



CLINICAL AND BIOCHEMICAL PROFILING OF LOW BODY WEIGHT DIABETIC MELLITUS TYPE 2 PATIENTS WITH SPECIAL EMPHASIS ON ECHOCARDIOGRAPHIC CHANGES

Dr. Rajat Jain

(M.D) Associate Professor, Department Of Medicine, Maharani Laxmi Bai Medical College, Jhansi, Uttar Pradesh

Dr. Mandavi Agarwal

(M.D) Assistant Professor, Department Of Medicine, Maharani Laxmi Bai Medical College, Jhansi, Uttar Pradesh

Dr. Bhawna Rai*

Junior Resident, Department Of Medicine, Maharani Laxmi Bai Medical College, Jhansi, Uttar Pradesh. *Corresponding Author Email: bhaw17@gmail.com

Dr. Misha Pandey

Junior Resident, Department Of Medicine, Maharani Laxmi Bai Medical College, Jhansi, Uttar Pradesh.

ABSTRACT

AIMS AND OBJECTIVE: To study the clinical and biochemical profile of low body weight type 2 diabetes mellitus (BMI < 19 kg/m²). To study the prevalence of echocardiographic abnormalities in low body weight diabetes mellitus type 2 patients and compare with non-lean type 2 diabetes. To compare microvascular & macrovascular complications

in low body weight diabetes mellitus type 2 and non lean diabetes mellitus type 2 patients. **MATERIALS AND METHODS:** This study was a hospital based cross-sectional study conducted in M.L.B. Medical College, Jhansi (U.P.). In this study, 100 low body weight type 2 diabetic patient were selected for the study coming to OPD and IPD of Internal Medicine Department, M.L.B Medical College, Jhansi (U.P.), during March 2019–Sept. 2020. The clinical, biochemical profile and echocardiographic study was done in these patients. **RESULT:** A total of 100 low body weight type 2 diabetes mellitus patients (BMI < 19 kg/m²) were studied. The study of biochemical profile in the low body weight type 2 DM patients showed poor glycemic control with mean HbA1C of 8.94. The lipid profile in these patients was well within normal range in majority of the patients. The prevalence of microvascular complications like peripheral neuropathy (seen in 65% of patients) was higher as compared to macrovascular complications like Coronary Artery Disease and Hypertension in low body weight type 2 diabetes patients. The majority of these patients revealed normal cardiac function (85% of total) and 15% of patient showed mild concentric LV Hypertrophy and grade 1 diastolic dysfunction and mean Carotid media intima thickness was well within normal range for the same age control group. **CONCLUSION:** The study of biochemical profile in low body weight type 2 diabetes mellitus patients concluded that mean HbA1C was higher in these patients with poor glycemic control. This study concluded that prevalence of microvascular complication was higher in low body weight type 2 diabetes mellitus patients as compared to the macrovascular complication. An abnormal echocardiography finding was found in 15% of the total study patients who had mild hypertrophy and grade I diastolic dysfunction as compared to 49.8% as seen in non lean type 2 diabetes mellitus patients.

KEY WORDS :

Low Body Weight Type 2 Diabetes Mellitus Patients, Lipid Profile, Microvascular And Macrovascular Complications, Echocardiography Findings, CIMT

INTRODUCTION

Type 2 diabetes mellitus is the most prevalent form of diabetes seen worldwide. Various studies in India have reported a prevalence of low body weight/lean (Body mass index < 19 kg/m²) type 2 diabetes mellitus ranging from 1.6% to 26%. The clinical and biochemical profile of these patients are different from classic type 2 diabetes mellitus. Anthropometry is not the only criterion that distinguishes these subjects with Type 2 DM as a distinct entity. Studies on newly diagnosed patients with Type 2 DM revealed that peripheral neuropathy (PN) was the commonest presenting feature in the lean/non-obese, while hypertension (HTN) and coronary artery disease (CAD) were more common in the obese and microangiopathy in the nonobese-standard weight (BMI > 19 and < 25) Type 2 DM.

The Type 2 DM-Lean patients had a marked lower incidence of hypertension, CAD, nephropathy and marginally higher prevalence of retinopathy and a markedly higher incidence of peripheral neuropathy and infections that forms the natural history of these lean diabetic patients. The lipid profile in the lean type 2 diabetes mellitus patient shows less derangement as compared to non-lean type 2 DM patient which contributes to decreased incidence of coronary artery disease in such patients. The reduced prevalence of echocardiographic abnormalities and normal range CIMT reflects on decreased incidence of macrovascular complications like coronary artery disease, cerebrovascular accident.

AIMS AND OBJECTIVES

- To study the clinical and biochemical profile of low body weight type 2 diabetes mellitus.

