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Prevalence of sleep apnea in patients with type 1 diabetes and its association with comorbidities and diabetic complications: A French nationwide prospective study

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Aim

To investigate sleep apnea prevalence, factors influencing severity, and associations between sleep apnea severity and micro-/macrovascular complications in a large population of patients with type 1 diabetes.

Materials and methods

- French multicenter prospective cohort study (NCT02796534): 52 centers
- Adults with type 1 diabetes using an insulin pump
- Home care provider nurses collected demographic and clinical data and set up oximetry to determine the oxygen desaturation index (ODI).
- No, mild-moderate and severe sleep apnea were defined as ODI <15 events/h, 15 to <30 events/h and ≥30 events/h, respectively.
- Univariate and multivariate analyses were performed to identify factors associated with sleep apnea, and associations between sleep apnea severity and micro-/macrovascular complications were determined using logistic regression.

Results

Study population

769 patients were prospectively enrolled in the study. Macrovascular and microvascular complications were present in 33.6% and 22.2% of patients, respectively.



Prevalence of sleep apnea and predictive factors

Characteristics	Overall (n = 769)	Sleep apnoea			P value
		None (n = 648)	Mild to moderate (n = 95)	Severe (n = 26)	
Demographics/clinical characteristics					
Age, years	49 (37, 61)	47 (35, 58)	61 (52, 71)	65 (55, 71)	<0.01
Female sex, n (%)	416 (54.1)	361 (55.7)	44 (46.3)	11 (42.3)	0.11
Body mass index, kg/m ²	25.1 (22.5, 28.2)	24.4 (22.2, 27.4)	28.3 (25.7, 31.6)	28.5 (26.0, 34.4)	<0.01
Smoking status, n (%)					
Current	169 (22.2)	157 (24.4)	8 (8.7)	4 (16.0)	<0.01
Former	139 (18.3)	110 (17.1)	22 (23.9)	7 (28.0)	
Glycated haemoglobin, %	7.5 (7, 8.1)	7.5 (6.9, 8.1)	7.8 (7.2, 8.2)	7.7 (6.9, 7.9)	0.26
Macrovascular complications, n (%)					
Hypertension	171 (22.2)	109 (16.8)	43 (45.3)	19 (73.1)	<0.01
Hyperlipidaemia	54 (7.0)	-	-	-	
Coronary artery disease	17 (2.2)	9 (1.4)	6 (6.3)	2 (7.7)	<0.01
Congestive heart failure	10 (1.3)	8 (1.2)	2 (2.1)	0 (0)	0.66
Stroke or transient ischaemic attack	16 (2.1)	8 (1.2)	5 (5.3)	3 (11.5)	<0.01
Arrhythmias	23 (3.0)	15 (2.3)	4 (4.2)	4 (15.4)	<0.01
Peripheral arterial disease	21 (2.7)	12 (1.9)	5 (5.3)	4 (15.4)	<0.01
Microvascular complications, n (%)					
Renal insufficiency	4 (0.5)	2 (0.3)	2 (2.1)	0 (0)	0.07
Diabetic retinopathy	98 (12.7)	70 (16.8)	24 (25.3)	4 (15.4)	<0.01
Diabetic nephropathy	9 (1.2)	8 (1.2)	1 (1.1)	0 (0)	0.84
Diabetic vegetative neuropathy	6 (0.8)	2 (0.3)	2 (2.1)	2 (7.7)	<0.01
Symptoms, n (%)					
Epworth sleepiness scale score	7 (4, 11)	7 (4, 11)	7 (5, 11)	8 (4, 12)	0.95
Pichot Fatigue Scale score	7 (3, 14)	7 (3, 14)	7 (3, 15)	7 (3, 15)	0.99
Pichot Depression Scale score	1 (0, 4)	1 (0, 4)	2 (0, 5)	2 (0, 5)	0.28

- 12.4% (95% CI 10.2-14.9) and 3.4% (95% CI 2.3%-4.9%) of patients, respectively, had mild-to-moderate or severe sleep apnea based on the ODI
- Prevalence of sleep apnea increased in parallel with increasing age, being 3.3%, 28.9% and 67.8% in patients aged 18 to <33 years, 33 to <57 years and ≥57 years, respectively ($P < 0.01$).
- BMI was significantly higher in individuals with mild-to-moderate OSA (28.3 [25.7, 31.6] kg/m²) or severe OSA (28.5 [26.0, 34.4] kg/m²) compared to individuals without OSA (24.4 [22.2, 27.4] kg/m²; $P < 0.01$).
- No significant differences between patients with versus without sleep apnea with respect to symptoms, including daytime sleepiness, fatigue and depression.

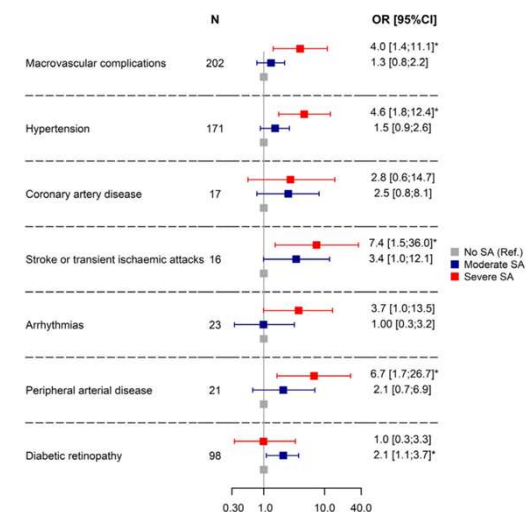
Conclusion

Sleep apnea is a significant comorbidity in patients with type 1 diabetes, especially with respect to diabetic complications. This highlights the need for sleep apnea screening and management in these individuals

Factors associated with sleep apnea on multivariate analysis

Variable	Beta (SD)	P value
Sex (men vs. women)	30.09 (6.72)	<0.01
Age (per 10-year increase)	2.67 (0.26)	<0.01
Body mass index (per 1-kg/m ² increase)	6.91 (0.77)	<0.01
Hypertension (yes vs no)	19.49 (9.25)	0.04

Association between sleep apnea severity and micro-/macrovascular complications



Significant association between sleep apnea severity and several macrovascular complications (hypertension, stroke or transient ischemic attack, and peripheral arterial disease) and with diabetic retinopathy