

CIRCADIAN VARIATIONS IN WATER AND SODIUM HANDLING ACCORDING TO AGE: A COMPARISON BETWEEN SUBJECTS WITH AND WITHOUT NOCTURNAL POLYURIA

Hypothesis / aims of study

Aging is accompanied by a higher prevalence of nocturnal polyuria (NP), which is explained by the interplay between physiological and pathological changes in hormonal mechanisms involved in water and sodium handling.

The aim of this study was to compare circadian variations of diuresis rate, free water clearance and sodium clearance between subjects with and without NP across different ages.

Study design, materials and methods

This was a post-hoc analysis of two prospective observational studies. A urine sample was collected every 3 hours during 24h and a blood sample was provided in order to calculate diuresis rate, free water clearance and sodium clearance. Assignment to subgroups was based on age: <40y (n=28), 41-50y (n=13), 51-60y (n=30), 61-70y (n=72), 71-80y (n=67) and >80y (n=20). In each subgroup, patients with (cases) and without (controls) NP (nocturnal urine output >90ml/h) were compared.

Results

We included 230 subjects (64% female) with a median age of 67 (56-74) years. Controls ≤60y had a lower nighttime diuresis rate and sodium clearance compared to daytime, while cases of the same age showed no circadian rhythms. In participants >60y, controls had no circadian rhythm in diuresis rate and sodium clearance, while cases showed an inversed rhythm with a higher nighttime diuresis rate and sodium clearance compared to daytime. Compared to daytime, higher nighttime values of free water clearance were found in cases >60y (figure 1).

Interpretation of results

We documented that in a population of adults without NP, there is an age-related loss of the circadian rhythm of diuresis, water diuresis and sodium diuresis. We also found that all subjects with NP, regardless of age, had a significantly higher nocturnal diuresis rate compared to the control population, but they also had an age-dependent change in circadian rhythm of diuresis, with a turning point around 60 years. Until 60 years, subjects without NP had a decrease in nighttime diuresis rate compared to daytime, while no circadian variation was observed in the subjects with NP. In participants older than 60 years, the opposite was observed: subjects with NP developed a circadian rhythm with a higher nighttime diuresis rate compared to daytime, while participants without NP lost their circadian rhythm. The timing of the change in circadian rhythm of diuresis rate coincided with the timing of changes in circadian rhythms of water and sodium diuresis.

Concluding message

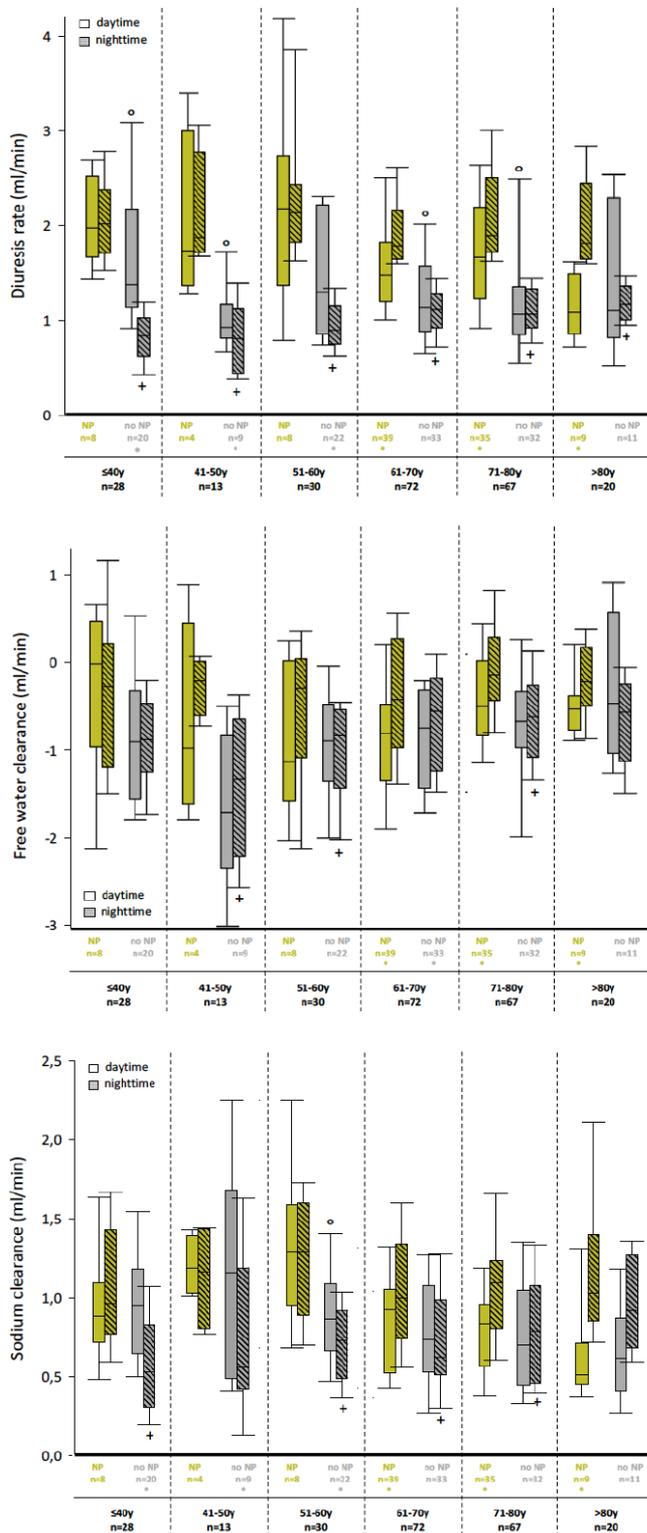
We found a turning point in the circadian pattern of diuresis rate, free water clearance and sodium clearance around 60 years.

Figure 1: Mean daytime and nighttime diuresis rate (ml/min), free water water clearance (ml/min) and sodium clearance (ml/min) in patients with and without nocturnal polyuria (NP) for different age categories

*p<0.05 for comparison between daytime and nighttime values (Wilcoxon signed rank test)

°p<0.05 for comparison of daytime values between NP and no NP (Mann-Whitney U test)

+p<0.05 for comparison of nighttime values between NP and no NP (Mann-Whitney U test)



Disclosures

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