- To study the prevalence of echocardiographic abnormalities in low body weight diabetes mellitus type 2 patients and compare with other type 2 diabetics.
- To compare microvascular & macrovascular complications in low body weight type 2 diabetes mellitus and other diabetes mellitus type 2 patients

MATERIAL AND METHODS

This study was a hospital based cross-sectional study conducted in M.L.B. Medical College, Jhansi (U.P.). In this study, 100 lean body type 2 diabetic patient were selected for the study coming to OPD and IPD of Internal Medicine Department, M.L.B Medical College, Jhansi (U.P.), during March 2019–Sept. 2020.

INCLUSION CRITERIA:

- Case (Total No. 100) – all the patients of DM type 2 with BMI < 19
- Control - all the patient of DM type 2 with BMI > 19.
- Diagnosis of diabetes mellitus based on American Diabetes Association (ADA) 2019 criteria.

EXCLUSION CRITERIA

- Any seriously ill patient whose sensorium and higher mental function is altered.
- Patients suffering from ESRD, Hepatic encephalopathy, critical illness, carcinoma and hyperthyroidism.

A detailed history of clinical information including the age, sex and intercurrent illness was taken. Anthropometric parameters – height, weight, waist and hip circumference was recorded and clinical

***Corresponding Author Dr. Bhawna Rai**

Junior Resident, Department of Medicine, Maharani Laxmi Bai Medical College, Jhansi, Uttar Pradesh

examination was performed to detect diabetic complications.

Neuropathy was diagnosed on the basis of subjective symptoms, objective evidence of absence of ankle jerk, glove stocking type of anesthesia or monofilament testing. Nephropathy was diagnosed on basis of persistent proteinuria in the absence of urinary tract infection. Ischemic heart disease was diagnosed on the basis of clinical symptoms, electrocardiogram (ECG), and ECHO. Cerebrovascular abnormalities was diagnosed on the basis of history of stroke along with measurement of CIMT.

Criteria for the Diagnosis of Diabetes Mellitus:

- Classic symptoms of polydipsia, polyphagia, polyuria and weight loss with a random serum glucose >200 mg/dl
- Fasting serum glucose >126 mg/dl on at least two occasions
- 2 hour serum glucose after 75 gms OGTT >200 mg/dl
- S. HbA1c level \geq 6.5%

BIOCHEMISTRY:

Glycemic status was assessed using fasting and two hours postprandial blood glucose (2 hr PPBS) and HbA1c (glycosylated haemoglobin). HbA1c level was estimated by High Performance Liquid Chromatography (HPLC). Low body weight DM type II patients were differentiated from type I DM patients on the basis of history and clinical presentation. Lipid profile was assessed for each patients. Cardiac examination was done with ECG, ECHO.

Echocardiographic examination:

All examination was done on ALOKA profound Alpha6 PNDD registered machine in Cardiology unit, Department of Medicine, M.L.B. Medical College, Jhansi (UP). Each patient was subjected to complete two-dimensional and Doppler echocardiography study by expert cardiologist.

STATISTICAL ANALYSIS:

SPSS (Statistical Package for Social Sciences) version 21 software & all results were expressed as percentage was used for data analysis.

RESULT

Table 1: Mean BMI (kg/m²) of patients of LBW types 2 DM patients

Groups (Mean BMI)	Male		Female	
	No. of Pts	Percentage	No. of Pts	Percentage
15-16	1	1.41%	4	13.79%
16.1-17	11	15.49%	4	13.79%
17.1-18	25	35.21%	12	41.38%
18.1-19	34	47.89%	9	31.03%
TOTAL	71	100%	29	100
Mean \pm SD	17.56 \pm 0.82			

Out of 100 patient with low body weight type 2 DM (BMI < 19kg/m²), majority of the patients were BMI 18-19 kg/m².

Table 2: Mean Duration of diabetes mellitus type II.

Duration of DM in yrs.	No. of Pts	Percentage
4-6	19	19%
7-9	37	37%
10-12	18	18%
13-15	14	14%
16-18	10	10%
>18	2	2%
Total	100	100

Out of 100 low body weight type 2 DM patient, majority of patients were found in 7-9 yrs of duration group i.e. 37 (37%). Mean \pm SD of LBW type-2DM patients is 10.06 \pm 3.93.

Table 3: Correlation of S.LDL in study population with sex-wise distribution

Serum LDL Level	Male		Female	
	No. of Pts	Percentage	No. of Pts	Percentage
60-80	22	30.99%	6	20.69%
81-100	36	50.70%	21	72.41%
101-120	7	9.86%	1	3.45%
121-140	5	7.04%	0	0.00%
>140	1	1.41%	1	3.45%
Total	71	100%	29	100%
Mean \pm SD	90.69 \pm 16.99			

Table 4: Correlation of S. Triglyceride in study population with sex-wise distribution.

