T and B Lymphocyte Subpopulations in Black Patients with Diabetes Mellitus

ARMAND B. GLASSMAN, M.D., JAMES H. LINDSAY, JR., M.A., JON H. LEVINE, M.D.* and CAROL E. BENNETT, B.S.

Department of Laboratory Medicine and Department of Medicine*, Medical University of South Carolina, Charleston, SC 29403

ABSTRACT

A modified method of assaying T and B lymphocytes was used to investigate the T and B cell subpopulations in black patients with diabetes mellitus. Thirty-eight black diabetic patients were compared to 55 non-diabetic patients (20 blacks and 35 whites). The diabetic patients had an increased T-lymphocyte population (73.4 percent ± 7.9) as compared to the black controls (66.2 percent ± 1.7, p < 0.001) and the white controls (68.1 percent ± 3.5, p < 0.001). Black non-diabetic patients had a decreased T-cell population compared to the white non-diabetic patients. This suggests race was not an explanation for the increased T-cell percentages observed in the diabetic population. No difference was demonstrated in the percentage of B-lymphocyte subpopulations between any group.

Introduction

An increased incidence of infection is recognized as a complication among patients with diabetes mellitus. Cell mediated immunity (CMI), as measured by lymphocyte blast transformation (LBT), has been investigated in patients with diabetes mellitus. The results of these investigations generally indicate a decreased sensitivity of diabetic lymphocytes to stimulation by the mitogen phytohemagglutinin (PHA). The purpose of the present study is to investigate further if T and B lymphocyte subpopulations in patients with diabetes mellitus differ from ambulatory normal subjects.

Materials and Methods

SUBJECTS

Thirty-eight black diabetics attending the Diabetic Outpatient Clinic at the Medical University of South Carolina were studied. Informed consent was ob-
tained from all subjects participating in the study. Multiple parameters were measured to provide a statistical base from which future comparisons can be made. These parameters include: age, sex, race, duration of diabetes, treatment, presence or absence of infection and blood glucose.

**T AND B CELL QUANTIFICATION**

The determination of T and B lymphocyte percentage was performed by a modified method previously described in detail. The T-cell population was measured by their ability to form "E" rosettes with sheep red blood cells and B-cells were determined by surface immunofluorescence.

**Results**

**CHARACTERISTICS OF STUDY GROUPS**

The control groups consisted of 20 black and 35 white, healthy, non-diabetic, ambulatory laboratory personnel. The black control group contained one male and 19 females with an age range of 22 to 54 years with a mean age of 32.0 ± 9.2 years. The white control group consisted of eight males and 27 females with an age range of 22 to 57 years and a mean age of 31.0 ± 8.9 years.

The diabetic population consisted of three black men and 35 black women ranging in age from 28 to 76 with a mean of 51.6 ± 10.6 years. The known duration of disease (diabetes mellitus) for all patients ranged from one month to 21 years with a mean of 9.3 ± 6.0 years. Thirty of the patients were treated with insulin, seven were treated with oral hypoglycemics and one patient was controlled by dietary regulation alone. Diabetes mellitus in all patients was in apparent clinical control. There was no evidence of acidosis or requirement for adjustment of diet, hypoglycemic agents or insulin. No patient was under treatment or had clinic evidence for an infection at the time of the study.

**T-CELL SUBPOPULATIONS**

The lymphocyte subpopulation in the black control and the white control groups was 66.2 percent ± 1.7 and 68.1 percent ± 3.5, respectively (figure 2, figure 3, and table I). The diabetic group (figure 1) had T-lymphocytes of 73.4 percent with one standard deviation of 7.9 (table I). An analysis of variance indicated that the percentage of T-lymphocytes in black diabetics differed from both the black control group (p < 0.001) and the white control group (p < 0.001). A difference of

![Figure 1](image-url)
T-lymphocyte percentages between the black control group and the white control group was observed ($p < 0.05$). The T-cell percentages of the diabetics were compared with respect to blood glucose. Diabetic subjects with fasting glucoses $<250$ mg per dl were compared to those with glucoses $>250$ mg per dl. There was no difference in T-cell percentages between the two groups.

