# Exploring Glucose Dysregulation in Migraine: Insights from Continuous Glucose Monitoring

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## Background

Despite being associated with hypoglycemia for nearly a century, a definitive relationship between migraines and glucose dysregulation remains elusive. Accumulating evidence suggests that migraines are in part due to a metabolic mismatch between cerebral demand and available energy. Research analyzing plasma glucose levels and migraine prevalence may further elucidate this interface between metabolic dysregulation and migraine pathophysiology and may potentially open avenues for therapeutic interventions targeting holistic metabolism for migraine management.

## Methods

We collected CGM data from 58 patients with chronic migraine and compared them to 9 controls. We analyzed the data using multiple metrics, including the Composite Glucose Index (**COGI**), Glycemic Risk Index (**GRI**), Glycemic Risk Assessment in Diabetes Equation (**GRADE**), Average Daily Risk Range (**ADRR**), Hypoglycemic Index, and Index of Glycemic Control (**IGC**), which quantify different aspects of glucose control and variability. We also calculated total glucose variance between groups and summed instances of significant glucose variation (+/- 10 mg/dL) within 25-minute periods to assess semi-quantitative glucose variance over time.

## Discussion

Our findings suggest that **migraine patients have a significantly more variable glucose baseline compared to controls**. COGI, ADRR, GRI, and IGC scores were significantly different during nighttime hours, suggesting that **migraine patients may have poorer glycemic control at night**. This finding, in conjunction with an overall lower average nighttime blood glucose, suggests a distinct circadian pattern in blood glucose for migraine patients, providing an interesting potential avenue for future research. Initial comparisons of glucose velocities show significant differences during lunchtime hours, highlighting a possible compensatory mechanism in migraine pathophysiology. Future research should explore the relationship between mealtimes and average blood glucose levels in migraine patients.

## Conclusion

While more data is needed to further elucidate the relationship between migraines and blood glucose, our research suggests that the relationship between the two may highlight a central facet of migraine pathophysiology. Future research may yield novel therapeutic approaches to this common yet enigmatic problem.

## Results

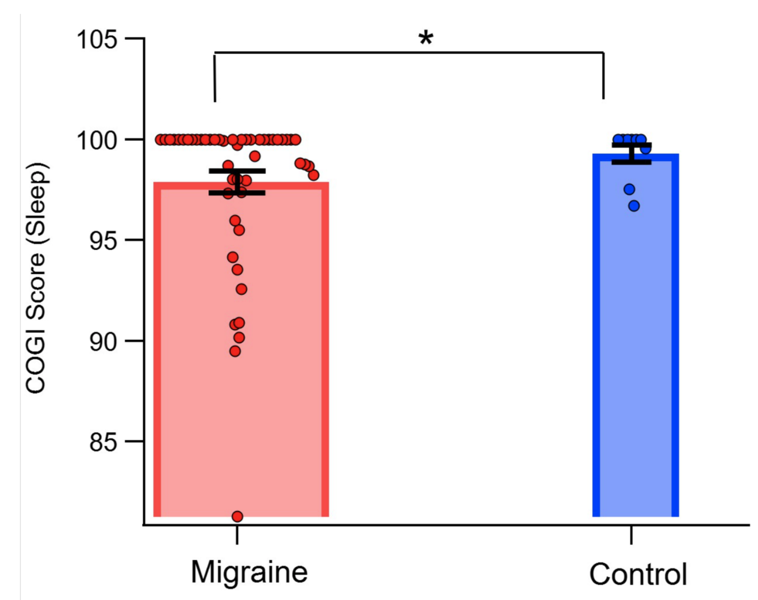



Figure 1: Continuous Glucose Monitoring Index (COGI) scores were lower for the migraine group during sleeping hours (97.9, 99.3; p=0.023)

