Original Article (APMC – 554)

DOI: 10.29054/APMC/19.554

To Compare Mean Triglyceride, HDL And LDL Levels in Controlled Type-II Diabetes Mellitus Patients Using Oral Hypoglycemic Drugs with Patient Using Insulin

Masood Javed, Dilshad Mohammad, Misbah Zahid, Zain Masood, Muhammad Amir, Muhammad Maroof

ABSTRACT

Background: Type 2 diabetes mellitus (T2DM), is characterized by progressively increasing blood glucose levels due to insulin resistance and eventual insulin deficiency caused by loss of Beta cell function. To start with only postprandial (PPG) levels are raised and later on fasting plasma glucose (FBG) is also increased. It is noted that hypertension, dyslipidemias, weight gain and CVD are more prevalent among diabetics. Anti-diabetic agents used for control of diabetes mellitus must be able to improve blood glucose, blood pressure, lipid levels and body weight. Insulin and OHGs, both are effective treatment regimens in controlling hyperglycemic events. **Objective:** (1) To determine mean triglyceride, HDL and LDL levels in controlled type II diabetes mellitus patients. To compare mean triglyceride, HDL and LDL levels in controlled type II diabetes mellitus patients using oral hypoglycemic drugs with patient using insulin. **Settings:** Department of Medicine, Allied/DHQ hospital, Faisalabad. **Duration:** 6 months from 01-03-2018 to 31-08-2018. **Study Design:** Cross-sectional Study. **Methodology:** Patients coming through OPD, fulfilling the inclusion criteria were enrolled and informed consent was taken from them. History regarding the treatment plan as taking insulin or oral hypoglycemic drugs was recorded. For assessing the triglyceride, LDL and HDL levels blood sample was sent to the hospital pathology laboratory and it was reported by pathologist. All the information was recorded on the proforma. **Results:** In our study, out of 225 cases, mean age was calculated as 50.27±7.76 years, 52%(n=117) were male whereas 48%(n=108) were females, on comparison of mean triglyceride levels in controlled type II diabetes mellitus patients using insulin or oral hypoglycemic drugs was recorded as 2.32±0.20 in patient on Oral Hypoglycemic drugs and 2.13±0.25 in patient on insulin therapy, p value was 0.0001. LDL in oral hypoglycemic control was 3.05±0.32 and 2.44±0.24 in insulin therapy, p value was 0.002 whereas HDL readings were 1.02±0.13 in patient on oral hypoglycemic drugs and 1.33±0.20 in patient on insulin therapy, p value was 0.0001. **Conclusion:** We concluded that mean triglyceride, HDL and LDL levels in controlled type II diabetes mellitus patients using insulin had better results as compared with patients using oral hypoglycemic drugs.

Keywords: Controlled type II diabetes mellitus, Comparison, Insulin, Oral hypoglycemic Drugs, Lipid profile

Corresponding Author

Dr. MASOOD JAVED, Associate Professor of Medicine, Faisalabad Medical University / DHQ Hospital Faisalabad-Pakistan.
Contact / Email: +92 323-9652022, drmasood1960@yahoo.com

Submitted for Publication: 24-10-2018 *Accepted for Publication: 10-03-2019*

Citation: Javed M, Mohammad D, Zahid M, Masood Z, Amir M, Maroof M. To Compare Mean Triglyceride, HDL And LDL Levels in Controlled Type-II Diabetes Mellitus Patients Using Oral Hypoglycemic Drugs with Patient Using Insulin. APMC 2019;13(2):113-6.

INTRODUCTION

Diabetes is an increasing global health problem and the proportion of people with type 2 diabetes has increased in a much shorter time, throughout Asia.[1] Type-II diabetes mellitus is prevalent in both developing and developed countries.[2] As a matter of fact rates of diabetes is increasing worldwide. According to IDF number of diabetics is expected to increase from 366million in 2011 to 552 million in 2030.[3] Pakistan is among the top 10 countries where number of patients with diabetes mellitus. The SEARCH study has shown that the prevalence of diabetes mellitus also depends upon racial and ethnic factors.[4] Insulin resistance has been considered to play an integral role in the pathogenesis of the disease.[5] Consequent Chronic hyperinsulinemia inhibits both insulin secretion and action, along with this hyperglycemia can impair both the insulin secretory response to glucose as well as cellular insulin sensitivity,[6] various factors such as physical inactivity, inheritance. Bad eating habits, alcoholism etc. all are involved in the development of T2DM.[7]

