

SLEEP MACROSTRUCTURE CHANGES ACROSS THE MIGRAINE CYCLE: PRELIMINARY EVIDENCE FROM PROLONGED HOME POLYSOMNOGRAPHIC MONITORING

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Background. Predicting migraine attacks by identifying reliable pre-ictal biomarkers remains a paramount clinical goal. Although laboratory studies show distinct neurophysiological sleep changes preceding attacks, real-world evidence is lacking. This pilot study aimed to investigate whether longitudinal, home-based polysomnography can track these phase-related fluctuations, providing a foundation for predictive digital biomarkers.

Methods. Eligible participants fulfilled ICHD-3 criteria for episodic migraine and were free of major sleep disorders or sleep-modifying medications. Continuous, home-based polysomnography was performed using a wearable device, yielding a total of 54 analyzable overnight recordings. Nights were classified as inter-ictal (>24 hours from an attack), pre-ictal (<24 hours before an attack), or ictal (the night following attack onset). Sleep parameters, including sleep latency (SL), wake after sleep onset (WASO), wake duration (WD), total sleep time (TST), sleep efficiency (SE) and sleep stage distribution were extracted from recordings. Owing to the repeated-measures design, analyses focused on within-subject comparisons and linear mixed-effects models, with correction for multiple testing.

Results. Ten patients (eight women, aged 24–54) completed 1–7 consecutive monitoring nights. The dataset included 38 inter-ictal, 5 pre-ictal, and 11 ictal nights. Neither comparisons in the whole population nor within-subject analyses revealed any statistically significant differences among interictal, ictal, and pre-ictal recordings; the largest numerical phase-related change was observed in REM sleep, which showed a higher percentage during pre-ictal than during interictal nights (median 22.6% vs 18.8%; Wilcoxon p=0.125).

Discussion. These preliminary observations suggest that migraine preferentially affects REM sleep regulation rather than global sleep architecture. Although the specific REM alterations observed differ from those reported by previous laboratory-based polysomnographic studies, these support the hypothesis that REM sleep represents the sleep stage most closely involved in the migraine cycle. This biological link aligns with literature highlighting shared aminergic and cholinergic brainstem networks that mutually regulate both REM sleep and migraine pathophysiology.

Conclusions. Although limited by the small sample size, this pilot study identifies preliminary trends in REM sleep alterations that align with established neurophysiological literature. These findings suggest that longitudinal, home-based polysomnography represents a promising approach to track phase-related fluctuations, potentially paving the way for future sleep-based digital biomarkers capable of predicting migraine attacks.