

## Study of Lipid Profile in Obese Persons with Type 2 Diabetes Mellitus

Dev Kishan Devra<sup>1</sup>, Soniya Pipliwal<sup>2\*</sup>, Bharti Maan<sup>3</sup>,  
Nishanta<sup>4</sup>, Usha Rani<sup>4</sup>, Purnima Rathore<sup>3</sup>

<sup>1</sup>Associate Professor, <sup>2</sup>M.Sc (Medicine) Physiology Final Year,  
<sup>3</sup>M.Sc (Medicine) Physiology, <sup>4</sup>PG Resident (IIIrd Year),  
Department of Physiology, S P Medical College, Bikaner, Rajasthan, India.

### ABSTRACT

**Introduction:** Diabetes is a universal endemic with fast increasing prevalence in both developing and developed countries. Obesity is an unnecessary accumulation of body fat and in its gross manifestation possesses a real hazard to health. It is well recognized that obesity is directly or indirectly associated with type 2 diabetes mellitus. The aim was to compare lipid profile in Type 2 diabetics with obesity and non-diabetic obese subject.

**Materials and Methods:** This study was conducted in Department of Physiology, S.P. Medical College and Hospital, Bikaner, Rajasthan during the period from March 2015 to February 2016. Weight was record in kilograms with the subject standing on the weighing machine without shoes and mini-mum clothing.

**Results:** Present study showed that the obese T2DM patients had significantly higher serum triglycerides, LDL-C levels and serum VLDL-C levels; with significant lower HDL-C levels when compared to obese non diabetic cases. Total cholesterol levels were increased without significant 'p' value.

**Conclusion:** We conclude that all the lipid fractions (except HDL-c) are strangely elevated in obese type 2 diabetics when compared with obese controls.

**Keywords:** Diabetes, LDL, VLDL, HDL.


### \*Correspondence to:

Soniya Pipliwal,  
M.Sc (Medicine) Physiology Final Year,  
Department of Physiology,  
S P Medical College, Bikaner, Rajasthan, India.

### Article History:

Received: 30-11-2017, Revised: 24-12-2017, Accepted: 22-01-2018

#### Access this article online

Website: <a href="http://www.ijmrp.com">www.ijmrp.com</a>	Quick Response code 
DOI: 10.21276/ijmrp.2019.5.1.071	

### INTRODUCTION

In the prehistoric Sanskrit Literature, diabetes mellitus was described as "honey-urine disease," connected with gross emaciation and wasting. Diabetes is a worldwide endemic with rapidly increasing prevalence in both developing and developed countries.<sup>1</sup> Obesity is an extreme accumulation of body fat and in its gross manifestation possesses a real risk to health.<sup>2</sup> It is well established that obesity is directly or indirectly associated with type 2 diabetes mel-litus.<sup>3</sup> In addition, alterations in body fat distribution are associated with changes in lipids and lipoproteins and with increased coronary heart disease (CHD).<sup>4</sup> In addition, obesity is measured as part of the metabolic syndrome in the pathogenesis of type 2 diabetes.<sup>4</sup> Different methods are used for the measurement of obesity including the determination of (i) body mass index<sup>5</sup>, (ii) skin fold thickness or waist hip ratio<sup>6</sup>, (iii) fat cell size and number, and (iv) body density.<sup>7</sup> Body mass index has gained favor as a better measure for adiposity<sup>8,9</sup> that is often used as a measure for body fatness in large epidemiological studies.<sup>10</sup> The aim was to compare lipid profile in Type 2 diabetics with obesity and non-diabetic obese subject.

### MATERIALS AND METHODS

This study was conducted in Department of Physiology, S.P. Medical College and Hospital, Bikaner, Rajasthan during the period from March 2015 to February 2016.

Weight was record in kilograms with the subject standing on the weighing machine without shoes and mini-mum clothing. Weight of the patients and controls were recorded in the same weighing machine.

