



Asian Journal of **Biochemistry**

ISSN 1815-9923



Academic
Journals Inc.

www.academicjournals.com



Case Report

Survey on Biochemical Parameters of Type 2 Diabetic Patients in Faizabad, India

¹Al-Sana Ahmed, ²G. Jayalakshmi and ²K. Sundar

¹Dr. Ram Manohar Lohia Avadh University, Faizabad, India

²Molecular Biology Laboratory, Sri Lakshmi Narayana Institute of Medical Sciences, Puducherry, 605502, India

Abstract

Background and Objective: Type 2 Diabetes Mellitus (DM) is a chronic metabolic illness that is becoming more common across the world. As a result of this trend, it is rapidly becoming an epidemic in some countries around the world, with the number of people affected expected to double in the next decade due to an increase in the elderly population, adding to the already existing burden on healthcare providers, particularly in less developed countries. Type 2 Diabetes Mellitus (T2DM) accounts for around 90% of all diabetes cases. The present study aimed to investigate the biochemical profile of type 2 diabetes patients. **Materials and Methods:** Survey on diabetes prevalence and biochemical profiles like Blood Glucose, Serum Glutamic Pyruvic Transaminase (SGPT), Serum Glutamic-Oxaloacetic Transaminase (SGOT), serum bilirubin (total), serum bilirubin (direct), alkaline phosphatase, total serum cholesterol, High-Density Lipoprotein (HDL) and Low-Density Lipoprotein (LDL) of selected people was done. **Results:** From the survey, it was found that type 2 diabetes is more prevalent among the rural population. Male with age group 50-80 is more prone to diabetes. **Conclusion:** Diabetes patients had higher total cholesterol, triglycerides, low-density lipoprotein levels and lower levels of high-density lipoprotein than normal healthy controls.

Key words: Type 2 diabetes mellitus, blood glucose, homeostasis, biochemical profile, alkaline phosphatase, serum bilirubin, cholesterol

Citation: Ahmed, Al-Sana, G. Jayalakshmi and K. Sundar, 2022. Survey on biochemical parameters of type 2 diabetic patients in Faizabad, India. Asian J. Biochem., 17: 25-29.

Corresponding Author: K. Sundar, Molecular Biology Laboratory, Sri Lakshmi Narayana Institute of Medical Sciences, Puducherry, 605502, India

Copyright: © 2022 Al-Sana Ahmed *et al.* This is an open access article distributed under the terms of the creative commons attribution License, which permits unrestricted use, distribution and reproduction in any medium, provided the original author and source are credited.

Competing Interest: The authors have declared that no competing interest exists.

Data Availability: All relevant data are within the paper and its supporting information files.

INTRODUCTION

Diabetes mellitus type 2 is a complicated endocrine and metabolic disease. The interaction of many genetic and environmental variables causes a diverse and progressive disease with varying degrees of insulin resistance and pancreatic-cell malfunction¹. Impaired glucose tolerance develops to type 2 diabetes when cells are no longer able to generate enough insulin to overcome insulin resistance¹⁻³. Glucose intolerance develops to type 2 diabetes when insulin production is no longer adequate to overcome insulin resistance. Persistent hyperglycemia (glucotoxicity), chronic exposure to non-esterified fatty acids (lipotoxicity), oxidative stress, inflammation and amyloid formation appear to be involved in the decrease in-cell function. Patients with type 2 diabetes typically have pancreatic-cell dysfunction, which leads to increased (or non-suppressed) glucagon production in the context of hyperglycemia and likely decreased prandial GLP⁻¹ secretion⁴. Global diabetes prevalence is expected to be 9.3% (463 million people) in 2019, increasing to 10.2% (578 million) by 2030 and 10.9% (700 million) by 2045⁵. Diabetes mellitus is the most prevalent kind of diabetes (especially Type 2). Diabetes mellitus is classified into three kinds (DM).

