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Diabetes Update

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Dear Doctor,

Greetings from Micro Labs Limited. We are happy to bring you **"DIABETES UPDATE"** which contains latest and interesting news in the field of Diabetes and Endocrinology.

- Necropsies of Type 2 Diabetes Mellitus Patients: Renal Histologic Findings
- Triglyceride glucose index and carotid intima-media thickness are related in obese and nonobese patients
- Retrospective cohort investigation evaluating variations in body composition and blood sugar levels in response to variations in thyroid-stimulating hormone level
- Euglycaemic Ketoacidosis Following Laparoscopic Sleeve Gastrectomy in a Type 2 Diabetic Patient

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Looking forward to your valuable feedback

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Necropsies of Type 2 Diabetes Mellitus Patients: Renal Histologic Findings

In individuals with end-stage renal disease, diabetic nephropathy (DN), a prevalent clinical diabetic microangiopathy, is known to be a significant cause of death. According to studies, vascular endothelial cell damage and inflammatory responses play a significant role in the etiology of DN.[1] Microalbuminuria is employed as a marker of endothelial dysfunction, suggesting the presence of glomerular impairment, in addition to its diagnostic and prognostic usefulness.[2] A patient's chance of developing proteinuria and end-stage renal disease increases if they have microalbuminuria. This urine biomarker is a crucial factor in determining how DN progresses.[3] Very few studies have examined early diabetic nephropathy (DN) histologic lesions in patients who show no symptoms of clinical involvement. The study examined renal histologic lesions found in diabetes patients' necropsies, whether or whether they had previously displayed DN symptoms.

Using 21 autopsy of type 2 diabetes mellitus (T2DM) patients—9 with albuminuria and 12 without—along with 4 controls—histological material was examined. The Tervaert classification was used to rate the histologic lesions.

Diabetes patients' kidneys scored considerably higher than non-diabetic controls in the majority of the histologic indices examined (glomerular basal membrane thickness, mild and severe mesangial expansion, nodular sclerosis, interstitial fibrosis, and tubular atrophy; all p 0:01). When contrasting the histologic scores of the 21 diabetic individuals with and without albuminuria, no appreciable variations were found. Severe mesangial enlargement and glomerular vascular lesions, in particular, were

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present in a sizable percentage of subjects without albuminuria. (Fig. 1) Between the two T2DM patient groups (albuminuric vs. nonalbuminuric), no discernible changes in age, blood pressure, diabetes vintage, BMI, HbA1c, cholesterol, triglycerides, or medications were detected.

The first finding of our study is that, although there were no significant differences in comorbidities and renal progression factors compared with the patient group with albuminuria, a significant proportion of patients without early clinical signs of DN, such as microalbuminuria, already show moderate to severe DN related histologic involvement. The high prevalence of arteriolar hyalinosis in our study (66.7% in albuminuric and 56.3% in nonalbuminuric patients) was the second intriguing finding. 2

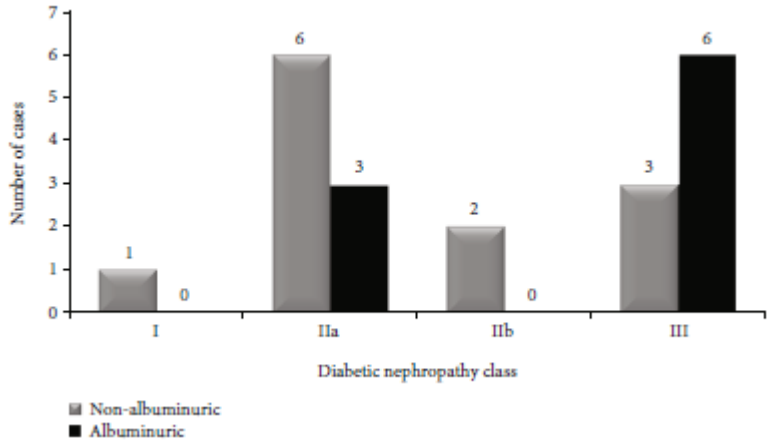

Fig. 1: The number of cases in the different classes of glomerular diabetic nephropathy lesions. Glomerular lesions in all diabetic patients.
We show albuminuric (black) against nonalbuminuric (gray) (n = 21) patients.

