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# Diabetes and chronic ailments- An analytical and comparative study

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**ABSTRACT**

Diabetes mellitus [1-8] is a silent chronic disorder characterized by elevated blood sugar levels either due to defective insulin secretion or action or both. It is associated with altered metabolism of carbohydrates, fats and proteins. This condition is characterized by the inability of the individuals to metabolize and utilize glucose. Diabetes is a disease which has no cure and prevention is the only method to counter the disease. Diabetes is a disease which probably affects every organ of the body right from the toe to the brain. The present study was undertaken to study the effect of diabetes on individuals suffering from other chronic ailments such as Cardiac [9-11] liver and renal diseases[12-26]. A thorough survey was carried out on a number of subjects and the results tabulated systematically to explain the correlation of biological parameters with diabetes and related chronic ailments in term of age sex and their overall health condition.

**Key words:** Diabetes mellitus, Correlation, Analysis, Estimation, Hematology and Serology

## INTRODUCTION

It must be noted that the third most threatening disease in the world is diabetes, a disease that can be controlled but not cured. Tuberculosis is also a dangerous and threatening disease which is commonly associated with the respiratory tract. Diabetes mellitus is a silent chronic disorder characterized by elevated blood sugar levels. It is associated with altered metabolism of carbohydrates, fats and proteins. There are two major types of diabetes, type 1 and type 2 diabetes. Type 1 diabetes (earlier called juvenile-onset or insulin-dependent diabetes), usually develops in children or young adults. In this type the body completely stops producing insulin, the hormone that enables the body to use glucose found in food into energy, due to damage to insulin producing cells (beta cells) of the pancreas. In type 2 diabetes (earlier called adult-onset or non insulin-dependent diabetes), the body produces some insulin, but it is not enough and moreover there is insulin resistance, which means that the available insulin does not work properly. Diabetes is a chronic disease and has no cure and only prevention. Individuals who are diabetic often suffer from diabetic nephropathy. Diabetes is the primary reason for adult blindness, end-stage renal disease (ESRD), gangrene and amputations. Overweight, lack of exercise, family history and stress increase the likelihood of diabetes. When blood sugar level is constantly high it leads to kidney failure, cardiovascular problems and neuropathy. Patients with diabetes are 4 times more likely to have coronary heart disease and stroke. In addition, Gestational diabetes is more dangerous for pregnant women and their fetus.

Though, Diabetes mellitus is not completely curable but, it is controllable to a great extent. So, you need to have thorough diabetes information to manage this it successfully. The control of diabetes mostly depends on the patient and it is his/her responsibility to take care of their diet, exercise and medication. Advances in diabetes

research have led to better ways of controlling diabetes and treating its complications.

## EXPERIMENTAL

### Instrumentation

The total count of white blood cells as made using a Haemocytometer, Differential count with Leishmann's staining and all the serological examinations were carried out on a Systronics Auto analyzer for estimation of Glucose, Choleserol, Urea and proteins.

| | | |
|---|---|---|
| Method 1 | : | WBC pipette, Neubar chamber, WBC Diluting fluid. |
| Method 2 | : | Leishman stain, Glass slide. |
| Method 3 | : | ESR westergrent tube strand needle. |
| Method 4 to 7 | : | All reagents were prepared as per standard procedures available for the respective estimations & measurements were taken using a Genesis UV Split beam spectrophotometer 110. |

### Reagents

All the chemicals used were of analytical grade. All the solutions were freshly prepared with double distilled water and a few of these reagents were directly used wherever necessary.

| | | |
|---|---|---|
| Method 1 | : | WBC diluting fluid. |
| Method 2 | : | Leishman stain |
| Method 3 | : | EDTA |
| Method 4 | : | Enzyme reagent, glucose standard. |
| Method 5 | : | Cholesterol reagent buffer $P^H$ (6.7) cholesterol esterase cholesterol oxidase, peroxidase, 4-aminoantipyrine, stabilizers), cholesterol standard. |
| Method 6 | : | Enzyme reagent (hypochlorite) and urea standard. |
| Method 7 | : | Albumin reagent (succinic acid, bromocresol green, sodium hydroxide, buffer $P^H$ (3.68), Albumin standard (BSA preservative). |

