

## Original research article

**Relationship of BMI with lipid profile and HbA1c in Type II Diabetes Mellitus Patients****Dr. Madan Lal<sup>1</sup>, Abhishek Sharma<sup>2</sup>, Vivek Gupta<sup>3</sup>, Nikhil Mishra<sup>4</sup>**<sup>1,2,3</sup> Department of General Medicine, NIMS University Jaipur, Rajasthan, India<sup>4</sup> Department of Pharmacy Practice, NIMS University Jaipur, Rajasthan, India**Corresponding Author: Dr. Nikhil Mishra****Abstract**

**Background:** The massive population of mankind lives with the diagnosis of diabetes mellitus. Asian countries have the highest number of people with diabetes. Because of genetic variation and high vulnerability, classified via a low BMI, excessive body fat proportion and a high degree of insulin resistance, the population of Asian Subcontinent faces higher risk for diabetes and its complications. Studies have shown a direct relationship between increasing BMI and raised TC, LDL, and TG. This correlation between BMI and lipoprotein levels, especially LDL, has been proposed to be a contributing risk factor for cardiovascular diseases in obese individual. **Methods and Materials:** This Study was conducted in Medicine ward of NIMS Hospital, Jaipur. Approval to conduct the study was obtained from Institutional Ethics Committee before starting the study. Total number of 76 patients were considered which includes 54 males and 22 females. Only those who agreed to participate were taken. **Conclusion:** This Study shows the Significant Correlation between BMI with Lipid profile and HbA1c in Type 2 Diabetes Mellitus patients. These results are imperative as they back up that there is modest impact of BMI on lipid profile. Further studies with large sample size are needed to identify the causes of obesity that would help in better understanding of its influence on lipid profile.

**Keywords:** Cholesterol, Low density lipoprotein ,triglyceride.

**Introduction**

The massive population of mankind lives with diagnosis of diabetes mellitus. It is a very complex illness mainly caused by insulin deficit and results many metabolic changes in metabolism of carbohydrates, lipids and proteins.<sup>1</sup> Diabetes mellitus (DM) refers to a group of common metabolic disorders that share the phenotype of hyperglycemia.<sup>2</sup> Asian countries have the highest number of people with diabetes. Because of genetic variation and high vulnerability, classified via a low BMI, excessive body fat proportion and a high degree of insulin resistance, the population of Asian Subcontinent faces higher risk for diabetes and its complications.<sup>3,4,5</sup> BMI is frequently used to categorize as underweight, normal, overweight and obese. It has been described that BMI is a predictor of heart diseases and type II diabetes mellitus.<sup>6,7</sup> Studies have shown a direct relationship between increasing BMI and raised TC, LDL, and TG. This correlation between BMI and lipoprotein levels, especially LDL, has been proposed to be a contributing risk factor for cardiovascular diseases in obese individual.<sup>8</sup> The sample size of obese and morbidly obese individuals in these studies is lacking to draw a conclusion regarding the expected lipid parameters in this population. Recently conducted observational studies validated a correlation between BMI and TG or HDL in obese patients.<sup>9,10</sup> Therefore, to evaluate the correlation between body mass index with lipid profile and HbA1c in people with type II diabetes mellitus was conducted.

### Methods and Materials

This Study was conducted in Department of Medicine from august 2019 to march 2020 at NIMS Hospital, Jaipur. Approval to conduct the study was obtained from Institutional Ethics Committee before starting the study. Total numbers of 76 patients were considered which includes 54 males and 22 females. Only those who agreed to participate were taken. Patients characteristics and basic data including age, sex, weight, height, smoking status, etc. A suitable data collection form was designed to collect and document the data. Collected data were analyzed by using IBM SPSS v2.0.

### Results

Out of 76 patients, 54 were males and 22 were females. Mean age (SD) of males was  $55.92 \pm 8.41$  and of female was  $53.77 \pm 10.55$ . Mean BMI (SD) of males was  $27.08 \pm 3.55$  and of female was  $28.62 \pm 3.68$ . Mean (SD) of HbA1c, Uric Acid, T. Lipid, TC, TPL, TG, HDL, LDL, VLDL for males were  $6.5 \pm 1.88$ ,  $5.16 \pm 1.21$ ,  $568.53 \pm 116.40$ ,  $179.27 \pm 37.28$ ,  $186.51 \pm 40.08$ ,  $120 \pm 50.83$ ,  $46.48 \pm 6.71$ ,  $94.61 \pm 23.20$ ,  $23.07 \pm 5.60$  respectively and for females  $7.17 \pm 2.66$ ,  $5.09 \pm 1.2$ ,  $551.45 \pm 135.12$ ,  $174.31 \pm 48.18$ ,  $182.59 \pm 48.08$ ,  $133.63 \pm 59.47$ ,  $43.45 \pm 6.34$ ,  $89.67 \pm 35.58$ ,  $24.35 \pm 6.10$  respectively.

