



EXPLORING BIOMARKERS ASSOCIATED WITH TYPE 2 DIABETES MELLITUS

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Abstract

The researchers wanted to see how people with type 2 diabetes fared against healthy controls of a comparable age in terms of their risk for cardiovascular disease and stroke. Increased HbA1c, newlines, homocysteine malondialdehyde, microalbuminuria, and decreased eGFR newline appear to increase the risk of cardiovascular disease and stroke in people with T2DM. It was also concluded that inflammation may play a role in the development of CVD/stroke in diabetic patients. T2DM patients' biochemical indicators must be evaluated for risk assessment of diabetes complications. The rising global incidence of new-onset T2DM may lead to an increase in the prevalence of cardiovascular disease and new-onset stroke among patients with T2DM. newline Regularly checking biochemical indicators in the blood and urine of newly diagnosed diabetics may be a crucial newline step in assisting these patients in avoiding or delaying the onset of cardiovascular disease. Biochemical indicators in type 2 diabetes new-onset patients were not correlated with LPL PvuII and MTHFR newlineC677T gene polymorphism data, however this could have been due to the study's small sample size. Conclusive proof may not be accessible until after extensive, randomised clinical trials of modern treatments are carried out.

Keywords: Immunology, life sciences, type 2 diabetes, cardiovascular disease, and stroke

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1. Introduction

High blood glucose levels and the breakdown of lipids, carbs, and protein due to insulin insufficiency are hallmarks of type 2 diabetes, which also contributes to diabetes mellitus. [1] Insulin deficiency is a hallmark of type 1 diabetes mellitus, also known as juvenile diabetes. As a result of beta cell malfunction, this illness manifests in the pancreas. A person with type 2 diabetes has high glucose levels, high insulin resistance, and low insulin production. Side effects of diuretic medications may include anxiety, sleepiness, and loss of weight. Possible side effects include increased hunger and fatigue, as well as harm to one's health. Approximately 5% of the population has diabetes, making it a major health concern for everyone. [2] Large and small vascular breakdowns are just two examples of the conflicts that arise during the metabolic game plan in diabetes. Enhanced oxidative stress is caused by multiple mechanisms, including increased mitochondrial oxidative glucose digestion, activated polyol pathway, non-enzymatic protein glycation, and activated protein kinase aldose reductase. Chronically elevated blood sugar levels in people with diabetes mellitus pose a threat to their kidneys, eyes, hearts, nerves, and blood vessels [3].

It is a perpetual illness that has reached every corner of the earth. Across the board, every age bracket was topped by Diabetes mellitus, a metabolic disorder associated with the body's failure to regulate blood glucose levels, is epidemic in the modern world. [4] Heredity is to blame for this issue. Type II diabetes accounts for 90% to 95% of all cases of diabetes. WHO estimates show that in 2009, Type II diabetes was the most frequent form of diabetes worldwide, affecting over 220 million people. [5] According to the CDC, by the year 2030, more than 350 million people would have been diagnosed with type II diabetes. Significant strides have been made in the development of personalised medications. Vegetable-rich diets have been shown to reduce the risk of developing type II diabetes, but studies are currently being conducted to identify everyday and economically viable food focus areas for monitoring hyperglycemia and hypertension associated with the development of the disease. By 2030, the value of these plant compounds will likely have increased from 2.8% to 4.4%, all due to their use in building. [6] In 2010, 6.6% of the world's adult population, or 285 million people, were diagnosed with diabetes. This figure is projected to reach 438 million by the year 2030.

More than 40,9 million people in India are living with diabetes, which is around 20% of the adult population of the world. Seven million new cases of infection are reported monthly. [7] The emergence of cheap food franchises and people's highly regimented ways of life have contributed to an epidemic of diabetes in India. India, the world's second most populated country, has the highest prevalence of type-2 diabetes. Worldwide, 382 million individuals had diabetes at the start of 2013. Type 2 is responsible for as many as 90% of all cases. [8] Approximately 8.3 percent of the adult population is comprised of both males and women. According to the International Diabetes Federation, diabetes caused the deaths of approximately 4.9 million individuals worldwide in 2014. The World Health Organization reports that in 2012, diabetes was the eighth greatest cause of death worldwide, taking the lives of 1.5 million people. Methods used by the IDF to determine the proportion of deaths attributable to diabetes are at odds with conventional mortality rates for people with diabetes, which are typically caused by cardiovascular diseases. Eighty percent or more of diabetic deaths occur in low- and middle-income countries. [9]

- High blood sugar levels are a sign of diabetes.
- Weight Loss The Medical Condition Known As Polyphagia (Increased Hunger)
- Polyurethane and Irritable Bowel Syndrome (increased thirst) (frequent urination)

Symptoms

- Discouragingly slow healing of a cut or sickness; fatigue; dark spots on the skin; an increased appetite; a lack of appetite;
- Blood with a very high quantity of an antagonist
- In most cases, both genetics and the surrounding environment play a role. Here are the top three causes of insulin resistance: My eyes are all blurry.
- increased arousal and frequency of urination unusually big or tiny insulin molecules

