

Table e-1. General and Sleep characteristics of patients without known type 2 diabetes.

	Total (n=126)	OSA - (n=39)	OSA + (n=87)	P
Age , years mean±SD	42.0 ± 10.0	39.0 ± 10.0	44.0 ± 10.0	0.005
BMI , Kg/m ² mean±SD	46.4 ± 6.0	44.7 ± 4.6	47.1 ± 6.4	0.039
Gender , Females %	75.4	74.4	75.9	0.856
Current smoking , %	17.5	23.1	14.9	0.532
Alcohol consumption , %	5.6	7.7	4.6	0.483
Body Fat , % mean±SD	48.8 ± 8.3	47.7 ± 8.1	49.3 ± 8.3	0.324
WC , cm mean±SD	129.1 ± 15.7	123.3 ± 13.9	131.7 ± 15.8	0.005
Waist-Hip Ratio mean±SD	0.92 ± 0.10	0.88 ± 0.08	0.94 ± 0.11	0.002
Neck circumference , cm*	42.0 (40.0 – 44.0)	41.0 (39.0 – 43.0)	42.0 (40.0 – 46.0)	0.023
Obesity Duration , years mean±SD	24.7 ± 10.4	24.0 ± 10.4	25.1 ± 10.4	0.593
Physical Activity , METS.min.week ⁻¹ , mean±SD	2319.6 ± 2491.7	2352.9 ± 2443.5	2304.4 ± 2528.0	0.921
Glucose tolerance assessment §, n (%)				
Diabetes	10 (7.9 %)	4 (10.3 %)	6 (6.9 %)	0.588
IGT	25 (19.8 %)	6 (15.4 %)	19 (21.8 %)	
Normal	82 (65.2 %)	26 (66.6 %)	56 (64.4 %)	
Missing data	9(7.1%)	3 (7.7 %)	6 (6.9 %)	
Arterial blood gases mean±SD				
PaO ₂ , mmHg	85.6 ± 11.3	88.5 ±10.5	84.3 ± 11.4	0.055
PaCO ₂ , mmHg	39.9 ± 5.0	39.0 ± 3.9	40.3 ± 5.4	0.146
Spirometry , mean±SD				
FVC % predicted	99.0 ± 15.1	99.2 ± 13.9	98.8 ± 15.6	0.896
FEV ₁ % predicted	99.9 ± 15.2	98.6 ± 13.0	100.5 ± 16.2	0.519
FEV ₁ /FVC%	81.3 ± 6.3	82.9 ± 6.6	80.6 ± 6.1	0.057
TST , minutes mean±SD	353.5 ± 66.9	363.6 ± 50.9	349.0 ± 72.8	0.196
Sleep Efficiency , % mean±SD	76.7 ± 13.9	78.7 ± 10.8	75.9 ± 15.1	0.237
Stage I* , %	6.7 (3.8 – 11.8)	6.7 (4.1 – 9.6)	6.7 (3.6 –13.4)	0.952

Stage II* , %	57.3 (50.0 – 65.0)	57.1 (49.6 – 65.0)	57.5 (50.1 – 65.6)	0.806
SWS* , %	20.0 (13.4 – 28.9)	22.1 (13.0 – 31.3)	19.5 (13.8 – 28.0)	0.377
Stage REM* , %	14.5 (9.6 – 18.3)	14.7 (11.5 – 18.3)	14.0 (9.0 – 18.3)	0.977
Arousal index* , number/hour	21.0 (13.8 – 36.6)	11.2 (8.6 – 18.0)	26.8 (18.0 – 46.7)	0.001
AHI* , events/hour	30.9 (14.3 – 49.0)	12.2 (9.2 – 13.9)	39.1 (29.4 – 60.1)	0.001
Time SpO₂ <90%TST* , %	3.0 (0.3 – 14.0)	0.3 (0.0 – 1.4)	6.5 (1.6 – 22.9)	0.001
Self-reported sleep duration , hours/night mean±SD	7.59 ± 1.59 1.63	6.92 ± 1.67	7.89 ± 1.47	0.002
Epworth sleepiness scale score mean±SD	7.0 ± 5.0	7.0 ± 4.0	8.0 ± 5.0	0.575
Subjects with ESS >10 , %	27.0	25.6	27.6	0.820