### Standard and Sample solutions

A survey was carried out with an in depth prepared questionnaire. Seeking information about various aspects, from the subjects concerned. The information was sought in terms of age, sex, food habits, family history, disease history, other ailments, their nature of work, and their stress levels and so on. After screening about 100 samples with reference to the type of study intended, 15 samples were selected for investigation and the following experimental procedures were carried out.

## EXPERIMENTAL

### Method 1: Total count of WBC

The blood was drawn into the WBC pipette upto 0.5 mark and the WBC diluting fluid was filled upto the 11 mark in the WBC pipette. The solution was mixed by swirling the pipette equally with hand and a small drop of diluted blood was allowed to drop into the Neubar chamber. The cells were observed by placing the chamber under 40X magnification on the mechanical stage of microscope.

### Method 2: Differential Count of WBC

A drop of blood was placed on a clean and neat glass slide and a thin smear was made with the help of a spreader. The smear was allowed to dry and a few drops of Leishman stain was added on to it and observed under microscope.

### Method 3: Erythrocyte Sedimentation rate

A volume of 1.6ml blood was collected with a disposable syringe and drawn into a tube in which 0.4 ml of sodium citrate solution is taken. The solutions were mixed thoroughly for 2 minutes this solution. Immediately blood sample is loaded into the ESR tube up to '0' mark. The tube was allowed standing for exactly 60 min and the level to which the red cell column has fallen at the end of 1 hour is noted.

### Method 4: Estimation of Blood Glucose

Test, standard and blank tubes were carefully labeled. In the three tubes 1 ml of working glucose reagent was added. In the tube marked standard 10 µl of glucose standard and in test 10 µl of serum was added. All the tubes were mixed well incubated at 37 $^{o}$C for 10 minutes. The absorbance

of the test and standard tubes was measured against reagent blank at a wavelength of 505 nm. Analyzer was programmed as per assay parameters and the absorbance is calculated.

**Method 5: Estimation of Cholesterol**

Test, standard and blank tubes were carefully labeled. In the tube marked test 10 µl of serum was suspended. In the tube marked standard 10 µl of cholesterol standard was added. To all the three tubes 1000 µl of cholesterol reagent was added. All the tubes were mixed well incubated at 37 °C for 10 minutes and the absorbance of the three tubes( including blank) was measured at a wavelength of 505 nm. Analyzer was programmed as per assay parameters and the absorbance is calculated

**Method 6: Estimation of Urea**

Test, standard and blank tubes were carefully labeled. In the three tubes 1 ml of working urea reagent was added. In the tube marked standard 10 µl of urea standard and in test 10 µl of serum was added. All the tubes were mixed well incubated at 37 °C for 3 minutes. To all the three tubes 1 ml of hypochlorite reagent was added. All the tubes were again mixed well incubated at 37 °C for 5 minutes and the absorbance of the three tubes (including blank) was measured at a wavelength of 578 nm. Analyzer was programmed as per assay parameters and the absorbance is calculated.

**Method 7: Estimation of Albumin**

Test, standard and blank tubes were carefully labeled. In the tube marked test 10 µl of serum was suspended. In the tube marked standard 10 µl of albumin standard was added. To all the three tubes 1000 µl of Albumin reagent (Succinic acid, Bromocresol green, sodium hydroxide) was added. All the tubes were mixed well incubated at room temperature for 1 minute and the absorbance of the three tubes (including blank) was measured at a wavelength of 630 nm. Analyzer was programmed as per assay parameters and the absorbance is calculated

## RESULTS AND DISCUSSION

The proposed methods are based on a comparative study conducted with utmost accuracy and keeping in view the relevance of the disease

