Study of lipid profile & electrolyte levels in diabetes

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Abstract
The study has planned in Shree Narayan Medical Institute & Hospital, The 50 Diabetic patients and 50 controlled normal patients were enrolled in to the study. The age group of the patients are from 25-70 years. The biochemical parameters like Fating glucose level, Glycated haemoglobin (HbA1c), Total cholesterol, Triglycerides, High Density Lipid, and Low Density Lipid were estimated. Also the electrolyte levels like sodium, potassium, chlorine and bicarbonate is also monitored.

The concentration of HbA1c, Cholesterol and low density lipid implies a positive correlation with the triglycerides. The levels of the high density lipid and serum chlorine showed negative correlation with triglycerides. Cholesterol and low density lipid showed significant positive correlation with HbA1c. The study also showed that the diabetic patients have electrolyte imbalance characterized by depletion in the levels of sodium, potassium and chlorine and increased in the levels of the bicarbonate ions.

Hence from the data generated above and the outcomes it may be established that the diabetic patients are prone to lipid and electrolyte imbalance. Primary acknowledgment and result of these levels of biochemical and electrolyte levels are supportive in anticipation of the further impediment.

Keywords: diabetes, lipid profile, electrolytes, etc.

Introduction
Diabetes mellitus (DM), commonly referred to as diabetes, is a group of metabolic disorders in which there are high blood sugar levels over a prolonged period. Symptoms of high blood sugar include frequent urination, increased thirst, and increased hunger [1-2]. If left untreated, diabetes can cause many complications [2]. Acute complications can include diabetic ketoacidosis, hyperosmolar hyperglycemic state, or death [3]. Serious long-term complications include cardiovascular disease, stroke, chronic kidney disease, foot ulcers, and damage to the eyes [2].

Diabetes is due to either the pancreas not producing enough insulin or the cells of the body not responding properly to the insulin produced. There are three main types of diabetes mellitus [2].

Type 1 DM results from the pancreas's failure to produce enough insulin. This form was previously referred to as "insulin-dependent diabetes mellitus" (IDDM) or "juvenile diabetes". The cause is unknown.

Type 2 DM begins with insulin resistance, a condition in which cells fail to respond to insulin properly. As the disease progresses a lack of insulin may also develop. This form was previously referred to as "non-insulin-dependent diabetes mellitus" (NIDDM) or "adult-onset diabetes". The most common cause is excessive body weight and not enough exercise.

Gestational diabetes is the third main form and occurs when pregnant women without a previous history of diabetes develop high blood sugar levels [2].

Prevention and treatment involve maintaining a healthy diet, regular physical exercise, a normal body weight, and avoiding use of tobacco. Control of blood pressure and maintaining proper foot care are important for people with the disease. Type 1 DM must be managed with insulin injections [2]. Type 2 DM may be treated with medications with or without insulin. Insulin and some oral medications can cause low blood sugar. Weight loss surgery in those with obesity is sometimes an effective measure in those with type 2 DM. Gestational diabetes usually resolves after the birth of the baby. Prevention and treatment involve a healthy diet, physical exercise, maintaining a normal body weight, and avoiding use of tobacco. Control of blood pressure and maintaining proper foot care are important for people with the disease. Type 1 DM must be managed with insulin injections [2]. Type 2 DM may be treated with medications with or without insulin [3]. Insulin and some oral medications can cause low blood sugar [4]. Weight loss surgery in those with obesity is sometimes an effective measure in those with type 2 DM [5]. Gestational diabetes usually resolves after the birth of the baby.

Glycosylated haemoglobin (HbA1c) is the most vital target of glycaemic control. The desirable value for HbA1c is values below 7.00. HbA1c is important standard in analysis of patients' status that indicates the average blood glucose during the past three months which is essential to ensure the optimal care of diabetic patients. The research has revealed that with each one percent reduction in the value ofHbA1c, the risk of micro vascular complications is reduced by40 percent.

Electrolytes are present in the human body. Electrolytes play an important role in many body processes, such as controlling fluid levels, acid-base balance (pH), nerve conduction, blood clotting and muscle contraction. Potassium, sodium and calcium are all important for proper electrolyte balance. Electrolyte imbalance resulting from kidney failure,

dehydration, fever, and vomiting has been suggested as one of the contributing factors toward complications observed in diabetes and other endocrine disorders.