Definitions of abbreviations: BMI, body mass index; WC, waist circumference; IGT, impaired glucose tolerance; PaO₂, partial arterial pressure of oxygen; PaCO₂, partial arterial pressure of carbon dioxide; FVC%, predicted percentage of forced vital capacity; FEV%, predicted percentage of forced expiratory volume in the first second; FEV1/FVC, FEV1/FVC ratio; TST, Total sleep time; SWS, slow-wave sleep; AHI, apnea-hypoapnea index; SpO₂, arterial oxygen saturation by pulse oximetry; Time SpO₂ <90% TST, mean percentage of sleep time with SpO₂ below 90%; Subjects with EES > 10: Percentage of patients with an Epworth sleepiness scale score above 10.

Data are presented as mean ± SD, median (percentile 25 – percentile 75) and percentage for normal, non-normal (*) distributed and categorical data, respectively.

Unpaired t-student, Mann-Whitney and chi-square test were performed on normally, skewed and categorical data, respectively.

§ Data according to Oral glucose test tolerance (OGTT) results in 117 patients.

Table e-2. Metabolic syndrome components and others metabolic variables according to OSA categories of patients without known type 2 diabetes.

	OSA -	OSA +			p
	AHI < 15 (n = 39)	AHI 15 – 30 (n=23)	AHI 30 – 50 (n=34)	AHI > 50 (n = 30)	
AHI * , events/hour	12.2 (9.2 – 13.9)	23.2 (19.3 – 28.4)	36.2 (33.1 – 44.8)	78.2 (57.3 – 94.7)	-
WC , cm mean±SD	123.3 ± 13.9	126.4 ± 12.2	131.7 ± 14.0	135.8 ± 19.3	0.005*
SBP , mmHg mean±SD	128.3 ± 17.1	131.3 ± 15.5	139.8 ± 17.6	140.7 ± 16.0	<0.001***
DBP * , mmHg	80.0 (60.0 – 90.0)	83.0 (70.0 – 90.0)	84.0 (80.0 – 90.0)	87.5 (83.0 – 90.0)	0.024***
cHDL , mmol/l mean±SD	1.30 ± 0.25	1.40 ± 0.64	1.23 ± 0.35	1.07 ± 0.24	0.012§
TG * , mmol/l	1.15 (0.90 – 1.53)	1.21 (0.89 – 1.62)	1.21 (1.00 – 1.90)	1.50 (1.10 – 2.01)	0.203
FBG* , mmol/l	5.40 (5.00 – 6.00)	5.40 (5.00 – 5.70)	5.70 (5.27 – 6.10)	5.60 (5.30 – 6.40)	0.158
Metabolic syndrome , %	33.3	52.2	61.8	63.3	0.040
Metabolic Index , number of components mean±SD	2.26 ± 1.02	2.52 ± 0.99	2.91 ± 1.08	3.23 ± 1.17	0.002*
Total Cholesterol , mmol/l mean±SD	5.04 ± 0.85	4.99 ± 1.07	4.88 ± 0.81	4.87 ± 0.97	0.844
cLDL * , mmol/l	1.36 (1.15 – 3.06)	1.32 (1.01 – 1.80)	1.17 (1.05 – 1.47)	1.26 (0.98 – 1.54)	0.155
cVLDL * , mmol/l	0.37 (0.25 – 0.66)	0.40 (0.23 – 0.61)	0.56 (0.27 – 0.65)	0.58 (0.34 – 0.92)	0.279
HbA1c* , %	5.4 (5.0 – 5.7)	5.5 (5.1 – 5.8)	5.4 (5.2 – 5.8)	5.8 (5.5 – 6.4)	0.007*** ¶¶
IGT + DM^o , %	25.6	35.0	23.5	33.0	0.594

Definitions of abbreviations: AHI, apnea-hipoapnea index; WC, waist circumference; SBP, systolic blood pressure; DBP, diastolic blood pressure; cHDL, high-density lipoprotein cholesterol, TG, triglycerides; FBG; fasting blood glucose; cLDL, low-density lipoprotein cholesterol; cVLDL, very low-density lipoprotein cholesterol; HbA1c, the percentage of

glycosylated hemoglobin; IGT, impaired glucose tolerance; Metabolic syndrome definition based on NCEP ATP III modified criteria (Circulation 2009; 120: 1640-1645) and metabolic index calculated as the sum of components of MetS presented in each subject divided by the number of subjects in each AHI category.