Micro and macro vascular complications occur due to chronic uncontrolled hyperglycemia in diabetes[8,9]. The complications of T2DM are mainly associated with diabetic vasculopathy, which are commonly grouped into two categories, viz., microvascular (retinopathy, neuropathy and nephropathy) and macrovascular (which puts the diabetic patients at increased risk of cardiovascular, cerebrovascular, peripheral vascular disease).[10] Diabetes Mellitus causes depression in large number of patients.[11] Diabetes mellitus, initially considered a carbohydrate metabolic disease, is now described as a disorder of multiple etiologies with disturbances of carbohydrate, lipid as well as protein metabolism.[12] Diabetes and dyslipidemia often occur simultaneously, both of which increase the risk of cardiovascular diseases. Abnormal lipid levels are more common in diabetes mellitus because various key enzymes and path ways in the metabolism of Lipids are effected by deficiency and insulin resistance [13-14] T2DM is accompanied by low levels of HDL-C and high TG.[1] Diabetes patients with dyslipidemia have increased mortality.[15]

A multidisciplinary approach is needed for optimal glycemic control. In this various life style modification including diet and exercise are first line of management this followed by oral hypoglycemic agent (OHG) and / or insulin therapy. Although OHGs are the mainstay of treatment for achieving optimal control of blood glucose levels along with reduction of cardiovascular disease, the majority of patient ultimately may need insulin as a superior treatment modality for good glycemic control in T2DM.[16]

Worldwide, a number of clinical studies have been conducted to provide evidence that intensive therapy reduces microvascular and macrovascular complications by controlling the lipids.[17] However, literature stated that the influence of oral hypoglycemic drugs on lipid were inconclusive In a study, triglycerides (TG) in controlled T2DM was 2.01±1.19 mmol/L, LDL-C was 2.89±1.12 mmol/L and HDL was 1.12±0.38mmol/L. In insulin users, triglycerides (TG) in controlled T2DM was 2.01±1.42 mmol/L, LDL-C was 2.35±0.83 mmol/L and HDL was 1.23±0.59mmol/L and with OHG, triglycerides (TG) in controlled T2DM was 2.11±1.15 mmol/L, LDL-C was 3.27±1.1 mmol/L and HDL was 1.09±0.28mmol/L.

Abnormal lipid profile is a common problem in T2DM patients. As insulin and OHGs, both are effective treatment regimens in controlling hyperglycemic events. If either of these two treatment modalities proves to be more effective in controlling lipid profile in T2DM patients, then it will be helpful in modifying the future management plan to control glycemia as well as lipids in terms of triglyceride, HDL and LDL to reduce the diabetic associated morbidities. Patient care will be improved and it will also minimize the additional use of lipid lowering drugs with insulin resistance treatment.

OPERATIONAL DEFINITIONS

Type II diabetes mellitus: Diagnosed patients of diabetes mellitus (BSF>126mg/dl and BSR>200mg/dl on two different occasions) suffered from more than 1 year.

Controlled diabetes: Patients having HbA1c < 7 was said to have controlled diabetes.

Triglyceride, HDL and LDL level: These were measured in mmol/L by taking patient's blood sample at time of enrollment.

METHODOLOGY

Study Design: Cross-sectional study.

Settings: Department of Medicine, Allied/DHQ Hospital, Faisalabad-Pakistan.

Duration: 6 months from 01-03-2018 to 31-08-2018

Sampling Technique: Non probability consecutive sampling.

Inclusion Criteria:

Patient of both genders having age ranging from 30 to 65 years.

Patients having controlled type II diabetes mellitus (as per operational definition) suffering from > 1 year.

Exclusion Criteria:

Patients on the same treatment regimens for < 6 months.

Pregnant females.

Patients with deranged clotting profile (INR>2).

Patients with the history of chronic liver disease.

Patients with renal insufficiency (serum creatinine>1.5mg/dl) or on hemodialysis.

The patients who already had history of CAD or cerebrovascular accident (CVA) or were diagnosed as having CAD or CVA on enrolment and patients already taking lipid-lowering drugs.

Data Collection Procedure: Patients coming through Medical OPD, who fulfill the inclusion criteria were enrolled and informed consent was taken from them. History regarding the glycemic control and treatment plan as taking insulin or oral hypoglycemic drugs was recorded. For assessing the triglyceride, LDL and HDL levels blood sample was sent to the hospital pathology laboratory and it was reported by pathologist.

