SHHS Study: Proposal to examine the relationship between kidney failure treated by maintenance hemodialysis and subjective and objective sleep quality using a matched comparison population of SHHS II.


Background and Significance:
Poor sleep and fatigue are commonly encountered in the practice of nephrology when caring for older adults undergoing hemodialysis. In the general population, sleep studies using polysomnography show a substantial prevalence of sleep apnea and other causes of sleep fragmentation in healthy older adults that contribute to sleepiness and fatigue, hypertension and cardiovascular disease. Potentially, such sleep disorders could contribute to the very high rates of sleepiness, morbidity, and mortality in the kidney failure population. We have demonstrated that at least 80% of dialysis patients note sleep problems, over twice the rate in the general population[1]. In addition, older adults have also been shown to have a higher risk of sleep problems and note difficulties with sleep initiation and maintenance. Poor sleep quality and sleep disorders among adults with end-stage renal disease are accompanied by a high rate of hypnotic use and diminished quality of life[1, 2]. A very few preliminary studies using polysomnography suggest that sleep apnea may affect the majority of dialysis patients[3-5]. However, the relative contribution to the poor sleep and sleep complaints has not been accounted for in previous works among ESRD patients.

Our group has characterized sleep apnea and sleep quality among 46 individuals aged 50-90 undergoing hemodialysis using a Compumedics platform and scoring using SHHS protocols. The study also used the SHHS instruments to measure comorbidity and self-reported sleepiness (Sleep Health Questionnaire, Epworth, Self-Reported Comorbidity, and anthropometric measurements). To specifically determine the role of kidney failure as a factor that may contribute to sleep quality, we seek to compare them to participants in the Sleep Heart Health Study II (SHHS) that represent a cohort of community-dwelling older adults. The study of hemodialysis subjects will demonstrate the relative prevalence of subjective and objective sleep quality in this population and underline the impact of kidney failure and its treatment on sleep quality independent of aging.

Study hypothesis:
Overall Aim: To characterize self-reported sleep quality and objective sleep quality among older adults undergoing hemodialysis. 1) To describe sleep apnea and sleep quality among older adults on hemodialysis compared to community dwelling older adults. Hypothesis: Hemodialysis subjects will have significantly poorer polysomnographic and subjective sleep quality

Study population:
The control sample consisted of 137 individuals who participated in the SHHS 2001-2002 examination. The goal was to randomly assign up to three SHHS controls individually matched to each CHD patient on gender, race and as close as possible on BMI and age. Forty-three CHD patients were each assigned three controls within ± 2 kg/m2 of BMI and ± 3 years of age while two CHD patients had three matches and one patient had two matches each within ± 3 kg/m2 of BMI and ± 5 years of age.
**Outcome variables:**

Sleep efficiency was defined as the percentage total time asleep, divided by the total time in bed after lights off to the time of final awakening.

PSG sleep time and sleep efficiency were examined as dichotomous variables with short sleep using a sleep time of less than five hours.

Inefficient sleep was characterized as a sleep efficiency of less than 70%. Severe sleep apnea was classified as greater than thirty apnea-hypopnea events per hour (RDI>30).

Sleep symptoms were obtained from responses to the Sleep Habits Questionnaire on a 5-point Likert scale to the items “Have trouble falling asleep,” “Wake up during the night and have difficulty getting back to sleep,” “Wake up too early in the morning and be unable to get back to sleep,” and “Take sleeping pills or other medication to help you sleep.” Daytime symptoms were “Unrested during the day”, “Overly sleepy”, and “Not enough sleep”. Response options were Never, Rarely (1/month or less), Sometimes (2-4/month), Often (5-15/month), and Almost Always (16-30/month). For analysis, these variables were collapsed into 2 categories: Infrequent, comprising the responses Never and Rarely; and Frequent, comprising the responses Sometimes, Often, and Almost Always. Epworth Sleepiness Scale (ESS) is an 8-item self-report measure of sleepiness[18, 19]. Scores range from 0-24 and values greater than or equal to 10 are considered to indicate significant sleepiness.

**Potential Confounders:**

- **Age, Gender and Race** - will be self reported using a questionnaire
- **Anthropometrics** - Body Mass Index (BMI) will be calculated as the ratio of weight to the square of height. **Cardiovascular disease** was defined as an affirmative response to physician-diagnosed heart failure, myocardial infarction or heart attack, or previous coronary artery bypass or angioplasty. **Lung disease** was based on an affirmative answer to diagnosed bronchitis, asthma, or emphysema. **Diabetes** was defined as the current use of insulin or oral hypoglycemic agents. **Smoking** was classified as a greater than 20 pack lifetime exposure. **Alcohol** exposure was measured by the total number of beer, wine, and hard liquor beverages consumed in the average week. **Caffeine** exposure was characterized using the number of cups of caffeinated coffee, tea, and soft drinks consumed per day.

**Data analysis:**

Baseline sleep, demographic, and chronic health conditions were described using means (SD) or medians for continuous variables and as frequency distributions for categorical variables. Statistical significance of the differences between groups (e.g., presence of diabetes) was tested using two-sample t-tests or ANOVA for continuous variables and Chi-square tests for categorical variables. The strength of association between self-reported sleep quality and PSG findings were examined using the Spearman’s correlation coefficient. Adjusted analyses were performed using conditional logistic regression. In all comparisons between samples using regression, the analyses accounted for the matching of CHD cases to controls. Logistic regression was used for each sample to examine the extent to which variables were associated with the presence of chronic health conditions and severe SDB. Analyses were performed using SAS (version 8.1; SAS Institute, Cary, NC).

**Analysis responsibility:** Local analysis.