Data are presented as mean \pm SD, median (percentile 25 – percentile 75) and percentage for normal, non-normal distributed* and categorical data, respectively.

p-value: comparisons among OSA categories. Chi-square test was used for categorical variables. ANOVA with Scheffe post-hoc analysis was used for normal continuous variables. Kruskal-Wallis test was used for not normal distributed continuous variables using Mann-Whitney test and Bonferroni correction to compare between groups.

[∞]: Data according to Oral glucose test tolerance (OGTT) results in 117 patients with 9 missing data (2, 3 and 4 patients from groups AHI <15, AHI 15-30 and AHI>50, respectively).

For normal data p values of intra-group tests were presented as following: *, **, §, §§ for inter-group results.

* p<0.001 between groups: AHI <15 and AHI >50.

** p<0.001 between groups: AHI <15 and AHI 30-50.

§ p<0.001 between groups: AHI 15-30 and AHI >50.

§§ p<0.001 between groups: AHI 15-30 and AHI 30-50.

¶ p<0.001 between groups: AHI <15 and AHI 15-30.

¶¶ p<0.001 between groups: AHI 30-50 and AHI >50.

Table e-3. The association of metabolic parameters with OSA severity evaluated as AHI and Time SpO₂ <90% TST in patients without known type 2 diabetes.

Dependent variable	Adjusted β coefficient * (95% CI)	p	Adjusted β coefficient ** (95% CI)	p
Independent variable: AHI				
WC, cm	0.047 (-0.017 – 0.110)	0.146	-	-
SBP, mmHg	0.133 (0.025 – 0.242)	0.017	0.121 (0.013 – 0.23)	0.029
DBP, mmHg	0.106 (0.006 – 0.206)	0.038	0.093 (-0.007 – 0.193)	0.067
TG, mmol/l	0.004 (-0.001 – 0.009)	0.090	0.003 (-0.001 – 0.008)	0.153
cHDL, mmol/l	-0.003 (-0.005 – -0.000)	0.045	-0.003 (-0.005 - 0.000)	0.041
FBG, mmol/l	0.002 (-0.005 – 0.009)	0.548	0.001 (-0.005 – 0.008)	0.668
HbA1c, %	0.006 (0.002 – 0.010)	0.006	0.006 (0.002 – 0.010)	0.006
Independent variable: Time SpO₂ <90% TST				
WC, cm	0.064 (-0.014 – 0.141)	0.108	-	-
SBP, mmHg	0.110 (-0.025 – 0.245)	0.108	0.093 (-0.042 – 0.228)	0.176
DBP, mmHg	-0.023 (-0.148 – 0.102)	0.713	-0.044 (-0.168 – 0.080)	0.485
TG, mmol/l	0.003 (-0.003 – 0.009)	0.313	0.002 (-0.004 – 0.008)	0.495
cHDL, mmol/l	-0.002 (-0.099 – 0.202)	0.245	-0.002 (-0.005 - 0.001)	0.239
FBG, mmol/l	0.052 (-0.005 – 0.009)	0.497	0.038 (-0.114 – 0.190)	0.624
HbA1c, %	0.007 (0.002 – 0.012)	0.009	0.007 (0.002 – 0.012)	0.009

Definitions of abbreviations: WC, waist circumference; SBP, systolic blood pressure; DBP, diastolic blood pressure; TG, triglycerides; cHDL, high density lipoprotein cholesterol; FBG, fasting blood glucose; HbA1c, the percentage of glycosylated hemoglobin;

Data was analyzed using linear regression being the dependent variable each of metabolic parameters and the independent variable apnea-hypopnea index or Time SpO₂ <90%

TST. Results were expressed as unadjusted and adjusted β coefficient (95% confidence interval) and p-value.

