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To Assess The Co-relation of Diabetes Mellitus and Co-Morbid Tuberculosis on the leukocyte and platelet counts

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Abstract

Objective: The aims of this study were to assess and compare the leukocyte and platelet counts among the patients with Tuberculosis alone and co-morbid with diabetes mellitus.

Methods: This was a preliminary study conducted at the respiratory clinic at public hospital, Pulau Pinang, Malaysia. Four groups were the defined retrospectively i.e patients with DM (118 patients), patient with TB (115 patients), DM-TB (76 patients) and Control subjects (118 patients). Lab values like; leukocyte count, platelets, and blood glucose levels of these groups were retrieved from the medical records and then were compares to see the possible association.

Results: DM patients showed quantitatively higher lymphocyte and neutrophil count than the patients with Tuberculosis (TB) alone.

Conclusion: Findings demonstrated that lymphocyte and neutrophils levels were higher among diabetic patients than those with TB alone. However, thrombocytes levels were higher among the patient with TB alone and with diabetes mellitus.

Keywords:

Diabetes mellitus, tuberculosis, Lymphocytopenia-neutrophilia, Thrombocytosis

Abbreviations:

DKA= diabetic ketoacidosis; DM = diabetes mellitus; ICL = idiopathic CD4+ lymphocytopenia; TB = tuberculosis

Introduction:

Diabetes Mellitus (DM) is characterized by abnormalities in the normal carbohydrate, fat, and protein metabolism. On the basis of the body response to insulin DM is mainly divided in two type's i.e Type-I DM and Type-II DM [1].

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Type-I is insulin dependent diabetes mellitus which involves damage of pancreatic ß cells, while Type-II is non-insulin dependent diabetes mellitus which progress with the resistance to insulin [1]. Due to high blood sugar levels DM patients are more susceptible to a wide range of infectious bacterial and fungal infections [1]. In the case of any infection the first defensive response is given by white blood cells and among all leucocytes, T-lymphocytes and monocytes are important in host defense against infections like mycobacterium [2]. It is seen that DM patients have depressed cell-mediated (T-lymphocytes) immunity [2,3]. And due to this reason the mortality rate of patients with coexistent infection and diabetic ketoacidosis (DKA) is as high as 43% [4]. Nowadays there is incline in the comorbid DM, especially with Tuberculosis and HIV [5,6]. A part from the other complications associated with the incidence of DM, many clinicians believe that DM also related to the immune dysfunction. Due to the lack of research in this particular area, the current study aim to assess and compare the leukocyte and platelet counts among the patients with Tuberculosis alone and co-morbid with diabetes mellitus

Materials and Methods:

This was a retrospective study conducted at respiratory and diabetic clinics of Public Hospital, Pulau Penang.

Study Design

All the patients registered at respiratory and diabetic clinic between January 2003 and January 2004 were the part of study. Patients' information was collected using a structured data collection form. Keeping in view the aims of study three cohorts were defined i.e Patients with DM alone (n=118), Patients with TB alone (n=115) and Patients with TB & DM (n=76). All the demographic information, the information about the Blood glucose level and leukocyte count was retrieved from the patient wallets. Although the relative percentages of leukocytes were studied, only absolute cell numbers were used for cell-distribution abnormalities and statistical analysis. Relative percentage and absolute numbers of lymphocytes, monocytes, neutrophilis , and platelets count were specially studied.

Excluded Cases

All the cases like HIV, organ transplantation, chemotherapy and cancer were not the part of study.

Ethical consideration and data analysis

The study protocol was approved by the clinical research committee, furthermore no personal information were recorded which may disclose the patient identity. All the data was analyzed using Statistical Package for Social Science SPSS version 13®. In order to attain the mean of the values descriptive statistics was applied, furthermore to identify the differences among the groups one way-ANOVA was used. P-value less than 0.05 was considered statistically significant.

Results

No correlation was found between leukocyte count and glucose level. Leukocyte count of hyperglycemic patients, including DKA cases, was not different from those non-diabetic subjects (Table 1). Severely ill patients exhibited an abnormal leukocyte distribution. Severe lymphocytopenia (0.3-0.6 $x10^9$/L) was mainly accompanied by neutrophilia.