Data Analysis: All the data was entered and analyzed by using SPSS V-20. Descriptive statistics were calculated for all the variables. Mean and standard deviation was calculated for all the quantitative variables like age, duration of disease, triglyceride, LDL and HDL levels.

RESULTS

A total of 225 cases according to the inclusion/exclusion criteria were enrolled to determine mean triglyceride, HDL and LDL levels in controlled type II diabetes mellitus patients and to compare mean triglyceride, HDL and LDL levels in controlled type II diabetes mellitus patients using oral hypoglycemic drugs with those using insulin.

Age distribution of the patients was done, it shows that 58.67%(n=132) were between 20-50 years of age whereas 41.33%(n=93) were between 51-65 years of age, mean±sd was calculated as 50.27+7.76 years. Table 1

Table 1: Age distribution (n=225)

Age (in years)	Number of Patients	%
20-50	132	58.67
51-65	93	41.33
Total	**225**	**100**
Mean±SD	**50.27±7.76**	

Gender distribution shows that52%(n=117) were male whereas 48%(n=108) were females. Table 2

Table 2: Gender distribution (n=225)

Gender	Number of patients	%
Male	117	52
Female	108	48
Total	**225**	**100**

Mean duration of disease was recorded as 3.6±1.79 yeas. Table 3

Table 3: Mean duration of disease (n=225)

Duration of Disease (years)	Mean	SD
	3.6	1.79

Mean lipid profile of the patients was recorded as 2.24±0.24 for triglycerides, 2.79±0.42 for LDL and 1.15±0.22 for HDL. Table 4

Table 4: Mean lipid profile of the patients (n=225)

Lipid profile	Mean	SD
Triglyceride	2.24	0.24
LDL	2.79	0.42
HDL	1.15	0.22

Frequency of treatment plan shows that 57.33%(n=129) were on oral hypoglycemic drug while 42.67%(n=96) were on insulin therapy. (Table No. 5)

Table 5: Frequency of treatment plan (n=225)

Treatment plan	No. of patients	%
Oral Hypoglycemic Drug	129	57.33
Insulin therapy	96	42.67
Total	**225**	**100**

Comparison of mean triglyceride, levels in controlled type II diabetes mellitus patients using insulin with patient using oral hypoglycemic drugs was recorded as 2.32±0.20 in in Oral Hypoglycemic drugs and 2.13±0.25 in insulin therapy. P value was 0.0001, LDL in oral hypoglycemic control was 3.05±0.32 and 2.44±0.24 in insulin therapy, p value was 0.002 whereas HDL readings were 1.02±0.13 in oral hypoglycemic drugs and 1.33±0.20 in insulin therapy, p value was 0.0001. (Table No. 6).

Table 6: Comparison of mean triglyceride, HDL and LDL levels in controlled type ii diabetes mellitus patients using insulin with patient using oral hypoglycemic drugs (n=225)

Lipid profile	Oral Hypoglycemic Drug		Insulin therapy		P value
	Mean	SD	Mean	SD	
Triglyceride	2.32	0.20	2.13	0.25	0.0001
LDL	3.05	0.32	2.44	0.24	0.001
HDL	1.02	0.13	1.33	0.20	0.0001

DISCUSSION

Type 2 diabetes mellitus (T2DM), is characterized by progressively increasing blood glucose levels due to insulin resistance and eventual insulin deficiency caused by loss of Beta cell function. Initially PPG increases followed by raise in FPG. various risk factors like hypertension, dyslipidemias and obesity are also associated with diabetes mellitus specially those having poor control of blood glucose levels. Anti-diabetic agents used for control of diabetes mellitus must be able to improve blood glucose, blood pressure, lipid levels and body weight.

Antibiotic agents especially Metformin and Glitazones have good effect on lipid metabolism by reducing insulin resistance. Improvements in glycemic control during sulfonylurea therapy have been associated with decreases in plasma total cholesterol, total triglyceride, very-low-density lipoprotein (VLDL) cholesterol and low-density lipoprotein (LDL) cholesterol levels, and either an increase or no change in HDL cholesterol levels. Pathways for the consumption of carbohydrates and fats are closely associated with each other so insulin which has a profound effect on carbohydrates metabolism also has an important effect on lipid metabolism.[18]

As insulin and OHGs, both are effective treatment regimens in controlling hyperglycemic events this study was planned to compare mean triglyceride, HDL and LDL levels in controlled type II diabetes mellitus patients using insulin with those patients using oral hypoglycemic drugs. If either of these two treatment modalities proves to be effective in controlling lipid profile in T2DM patients, then it may be helpful in modifying the future management plan to control glycemia as well as lipids in terms of triglyceride, HDL and LDL to reduce the diabetes associated morbidities. Patient care may be improved by minimizing the additional use of lipid lowering drugs along with insulin resistance treatment.

