Association Between Polysomnographic Phenotypes of Obstructive Sleep Apnea and Incident Type 2 Diabetes

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BACKGROUND

• Obstructive sleep apnea (OSA) is associated with increased risk for adult type 2 diabetes (T2DM) cardiovascular disease (CVD).
• The specific linking mechanism between T2DM and OSA has yet to be fully described, and a better characterization of OSA subgroups at higher risk for T2DM is needed.
• Concerning T2DM risk, we know little about the relationship of these polysomnographic phenotypes.

RESEARCH HYPOTHESIS

Our hypothesis: Combinations of simple, available, abstracted polysomnographic metrics (identified as phenotypes/clusters via cluster analysis) can aid in identifying OSA adults at greatest risk for T2DM.

OBJECTIVES

1) To discover differences in T2DM incidence rates using the seven polysomnographic phenotypes:
2) To compare polysomnographic baseline features with the clinical characteristics (differences) throughout polysomnographic phenotypes/clusters.
3) To examine if polysomnographic phenotypes associate with incident T2DM in an adult cohort during OSA evaluation.

METHODS

Study Design and Sample
• Retrospective secondary data analysis of the Determining Risk of Vascular Events by Apnea Monitoring (DREAM) study.
• Sample: A US veteran cohort with suspected OSA but without baseline diabetes (N=840).
• Cohort derived from three VA medical centers (West Haven, Connecticut; Indianapolis, Indiana; and Cleveland, Ohio) and enrolled from 2000-2004 with follow-up through 2012.

Definition of Incident T2DM
• Absence of known diabetes at baseline but a fasting glucose level >126 mg/dL plus a new diabetes diagnosis during the follow-up period.

Data Analysis
• Incidence rate of T2DM: The rate was calculated as number of patients with T2DM in each phenotype divided by total number of patient-years under observation. This was then expressed as number of events per 100 patient-years.
• Unadjusted and adjusted Cox proportional hazards regression: Both were used to examine the longitudinal relationship between the polysomnographic phenotypes and incident T2DM.

RESULTS

Baseline Characteristics of Polysomnographic Phenotypes
• Mild: The lowest AHI, greater sleep efficiency, a higher percentage of REM sleep
• PLMS: The highest PLMS index and a low respiratory event frequency (AHI 12.6 events/hr)
• NREM & poor sleep: An impaired sleep architecture with events in NREM sleep but minimal hypoxia
• REM & hypoxia: A preserved sleep but respiratory events in REM sleep with a higher burden of hypoxia
• Hypopnea & hypoxia: 9 out of 10 events were associated with a ≥4% desaturation and a high burden of hypoxia
• Arousal & poor sleep: Apnea with arousals only dominated, markedly disturbed sleep
• Combined severe: Markedly high AHI, highest percent combined apneas with most severe burden of hypoxia

Note: PLMS= periodic limb movements of sleep; NREM=non rapid eye movement; REM=rapid eye movement.

LIMITATIONS

• Retrospective design; criteria for DM definition.
• Non-inclusion of other metrics of physiological sleep disturbances such as hypoxic burden.

CONCLUSIONS

• T2DM incidence rates vary according to polysomnographic phenotypes in a veteran cohort.
• “Hypopnea and hypoxia” and “PLMS”, two polysomnographic phenotypes, associated independently with increased risk of T2DM.

Figure 1. Rates of Incident T2DM, Stratified by Polysomnographic Phenotypes/Clusters.

Figure 2. Kaplan-Meier Curves for the Association of Polysomnographic Phenotypes and Incident T2DM