The osmotic effect of glucose results in decreased circulating blood volume and fluid shift from the intracellular spaces causing cellular dehydration. This study aims to identify the relationship of serum electrolytes and lipid profile with fasting blood glucose levels in diabetic subjects.

Materials & Methodology

The study has planned in Shree Narayan Medical Institute & Hospital. The 50 Diabetic patients and 50 controlled normal patients were enrolled in to the study. The age group of the patients are from 25-70 years. The patients visited to Out Patient Department (OPD) and in-patient department (IPD) of a tertiary care hospital in North India were considered in the study. All the patients are informed consents. All the patient's clinical history were collected.

The biochemical parameters like Fating glucose level, Glycated haemoglobin (HbA1c), Total cholesterol, Triglycerides, High Density Lipid, and Low Density Lipid were estimated. Also the electrolyte levels like sodium, potassium, chlorine and bicarbonate is also monitored.

Group A: Diabetic patients
Group B: Controlled study patients

Results & Discussion

The data from 100 patients are collected and presented as below. The age group of the patients are from 25-70 years.

Table 1: Comparison of Bio Chemical Parameter in 2 study groups

Bio Chemical Parameter	Group A: Diabetic patients	Group B: Controlled study patients
Fating glucose level (mg %)	163.8 ±20.1	95.8±11.5
Glycated haemoglobin (HbA1c) (%)	8.5 ±2.1	6.8±0.8
Total cholesterol (mg %)	186.2±36.2	181.2±32.5
Triglycerides (mg %)	198.3±74.4	185.3±57.6
High Density Lipid (mg %)	43.6±8.5	42.5±12.6
Low Density Lipid (mg %)	97.7±26.6	117.6±34.3

The diabetic patients showed as usual increased in glucose level. The HbA1c level also found increased in the case study group as compared to controlled study group. There is no change in the levels of the total cholesterol, triglycerides, high density and low density lipids.

Table 2: Comparison of Serum electrolytes in 2 study groups

Electrolyte	Group A: Diabetic patients	Group B: Controlled study patients
Sodium (mmol/L)	142.5±3.9	149.1±3.4
Pottasium (mmol/L)	4.6±0.6	4.6±0.9
Chlorin (mmol/L)	103.2±3.8	116.4±2.5
Bicarbonate (mmol/L)	26.3±2.4	24.1±2.8

The concentration of serum sodium and chlorine were slightly lower than the controlled study. The serum potassium ion and bicarbonate level does not show major significant change.

The concentration of HbA1c, Cholesterol and low density lipid implies a positive correlation with the triglycerides. The levels of the high density lipid and serum chlorine showed negative correlation with triglycerides. Cholesterol and low density lipid showed significant positive correlation with HbA1c. The bicarbonate showed a significant positive correlation with high density lipid. The low density lipid showed a positive correlation with cholesterol.

Derangement of water and electrolyte balances may occur in subjects with diabetes mellitus, resulting from insulin deficiency, hyperglycemia, and hyperketonemia [6]. The present study showeda very highly significant reduction in serum Na+ and K+ levels and an elevation in serum Ca2+ and Cl´ in subjects with DM were observed. This result was consistent with those reported by previous studies [7, 8]. Under physiological conditions, most of the Na+ is reabsorbed in the proximal tubule of the kidney [9].

The diabetes is the chronic disorder which leads to cardiovascular and renal complication. Early recognition and finding of these levels of biochemical and electrolyte levels are helpful in prevention of the further complication.

The metabolic disturbances and their consequences in diabetes mellitus are well known but still our knowledge on the diabetic disorders in electrolytes and membrane function is limited [9]. It has been reported that sodium and potassium depletion is a common feature of essential hypertension and type 2 diabetes [10].

The study concludes that the diabetic patients have electrolyte imbalance characterized by depletion in the levels of sodium, potassium and chlorine and increased in the levels of the bicarbonate ions.

The detected decline in the serum sodium and potassium in the present study group may be due to electrolyte loss. This electrolyte loss may occur due to the kidney dysfunction, diabetic nephropathy or dehydration. This electrolytes imbalance might also occur due to inhibition of the rennin-angiotensin-aldosterone system, which plays a key role in the regulation of fluid and electrolyte balance. This enzyme system has been reported to be affected in many endocrine and cardiovascular diseases particularly diabetes [11].

Conclusion

Hence from the data generated above and the outcomes it may

be established that the diabetic patients are prone to lipid and electrolyte imbalance. Primary acknowledgment and result of these levels of biochemical and electrolyte levels are supportive in anticipation of the further impediment.

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