S. Triglyceride	Male		Female	
	No. of Pts	Percentage	No. of Pts	Percentage
80-110	7	9.86%	3	10.34%
111-140	43	60.56%	17	58.62%
141-180	13	18.31%	6	20.69%
>180	8	11.27%	3	10.34%
Total	71	100%	29	100%
Mean \pm SD	141.88 \pm 31.78			

Table 5: Correlation of HbA1C level in study population sex wise distribution

HbA1C	Male		Female	
	No. of Pts	%	No. of Pts	%
< 6.5	4	5.63%	1	3.45%
6.5-10	52	73.24%	21	72.41%
10.1-13	14	19.72%	7	24.14%
>13	1	1.41%	0	0.00%
Total	71	100%	29	100%

Table 6: Correlation of Serum creatinine level in study population in with sex-wise distribution

S. Creatinine	Male		Female	
	No. of Pts	%	No. of Pts	%
0.6-1	52	73.24%	20	68.97%
1.1-1.40	13	18.31%	6	20.69%
>1.40	6	8.45%	3	10.34%
Total	71	100%	29	100%
Mean \pm SD	0.96 \pm 10.25			

Only 9 patients showed elevated level of serum creatinine (>1.4mg/dl)

Table 7: Prevalence of tingling & numbness (Peripheral neuropathy) in low body weight type 2 DM patient with sex wise distribution.

Tingling & Numbness	Total Products	Percentage
Male	49	75.38%
Female	16	24.62%
Total	65	100%

According to found data, the prevalence of Peripheral neuropathy was highest, 65% of the total patients had complaints of tingling and numbness in limbs and confirmed objectively by positive monofilament testing in 50 % of the total patients. Out of these, majority of patients were males i.e. 49 (75.38%) and rest were females 16 (24.62%).

Table 8: Prevalence of Coronary Artery Disease in Low Body Weight type – 2 DM patients with sex wise distribution.

	Total Products	Percentage
Male	6	6%
Female	2	2%
Total	8	100%

In the study, prevalence of macrovascular complication i.e. coronary disease was 8% in low body weight type 2 DM patient. Out of which, majority of the patents (i.e. 6 out of 8) were males.

Table 9: Prevalence of Hypertension in Low body weight type 2 DM patients.

Patients Sex	Total Products	Percentage
Male	4	66.66%
Female	2	33.33%
Total	6	100%

In our study, prevalence of hypertension (macrovascular complication) was 6 % of the total population with male preponderance (66.66%).

Table 10: Prevalence of Stroke in Low Body Weight type – II DM patients with sex wise distribution

	Total Products	Percentage
Male	0	0
Female	2	2%
Total	100	2%

In our study, prevalence of CA (macrovascular complication) was just 2% of the study population with females preponderance.

Table 11: Echocardiographic findings in the study population with sex-wise distribution

LVEF (%age)	Male		Female	
	Total No. of Patients	Percentage	Total No. of Patients	Percentage
55-59%	11	15.49%	5	17.24%
60-64%	22	30.99%	13	44.83%
>65%	38	53.52%	11	37.93%
Total	71	100%	29	100%

In our study, special emphasis was given on Echocardiographic findings in low body weight type 2 diabetes mellitus patients. It revealed normal cardiac function in majority of the patients (85% of the total).

Table 12: Correlation of CIMT (Carotid Initial Media Thickness) of study population in with sex-wise distribution.

CIMT (inmm)	Male		Female	
	No. of Pts	Percentage	No. of Pts	Percentage
0.6	16	22.54%	7	24.14%
0.7	55	77.46%	22	75.86%
Total	71	100%	29	100%

DISCUSSION

Diabetes mellitus is the most prevalent metabolic and one of the most important non-communicable diseases. In a prospective study, sponsored by the Indian Council of Medical Research (ICMR) it was observed that about one-fourth of the diabetic patients have a body mass index (BMI) below 19 kg/m² which is low body weight type 2 diabetes mellitus (LBW type 2 DM). The low body weight type 2 diabetes mellitus is a distinct clinical entity. The clinical presentation and profile of associated complications is different in lean patients of type 2 diabetes as compared to non-lean or obese diabetes.

Out of 100 patients, 71 patients in our study were males and 29 were females showing male preponderance. The mean age of the patient in this study was 54.09±9.34 years, ranging between 35- 85 years. The mean duration of diabetes was 10 years. In our study, the mean Body mass index of all our patients was 17.56±0.82 kg/m². In our study, the patients of low body weight diabetes mellitus had mean HbA1c of 8.94±1.55 which shows poor glycemic control as compared to studies done by other authors. This may be due to poor patient compliance and inability of regular follow-up.