Height was record with the subject barefooted, feet together, back and heels against the upright bar of the height scale; head upright in Frankfort horizontal plane – look straight ahead. The height measuring equipment consisted of a vertical bar with a horizontal bar of wood which was brought down snugly on examinee's head.<sup>11</sup>

Body Mass index was calculated from the formula: BMI = weight in kilograms / (height in meters)<sup>2</sup> Patients were taken as obese if their body mass index was 27.8 and 27.3 for males and females respectively.<sup>12</sup> Randomly selected, 52 subjects out of them 26 were obese Type 2 DM patients and 26 were obese non diabetic

control were studied for following biochemical-cal parameters:

1. Blood Glucose by GOD-POD methods.<sup>13</sup>
  2. Total Cholesterol (TC) by enzymatic end point CHOD-POD methods.<sup>14</sup>
  3. Triglyceride (TG) by enzymatic glycerol phosphate oxidase/peroxidase methods<sup>15</sup>
  4. HDL-Cholesterol by direct enzymatic end point method.<sup>16,17</sup>
  5. LDL-Cholesterol by Friedewald's formula.<sup>18</sup>
  6. VLDL-Cholesterol by Friedewald's equation.
- $LDL-c = TC - HDL-c(TG/5)$

We used student t-test to locate the statistical significance. P-value <0.05 was to be considered statistically significant.

**Table 1: Anthropometric Measurement of the Study Population**

Variables	Obese type 2 DM (n=26)	Obese control (n=26)
Age (yrs)	46.7+/-4.12	48.4+/-4.01
Weight (kg)	79.5+/-9.07	77.03+/-5.0
Height (cm)	78.04+/-7.9	80.03+/-8.13
BMI	33.02+/-4.1	32.06+/-3.2
Waist circumference (cm)	103.21+/-9.43	96.76+/-7.24

**Table 2: Comparison of lipid profile Between Obese type-2 DM & Obese Control**

Parameters	Obese type 2 DM (n=26)	Obese control (n= 26)
TC	245.36+/-35.72	154.06+/-10.06
TG	203.97+/-56.04	117.56+/-21.9
HDL-c	43.4+/-9.02	46.25+/-4.33
LDL-c	165.61+/-14.5	136.2+/-34.7
VLDL-c	42.52+/-10.9	22.02+/-4.46
FBS	142.50+/-37.61	110.21+/-20.2

## RESULTS AND DISCUSSION

In this study we assess the lipid profile in type 2 diabetes mellitus with obesity. Table 1 shows the age and anthropometric characters of the study population. Table 2 shows the estimated levels of lipid profile in obese type 2 diabetes and obese non diabetic cases along with fasting blood sugars of obese type 2 DM. Table-2 shows the mean TC, TG, HDL-c, LDL-c, VLDL-c, and FBS. In our study, the levels of TC, TG, LDL-c, VLDL-c were significantly increased while HDL-c levels did not show statistically significant difference in the two group.

Obesity, Dyslipidemia and Diabetes were considered as independent risk factors for coronary vascular disease and is associated with high amount of morbidity and mortality. Even though they were independent risk factors, the three entities were closely related i.e. obesity leads to insulin resistance which in turn causes type 2 diabetes and both together leads to dyslipidemia.

Diabcare Asia-India study conducted nationwide survey of patients attending tertiary diabetes care centers and re-ported a mean age of onset of diabetes as 43.6years with a mean duration of diabetes of 10.0years and 90.6% having T2DM (Raheja BS, Kapur A-2001). This study showed that there was not much sex

variation in the prevalence of T2DM with obesity; with only a slight increase in female group, a study made by Nalchjavani and others found that all types of dyslipidemia were significantly more prevalent in females.<sup>19</sup> Women had higher HDL-C compared to men, high prevalence of hypertriglyceridemia in females due to their higher BMI. It showed that disease status was high in unemployed or employed with sedentary jobs.