- Type 1 Diabetes Mellitus is caused by the body's inability to generate insulin.
- Type 2 Diabetes Mellitus is a disease in which in-cells fail to effectively utilize insulin, which is occasionally accompanied by an absolute insulin shortage⁶.
- Gestational Diabetes Mellitus is a variable level of decreased glucose tolerance that begins or is diagnosed during pregnancy and resolves shortly after delivery⁷.

The following are the symptoms of untreated diabetes:

- Weight loss polydipsia is a third kind of polydipsia (increased thirst)
- Urinary incontinence (frequent urination) 4 polyphagia (increased hunger).

Insulin resistance is characterized as a decreased response to insulin in T2DM. During this condition, insulin is inefficient and is initially offset by an increase in insulin production to maintain glucose homeostasis, but this diminishes with time, leading to T2DM⁸. T2DM is more prevalent in those over the age of 45. Nonetheless, it is becoming more common in children, adolescents and young adults as a result of increased levels of obesity, physical inactivity and energy-dense meals. Diabetes is a global pandemic. Diabetes prevalence has grown

globally as a result of changing lifestyles and rising obesity. In 2017, the global prevalence of diabetes was 425 million. According to the International Diabetes Federation (IDF), around 10% of the American population had diabetes in 2015. About 7 million of these people went undiagnosed. The prevalence of diabetes rises as people get older. Diabetes affects around 25% of the population over the age of 65.

The goal of this study is to look at fasting and post-prandial behaviour in the sub-urban region of Faizabad to investigate the lipid profile and cholesterol profile of type 2 diabetes patients.

MATERIALS AND METHODS

Study area: A survey on 0.5% of the total population was conducted and blood samples from 250 diabetic patients with type 2 diabetes were obtained from rural and sub-urban regions of Tanda, Ambedkar Nagar, Uttar Pradesh (East), India, ranging in the age group from 35-80 years after obtaining the consent form. The study was conducted from July-December, 2020 at the Department of Microbiology, Dr. Ram Manohar Lohia Avadh University, Faizabad, India.

Methodology: A survey on 0.5% of the total population was conducted and blood samples from 250 diabetic patients with type 2 diabetes were obtained from rural and sub-urban regions of Tanda, Ambedkar Nagar, Uttar Pradesh (East), ranging in age from 35-80 years after obtaining the consent form.

Blood samples were obtained from diabetes mellitus patients through the venous puncture in a heparinized tube. Plasma was separated by centrifugation at 3000 rpm. Blood glucose, SGPT, SGOT, serum bilirubin (total), serum bilirubin (direct), Alkaline Phosphatase, Total serum cholesterol, HDL and LDL were measured in serum and plasma using an auto analyzer.

Questionnaire

Value research on hyperglycemia patients

Name:

Sex:

- (a) Male
- (b) Female
- (c) Prefer not to say

Age:

Locality:

Height:

Weight:

What is your diet chart?

- (a) Chia Seeds
- (b) Leafy Greens
- (c) Cinnamon
- (d) Fatty Fish

When you were first diagnosed with diabetes? Mention age?

What type of medicine you intake?

- (a) Allopathy
- (b) Homeopathy
- (c) Ayurveda and Unani

Please list all medication(s) you take, including dosage, If u take insulin, please do mention how many units, type of insulin and dose?

Do you exercise regularly?

- (a) Yes
- (b) No

What type of exercise you do?

- (a) Walking
- (b) Yoga
- (c) Cycling

Occupation

Do you smoke?

- (a) Yes
- (b) No

Do you consume alcohol?

- (a) Yes
- (b) No

Do you check your blood glucose level?

- (a) Regularly
- (b) Often
- (c) Never

Do you have results for diabetic tests?

- (a) No
- (b) If yes then mention tests with its value

Statistical evaluation: All of the values in this study are presented as Mean $\pm$ S.D. (n = 40).

RESULTS AND DISCUSSION

The current study was conducted to examine several biochemical parameters in diabetes individuals from Tanda,

Ambedkar Nagar, Uttar Pradesh (East), India. Among the study populations, males are more susceptible to diabetes as compared to females. Male fasting blood glucose level is 186.13 ± 109.13 (mg dL⁻¹) and post prandial glucose level is 289.26 ± 94.66 (mg dL⁻¹) and in female Fasting Blood Glucose level is 169.47 ± 40.20 (mg dL⁻¹) and post prandial glucose level is 273.46 ± 77.57 (mg dL⁻¹). The biochemical parameters of the male and female study groups are compared in Table 1. All the biochemical parameters are comparatively more in the case of males related to females.