In our study, out of 225 cases, mean age was calculated as 50.27±7.76 years,52%(n=117) were male whereas 48%(n=108) were females. A study by Meo et al shows that overall prevalence of T2DM in males is higher than female and this is also noted in our study.[19] On comparison of mean triglyceride, HDL and LDL levels in controlled type II diabetes mellitus patients using insulin with oral hypoglycemic drugs was recorded as 2.32±0.20 in Oral Hypoglycemic drugs and 2.13±0.25 in insulin therapy for triglycerides, p value was 0.0001, LDL in oral hypoglycemic control was 3.05±0.32 and 2.44±0.24 in insulin therapy, p value was 0.002 whereas HDL readings were 1.02±0.13 in oral hypoglycemic drugs and 1.33±0.20 in insulin therapy, p value was 0.0001.

A previous study reveals that triglycerides (TG) in controlled T2DM were 2.01±1.19 mmol/L, LDL-C was 2.89±1.12 mmol/L and HDL was 1.12±0.38mmol/L. While in insulin users, triglycerides (TG) in controlled T2DM was 2.01±1.42 mmol/L, LDL-C was 2.35±0.83 mmol/L and HDL was 1.23±0.59mmol/L and with OHG, triglycerides (TG) in controlled T2DM was 2.11±1.15 mmol/L, LDL-C was 3.27±1.1 mmol/L and HDL was 1.09±0.28mmol/L.[16] These findings collaborate with our findings.

Various studies show that metformin reduces total cholesterol levels[20] while some others say that both total cholesterol and triglycerides are reduce while HDL C is increased[21] and this effect is seen even in individual who does not have diabetes mellitus. On the other hand, there are some studies which nullify this beneficial effect of Metformin on lipids.[22]

A previous meta-analysis covering 41 studies on the effects of metformin on BP and lipid profile showed that only TC reduction was significant.

We found very limited data to compared with national or international studies on the same issue evaluated in our study. Though, our findings reveal that insulin therapy cases had significantly better lipid profile as compared to oral hyperglycemic control drugs but it needs to be verified through more multicenter studies in our local population.

CONCLUSION

We concluded that mean triglyceride, HDL and LDL levels in controlled type II diabetes mellitus patients using insulin had better results when compared with oral hypoglycemic drugs.

REFERENCES

1. Park C, Kang JG, Chon S, Noh J, Oh SJ, Lee CB. Comparison between the therapeutic effect of metformin, glimepiride and their