The findings in this study showed that the obese T2DM patients had significantly higher serum triglycerides, LDL-C levels and serum VLDL-C levels; with significant lower HDL-C levels when compared to obese non diabetic cases. Total cholesterol levels were increased without significant 'p' value. Similar results had been observed by some.<sup>20,22</sup> Similar results were also seen in others but their HDL-C levels did not differ significantly.<sup>23,24</sup> The studies of Santen et al (1972) and Peret et al (1974) observed mean serum triglyceride levels higher in obese diabetics in comparison to obese control subject.<sup>25,26</sup> Hypercholesterolemia and hypertriglyceridemia were seen in this study.<sup>27</sup> Hypertriglyceridemia predisposes the patients to life threatening complications like diabetic ketoacidosis, coronary artery disease and lipaemia retinalis.<sup>28</sup>

Sharma (1970) and Jain (1980) observed increase in the levels of serum total cholesterol, serum triglycerides, and serum phospholipids in diabetic subjects when compared to normal controls.<sup>29,30</sup> Bijlani et al (1984) found HDL-C to be significantly lower in obese diabetics when compared to normal weight diabetics. Gambhir et al found that low HDL-C were independent risk factor for premature coronary artery disease.<sup>31</sup> In a study at Joslin clinic also showed an inverse correlation of HDL-C with adiposity and triglyceride levels.

## CONCLUSION

Our conclusion was that all the lipid fraction (except HDL-c) is unusually elevated in obese type 2 diabetics when compared with obese controls. There are studies which appear to suggest that the lipoprotein distribution in Type 2 diabetes mellitus is not significantly changed by the degree of metabolic control. Thus Lipid profile analysis must be ended a vital part of Type 2 DM patients' clinical re-views and treatment. Type 2 DM and other diabetes must be educated on the risk they face as a result of their state and the necessary steps they need to supervise it.

## REFERENCES

1. Manoj Kumar Yadav, Tapan Kumar Mohapatra, Rabindra Kumar Mohapatra et al. Study on Glycated Hemoglobin & lipid profile in Type-2 Diabetes Mellitus. International Journal of Science & Research (IJSR) 2015;4(6): 1917-19.
2. Shigeta H, Shigeta M, Atsuko N, Nakamura N, Yoshikawa T. Lifestyle, obesity, and insulin resistance. Am Diabetes Assoc 2001; 24: 608-11.
3. Monteiro CA, Conde WL, Popkin BM. Obesity in developing countries: biological and ecological factors independent effects of income and education on the risk of obesity in Brazellian adult population. J Nutr 2001; 131: 881-86.
4. WHO study group on diabetes mellitus. World health organization technical report series 1985; 727.
5. Mukhya Prana PM, Vidyasagar S, Shashikiran J. Clinical profile of type 2 diabetes mellitus and body mass index. Is there any correlation? Calicut Med J 2004; 2(4) e3.