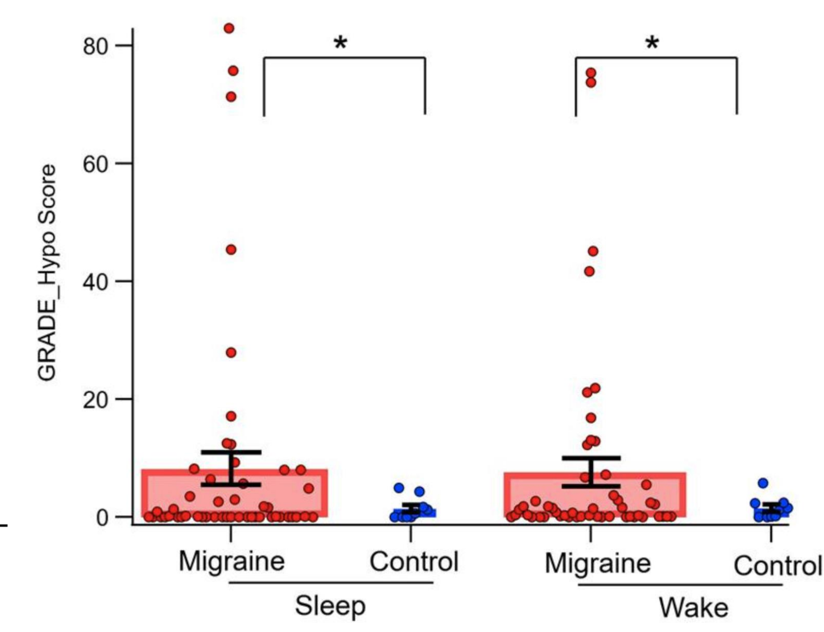



Figure 2: Hypoglycemic Risk Assessment Diabetes Equation (GRADE) scores were higher in the migraine group during both sleeping hours (8.22, 1.42; p=0.0092) and waking hours (7.61, 1.50; p=0.0080)

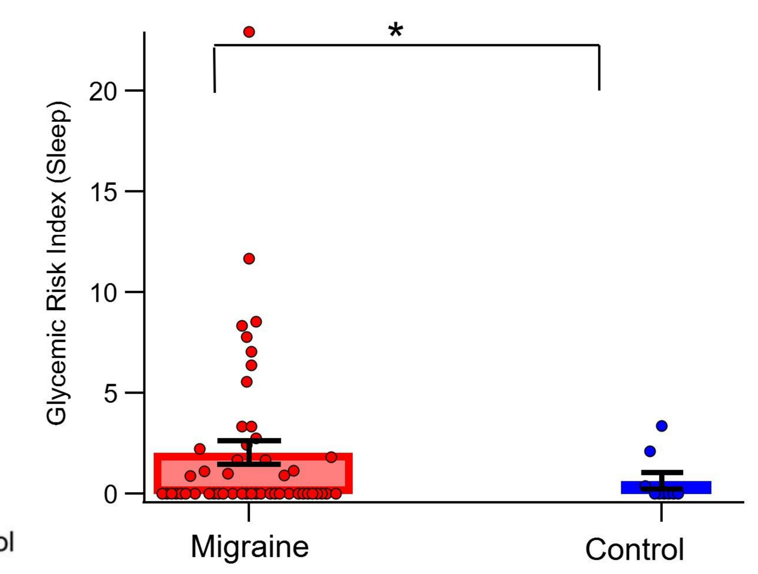



Figure 3: Glycemic Risk Index (GRI) scores were higher in the migraine group during sleeping hours (2.05, 0.65; ; p=0.015)

