Beyond AHI: Phenotypic Stratification of Sleep-Disordered Breathing in Obese Women

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INTRODUCTION

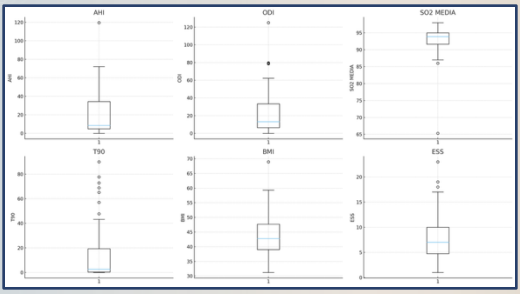
Obesity is a major risk factor for obstructive sleep apnea (OSA), yet its clinical expression is highly variable. This study aimed to **identify and characterize distinct phenotypic clusters** in obese women referred for suspected sleep-disordered breathing, to assess the potential of a **multiparametric approach beyond AHI**.

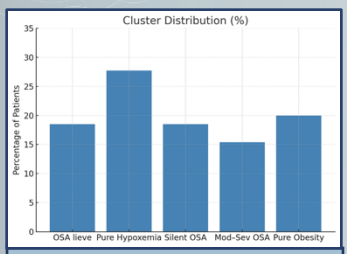
OBJECTIVES

1. Identify **clinical–functional phenotypes** based on AHI, ODI, SpO_2, T90, BMI, ESS, PSQI.
2. Explore **concordance/discordance** between subjective (ESS/PSQI) and objective (AHI/ODI) measures.
3. Assess the impact of **age** on hypoxemia and sleepiness.

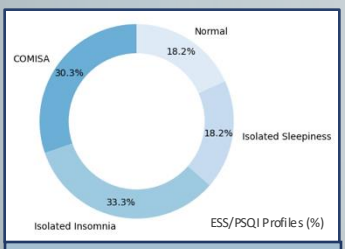
METHODS

Population: 65 obese women (mean age ~53 yrs).
Parameters: AHI, ODI, SpO_2 mean, T90, BMI, ESS, PSQI (n = 33).
Analyses:
- Descriptive stats (mean ± SD)
- Predefined clusters → Resilient OSA, Silent OSA, Pure Hypoxemia, Moderate-Severe OSA, Pure Obesity
- Spearman correlations (age ↔ ESS, SpO_2 mean, T90)
- Significance $p < 0.05$





DISTRIBUTION OF PHENOTYPIC CLUSTERS



SUBJECTIVE SLEEP AND INSOMNIA PROFILES

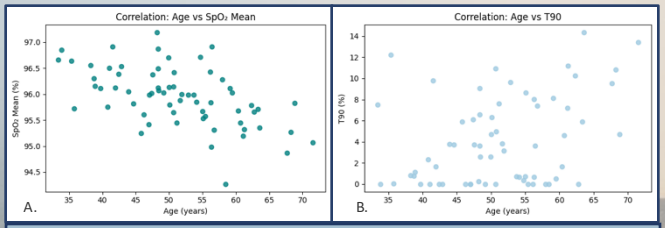
RESULTS

Five phenotypic groups emerged:

Cluster	n (%)	AHI	SpO_2%	ESS	T90%
Mild OSA	12 (18.5)	8.6 ± 2.9	94.1 ± 1.2	7.5 ± 2.1	3.8 ± 2.1
Pure Hypoxemia	18 (27.7)	7.8 ± 3.1	91.9 ± 1.1	8.2 ± 2	16.1 ± 7.3
Silent OSA	12 (18.5)	26.1 ± 7.8	93.3 ± 1.6	7.1 ± 1.9	7.2 ± 5.8
Mod-Sev OSA	10 (15.4)	32.4 ± 9.1	91.6 ± 1.5	12.1 ± 1.7	18.5 ± 6.7
Pure Obesity	13 (20)	3.0 ± 1.4	94.6 ± 0.6	7.0 ± 2	2.9 ± 1.2

ESS/PSQI profiles (n = 33):
- COMISA 30%
- Isolated insomnia 33%
- Isolated sleepiness 18%
- Normal 18%

Correlations:
- Age ↔ SpO_2 mean $\rho = -0.43$ ($p = 0.0006$)
- Age ↔ T90 $\rho = +0.28$ ($p = 0.028$)
- Age ↔ ESS ns



AGE-RELATED ASSOCIATIONS

DISCUSSION

Phenotypes such as **Silent OSA**, **Resilient OSA**, and **Pure Hypoxemia** highlight the **limits of AHI alone** as a diagnostic marker. A **combined clinical–instrumental** approach better reflects the heterogeneity of sleep-disordered breathing in obese women. **Age** was associated with worse hypoxemia but not with subjective sleepiness.

CONCLUSIONS

A **phenotypic, multiparametric framework** may improve personalized OSA management, especially in borderline or discordant cases. Monitoring beyond AHI (ODI, T90, SpO_2, ESS) could enhance risk stratification and treatment adherence.

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