From the study, it is concluded that the rural population are more susceptible when compared to sub-urban. Rural fasting blood glucose (mg dL⁻¹) is 183.20 ± 115.96 and post prandial glucose (mg dL⁻¹) is 281.89 ± 86.53 and in sub-urban fasting blood glucose (mg dL⁻¹) is 175.27 ± 48.55 and post prandial glucose (mg dL⁻¹) is 282.38 ± 89.68 . The biochemical parameters of a suburban and rural study group are compared in Table 2. All the biochemical parameters are comparatively more in the case of rural related to sub-urban.

The study proved that the people from age group (50-80 year) are more susceptible to diabetes as compared to age (30-50 year). Age group age (50-80 year) fasting blood glucose (mg dL⁻¹) is 178.42 ± 48.55 and post prandial glucose (mg dL⁻¹) is 285.87 ± 91.42 . Age (30-50 year) fasting blood glucose (mg dL⁻¹) is 179.63 ± 141.01 and post prandial glucose (mg dL⁻¹) is 273.44 ± 78.88 . The biochemical parameters of age (30-50 year) and age (30-50 year) group is compared in Table 3. All the biochemical parameters are comparatively more in the case of age (30-50 year) age (30-50 year).

The results were compared and displayed based on gender, rural/sub-urban and age group. The biochemical parameters include fasting blood glucose, post prandial glucose, SGPT (U L⁻¹), SGOT, serum bilirubin (total), serum bilirubin (direct), alkaline phosphatase, LDL, HDL, total serum cholesterol. Whole pancreas transplantation is a therapeutic option for diabetes, but it has numerous drawbacks, including extensive surgery, a scarcity of donors and organ rejection following transplantation. Islet cell transplantation is a noninvasive process in which insulin-secreting cells respond physiologically to blood glucose levels⁹. Islet cells are extracted from cadavers and injected into the portal vein of the recipient. The initial beta-cell mass was decreased by immediate blood-mediated inflammatory reactions, alloimmune reactions to transplanted cells and the diabetogenic impact of immunosuppressive medications and many patients required recurrent bouts of cell transplantation¹⁰. Because of these restrictions, transplantation of stem cells from embryonic or adult origins might be another option for diabetes therapy¹¹.

Table 1: Gender based biochemical parameters of selected patients

Parameters	Male	Female
Fasting blood glucose (mg dL ⁻¹)	186.13±109.13	169.47±40.20
Post prandial glucose (mg dL ⁻¹)	289.26±94.66	273.46±77.57
SGPT (U L ⁻¹)	59.16±30.72	62.73±31.31
SGOT (U L ⁻¹)	60.47±36.35	55.73±27.39
Serum bilirubin (total) (mg dL ⁻¹)	0.76±0.50	0.73±0.46
Serum bilirubin (direct) (mg dL ⁻¹)	0.31±0.18	0.28±0.17
Alkaline phosphatase	141.61±23.27	134.77±23.88
LDL (mg dL ⁻¹)	79.11±41.87	74.26±38.54
HDL (mg dL ⁻¹)	63.84±34.04	62.09±39.19
Total serum cholesterol (mg dL ⁻¹)	203.86±61.86	206.35±66.53

Table 2: Biochemical parameters of selected patients in the sub-urban and rural areas

Parameters	Sub-Urban	Rural
Fasting blood glucose (mg dL ⁻¹)	175.27±48.55	183.20±115.96
Post prandial glucose (mg dL ⁻¹)	282.38±89.68	281.89±86.53
SGPT (U L ⁻¹)	60.40±31.14	60.78±30.68
SGOT (U L ⁻¹)	56.56±32.24	60.62±33.55
Serum bilirubin (total) (mg dL ⁻¹)	0.76±0.48	0.73±0.48
Serum bilirubin (direct) (mg dL ⁻¹)	0.29±0.17	0.30±0.18
Alkaline phosphatase	137.91±23.95	139.91±23.42
LDL (mg dL ⁻¹)	72.79±37.69	82.60±43.32
HDL (mg dL ⁻¹)	63.90±37.35	61.98±34.80
Total serum cholesterol (mg dL ⁻¹)	207.74±65.78	201.92±60.99

