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Original Research Article

Correlation of Total Leucocyte Count and Differential Leucocyte Count in Relation to Glycated Haemoglobin in Type 2 Diabetes

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ABSTRACT

Elevated blood glucose is a one among the other cause of unfavorable changes in biochemical and hematological 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 total leucocyte count and differential leukocyte count with glycated hemoglobin 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 hemoglobin and hematological indices (TLC & DLC). Abnormal test results are indicated by numbers higher or lower than the range 4000 – 10000 cells / cumm or microliter (mcL). Result shows that 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 hemoglobin indicating some form of non specific inflammation or infection .

Key words: Glucose, glycated hemoglobin, total leucocyte count, differential count, insulin, diabetes

INTRODUCTION

Diabetes mellitus is a group of metabolic disorder characterized by the presence of high blood sugar for a prolonged period due to defective insulin production or appropriate and efficient utilization of insulin by cells.

It is one of the disorders which is spreading like epidemic all over the world inappropriately managed diabetes cause severe complications. The chronic, long term complications are related to damage caused by high blood sugar mainly the blood vessels and are generally classified into micro vascular disease such as diabetic retinopathy (eyes), nephropathy (kidneys), and neuropathy (nerves) and macro vascular disease concerning the heart and blood vessels (large vessel disease).

Apart from this, another main form of complication is the infection by microorganism. the pathogenesis behind the infection which occur almost ten fold increase in diabetic patients than normal individual due to immune suppression which is due to reduced T Lymphocytes response, Neutrophil function, Humoral immunity, Anti oxidant system, Angiopathy and increased blood glucose which itself not a cause. The infection which is common in diabetics are pneumonia, tuberculosis, pyelonephritis, cystitis, perinephric abscess, soft tissue infection including diabetic foot, osteomyelitis, necrotizing fasciitis, mucocutaneous candidacies, invasive /

malignant otitis externa, rhino cerebral mucormycosis, emphysematous pyelone-phritis, emphysematous cholecystitis.

Obesity and type 2 diabetes are leading causes of morbidity and mortality, and their prevalence is increasingly rising in the younger population. [(1)] 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. [(2)] 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. [(3,4)] Chronic inflammation in conditions like rheumatoid arthritis and psoriasis has been associated with an increased incidence of diabetes even in the absence of obesity, [(5,6)] and treatment in these conditions with anti-inflammatory drugs significantly decreased the rates of diabetes. [(7)] 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, [(8)] but observations were not consistent. [(9,10)] A recent meta-analysis of 20 studies including ~90,000 participants demonstrated a positive correlation between increased WBC level and diabetes risk. [(11)] 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.

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 Saveetha Medical college and hospital, 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 Total leukocyte count, differential leucocyte count and HbA1c. Samples for fasting blood glucose estimation were collected in non vacuum fluoride tubes and are estimated by glucose oxidase method. TLC & DLC is estimated using SYSMEX XN 1000 Automated analyzer.

ANALYSIS

The data were statistically analyzed using Statistical Package for Social Sciences version SPSS 20.0.

RESULT

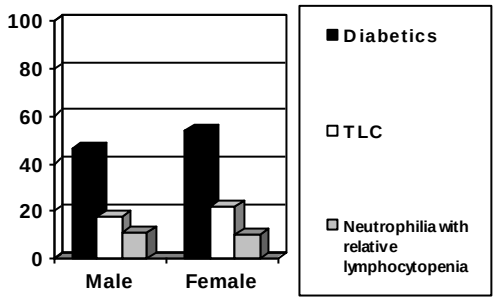
Among the 100 Type II Diabetic patients with increased glycated haemoglobin (HbA1c), Total leucocyte count is elevated in about 18 of 46 Male and 22 of 54 Female patients – 40 as a total. Among the 18 male diabetic patients who had elevated total leucocyte count, 11 patients have elevated neutrophil 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.

DISCUSSION

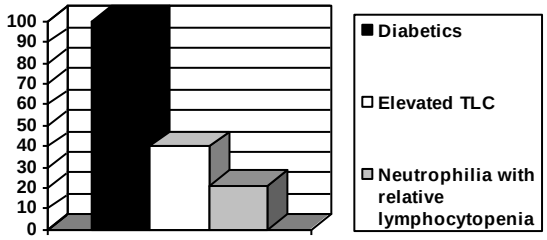
Hyperglycemia induced variation in haematological parameters has been reported by several studies. The present study demonstrated that the total and differential leukocyte counts were significantly altered in patients with hyperglycemia. Patients with Uncontrolled type II Diabetes had higher counts of total

WBCs or leucocytes and neutrophils but lower counts of lymphocytes. 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 lymphocytopenia may be relative due neutrophilia.

CORRELATION OF HIGH HbA1c WITH TLC & DLC IN MALE & FEMALE PATIENTS AS SEPARATE



CORRELATION OF HIGH HbA1c WITH TLC & DLC IN BOTH MALE AND FEAMLE PATIENTS AS COMBINED



CONCLUSION

In our study neutrophil are increased and indicates that patient had infection. Poor glycemic control causes an alteration in the Total leukocyte count and Differential leukocyte count which may be probably due to non specific inflammation or infection which is more common in diabetic patients.

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