* data adjusted by age, gender, BMI and smoking

** data adjusted by age, gender, waist circumference and smoking

Table e-4. General and Sleep characteristics of the female group.

	Total (n=115)	IAH < 15 (n=33)	IAH ≥ 15 (n=82)	P
Age, years mean±SD	44.0 ± 10.0	41.0 ± 10.0	45.0 ± 10.0	0.032
BMI, Kg/m² mean±SD	46.0 ± 5.3	44.9 ± 4.6	46.5 ± 5.6	0.149
Postmenopausal state, %	24.3	15.2	34.6	0.038
Current smoking, %	18.3	27.3	14.6	0.147
Alcohol consumption, %	3.5	6.1	2.4	0.338
Body Fat, % mean±SD	50.7 ± 7.4	48.0 ± 8.3	51.8 ± 6.7	0.025
WC, cm mean±SD	126.3 ± 14.2	102.6 ± 14.5	128.6 ± 13.5	0.006
Waist-Hip Ratio mean±SD	0.90 ± 0.08	0.86 ± 0.05	0.92 ± 0.08	0.001
Neck circumference, cm*	41.0 (39.0 – 43.0)	40.0 (39.0 – 42.0)	42.0 (40.0 – 43.5)	0.020
Obesity Duration, years mean±SD	25.5 ± 10.3	24.9 ± 9.3	25.7 ± 10.7	0.045
Physical Activity, METS.min.week⁻¹, mean±SD	2358.4 ± 2442.2	2103.1 ± 2411.5	2464.6 ± 2462.6	0.484
Glucose tolerance assessment[§], n (%)				
Diabetes	27 (23.5%)	7 (21.2%)	20 (24.4%)	0.512
IGT	17 (14.8%)	4 (12.1%)	13 (15.9%)	
Normal	65 (56.5%)	20 (60.6%)	45 (54.9%)	
Missing data	6 (5.2%)	2 (6.1%)	4 (4.8%)	
Arterial blood gases mean±SD				
PaO ₂ , mmHg	85.7 (10.5)	86.4 (10.2)	85.5 (10.7)	0.693
PaCO ₂ , mmHg	39.4 (4.5)	38.6 (4.1)	39.7 (4.7)	0.240
Spirometry, mean±SD				
FVC % predicted	100.3 ± 15.1	95.3 ± 16.1	102.3 ± 14.3	0.030
FEV ₁ % predicted	101.2 ± 14.8	96.2 ± 13.6	103.2 ± 14.9	0.026
FEV ₁ /FVC%	81.2 ± 7.1	79.5 ± 6.3	81.8 ± 7.2	0.125
TST, minutes mean±SD	349.6 ± 65.6	351.7 ± 51.1	348.7 ± 70.9	0.806
Sleep Efficiency, % mean±SD	75.3 ± 13.7	76.0 ± 12.1	74.9 ± 14.4	0.721
Stage I*, %	6.5 (3.8 – 11.0)	7.4 (5.0 – 9.5)	5.9 (3.5–13.4)	0.551
Stage II, % mean±SD	58.6 ± 15.5	57.6 ± 10.3	59.0 ± 17.2	0.657
SWS*, %	21.5 (14.2 – 28.9)	21.6 (13.4 – 30.0)	21.1 (15.6 – 28.9)	0.359

Stage REM* , %	14.5 (9.3 – 19.0)	14.7 (11.5 – 18.3)	14.3 (9.1 – 19.0)	0.588
Arousal index* , number/hour	22.7 (13.8 – 38.3)	11.0 (8.6 – 18.0)	27.9 (17.4 – 45.2)	< 0.001
AHI* , events/hour	30.8 (14.3 – 48.0)	11.7 (7.7 – 13.6)	36.9 (28.9 – 56.1)	< 0.001
Time SpO₂ <90%TST* , %	3.2 (0.4 – 13.8)	0.2 (0.0 – 1.1)	5.7 (1.5 – 16.1)	< 0.001
Self-reported sleep duration , hours/night mean±SD	7.61 ± 1.76	6.72 ± 1.74	7.77 ± 1.57	0.003
Epworth sleepiness scale score mean±SD	7.0 ± 5.0	7.0 ± 4.0	7.0 ± 5.0	0.642
Subjects with ESS >10 , %	29 (25.2)	7 (21.2)	22 (26.8)	0.039

