

Sex Differences in Symptom Presentation among Real-World Patients with Sleep Apnoea in a Comprehensive Telehealth Sleep Care Management Program: Implications for Detection and Treatment Adoption

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Introduction

Sleep disorders often present with heterogeneous signs and symptoms that extend beyond physiologic measures. Factors related to biological sex-based differences may contribute to under-recognition and delayed diagnosis, especially among women.¹

Objective: This study aimed to 1) characterize sex differences in symptom presentation among patients seeking care in a telehealth-delivered sleep care program and 2) explore their relationship with treatment adoption.

Methods

Study Design and Participants

This retrospective, observational, analytical study investigated real-world outcomes among adults who were patients in the sleep-disordered breathing treatment pathway of a telehealth-delivered sleep care management program, 2020–2024 (employees and dependents; N=27,394 with self-reported sex as male or female). Patients with self-reported male or female sex and a positive Type III home sleep apnoea test (HSAT) were analysed (HSAT+; n=4,214).

Measures

Parameters evaluated included: Insomnia symptoms (Abbreviated 3-item Regensburg Insomnia Scale [RIS-3]), Depression (Patient Health Questionnaire [PHQ-9]), Anxiety (Generalized Anxiety Disorder [GAD-7]), Daytime sleepiness (Epworth Sleepiness Scale [ESS]), Apnoea risk (Multivariable Apnoea Prediction [MAP] index). ESS, GAD-7 and PHQ-9 full scales followed 2-item screeners; patients without a full evaluation were coded as the lowest category.

Data Analysis

Three cohorts were created: all patients, HSAT+ patients, and HSAT+ patients who adopted positive airway pressure (PAP) therapy (i.e., started PAP). Sex differences were evaluated using unadjusted ordinal logistic regression. PAP adoption was compared by sex and symptoms using unadjusted logistic regression. Characteristics of the HSAT+ cohort are presented in Table 1. Distribution of MAP and REI/AHI Severity by sex are presented in Figure 1.

Table 1. Characteristics of HSAT+ patients by sex

Characteristic	Male (n=2,488)	Female (n=1,726)
Age, mean (SD)	45.1 (10.54)	47.2 (10.55)
BMI, mean (SD)	31.5 (6.34)	32.8 (7.88)
MAP score, mean (SD)	63.2 (19.23)	37.9 (21.23)
RIS-3 score, mean (SD)	5.5 (1.81)	6.0 (1.75)
ESS completed, n (%)	2,138 (85.9%)	1,516 (87.8%)
Excessive sleepiness, n (%)	955 (38.4%)	616 (35.7%)
GAD-7 completed, n (%)	481 (19.3%)	550 (31.9%)
Moderate+ anxiety, n (%)	348 (14.0%)	414 (24.0%)
PHQ-9 completed, n (%)	355 (14.3%)	327 (18.9%)
Moderate+ depression, n (%)	303 (12.2%)	303 (17.6%)

Percentages use all HSAT-positive patients of that sex as denominator. ESS, GAD-7, and PHQ-9 full scales followed 2-item screeners ("completed"= full scale administered). Only the first 3 questions of the RIS were administered to screen for insomnia. Non-completers were coded as the lowest category in the ordinal models (Figure 2).

Conclusions

Men presented with more indicators of sleep-disordered breathing (higher MAP and REI/AHI); women reported more insomnia, anxiety and depressive symptoms. Results were generally consistent in all three cohorts. PAP adoption was higher in men, who also demonstrated higher apnoea risk and OSA severity. Sex-specific symptom patterns merit consideration across screening, diagnosis and care.

Study Limitations: Unadjusted analyses: odds ratios are not adjusted for age, BMI, or other covariates; the MAP index itself incorporates sex, age, and BMI. Symptom measures were incomplete: the RIS comprised only its first 3 items, and the GAD-7 and PHQ-9 full scales were administered only after a positive 2-item screener. Selected sample: HSAT+ patients are a subgroup, so findings may not generalise to all patients (sleepiness differed by sex among all patients but not HSAT+). Exploratory interactions: 6 sex × symptom interactions on PAP adoption were tested; none were significant (closest: MAP × sex, p=0.053).