6. Bray G.A. Obesity: definition, diagnosis and disadvantages. *Med J Aust* 1985; 142:52.
7. Brunzell JD. Obesity and risk for cardiovascular disease. In: Greenwood MRC (ed), *Obesity* 1st ed, NewYork, Churchill Livingstone: 1983; 6-13.
8. Kraemer H, Berkowitz RL, Hammer LD. Methodological difficulties in studies of obesity, I: measurement issues. *Ann Behav Med* 1990; 12: 112- 18.
9. Must A, Dallal GE, Dietz WH. Reference data for obesity: 85th and 95th percentiles of body mass index (Wt/ht<sup>2</sup>) and triceps skin folds thickness. *Am J Clin Nutr* 1991; 53: 839-46.
10. Willett WC. *Nutritional Epidemiology*. NewYork: Oxford University press. 1996; 217-44.
11. Frisancho AR. New standards of weight and body composition by frame size and height for assessment of nutritional status in adults and elderly. *Ann J. Clinnutri*.1984;40:808.
12. Olefsky JM. Diabetes mellitus, In *cecil textbook of Medicine* 18th Ed. Wynaagarden and Smith Jr. Eds;WB Saunders Int ED. 1992; 1291.
13. Bergmayer H.V. *Methods of Enzymatic Analysis*, A.P., N.Y. 1974, Page 1196.
14. Richmond W. Preparation and properties of cholesterol oxidase from *Nocardia* sp. and its application to the enzymatic assay of total cholesterol in serum. *Clin Chem*.1973; 19: 1350-56.
15. Foosati P. and Prencipe L. Serum triglyceride determined colorimetrically with an enzyme that produce hydrogen peroxide. *Clin Chem*. 1982; 28: 2077-80.
16. Rifai N. and Warnick G.R., Ed. *Laboratory measurements of lipids, lipo-proteins and apolipoproteins*. AACC press, Washington, DC, USA 1994.
17. Burtis, C.A. and Ashwood, E.R. Ed. *Tietz Textbook of clinical chemistry*, 2nd Ed, Saunders, Philadelphia, 1994.
18. Friedewald W.T., Levy R.I., Fredrickson D.S., *Clin Chem*. 18:499, 1972.
19. Micheal T. Johnstone, MD, CM, FRCP Aristiclis veves, MD, DSC *Diabetes and cardiovascular disease*; 2nd edi; chapters11,7,15.
20. Abdul Hamid Zargar, Farooq Ahmad Wandroo, Mool Brahman Wadhwa, Bashir Ahmad Laway, Shariq Rashid Masoodi, Nissar Ahmad Shah. Serum Lipid Profile in Non-insulin-dependent Diabetes Mellitus Associated with Obesity *Int. J. Diab. Dev. Countries* (1995); 15.
21. Nagila A, Bhatt M, Poudel B, Mahato P, Gurung D, Prajapati S, Arun Kumar, Tamrakar Bk. Thyroid Stimulating Hormone And Its Correlation With Lipid Profile In The Obese Nepalese Population. *Journal of Clinical and Diagnostic Research*. 2008 Aug; (2) 932-37.
22. Idogun ES, Unuigbo EI, Ogunro PS, Akinola OT, Famodu AA. Assessment of the serum lipids in nigerians with type 2 diabetes mellitus complications. *Pak.J. Med. Sci.(Part 1)*2007;23(5):708-12.
23. Yadav NK, Thanpari C, Shrewastwa MK, Mittal RK. Comparison of Lipid Profile In Type-2 Obese Diabetics And Obese Non-Diabetic Individuals. A hospital Based Study from Western Nepal Kathmandu Univ Med J 2012; 39(3):44-7.
24. Cohen AM, Fidel J, Cohen B, Furst A, Eisenberg S. Diabetes, blood lipids, lipoproteins, and change of environment: restudy of the "new immigrant Yemenites" in Israel. *Metabolism* 1979; 28(7):716-28.
25. Santen JR, Park W Willis, Stefan S. Atherosclerosis in diabetes mellitus correlation with serum lipid levels, adiposity and serum insulin levels. *Arch Int Med* 1972; 130.
26. Paret AD, Rows A, Shahmanesh M. Blood lipids in treated diabetics. *Diabetologia* 1974; 10: 115.
27. Addisu Y Mengesha, MD. Lipid profile among diabetes patients in Gaborone, Botswana article Gaborone City Council, Health Department, PO Box 46318, Gaborone, Botswana *S Afr Med J* 2006; 96: 147-48.
28. Oh RC, Lanier JB. Management of Hypertriglyceridemia. *Am Fam Physician* 2007; 75(9): 1365-71.
29. Sharma D, Bansal BC, Prakash C. Serum lipid studies in thin insulin dependent diabetics below the age of 30 years. *J Indian Med Assoc* 1970; 54(9):416-20.
30. Jain AP and Gupta DP. Study of Blood Lipid in Diabetics without any Manifest Vascular Complications. *J. Dia. Asso. Ind* 1980; 199:29-34.
31. Gambhir JK, Kaur H, Gambhir DS, Prabhu KM. Lipoprotein (a) as an independent risk factor for coronary artery disease in patients below 40 years of age. *Indian Heart J* 2002; 52: 411-5.

**Source of Support:** Nil. **Conflict of Interest:** None Declared.

**Copyright:** © the author(s) and publisher. IJMRP is an official publication of Ibn Sina Academy of Medieval Medicine & Sciences, registered in 2001 under Indian Trusts Act, 1882.

This is an open access article distributed under the terms of the Creative Commons Attribution Non-commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

**Cite this article as:** Dev Kishan Devra, Soniya Pipliwal, Bharti Maan, Nishanta, Usha Rani, Purnima Rathore. Study of Lipid Profile in Obese Persons with Type 2 Diabetes Mellitus. *Int J Med Res Prof*. 2019 Jan; 5(1):317-19.DOI:10.21276/ijmrp.2019.5.1.071