Blurred vision, pain, fringe neuropathy, occasional vaginal contamination, and weakness at the conclusion of treatment are all typical. [10] Many patients report feeling fine over the first several years of treatment, but they still be checked frequently just in case. If you have type 2 diabetes mellitus and experience low heart rate in conjunction with a high blood sugar level, you may be experiencing hyperosmolar hyperglycemic express. Any diabetic consequence is worse than none, but all diabetes complications together are especially dangerous. But there may be as many as 21 persons who haven't settled their differences after a considerable amount of time has passed

(10–20 years). The most severe long-term effect is damage to the veins. Approximately 75% of diabetic deaths are attributed to infections of the coronary supply pathways, which are made worse by diabetes.

Insulin resistance and dysfunctional pancreatic cells both contribute to the development of type 2 diabetes. Glucose is a primary regulator of transcription and translation in pancreatic beta cells. Those with type 2 diabetes may lose as much as 60% of their cell mass over time. Insulin resistance causes cell dysfunction and has multiple causes, including predisposition from genetics, glyco-lipotoxicity, impaired insulin pulsatile secretion, and pancreatic steatosis. There is also a decline in islet amyloid polypeptide, or amylin, secretion once T2DM is well established. The progression from IGT to T2DM is associated with lower 2-hour OGTT insulin levels and decreased first-phase insulin production across most ethnic groups (insulinogenic index). A biomarker is any change in a biological medium (such as human tissue, cells, or fluids) that can be used as an indicator of a disease or other condition. Recently, the definition of biomarkers—defined as biological features that may be objectively investigated and analysed as a sign of normal biological processes or pharmacological reactions to therapeutic intervention—has been broadened.[11]

2. Materials and Method

This prospective study was done on patients in and around Gurugram, Haryana and samples were processed at the tertiary care lab based at Gurugram-Haryana.

Samples

A total of 300 people took part in the study; 142 men and 158 women. The entire population was enlisted and then randomly split into one of three categories. Group 1 consists of one hundred people (56 men and 44 women) who have a background of type 2 diabetes and cardiovascular disease/stroke. Group 2 consists of 100 people (47 men and 53 women) who have type 2 diabetes but no other serious health problems. One hundred people are included in Group 3, who are all in good health (55 males and 45 females). Participants' age, gender, height, weight, waist-to-hip ratio, neck-to-neck ratio, systolic and diastolic blood pressure, duration of diabetes, smoking and drinking habits, level of physical activity, family history (FH), and quality of sleep were all recorded.

➤ Group 1

Inclusion criteria:

- Participants in this study had to be between the ages of 30 and 60, and they had to have Type 2 diabetes (T2DM) and either stroke or cardiovascular disease (CVD/stroke).
- 12-lead ECG indicating angina or a previous MI
- Prior hospitalisation for a myocardial infarction (MI), whether fatal or not.
- Prior coronary artery bypass grafting (CABG) or percutaneous transluminal coronary angioplasty (PTCA) history Stroke

Criteria for exclusion

- Patients having a history of cardiovascular disease or stroke are at an increased risk of death from type 2 diabetes.

➤ Group 2

Criteria for Inclusion

Patients with T2DM (FBS > 125 mg/dl) between the ages of 30 and 60.

Criteria for exclusion

The following is a list of complications that have been linked to type 2 diabetes, including those affecting the liver, kidneys, thyroid, lungs, and more.

➤ Group 3:

Male and female adults (30-60) in excellent health make up.

Information Gathering Process

The blood samples were separated into three tubes, one each for 2, 3, and 5 millilitres. Within 30 minutes of drawing blood, the first 5 mL are centrifuged without anticoagulants to separate the serum from the plasma. In the second part of the blood sample, glucose and HbA1c were measured using ethylenediaminetetraacetic acid (EDTA) (2 ml). After collecting EDTA-treated blood samples (3 ml), they are immediately refrigerated at 2–4 degrees Celsius until they may undergo molecular analysis. Microalbuminuria was determined by measuring the albumin-to-creatinine ratio in 25 ml of each person's unprompted urine sampled into a clean container. Ten individuals were selected at random from the second group (type 2 diabetics) in order to investigate polymorphism in the MTHFR gene (exon 4, C677T site) and the LPL gene

3. Results

Table 1. Clinical characteristics of T2DM patients stratified by BMI intervals

Characteristics	Normal weight (n=21)	Overweight (n=18)	Obese (n=61)
Phase (year)	45.8	46.5	47.7
BMI (kg/m ²)	124.8	136.3	127.2
SBP (mmHg)	81.1	86.5	83.1
NC (cm)	34.8	38.9	39.2
DBP (mmHg)	84.2	96.6	104.2
WC (cm)	102.2	99.5	107.5
HC (cm)	215.3	169.7	183.7
FBS (mg/dl)	190.8	204.4	196.9
TC (mg/dl)	198.7	192.5	220.5
TGL (mg/dl)	47	45.6	45.1