The data indicate that renal involvement in T2DM patients is present at earlier stages of the illness (patients without albuminuria), emphasizing the significance of early metabolic control as well as treatment of other risk factors that may influence DN development.

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Triglyceride glucose index and carotid intima-media thickness are related in obese and nonobese patients

Obesity and atherogenic dyslipidemia are common in T2DM patients, which significantly raises their risk for coronary artery disease. Increased levels of triacylglycerol, low density lipoprotein cholesterol (LDL-C), and TG/HDL, a measure of tiny dense LDL particles, have been demonstrated to accelerate the onset of cardiovascular disease in diabetics.[1] Future cerebrovascular and cardiovascular events are linked to the carotid intima-media thickness (CIMT), a proxy indication for the existence and progression of atherosclerosis.[2] As substitute markers for the evaluation of insulin resistance, a number of indices, including the TyG index, TG/HDL ratio, BMI, waist circumference (WC), and visceral adiposity index (VAI), have recently demonstrated promising results.[1] looked into the link between the TyG index and the risk of a high CIMT.[2]

5751 people who had baseline normal carotid intima-media thickness (CIMT) participated in this prospective study. The fasting

triglycerides to fasting glucose ratio was used to calculate the TyG index, which was used to split the population into four categories. Ultrasonography was used to gather data about CIMT. IMT values more than 0.9 mm at follow-up were considered incidentally increased CIMT. Multivariable logistic regression models were used to determine the odds ratios (ORs) and 95% confidence intervals (CIs) of the connections between the TyG index and high CIMT.

A median follow-up of 4.3 years revealed that 722 (12.6%) people had advanced to increased CIMT. (Table 1). After correcting for relevant confounders, the first and fourth quartiles of the TyG index both carried increased chances of elevated CIMT in comparison to the second quartile. The ORs for the first and fourth quartiles in the entire population were 1.29 (95% CI, 1.00-1.66) and 1.42 (95% CI, 1.11-1.83), respectively. Among all adults and nonobese individuals, restricted cubic splines showed a roughly U-shaped connection between the TyG index and higher CIMT (P for nonlinearity) (Fig.1).

Table 1: Odds ratios (95% CI) for risk of elevated CIMT according to quartiles of TyG index

	Quartile 1	Quartile 2	Quartile 3	Quartile 4
Cases (incidence, %)	165 (11.5)	152 (10.6)	193 (13.4)	212 (14.8)
Model 1	1.10 (0.87-1.38)	1(ref)	131 (1.04-1.64)	1.46 (1.17-1.83)
Model 2	1.19 (0.94-1.51)	1(ref)	131 (1.04-1.64)	1.46 (1.16-1.83)
Model 3	1.29 (1.00-1.66)	1(ref)	1.24 (0.97-1.59)	1.42 (1.11-1.83)

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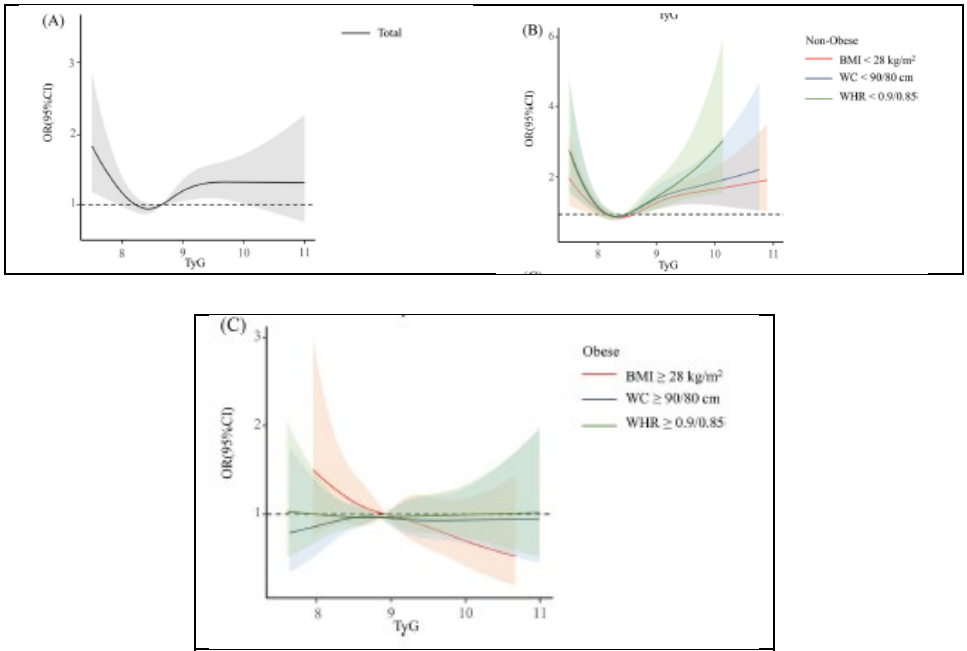

