

**Original article:**

## **Study of association of Microvascular complications and BMI, WHR and Lipid profile in type 2 diabetes mellitus**

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### **Abstract**

**Introduction:** In contrast, three recent large studies, examining the risks of macrovascular disease and mortality by fasting blood glucose concentrations and HbA1c levels, have described a nonlinear relationship with one study suggesting that both low and high HbA1c levels were associated with increased risks.

**Materials and methods** The present cross sectional study was conducted on randomly selected newly diagnosed type 2 diabetes mellitus cases coming to the Department of Medicine, Padmashree Dr. D. Y. Patil Medical College, Hospital and Research Centre, Pimpri, Pune. The period of data collection was spread over one and half year months from October 2017 to March 2019. After collection of data, the data entry forms were checked for their completeness and missing and incomprehensible data was rechecked from the respective participant profile.

**Results:** It was observed that mean BMI in Microvascular complications present cases was  $28.77 \pm 3.769$  and mean BMI in Microvascular complications absent cases was  $24.62 \pm 2.537$ . The association between BMI and Microvascular complications present is statistically significant ( $p < 0.05$ ). It was observed that mean WHR in Microvascular complications present cases was  $1.037 \pm 0.218$  cm and mean WHR in Microvascular complications absent cases was  $0.915 \pm 0.188$  cm. The association between WHR and Microvascular complications present is statistically significant ( $p < 0.05$ ).

**Conclusion:** Association of Microvascular complications and BMI, WHR and Lipid profile in type 2 diabetes mellitus were found statistically significant.

### **Introduction:**

In contrast, three recent large studies, examining the risks of macrovascular disease and mortality by fasting blood glucose concentrations and HbA1c levels, have described a nonlinear relationship<sup>1,2,3</sup> with one study suggesting that both low and high HbA1c levels were associated with increased risks.<sup>5</sup> A prior meta-analysis examining the effects of glycaemic exposure on major cardiovascular events in patients with type 2 diabetes reported a pooled greater risk of 18% for every 1% higher level of HbA1c (95% CI 10, 26%).<sup>6</sup> However, the authors also found significant heterogeneity in the effects among the studies included (with some reporting increases in risk of between 3% and 156%).

Moreover, the generalizability of these findings remains unclear due to changes in the current management of patients with type 2 diabetes. Although a number of individual large-scale clinical trials aiming for near-normal HbA1c targets have separately failed to demonstrate significant benefits on major cardiovascular events or death,<sup>7</sup> a meta-analysis pooling data from these trials and the UKPDS trial, did show a modest benefit for cardiovascular events but not mortality.<sup>8</sup>

Thus, evidence regarding correlation of HbA1c and microvascular complication of type 2 DM is unclear. With this background, the purpose of the present research was to study of microvascular complications in patients with type 2 diabetes mellitus and its correlation with quantitative HbA1c.

### Materials and methods

The present cross sectional study was conducted on randomly selected newly diagnosed type 2 diabetes mellitus cases coming to the Department of Medicine, Padmashree Dr. D. Y. Patil Medical College, Hospital and Research Centre, Pimpri, Pune.

The period of data collection was spread over one and half year months from October 2017 to March 2019. After collection of data, the data entry forms were checked for their completeness and missing and incomprehensible data was rechecked from the respective participant profile. Data entry was done in MS Excel data sheet. This procedure was conducted over the period of 2 months. The data cleaning and the retrieval of the missing data were done over a period of one month. The collected data was analyzed over a three-month period and the report writing was completed by end of Oct 2019.

100 randomly selected newly diagnosed type 2 diabetes mellitus who attend Medicine department were included in the study. Patients were included in the study after taking their voluntary informed consent.

### Inclusion criteria

- Type 2 diabetes mellitus patients
- Male or female of
- Age > 40 years irrespective of disease duration

### Exclusion criteria

- Type 1 diabetes mellitus patients
- Gestational diabetes mellitus patient

### Results:

**Table 1 : Distribution of cases according to laboratory profile**

Variable	N	Minimum	Maximum	Mean	SD
Fasting Blood Sugar	100	128	172	136.81	8.249
2hour BS	100	203	271	221.47	13.954
HbA1c	100	5.60	13.0	9.42	3.14
HDL	100	35	53	42.36	6.861
LDL	100	123	218	172.63	19.617
Triglyceride	100	132	259	186.32	23.511
Cholesterol	100	171	260	198.51	21.517

The above table shows distribution of cases according to laboratory parameters. It was observed that mean fasting blood sugar of cases was  $136.81 \pm 8.249$  g/dl, mean 2 hour blood sugar of cases was  $221.47 \pm 13.954$  g/dl, mean HbA1c of cases was  $9.42 \pm 3.14$  %, mean HDL of cases was  $42.36 \pm 6.861$  mg/dl, mean LDL of cases was  $172.63 \pm 19.617$  mg/dl, mean Triglyceride of cases was  $186.32 \pm 23.511$  mg/dl and mean cholesterol of cases was  $198.51 \pm 21.517$  mg/dl.