Results

Symptom Presentation by Sex

Men and women showed distinct symptom profiles (Figure 2). Men had greater odds of higher apnoea risk (MAP; OR 6.86) and REI/AHI severity (OR 1.95); women had roughly 1.4 to 1.9-fold greater odds of insomnia, anxiety and depressive symptoms (all p<0.001). Sleepiness did not differ by sex in HSAT+ patients (p=0.69), though women scored higher across all patients. Findings were similar in all patients and PAP adopters.

Figure 1. Distribution of apnoea risk (MAP) and REI/AHI severity by sex, HSAT+ patients

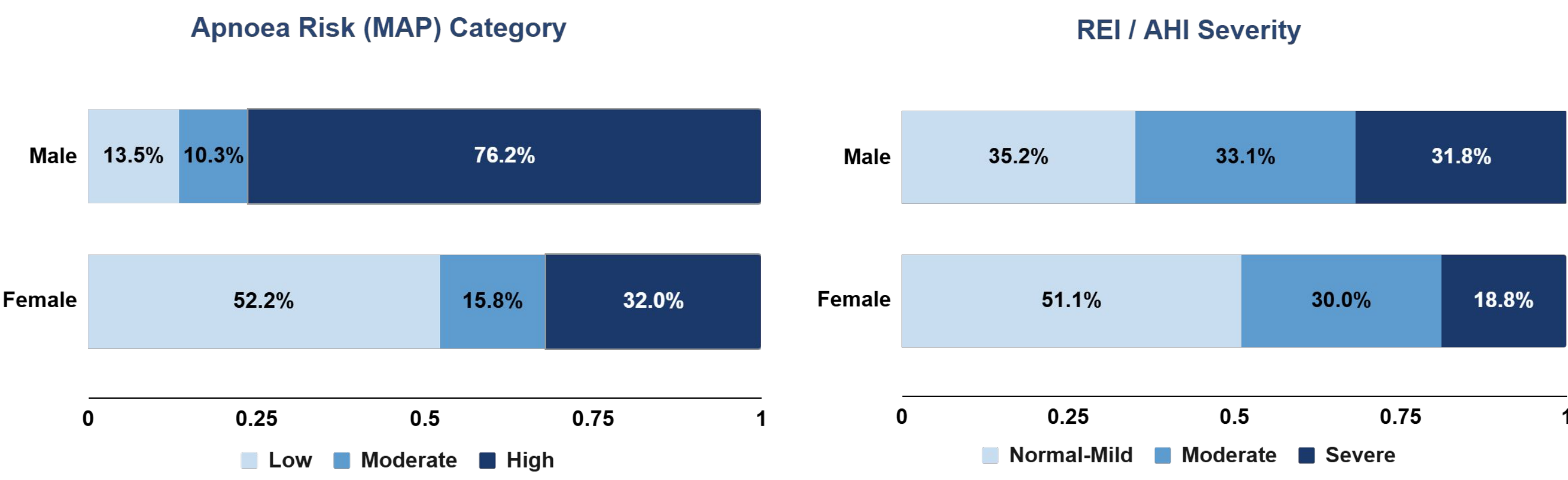
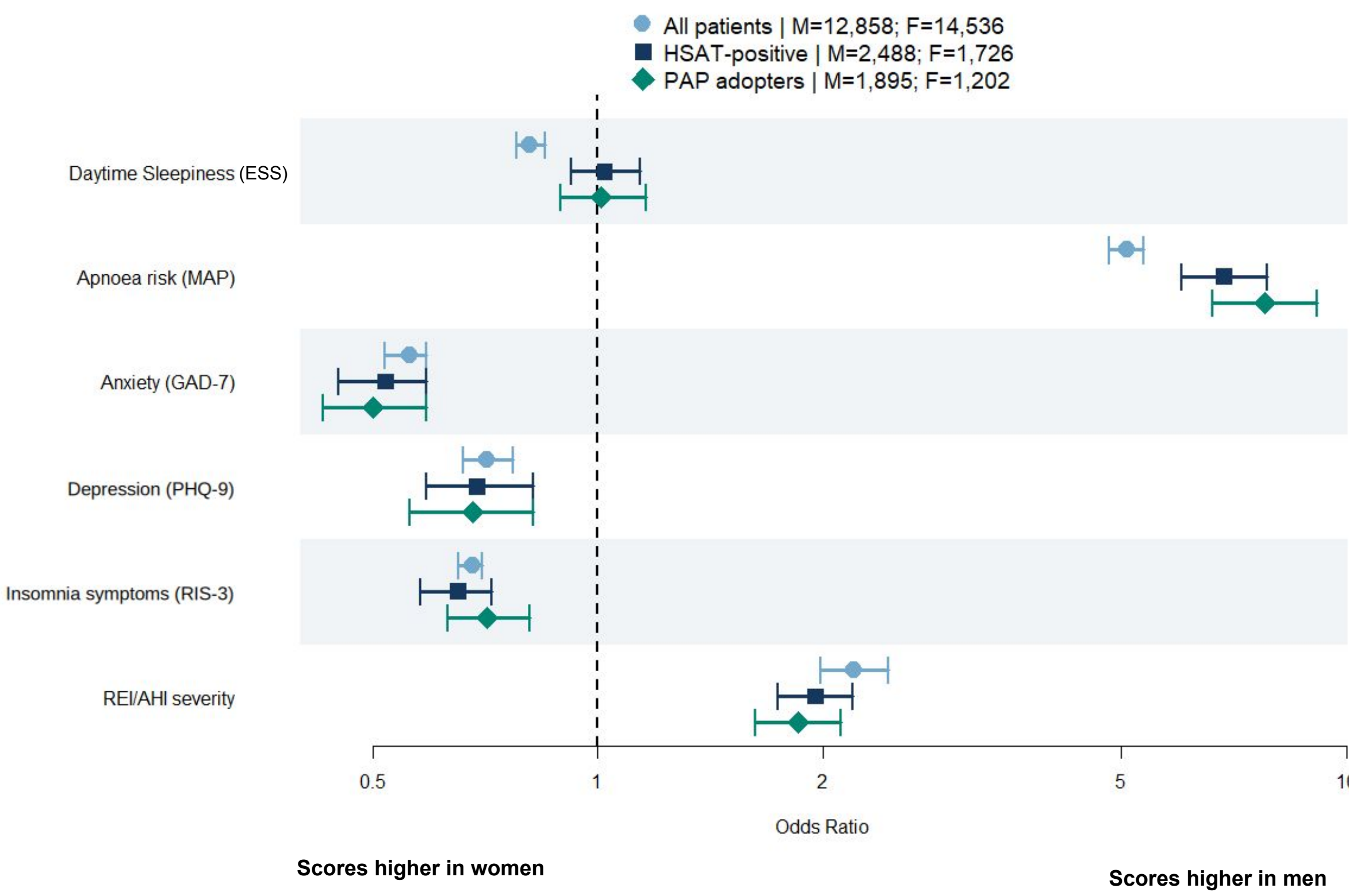


Figure 2. Sex differences in symptom measures, by cohort



Odds ratios (men vs women) with 95% CIs from unadjusted ordinal logistic regression. All p<0.001 except ESS in HSAT+ (p=0.69) and PAP-adopter (p=0.83) cohorts. ESS/GAD-7/PHQ-9 non-completers coded as lowest category.

PAP Adoption

Among HSAT+ patients (n=4,214), 3,097 adopted PAP. Adoption was higher in men (1,895/2,488) than women (1,202/1,726): unadjusted OR 1.39, 1.21-1.60. Adopters had higher MAP (OR 2.85, 2.50-3.26), REI/AHI severity (OR 2.44, 2.14-2.79) and ESS (OR 1.71, 1.51-1.93), all p<0.001. GAD-7 (OR 0.96, 0.82-1.13; p=0.65) and PHQ-9 (OR 1.19, 0.98-1.44; p=0.07) were not associated with adoption; RIS-3 effect was small (OR 1.23, 1.09-1.39).