Table 1 Leukocyte and platelets differentiation

Cell Differentiation	D M	DM+TB	TB
Lymphocytes			
Absolute numbers	11%	4.8 %	8.4%
Relative percent	47%	46 %	54%
Average ± SD	**2.10 ± 1.1**	**1.95±0.75**	**1.6 ±0.6**
Neutrophilis			
Absolute number	38%	30.9%	17.5%
Relative percent	47%	28%	30 %
Average ±SD	**7.99 ± 4.8**	**7.15 ± 3.0**	**5.95±2.9**
Monocytes			
Absolute number	18.8%	28.6%	25.16
Relative percent	13%	32%	45%
Average ± SD	**0.78 ± 0.4**	**0.88±0.48**	**0.8 ±0.4**
Platelets			
Thrombocytosis	13.4%	16%	32.2%
Average ± SD	**295.4 ± 138**	**342 ±133**	**349±250**

Lymphocytopenia cases were more frequent in the DM group (11%) and less frequent in the DM-TB group (4.8 %). Certain cases, lymphocytopenia was associated with monocytosis. No cases of lymphocytopenia without combined neutrophilia or monocytosis were noted. Leukocyte abnormalities in the relative percentage were more apparent than in the absolute values (Table 1). However, the highest lymphocyte mean value was observed in the DM group (2.10), while the lowest value was found in the TB group (1.61). For neutrophilis, means of DM and DM-TB were higher than other group. With respect to absolute numbers, no cases of neutropenia or monocytopenia were noted.

Discussion

In the present study, no correlation was found between leukocyte count and blood glucose level. Cruz et al, has also reported unaltered total and differential leukocyte count in the peripheral blood of diabetic subjects [7]. Clinicians' opinion about lymphocytopenia is controversial; Stevens et al have reported mycosis fungoides associated with idiopathic CD4+ T-lymphocytes (ICL) [8]. Considerable numbers of CD4+ T-lymphocytes migrated from peripheral blood vessels to the sit of infection; and that migration is responsible for the apparent peripheral lymphocytopenia. Lymphocytopenia-neutrophilia that resulted from psychological disturbance or dexamethazone administration have been reported [9]. Hoffman et al have linked lymphocytopenia and counter-regulatory hormones/catecholamines that were elevated during episodes diabetic ketoacidosis. Lymphocytopenia normalized after treating DKA [10]. Onorati et al have reported a case of lymphocytopenia induced by tuberculosis, and opportunistic infection of Pneumocystis carinii resulted from the lymphocytopenia [11]. Leukocytosis that was related to the severity of DKA rather than the presence of infection was reported [12]. Because DKA is associated with infection-like symptoms (malaise, vomiting, and leukocytosis), clinicians may consider these symptoms as results of infection. However, combined neutrophilia-lymphocytopenia is observed when immune system response to surgical stress, systemic inflammation or sepsis [13]. Idiopathic CD4+ lymphocytopenia has been related to viral infection [14,15].

Comparing our study to the above mentioned reports, it seems that combined lymphocytopenia-neutrophilia was related to the severity and acuteness of the illness. It is a stress induced abnormality. Most of our patients who exhibited such abnormalities were admitted to the hospital from the Emergency Department with a history of congestive heart failure, chronic obstructive pulmonary disease /bronchial asthma, DKA exacerbated with klebsiella, cellulitis, or hypertensive crisis. Lymphocytopenia-neutrophilia was also observed in severely ill patients with renal failure, malnutrition, surgical cases and long time bed-ridden patients. Lymphocytopenia resulted, as suggested by Steven et al, from the migration of lymphocytes to the areas of inflammation at the expense of the circulating peripheral lymphocytes [8]. The inflammation could be due to excessive release of hormones or catechlomines, injury and/or surgery, infection or other reasons.

In the present study, the DM group exhibited the highest average of lymphocyte value (2.1), while the TB group showed the lowest lymphocyte value (1.61). This finding indicates that the DM patients, in comparison to other groups, have normal or even elevated lymphocyte count. Hoffman et al also found an increased lymphocyte activation following treatment of DKA [10]. With respect to TB group, the lower level of lymphocytes could have resulted from either malnutrition or from the TB infection. It is reported that chronic protein malnutrition has a negative impact on lymphocyte activation [10]. Malnutrition as a risk factor for infection in hospitalized elderly patients have been described [16].

In the present study, the TB and DM-TB groups showed monocytosis and thrombocytosis higher than the other two groups. It seems that this resulted from tuberculosis infection. Morris has reported monocytosis

and thrombocytosis in aged pulmonary tuberculosis patients [17,18]. Correlation between monocyte rebound and intensity of myocarditis has been observed [19]. Monocytosis and thrombocytosis among children with suspected tuberculosis has been found [20]. Thrombocytosis secondary to Haemophilus influenza infection was described by Ruble et al, Thrombocytosis that resolved 30 days after treatment was found in patients with active pulmonary tuberculosis [21,22].

Limitations

This study has several limitations. Due to the nature of retrospective study it was difficult to attain the desired objective from the available data. Furthermore, Lymphocytes differentiations were not done for all patients and severity of illness of all groups was not the same which may have affect on the lymphocytes count.

Conclusions

Findings demonstrated that lymphocyte and neutrophils levels were higher among diabetic patients than those with TB alone. However, thrombocytes levels were higher among the patient with TB alone and with diabetes mellitus.

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Conflict of interest:

All the authors have no conflict of interest

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