combination on as add-on treatment to insulin glargine in uncontrolled patients with type 2 diabetes. PLoS One. 2014;9(3):e87799.
2. Cui R, Qi Z, Zhou L, Li Z, Li Q, Zhang J. Evaluation of serum lipid profile, body mass index, and waistline in Chinese patients with type 2 diabetes mellitus. Clin Interv Aging. 2016;11:445-52.
3. One adult in ten will have diabetes by 2030. International Diabetes Federation. November 14, 2011.
4. Mayer-Davis EJ, Lawrence JM, Dabelea D. Incidence Trends of Type 1 and Type 2 Diabetes among Youths, 2002-2012. N Engl J Med. 2017;377(3):301.
5. Yalow RS, Berson SA. Immunoassay of endogenous plasma insulin in man. J Clin Invest. 1960;39(7):1157–75.
6. Fink RI, Wallace P, Brechtel G, Olefsky JM. Evidence that glucose transport is rate-limiting for in-vivo glucose uptake. Metabolism. 1992;41(8):897-902.
7. Foshati S, Nouripour F, Akhlaghi M. Effect of date and zaisin snacks on glucose response in T2DM. Nut food Sci Res. 2015;2:19-25.
8. Folli F, Corradi D, Fanti P, et al. The role of oxidative stress in the pathogenesis of type 2 diabetes mellitus micro- and macrovascular complications: avenues for a mechanistic-based therapeutic approach. Curr Diabetes Rev. 2011;7(5):313–24.
9. Maritim AC, Sanders RA, Watkins JB. Diabetes, oxidative stress, and antioxidants: a review. J Biochem Mol Toxicol. 2003;17(1):24–38.
10. Mullugeta Y, Chawla R, Kebede T, Worku Y. Dyslipidemia associated with poor glycemic control in type 2 diabetes mellitus and the protective effect of metformin supplementation. Indian J Clin Biochem. 2012;27(4):363-9.
11. Rehman S, Shuaib M, Irfan M, Zaib S, Amjad S, Shafiullah. Prevalence of Depression Among Patients with Diabetes Mellitus Presenting in Diabetic Clinic Jinnah Hospital Lahore. APMC. 2018;12(3):236-40.
12. Chen YH, Du L, Geng XY, et al. Effect of sulfonylureas on lipids in type 2 diabetes: a meta-analysis of randomized controlled trials. J Evid Based Med. 2015;8(3):134-48.
13. Lorenzo C, Hartnett S, Hanley AJ. Impaired fasting glucose and impaired glucose tolerance have distinct lipoprotein and apolipoprotein changes: the insulin resistance atherosclerosis study. J Clin Endocrinol Metab 2013;98(4):1622–30.
14. Jorgensen AB, Frikke-Schmidt R, Nordestgaard BG. Loss-of-function mutations in APOC3 and risk of ischemic vascular disease. N Engl J Med. 2014;371(1):32–41.
15. Hussain Z, Sherwani MK, Mehmood S. Prevalence of metabolic syndrome; its risk factors and viral hepatitis B & C in underprivileged suburban population of Lahore, Pakistan. Professional Med J 2016; 23(4):434-443.
16. Al-Sagaaf W, Asiri M, Ajlan B, Afif AB, Khalil R, Salman AB. Reported benefits of insulin therapy for better glycemic control in type 2 diabetes patients- is this applicable in Saudi patients? Clin Med Insights Endocrinol Diabetes. 2016;9:13-7.
17. Ueki K, Sasako T, Kato M, Okazaki Y, Okahata S, Katsuyama H. Design of and rationale for Japan Diabetes Optimal Integrated Treatment study for 3 major risk factors of cardiovascular disease (J-DOIT3): a multicenter, open-label, randomized, parallel-group trial. BMJ Open Diabetes Res Care. 2016;4(1):e000123.
18. Marso SP, Daniels GH, Brown-Frandsen K, et al. Liraglutide and Cardiovascular outcomes in type-2. Diabetes N.Engl J Med. 2016;375(4):311-22.
19. Meo SA, Zia I, Bukhari IA Arian SA. T2DM in Pakistan. Current prevalence and future forecast JPMA. J Pakistan Med Associ 2016;66:1037-42.
20. Ginsberg H, Plutzky J & Sobel BE. A review of metabolic and cardiovascular effects of oral antidiabetic agents: beyond glucose-level lowering. J Cardiovascular Risk. 1999;6:337-46.
21. Yki-Jarvinen H, Ryysy L, Nikkila K. Comparison of bedtime insulin regimens in patients with type 2 diabetes mellitus. A randomized, controlled trial. Annals of Inter Med. 1999;130:389-96.
22. Groop L, Widen E, Franssila-Kallunki A. Different effects of insulin and oral antidiabetic agents on glucose and energy metabolism in type 2 (non-insulin-dependent) diabetes mellitus. Diabetologia. 1989;32(8):599-605.

AUTHORSHIP AND CONTRIBUTION DECLARATION

AUTHORS	Contribution to The Paper	Signatures
Dr. Masood Javed Associate Professor, Medicine FMU / DHQ Hospital Faisalabad	Conception and Designing, Data Analysis	
Dr. Dilshad Mohammad Associate Professor, Medicine FMU / DHQ Hospital Faisalabad	Coordinator, Drafting & Proof Reading	
Dr. Misbah Zahid Ex-PGR, Medical Unit-III Women Medical Officer Civil Dispensary, Faisalabad	Critical Review of Article	
Zain Masood BSc (Hon's) Human Nutrition & Dietetics (HND) M.Phil (Student) HND, University of Agriculture Faisalabad	Data Analysis, Statistical Analysis	
Dr. Muhammad Amir Assistant Professor, Medicine FMU / Allied Hospital, Faisalabad	References Collection	
Dr. Muhammad Maroof Senior Registrar, Medicine Allied Hospital, Faisalabad	Proof Reading