**Table 2 : Association of Microvascular complications and BMI, WHR and Lipid profile**

Variables	Microvascular complications	N	Mean	SD	P value
BMI	Present	44	28.77	3.769	0.001
	Absent	56	24.62	2.537	
WHR	Present	44	1.037	0.218	0.003
	Absent	56	0.915	0.188	
HbA1c	Present	44	9.43	1.596	0.001
	Absent	56	6.93	1.837	
HDL	Present	44	39.52	6.445	0.001
	Absent	56	44.26	5.665	
LDL	Present	44	186.42	7.842	0.001
	Absent	56	161.56	14.374	
Triglycerides	Present	44	191.6	8.146	0.001
	Absent	56	165.22	12.056	
Cholesterol	Present	44	216.89	11.062	0.001
	Absent	56	183.67	16.889	

**Discussion:**

In our study, it was observed that mean BMI in Microvascular complications present cases was  $28.77 \pm 3.769$  and mean BMI in Microvascular complications absent cases was  $24.62 \pm 2.537$ . The association between BMI and Microvascular complications present is statistically significant ( $p < 0.05$ ). It was observed that mean WHR in Microvascular complications present cases was  $1.037 \pm 0.218$  cm and mean WHR in Microvascular complications absent cases was  $0.915 \pm 0.188$  cm. The association between WHR and Microvascular complications present is statistically significant ( $p < 0.05$ ). It was observed that mean HbA1c in Microvascular complications present cases was  $9.43 \pm 1.596\%$  and mean HbA1c in Microvascular complications absent cases was  $6.93 \pm 1.837\%$ . The association between HbA1c and Microvascular complications present is statistically significant ( $p < 0.05$ ).

It was observed that mean HDL in Microvascular complications present cases was  $39.52 \pm 6.445$  mg/dl and mean HDL in Microvascular complications absent cases was  $44.26 \pm 5.665$  mg/dl. The association between HDL and Microvascular complications present is statistically significant ( $p < 0.05$ ).

It was observed that mean LDL in Microvascular complications present cases was  $186.42 \pm 7.842$  mg/dl and mean LDL in Microvascular complications absent cases was  $161.56 \pm 14.374$  mg/dl. The association between LDL and Microvascular complications present is statistically significant ( $p < 0.05$ ).

It was observed that mean triglyceride in Microvascular complications present cases was  $191.6 \pm 8.146$  mg/dl and mean triglyceride in Microvascular complications absent cases was  $165.22 \pm 12.056$  mg/dl. The association between triglyceride and Microvascular complications present is statistically significant ( $p < 0.05$ ). It was observed that mean cholesterol in Microvascular complications present cases was  $216.89 \pm 11.062$  mg/dl and mean cholesterol in Microvascular complications absent cases was  $183.67 \pm 16.889$  mg/dl. The association between cholesterol and category of WHR is statistically significant ( $p < 0.05$ ).

It was observed that mean BMI in Microvascular complications present cases was  $28.77 \pm 3.769$  and mean BMI in Microvascular complications absent cases was  $24.62 \pm 2.537$ . The association between BMI and Microvascular complications present is statistically significant ( $p < 0.05$ ). Thus, the study participants were more likely to be overweight. This can be due to the influence of an obesogenic environment that promotes obesity.<sup>9</sup>

It was observed that mean WHR in Microvascular complications present cases was  $1.037 \pm 0.218$  cm and mean WHR in Microvascular complications absent cases was  $0.915 \pm 0.188$  cm. The association between WHR and Microvascular complications present is statistically significant ( $p < 0.05$ ). It was observed that mean HbA1c in Microvascular complications present cases was  $9.43 \pm 1.596\%$  and mean HbA1c in Microvascular complications absent cases was  $6.93 \pm 1.837\%$ . The association between HbA1c and Microvascular complications present is statistically significant ( $p < 0.05$ ). The association between the glycaemic control, as reflected by HbA1C, and the risk of development of the microvascular complications is statistically significant. Similar results were found by Hussein et al.<sup>8</sup>

It was observed that mean HDL in Microvascular complications present cases was  $39.52 \pm 6.445$  mg/dl and mean HDL in Microvascular complications absent cases was  $44.26 \pm 5.665$  mg/dl. The association between HDL and Microvascular complications present is statistically significant ( $p < 0.05$ ). It was observed that mean LDL in Microvascular complications present cases was  $186.42 \pm 7.842$  mg/dl and mean LDL in Microvascular complications absent cases was  $161.56 \pm 14.374$  mg/dl. The association between LDL and Microvascular complications present is statistically significant ( $p < 0.05$ ). It was observed that mean triglyceride in Microvascular complications present cases was  $191.6 \pm 8.146$  mg/dl and mean triglyceride in Microvascular complications absent cases was  $165.22 \pm 12.056$  mg/dl. The association between triglyceride and Microvascular complications present is statistically significant ( $p < 0.05$ ).

It was observed that mean cholesterol in Microvascular complications present cases was  $216.89 \pm 11.062$  mg/dl and mean cholesterol in Microvascular complications absent cases was  $183.67 \pm 16.889$  mg/dl. The association between cholesterol and category of WHR is statistically significant ( $p < 0.05$ ).

It was observed that mean HbA1c in Chronic Kidney Disease cases was  $10.3 \pm 2.13$  g/dl, in Microalbuminuria cases was  $9.6 \pm 1.76$  g/dl, in Retinopathy cases was  $9.4 \pm 1.51$  g/dl, in Peripheral neuropathy cases was  $9.8 \pm 2.14$  g/dl, in Autonomic neuropathy cases was  $9.1 \pm 0.86$  g/dl and in Erectile dysfunction cases was  $9.8 \pm 1.64$  g/dl.

**Conclusion:**

Association of Microvascular complications and BMI, WHR and Lipid profile in type 2 diabetes mellitus were found statistically significant.

**References:**

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