Fig.1 : The association between baseline TyG level and incident elevated CIMT based on restricted cubic splines.

The baseline TyG index and risk of newly-onset increased CIMT were found to be nonlinearly correlated in the study. Furthermore, the association only held true for people who did not have general or abdominal obesity. Our findings show that the TyG index is effective in identifying those who are at high risk of developing subclinical atherosclerosis, particularly in nonobese people. 2 631 participants showed that subclinical atherosclerosis, defined as CIMT > 0.9 mm, linked with the TyG index, according to Fiorentino TV et al. 3 According to research by Wu Z et al, a higher TyG index raises the incidence of carotid atherosclerosis in the general population. 4 According to these research, this study also discovered a link between a higher TyG index and a higher likelihood of elevated CIMT.[2]

The findings of the study imply that the baseline TyG index may be helpful in preventing subclinical atherosclerosis because it is nonlinearly linked with the likelihood of high CIMT in middle-aged and elderly nonobese persons

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Retrospective cohort investigation evaluating variations in body composition and blood sugar levels in response to variations in thyroid-stimulating hormone level

The most prevalent endocrine condition, diabetes mellitus (DM), is brought on by malfunctioning pancreatic b cells. It has been shown that people with diabetes are more likely to experience thyroid dysfunction, and numerous clinical studies have been carried out all over the world to ascertain how they are related. In T2DM patients, hypothyroidism is a common complication, and recent investigations have linked it in large part to insulin resistance.[1] The relationship between changes in thyroid-stimulating

hormone (TSH) levels and the likelihood of acquiring diabetes in the euthyroid state is still up for debate. Furthermore, it is unknown how changes in TSH levels over time correlate with changes in numerous body indices that affect blood glucose levels.[2]

This study comprised a total of 15,557 patients who had health examinations at least twice, with an average delay of two years. TSH Q1, TSH Q2, TSH Q3, and TSH Q4 were the baseline TSH values taken at the initial visit. Differences in a number of variables, including fasting blood glucose and HbA1c, were confirmed. The rate of change () of each variable according to TSH Q was examined and compared after two years.

After two years, there were 377 out of 15 557 individuals who had diabetes mellitus, or 2.4% of all patients. According to TSH Q or TSH Q, there was no statistically significant difference in the incidence of diabetes ($p = 0.243$ and 0.131, respectively). Skeletal muscle mass, on the other hand, declined ($p< 0.001$) when ΔTSH levels rose, whereas Δbody fat mass and percent body fat considerably ($p< 0.001$) increased. Fasting blood glucose and body mass index both substantially increased with an increase in TSH (all $p< 0.001$) As skeletal muscle mass rose, the prevalence of diabetes dramatically decreased (odds ratio 0.734, $p< 0.001$). (Table 1)