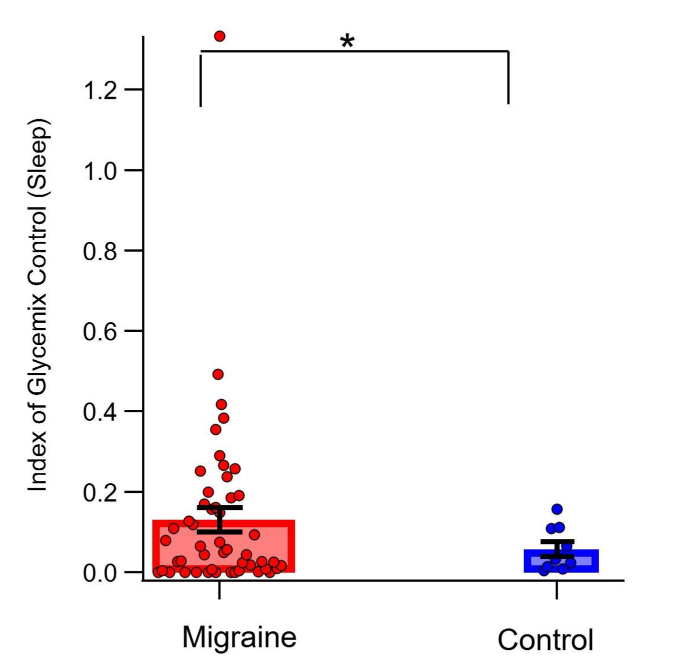



Figure 4: Index of Glycemic Control (IGC) values were higher in the migraine group during sleeping hours (0.20, 0.084; p=0.025)

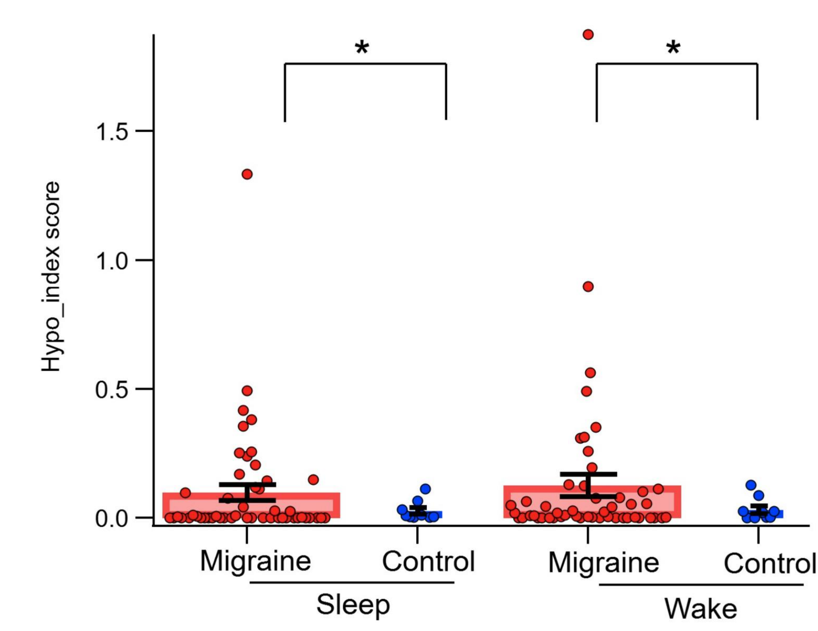



Figure 5: Hypoglycemic index scores were higher in the migraine group during both sleep (0.098, 0.032; p=0.034) and waking hours (0.12, 0.032; p=0.022)

