabetes, Other investigations must also be thought in mind. Several recent studies shows that increase in HbA1c concentration was directly proportional to increased MPV. However, in this study,there in no much significance in the MPV. Our suggestion is should not neglect/delay investigations in diabetic patients.

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CONFLICT OF INTEREST

Conflict of interest declared none.

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