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	Total $n = 15\,557$	TSH_Q1 $n = 3712$	TSH_Q2 $n = 3823$	TSH_Q3 $n = 3870$	TSH_Q4 $n = 4152$	p for trend
ΔGlucose, mg/dl	2.3 ± 11.2	2.6 ± 12.4	2.5 ± 11.4	2.3 ± 10.8	1.9 ± 9.9	<0.005
Baseline	91.8 ± 11.4	91.5 ± 12.5	92 ± 11.3	91.9 ± 11.0	91.7 ± 10.9	0.659
2 YA	94.1 ± 12.2	94.4 ± 14.3	94.1 ± 11.6	94.2 ± 11.7	93.7 ± 11.2	0.024
ΔHbA1c, %	0.1 ± 0.2	0.1 ± 0.0.2	0.04 ± 0.2	0.1 ± 0.2	0.1 ± 0.2	0.487
Baseline	5.4 ± 0.3	5.4 ± 0.3	5.4 ± 0.3	5.4 ± 0.3	5.4 ± 0.3	0.936
2 YA	5.5 ± 0.4	5.5 ± 0.4	5.5 ± 0.4	5.5 ± 0.4	5.5 ± 0.4	0.122
ΔBMI, kg/m^2	0.1 ± 1.1	0.01 ± 1.1	0.1 ± 1.0	0.1 ± 1.1	0.1 ± 1.0	<0.001
ΔSkeletal muscle mass, kg	−0.02 ± 1.0	−0.1 ± 1.1	−0.008 ± 1.0	−0.01 ± 1.0	0.003 ± 1.0	<0.001
ΔBody fat mass, kg	0.2 ± 2.4	0.2 ± 2.4	0.2 ± 2.7	0.2 ± 2.3	0.3 ± 2.3	<0.050
ΔPercent body fat (%)	0.2 ± 2.7	0.2 ± 2.8	0.2 ± 2.7	0.3 ± 2.7	0.3 ± 2.7	0.306
ΔWaist-hip ratio	0.009 ± 0.60	0.004 ± 0.02	0.004 ± 0.02	0.02 ± 1.30	0.004 ± 0.02	0.665
ΔWaist circumference, cm	0.5 ± 4.8	0.4 ± 4.8	0.5 ± 4.8	0.5 ± 4.7	0.6 ± 4.8	0.053
ΔHeart rate, bpm	−0.4 ± 7.7	0.02 ± 8.1	−0.4 ± 7.7	−0.6 ± 7.4	−0.8 ± 7.6	<0.001
ΔFEV1, %	−1.9 ± 15.9	−2.1 ± 7.9	−1.6 ± 18.4	−1.7 ± 18.1	−2 ± 16.5	0.993
ΔFVC, %	−1 ± 6.6	−0.9 ± 6.4	−0.8 ± 6.6	−0.9 ± 6.6	−1.2 ± 6.8	0.046
ΔFEV1/FVC	−0.4 ± 8.0	−0.5 ± 4.4	−0.5 ± 4.6	−0.5 ± 4.3	−0.3 ± 13.7	0.222
ΔFEF 25%–75%	−0.2 ± 21.7	0.1 ± 24.1	−0.02 ± 27.3	−0.1 ± 17.1	−0.6 ± 17.2	0.172
Progression of DM, n (%)	377 (2.4)	98 (2.7)	87 (2.3)	103 (2.6)	89 (2.2)	0.243

Table 1: Change of various variables after 2 years according to baseline TSH

Skeletal muscle mass dropped while BMI, body fat mass, percent body fat, and waist-hip ratio significantly increased when TSH levels rose in the euthyroid condition. It is common knowledge that hypothyroidism causes an increase in body weight, body fat percentage, and muscle weakness. 3

This study is the first to track changes in body composition in euthyroid patients based on baseline TSH and TSH levels. Despite the fact that the link between baseline TSH levels in the euthyroid state and blood glucose levels in this investigation could not be statistically demonstrated, because of the little follow-up time, a positive correlation between TSH and glucose was found. Attention and instruction are needed for patients with high TSH levels in the euthyroid state in order to improve physical functions, such as boosting muscle mass and reducing fat and weight loss.