**Table 1: Comparison of Age, BMI, HbA1c, Uric Acid, T. Lipid, TC, TPL, TG, HDL, LDL, VLDL**

S.No.	Parameters	Male Mean $\pm$ S.D	Female Mean $\pm$ S.D
1	Age	$55.92 \pm 8.41$	$53.77 \pm 10.55$
2	BMI	$27.08 \pm 3.55$	$28.62 \pm 3.68$
3	HbA1c	$6.5 \pm 1.88$	$7.17 \pm 2.66$
4	Uric Acid	$5.16 \pm 1.21$	$5.09 \pm 1.2$
5	T. Lipid	$568.53 \pm 116.40$	$551.45 \pm 135.12$
6	TC	$179.27 \pm 37.28$	$174.31 \pm 48.18$
7	TPL	$186.51 \pm 40.08$	$182.59 \pm 48.08$
8	TG	$120 \pm 50.83$	$133.63 \pm 59.47$
9	HDL	$46.48 \pm 6.71$	$43.45 \pm 6.34$
10	LDL	$94.61 \pm 23.20$	$89.67 \pm 35.58$
11	VLDL	$23.07 \pm 5.60$	$24.35 \pm 6.10$

**Table 2: Correlation between BMI and Total Cholesterol**

	R-value	P-value	Significance
BMI v/s TC	+0.414	< 0.05	Significant

The Correlation between BMI and Total Cholesterol was found significant with R-value +0.414 and P-value <0.05.

**Table 3: Correlation between BMI and HbA1c**

	R-value	P-value	Significance
BMI v/s HbA1c	+ 0.277	< 0.05	Significant

The Correlation between BMI and HbA1c was found significant with R-value +0.277 and P-value < 0.05.

**Table 4: Correlation between BMI v/s T. Lipid**

	R-value	P-value	Significance
BMI v/s T. Lipid	+ 0.420	< 0.05	Significant

The Correlation between BMI and T. lipid was found significant with R-value +0.420 and P-value < 0.05.

**Table 5: Correlation between BMI v/s HDL and BMI v/s LDL**

	R-value	R-value	Significance
BMI v/s HDL	-0.407	< 0.05	Significant
BMI v/s LDL	+ 0.415	< 0.05	Significant

The Correlation between BMI and HDL was found significant with R-value - 0.407 and Pvalue < 0.05. The correlation between BMI and LDL was found significant with R-value + 0.415 and P-value < 0.05.

### Discussion

We study the correlation of BMI with lipid profile and HbA1c in Type II Diabetes Mellitus Patients. There were 76 cases of type II diabetes mellitus in which most of cases were obese. Research literature support a relationship between BMI and TG, and the relationship of blood lipids and body fat distribution has been under discussion over the past few decades. Body fat and blood lipids have been observed to be key determinants of metabolic disorders, like cardiovascular diseases (CVD), diabetes, dyslipidemia, hypertension, hyperinsulinemia and elevated serum uric acid.<sup>5,6,7</sup> Following the WHO, ADA and NCEP ATP III criteria for BMI, HbA1c and Lipid profile values. The most common lipid abnormality was seen in TGs with 69% of the study participants, followed by the LDL-C (54.1%). This result is in agreement with published studies in Northwest Ethiopia (63.5%), Hyderabad-India (60%) and Sudan (48.8%).<sup>8</sup> These findings may be due to the increased secretion of LDL-C by the liver and

slow removal of TGs rich lipoproteins, as well as raised levels of substrates for TG production from augmented mobilization of free fatty acid (FFA) from adipose tissue in people with diabetes.<sup>5</sup> High TG levels are a prominent lipid abnormality in T2DM and also occur in individuals with prediabetes states.<sup>8</sup> A fasting TG level of >150 mg/dl is one of the benchmark for characterizing peoples at high risk for CVD and T2DM. Our results showed raised LDL-C and low HDL-C levels in DM patients.<sup>11</sup> These results are in agreement to Asian Pacific Cohort Studies Collaboration. These findings are thought to be due to differences in genetic makeup, differences in life style and the management of specific population of DM being studied.<sup>4,5,6</sup>

### Conclusion

This Study shows the Significant Correlation between BMI with Lipid profile and HbA1c in Type 2 Diabetes Mellitus patients. These results are imperative as they back up that there is modest impact of BMI on lipid profile. Further studies with large sample size are needed to identify the causes of obesity that would help in better understanding of its influence on lipid profile.

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