**B-CELL SUBPOPULATION**

The B-Cell subpopulation for the diabetic group was 7.9 percent ± 2.6. The black control group and the white control group had a B-lymphocyte percentage of 7.7 percent ± 1.1 and 7.9 percent ± 1.5, respectively. An analysis of variance revealed no significant differences between any group.
TABLE I

Comparison of T and B Lymphocyte Subpopulations

<table>
<thead>
<tr>
<th></th>
<th>T-Cell Percent</th>
<th>B-Cell Percent</th>
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</thead>
<tbody>
<tr>
<td>Black diabetics (n = 38)</td>
<td>73.4 ± 7.9 (52-88)</td>
<td>7.9 ± 2.6 (2-12)</td>
</tr>
<tr>
<td>White controls (n = 35)</td>
<td>68.1 ± 3.5 (60-76)</td>
<td>7.9 ± 1.5 (5-11)</td>
</tr>
<tr>
<td>Black controls (n = 20)</td>
<td>66.2 ± 1.7 (64-71)</td>
<td>7.7 ± 1.1 (6-10)</td>
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</table>

The values are expressed as the mean ± 1 standard deviation with the range in parentheses.

Discussion

Significant differences in the percentages of subpopulations of B or T lymphocytes between diabetic and non-diabetic subjects have not been previously reported. The present investigation can only support the finding of no differences in B-cell subpopulations. One possible explanation of this difference in T-cell percentages could be varying methodologies used to assay the T-cells. Other possible explanations of the different findings could be indigenous differences between the diabetic groups studied.

This study indicates that the increase in T-cell percentages in the black diabetics is not on the basis of race. Black diabetics had an elevated mean T-cell percentage while the black non-diabetics had a lower mean T-cell percentage when compared to the white non-diabetic control group. It has been reported that a decrease in T-cell percentages occurs during aging. In our study, the diabetic data reveal that the population with the highest mean age had the highest mean T-cell percentages. This is contrary to what would be expected on the basis of age alone.

A difference in T-cell percentage between blacks and whites appears to exist independent of the percentage or absence of diabetes. That is for the control group of 20 blacks, T percentage = 66.2 ± 1.7 percent and for 35 white controls, T percentage = 68.1 ± 3.5 percent (p < 0.05). This difference could be genetic, environmental, due to sampling error or some combination of these factors.

Multiple parameters were measured, i.e., age, sex, race, duration of diabetes, presence or absence of infection, blood glucose level and therapy. None were statistically significant with regard to the increased T cell percentages. Comparison of subjects with blood glucose <250 mg per dl or >250 mg per dl demonstrated no statistical significant difference of T cells. The effect of poor diabetic control, e.g., acidosis, on the percentage or function of lymphocyte subpopulation was not tested in this study.

Lymphocytes from diabetic subjects show a decreased sensitivity in response to an immunologic challenge. This is clinically supported by recognition of an increased incidence of infection and the association of diabetes with several autoimmune diseases. The increased percentage of T-cells found in black diabetics may represent an attempt to overcome this immunological deficit by increasing the circulating pool of T-cells. Preliminary results from assays of lymphocyte blast transformation (LBT) performed on cells from the black diabetic subjects in this study suggest that the decreased cell mediated immunity (CMI) is not a function of the number of cells but rather an intrinsic deficiency of the T-cell itself. Whether the deficient response of T-cells from diabetic patients is due to membrane alterations or metabolic deficiencies or a combination of both is a question that merits further investigation.

Conclusions are as follows:

1. A modified T and B lymphocyte assay was used in comparing 38 black diabetics and 20 black and 35 white non-diabetics.

2. The black diabetic group had an increased T-cell percentage when compared to either white or black control groups (p < 0.001).

3. The black control group had a decreased T-cell percentage when com-
pared to the white control group (p < 0.05).

4. The increase in T lymphocytes could not be correlated with infection, blood glucose levels, duration of or treatment for diabetes.

5. There were no differences in B-cell percentages among any of the groups.

References