Table 3: Age based biochemical parameters of selected patients

Parameters	Age (30-50 year)	Age (50-80 year)
Fasting blood glucose (mg dL ⁻¹)	179.63±141.01	178.42±48.55
Post prandial glucose (mg dL ⁻¹)	273.44±78.88	285.87±91.42
SGPT (U L ⁻¹)	61.18±29.03	60.32±31.61
SGOT (U L ⁻¹)	57.22±33.66	58.98±32.52
Serum bilirubin (total) (mg dL ⁻¹)	0.79±0.49	0.73±0.47
Serum bilirubin (direct) (mg dL ⁻¹)	0.27±0.15	0.30±0.18
Alkaline phosphatase	138.96±22.13	138.88±24.32
LDL (mg dL ⁻¹)	77.57±38.61	77.55±41.55
HDL (mg dL ⁻¹)	61.83±36.95	63.32±35.78
Total serum cholesterol (mg dL ⁻¹)	206±66.84	203.90±62.08

Biochemical studies of diabetes mellitus patient's blood samples from Pattukkottai, Tamil Nadu, India was studied by Ramya and Prasanna⁶, the results were concluded based on BMI (Body Mass Index) of normal patients, diabetic patients without treatment and diabetic patients with treatment and concluded that BMI of diabetic patients without treatment was (3.48±0.15) seen to be increased as compared to the normal patients (2.39±0.11) and diabetic patients with treatment (2.63±0.07). From their studies on various biochemical parameters fasting blood glucose, post prandial glucose, SGPT, SGOT, serum bilirubin (total), serum bilirubin (direct), alkaline phosphatase, LDL, HDL, total serum cholesterol was done. A comparison of biochemical parameters of males and females was done which concluded that the male has higher values than females and the concentration of HDL (83.7±3.64) was seen to be increased as compared to the diabetic patients without treatment. The risk of diabetes rises linearly with BMI¹².

Ferdi *et al.*¹³, studied the biochemical profile of diabetes patients from Algeria to age and gender and anthropometric parameters. They found that type 2 diabetes was significantly more frequent than type 1, it was pointedly more common in women than in men and diabetes was extremely related to age and body mass index. Investigation on the lipid profile in Indian diabetes families shown that the occurrence of diabetes is higher in women¹⁴, Ferdi *et al.*¹⁵ also found related results with socioeconomic factors. The distribution of diabetes by gender reveals globally a female predominance (55%), probably related to the high longevity of women in North Africa and other regions worldwide (25). The incidence of diabetes increases with age, because of the positive connotation between blood glucose and age¹⁶.

Biochemical and haematological factors in type 2 diabetes mellitus patients and the controlled group was studied by Shehri in 2017 and found that type 2 diabetes mellitus patients' biochemical and haematological characters are distinct from control subjects¹⁷.

The present study explores the diabetes prevalence in the study location and this is the first report in Faizabad, India. We have also studied the other biochemical parameters which will support the patients in their treatment strategy. As this study has been done with the limited population could be expanded to more community.

CONCLUSION

Diabetes mellitus is the most common metabolic condition and one of the five main causes of mortality worldwide. It is distinguished by an absolute or relative deficit in insulin secretion and/or action, as well as persistent hyperglycemia and abnormalities in carbohydrate, lipid and protein metabolism. Various biochemical markers for diabetes individuals were studied in our study. Diabetes patients had higher fasting and postprandial glucose levels, total cholesterol, triglycerides, low-density lipoprotein levels and lower levels of high-density lipoprotein than normal healthy controls.