Table 2. Clinical characteristics of T2DM patients stratified by BMI intervals

Characteristics	Normal weight (n=21)	Overweight (n=18)	Obese (n=61)
HDL-C (mg/dl)	46.1	45.5	45.3
LDL-C (mg/dl)	107.3	120.5	107.6

VLDL (mg/dl)	39.5	39	44.4
SCR (mg/dl)	0.91	0.97	0.94
HbA1c (%)	8.6	8.5	8.7
hsCRP (mg/L)	0.81	1.43	1.2
Hcy ($\mu\text{mol/L}$)	10.6	14.7	15.5
MDA ($\mu\text{mol/L}$)	7.4	7.2	7.3
MA (mg of albumin /g of creatinine)	87.5	47.5	59.8
eGFR (ml/min/1.73m ²)	86.2	85.4	85.3

Table 3. HbA1c and hsCRP of T2DM patients stratified by homocysteine intervals

Characteristics	Desirable (n=28)	Intermediate (n=33)	High (n=35)	Very high (n=4)
HbA1c(%)	9.1	8.8	8.9	7.6
HsCRP (mg/L)	0.92	1.15	1.25	0.92

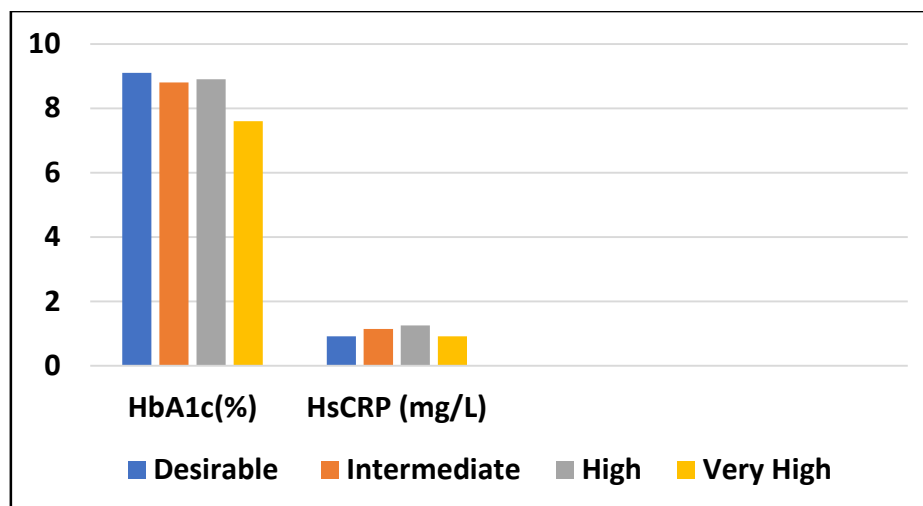


Fig 1. HbA1c and hsCRP of T2DM patients stratified by homocysteine intervals

Table 4. Hcy in T2DM patients stratified by microalbuminuria intervals

Characteristics	Normo albuminuria (n=41)	Microalbuminuria (n=56)	Macroalbuminuria (n=3)
Hcy ($\mu\text{mol/L}$)	14.05	14.3	19.1

2. Discussions

The two record normal forms of diabetes are type 2 and type 1. Around 5–8% of people with diabetes have diabetes of type 1, which is characterised by beta cells in the pancreas that destroy themselves. [12]Diabetes of type 2 (T2D) is the greatest mutual form of the disease and occurs when the body stops responding normally to insulin. Microvascular problems, such as retinopathy, nephropathy, and cardiomyopathy, are more likely in those with Type 1 and Type 2 diabetes compared to individuals with normal blood sugar levels. [13]Diabetic nephropathy increases the chance of kidney failure in persons with both Diabetes of type 2 and type 1 diabetes (DN). Diabetic cardiomyopathy is characterised by diastolic dysfunction and cardiovascular remodelling (DC). Several people suffer from type 2 diabetes, while type 1 diabetes is also prevalent. T1DM is characterised by beta cells in the pancreas that destroy themselves, and it affects between 5 and 8% of diabetics. [14] Physical activity, sleep quality, and snoring were all affected by BMI in a statistically meaningful way. More people with type 2 diabetes who were obese also exercised, snored, or had sleep disruptions than those who were overweight or normal weight. Examination of the MA in people with T2DM revealed that 41 had normoalbuminuria, 56

had microalbuminuria, and 3 had macroalbuminuria [15].

3. Conclusions

As more and more people develop diabetes mellitus (DM), the global health and economic impact of the disease is becoming increasingly dire. Diabetes mellitus offers several benefits despite the long asymptomatic phase. Numerous studies have shown that diagnosing diabetes at its earliest stages (including prediabetes) is essential for preventing the disease's more severe effects. More comparative research are needed to assess the clinical relevance of biomarkers. Future genetic research may reveal more about the connections between genetic abnormalities and metabolic problems. The researchers set out to identify potential biomarkers that could aid persons with type 2 diabetes in warding off cardiovascular disease and stroke.

4. References

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