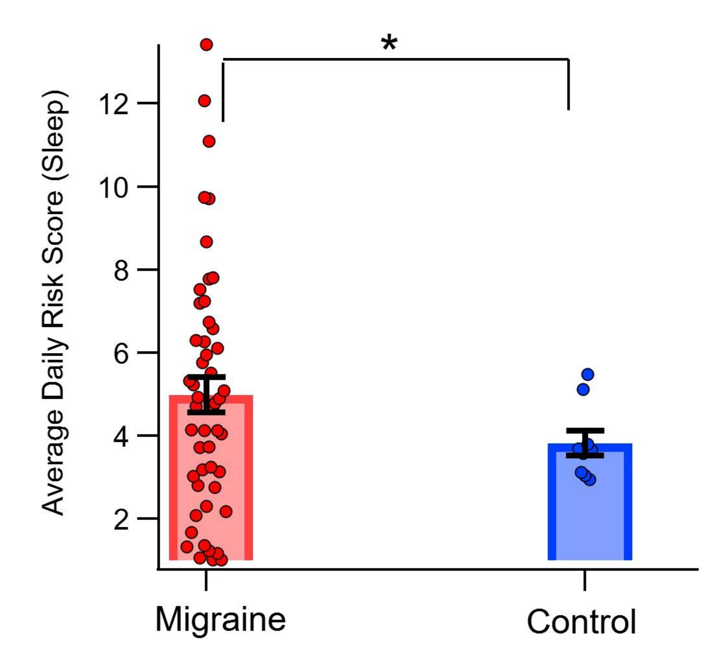
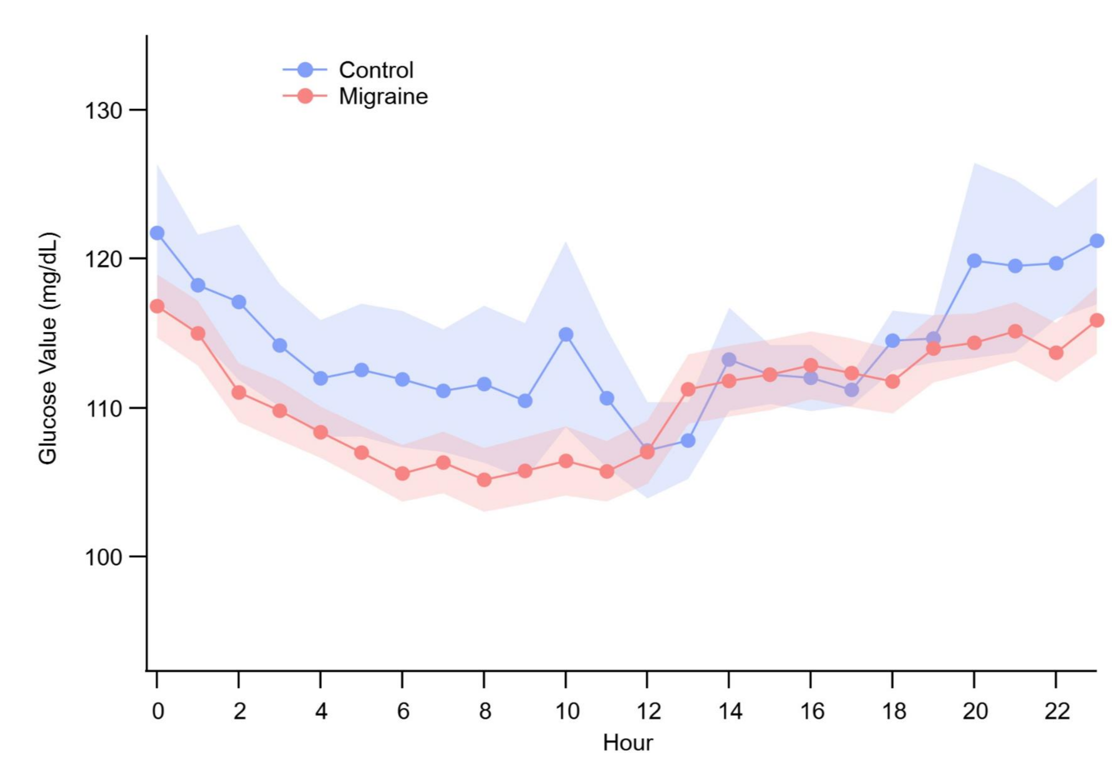



Figure 6: Average Daily Risk (ADR) scores were higher in the migraine group during sleeping hours (4.99, 3.82; p=0.014)