The study of biochemical profile in low body weight type 2 diabetes mellitus patients concluded that the lipid profile in these patients was well within normal limits in majority of the patients. In our study, patients with elevated levels of total cholesterol were 8, with mean level 176.89±32.84 with elevated levels of triglycerides were 8, with mean level 141.88±31.78 and patients with elevated level of LDL were 0 with mean level 90.69±16.99 which is much less as

compared to non-lean/obese type 2 diabetes mellitus patients with BMI >19 kg/m². Analyses of the biochemical milieu revealed that patients of low body weight type 2 diabetes mellitus did not have hyperlipidemia which may be conducive to the development of atherosclerosis and Coronary artery disease.

The lipid profile was just high-normal to slightly raised in these patients. The prevalence of microvascular complications was much more than macrovascular complications in low body weight type 2 diabetes mellitus patients. In this study, the prevalence of Peripheral neuropathy was highest, 65% of the total patients with BMI <19 kg/m² had complaints of tingling and numbness in limbs and confirmed objectively by positive monofilament testing in 50 % of the total patients. The prevalence of Nephropathy was 6% of the total low body weight type 2 diabetes mellitus patients in our study which was estimated by the presence of albuminuria as compared to 17 percent in the type 2 diabetes with BMI >19 kg/m².

The prevalence of macrovascular complications like Coronary artery disease was 8% in low body weight type 2 diabetes mellitus patients as compared to 24.7% in non-lean/obese type 2 diabetes mellitus patients (ICMR data on NIDDM). The prevalence of another Macrovascular complication, Hypertension was 6% in our study in low body weight type 2 diabetes mellitus patients as compared to 26.4 % in non-lean/obese type 2 diabetes mellitus patients (ICMR data on NIDDM).

In our study, special emphasis was given on echocardiographic findings in low body weight type 2 diabetes mellitus patients. It revealed normal cardiac function in majority of the patients (85% of the total). An abnormal echocardiographic finding was found in 15 % of the total study patients who had mild concentric left ventricular hypertrophy and grade 1 diastolic dysfunction.

The mean carotid intima thickness of carotid artery as evaluated by B MODE of ultrasound is 0.678±0.04, which is in normal range with reference to the age group. This echocardiographic finding was compared to the data on non-lean/obese type 2 diabetes mellitus patients where prevalence of abnormal echocardiographic finding is 49.8%.

CONCLUSION

- The study of biochemical profile in low body weight type 2 diabetes mellitus patients concluded that the lipid profile in these patients was well within normal limits in majority of the patients and HbA1c was elevated suggestive of poor glycemic control.
- The prevalence of microvascular complications was significantly higher than macrovascular complications in low body weight type 2 diabetes mellitus patients.
- The prevalence of Peripheral neuropathy was highest (65% of the total patients) followed by Nephropathy.
- The prevalence of macrovascular complications like Coronary artery disease and Hypertension was reduced in low body weight type 2 DM patients.
- Echocardiographic findings in low body weight type 2 diabetes mellitus patients revealed normal cardiac function in majority of the patients (85% of the total) as compared to higher prevalence of reduced cardiac function in non-lean/obese patient.

REFERENCES:

1. S M Shavana, Zufire H M Khan, Heber Anandan. Clinical and Biochemical Profile of Lean, Normal, Obese Type 2 Diabetes Mellitus. *International Journal of Scientific Study*. July 2017. Vol 5. Issue 4.
2. Punyakrit Deb Barma, Salam Ranabir, Lallan Prasad, and Thangjam Premchand Singh. Clinical and biochemical profile of lean type 2 diabetes mellitus. *Indian J Endocrinol Metab*. 2011 Jul; 15(Suppl1):S40-S43.

3. Sandeep Singh, Ajay Pal Singh, Manish Kishore Multani, Ashish Purohit. Clinical and biochemical profile of Indians with type 2 diabetes mellitus: A problem lurking for India. Year : 2014, Vol. 17, Issue: 2, Pg.91-98.
4. Mamatha B Patil, E Dinesh Ragav *et al.*, (2018). A Clinical, Biochemical Profile of Type-2 Diabetes in Women with Special Reference to Vitamin- D Status in Obese and Non-Obese. *Journal of the Association of Physicians of India*. Dec. 2018. Vol. 66 (2), 22-29. International Diabetes Federation (IDF). IDF diabetes atlas. 6th ed. Brussels: IDF, <http://www.idf.org/diabetesatlas> (2013, accessed 4 June 2015)