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Euglycaemic Ketoacidosis Following Laparoscopic Sleeve Gastrectomy in a Type 2 Diabetic Patient

In the last 20 years, there has been an increase in the number obese people who have been recommended for bariatric surgery, despite the fact that access to the procedure is still restricted. In patients with severe obesity, bariatric surgery lowers overall mortality and long-term cardiovascular risk.[1] According to a recent report, people who have had sleeve gastrectomy may develop euglycaemic ketoacidosis (EKA) after using SGLT-2 inhibitors. Nevertheless, occurrences of T2DM with EKA following bariatric surgery are infrequently documented without the use of SGLT2 inhibitors. This paper describes a T2DM patient who experienced EKA shortly after undergoing laparoscopic sleeve gastrectomy without the use of an SGLT2 inhibitor.[2]

T2DM and obesity were identified as the patient's conditions at the age of 32. The woman had a laparoscopic sleeve gastrectomy to reduce her weight and regulate her blood sugar. During the first several days following surgery, she consumed less than 500 kcal per day and 800–1000 mL of fluid daily. Her blood sugar was less than 13.9 mmol/L, and she was given degludec insulin, metformin, and dulaglutide as prescriptions. The patient complained of weariness and vomiting on day six following surgery. The diagnosis of ketoacidosis was supported by blood gas analysis and urine analysis. The patient received insulin, glucose, and fluid resuscitation right away. The patient recovered without any symptoms by postoperative Day 8.

Table 1: Pancreatic β Cell Function of the Patient (Insulin Releasing Test)					
	0min	30min	60min	120min	180min
Blood glucose (mmol/L)	15.11	20.35	22.6	20.48	14.88
Insulin level (mU/L)	50.62	53.49	58.64	49.52	37.78
C peptide (ng/mL)	1.72	2.22	2.56	3.04	2.51

Table 2: Laboratory Studies from Postoperative Day 1 to Day 8				
	PODI	POD6	POD7	POD8
Serum glucose level (mmol/L)	13.9	16.1	11.8	10.9
PH	7.389	7.265	7.333	7.385
pCO2 (mmHg)	35.8	23.7	27.2	34.2
Bicarbonate (mmol/L)	24.2	10.5	14.1	21.6
Anion gap	14	21.8	22	16
ABE (mmol/L)	-2.9	-14.5	-10.1	-3.0
SBE (mmol/L)	-3.0	-14.5	-10.3	-3.3
Lactate (mmol/L)	I	0.5	0.4	0.7
Urine ketone	+-	++++	+++	-

The two main types of bariatric surgery are as follows. Following malabsorptive surgery (bypass), postoperative malnutrition is typically more likely to happen because of the restriction on food intake and the altered absorption. However, following restricted surgery, postoperative starvation is incredibly uncommon (sleeve gastrectomy). EKA in T2DM with obesity may therefore be more frequent after gastric bypass.[3] In fact, after sleeve gastrectomy, patients with T2DM complicated by EKA have been documented. But in these cases, the patients were using SGLT2 inhibitors.[4]

Without the use of SGLT2 inhibitors, T2DM was identified in this patient, and a successful laparoscopic sleeve gastrectomy was performed. Both infections and alcohol consumption were absent. Her blood glucose level was lower than 13.9 mmol/L in the days prior to when she first started vomiting. She denied taking more calories until she experienced dizziness, nausea, and 30 episodes of vomiting. The findings of the urine and blood tests for ketone bodies confirmed the diagnosis of ketoacidosis. Blood gas analysis revealed a glucose level of 16.1 mmol/L, which was thought to be a result of stress from excessive vomiting. Ketoacidosis has clinical signs such as nausea and vomiting. With the help of glucose, insulin, and fluid resuscitation, the patient recovered swiftly. Considering all of the clinical evidence, it is clear that this patient had EKA, which had dehydration and extremely low calorie intake as its primary causes.[2]

In conclusion, due to extremely low calorie intake and dehydration, the patient in this study's exceptionally unusual incidence of T2DM developed EKA following laparoscopic sleeve gastrectomy. Even without the use of SGLT2 inhibitors or the presence of stressors, such as infection, doctors should be on the lookout for ketoacidosis in patients with T2DM after bariatric surgery with a euglycemic condition.

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