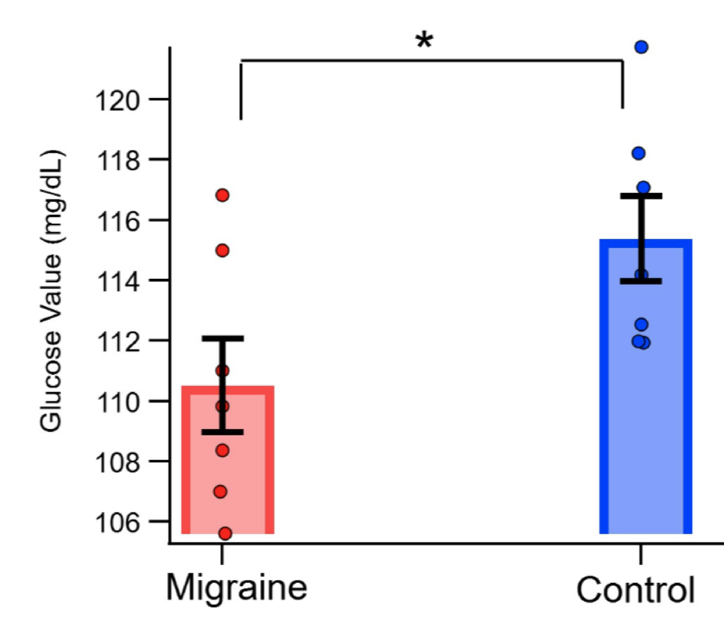
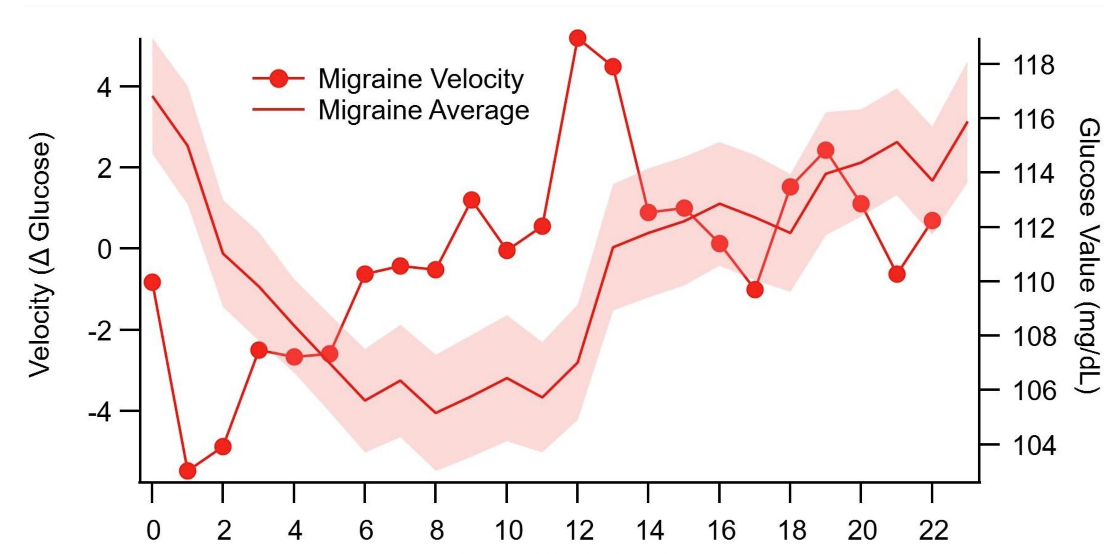




Figure 7 (leftmost): Averaged CGM data over 24-hour period

Figure 8 (rightmost): Migraine patients had significantly lower average blood glucose during the hours of 12am to 6am (110.5, 115.4; p=0.041)