Definitions of abbreviations: BMI, body mass index; WC, waist circumference; IGT, impaired glucose tolerance; PaO₂, partial arterial pressure of oxygen; PaCO₂, partial arterial pressure of carbon dioxide; FVC%, predicted percentage of forced vital capacity; FEV%, predicted percentage of forced expiratory volume in the first second; FEV1/FVC, FEV1/FVC ratio; TST, Total sleep time; SWS, slow-wave sleep; AHI, apnea-hypoapnea index; SpO₂, arterial oxygen saturation by pulse oximetry; Time SpO₂ <90% TST, mean percentage of sleep time with SpO₂ below 90%; Subjects with EES > 10: Percentage of patients with an Epworth sleepiness scale score above 10.

Data are presented as mean ± SD, median (percentile 25 – percentile 75) and percentage for normal, non-normal distributed (*) and categorical data, respectively.

Unpaired t-student, Mann-Whitney and chi-square test were performed on normally, skewed and categorical data, respectively.

§ Data according to OGTT results in 89 patients and previous known diabetes in 20 patients.

Table e- 5. The association of metabolic syndrome with obstructive sleep apnea in females

Independent Variable	Unadjusted Odds Ratio (95% CI)	p	Adjusted Odds Ratio (95% CI)	p
Presence of OSA AHI \geq 15 events/hour	3.86 (1.64-9.08)	0.002	2.79 (1.09-7.17)	0.033
Age, years			1.03 (0.97-1.10)	0.319
BMI, Kg/m ²			1.08 (0.99-1.17)	0.073
Postmenopausal state, %			1.98 (0.51-7.65)	0.322
Body Fat, %			1.02 (0.96-1.09)	0.490
Independent Variable	Unadjusted Odds Ratio (95% CI)	p	Adjusted Odds Ratio (95% CI)	p
Presence of nocturnal hypoxemia Time SpO ₂ <90% \geq 3.30% of TST	4.67 (2.11-10.45)	<0.001	3.90 (1.61-9.46)	0.003
Age, years			1.02 (0.96-1.09)	0.529
BMI, Kg/m ²			1.09 (1.00-1.19)	0.056
Postmenopausal state, %			2.17 (0.54-8.68)	0.274
Body Fat, %			1.02 (0.95-1.08)	0.640
Independent Variable	Unadjusted Odds Ratio (95% CI)	p	Adjusted Odds Ratio (95% CI)	p
Presence of OSA with significant nocturnal hypoxemia AHI \geq 15 events/hour and Time SpO ₂ <90% \geq 3.30% of TST	2.79 (1.68-4.64)	<0.001	2.47 (1.39-4.38)	0.002
Age, years			1.02 (0.96-1.09)	0.564
BMI, Kg/m ²			1.08 (0.99-1.18)	0.073
Postmenopausal state, %			2.02 (0.50-8.13)	0.321
Body Fat, %			1.01 (0.94-1.08)	0.847

Definitions of abbreviations: AHI, apnea-hypoapnea index; Presence of OSA defined as an AHI ≥ 15 events/hour; Time SpO₂ <90% TST, mean percentage of sleep time with SpO₂ below 90%; Presence of significant nocturnal hypoxemia considering values higher or equal to the median of the variable Time SpO₂ <90%TST; BMI, body mass index.

Data were analyzed using binary logistic regression. The presence of metabolic syndrome defined by NCEP ATP III modified criteria (Circulation 2009; 120: 1640-1645) was considered the dependent variable. Data were adjusted for age, BMI, postmenopausal state and Body Fat. Results were expressed as unadjusted and adjusted odds ratio (95% confidence interval) and p-value.