SIGNIFICANCE STATEMENT

This study notices the prevalence of type 2 diabetes in the sub-urban region of Faizabad, UP, India that can be beneficial for the populations to understand their health status. This study will help the researcher to uncover the critical areas of a particular population that many researchers were not able to explore. Thus a new theory on the prevalence and biochemical profile may be arrived at.

REFERENCES

1. Stumvoll, M., B.J. Goldstein and T.W. Van Haeften, 2005. Type 2 diabetes: Principles of pathogenesis and therapy. *Lancet*, 365: 1333-1346.
2. Rao, S.S., P. Disraeli and T. McGregor, 2004. Impaired glucose tolerance and impaired fasting glucose. *Am. Family Physician*, 69: 1961-1968.
3. Kahn, S.E., R.L. Hull and K.M. Utzschneider, 2006. Mechanisms linking obesity to insulin resistance and type 2 diabetes. *Nature*, 44: 840-846.
4. Nauck, M.A., I. Vardarli, C.F. Deacon, J.J. Holst and J.J. Meier, 2011. Secretion of glucagon-like peptide-1 (GLP-1) in type 2 diabetes: What is up, what is down? *Diabetologia*, 54: 10-18.
5. Saeedi, P., I. Petersohn, P. Salpea, B. Malanda and S. Karuranga *et al.*, 2019. Global and regional diabetes prevalence estimates for 2019 and projections for 2030 and 2045: Results from the international diabetes federation diabetes atlas, 9th edition. *Diabetes Res. Clin. Pract.*, Vol. 157. 10.1016/j.diabres.2019.107843.
6. Ramya, S. and G. Prasanna, 2015. Biochemical studies on blood sample of diabetes mellitus patients. *J. Chem. Pharm. Res.*, 7: 22-26.
7. S. Vijan, 2010. In the clinic: Type 2 diabetes. *Ann. Intern. Med.*, Vol. 152, No. 5. 10.7326/0003-4819-152-5-201003020-01003.
8. Wilcox, G., 2005. Insulin and insulin resistance. *Clin. Biochem. Rev.*, 26: 19-39.
9. Powers, A.C., 2008. Insulin therapy versus cell-based therapy for type 1 diabetes mellitus: What lies ahead? *Nat. Clin. Pract. Endocrinol. Metab.*, 4: 664-665.
10. Shapiro, A.M.J., J.R.T. Lakey, E.A. Ryan, G.S. Korbutt and E. Toth *et al.*, 2000. Islet transplantation in seven patients with type 1 diabetes mellitus using a glucocorticoid-free immunosuppressive regimen. *New Engl. J. Med.*, 343: 230-238.
11. Azarpira, N., M. Kaviani and S. Salehi, 2015. The role of mesenchymal stem cells in diabetes mellitus. *Int. J. Stem cell Res. Ther.*, Vol. 2. 10.23937/2469-570x/1410010
12. Yaturu, S., 2011. Obesity and type 2 diabetes. *J. Diabetes Mellitus*, 01: 79-95.
13. Ferdi, N.E.H., K. Aba and H. Chenchouni, 2018. Biochemical profile of an adult diabetic population from Algeria in relation with anthropometric parameters, age and gender. *Iran J. Public Health.*, 47: 1119-1127.
14. Panikar, V.K., S.R. Joshi, P. Kakraniya, N. Nasikkar and C. Santavana, 2008. Inter-generation comparison of type-2 diabetes in 73 Indian families. *J. Assoc. Physicians India*, 56: 601-604
15. Ferdi, N.E.H., K.H. Aba and H. Chenchouni, 2016. Effect of socioeconomic factors and family history on the incidence of diabetes in an adult diabetic population from Algeria. *Iran J. Public Health*, 45: 1636-1644.
16. Shaw, J.E., R.A. Sicree and P.Z. Zimmet, 2010. Global estimates of the prevalence of diabetes for 2010 and 2030. *Diabetes Res. Clin. Pract.*, 87: 4-14.
17. Shehri, Z.S.A., 2017. The relationship between some biochemical and hematological changes in type 2 diabetes Mellitus. *Biomed. Res. Ther.*, 4: 1760-1774.