**Table 1: Blood glucose values in relation to other biological parameters**

| Code | Age/ | Glucose | Cholesterol | Protein | Urea | T.C | DC | | | ESR |
|---|---|---|---|---|---|---|---|---|---|---|
| NO | SEX | mg/dl | mg/dl | mg/dl | mg/dl | | N* % | E** % | L*** % | mm |
| D1 | 50/F | 85.28 | 76.41 | 6.71 | 32.22 | 11,250 | 78% | 2 | 20 | 100 |
| D2 | 52/M | 145 | 197 | 4.86 | 27.14 | 6,250 | 62 | 4 | 34 | 2 |
| D3 | 41/M | 111.76 | 105.88 | 5.57 | 24.4 | 8,300 | 60 | 2 | 36 | 2 |
| D4 | 46/F | 70.588 | 94.11 | 4.28 | 38.8 | 9,250 | 70 | 6 | 24 | 53 |
| D5 | 50/M | 64.705 | 105.88 | 4.41 | 44.4 | 5,150 | 58 | 2 | 40 | 70 |
| D6 | 56/M | 129.1 | 202 | 4.76 | 24.27 | 7,000 | 62 | 8 | 30 | 27 |
| D7 | 55/F | 147.05 | 88.28 | 3.71 | 24.4 | 8,750 | 66 | 2 | 32 | 10 |
| D8 | 45/F | 110.51 | 189.2 | 4.6 | 29 | 7,750 | 64 | 2 | 34 | 18 |
| D9 | 55/F | 194.23 | 88.28 | 4.14 | 21.11 | 5,750 | 72 | 2 | 26 | 24 |
| D10 | 49/F | 114.7 | 94.17 | 4 | 28.88 | 8,150 | 60 | 4 | 36 | 12 |
| D11 | 75/M | 129.11 | 76.48 | 4.57 | 32.2 | 5,150 | 56 | 4 | 40 | 48 |
| D12 | 60/F | 91.17 | 111.76 | 4 | 13.33 | 6,750 | 60 | 2 | 38 | 16 |
| D13 | 38/F | 191.17 | 105.88 | 4 | 20 | 8,500 | 77 | 1 | 32 | 50 |
| D14 | 55/M | 179.11 | 141.6 | 4.14 | 30 | 7,000 | 68 | 2 | 30 | 4 |
| D15 | 50/M | 102.4 | 64.55 | 4 | 17.7 | 9,000 | 66 | 4 | 30 | 2 |

* Neutrophil ** Eoisnophil ***Lymphocytes

under study. All the results for the estimations of various biological parameters have been tabulated. The study was intended to study the relationship between diabetes and renal, respiratory and cardiac diseases and for this purpose estimations related to urea, albumin and cholesterol were carried out.

Thus the proposed study is case sensitive and could throw sufficient light from the evidences collected for the individual subjects. It has been observed that people who are strongly diabetic are also found to suffer from high levels of cholesterol as their carbohydrate utilization capacity is decreased and the lipid utilization capacity is increased. Moreover it was also keenly observed that people who have sedentary food habits and do not undergo exercise, they have a tendency for renal dysfunction and elevated protein levels in blood and urine. It is also seen that subjects who have a good level of exercises and maintain a diet with time, are capable of controlling diabetes and hence their other parameters have also shown normal levels. The tendency for other organs to show abnormality is probably more in the age group of 40 years and above. In all the subjects' one thing that was commonly observed irrespective of the age group was a very abnormal ESR level. The total and differential counts in most of the subjects were normal.

## CONCLUSION

Though, Diabetes mellitus is not completely curable but, it is controllable to a great extent. So, you need to have thorough diabetes information to manage this it successfully. The control of diabetes mostly depends on the patient and it is his/her responsibility to take care of their diet, exercise and medication. Advances in diabetes research have led to better ways of controlling diabetes and treating its complications. As long as the individual lives in a stress free environment and has control on his life style and habits, the disease will not affect any other organ or organ system of the body.

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