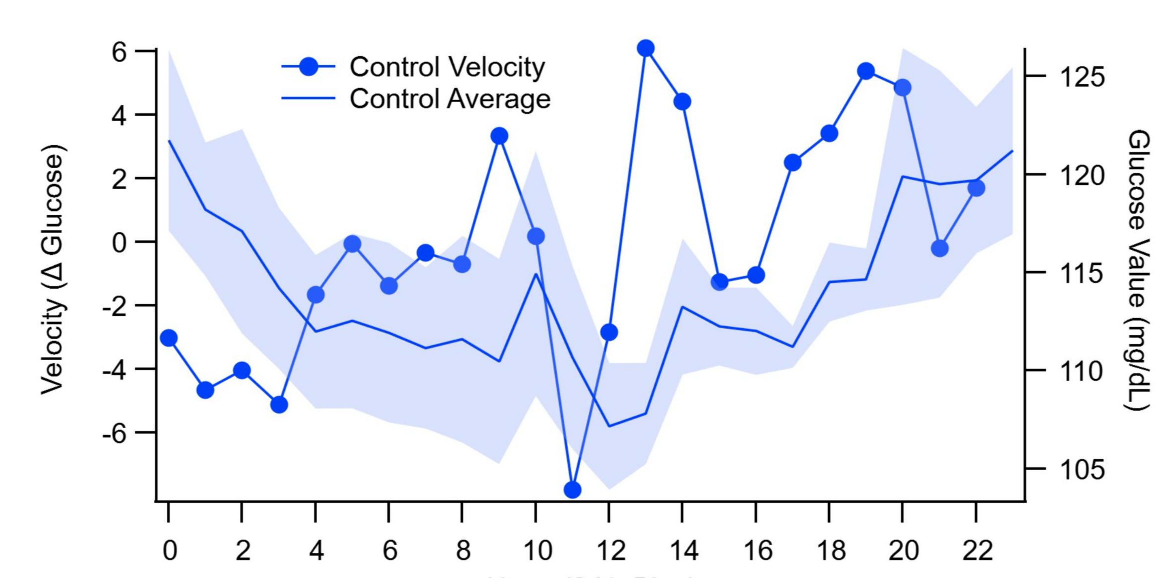
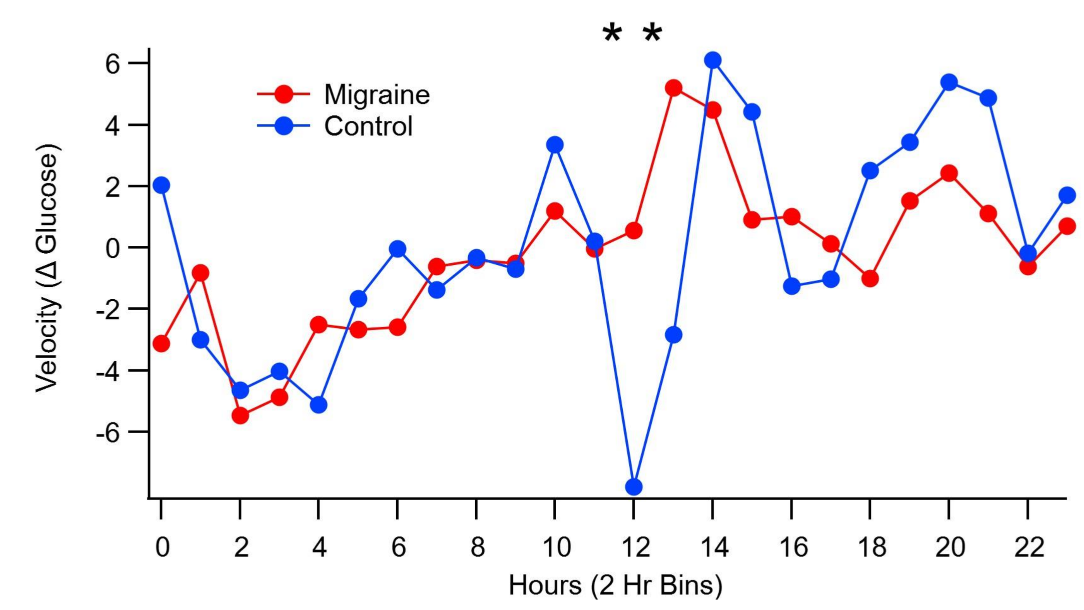
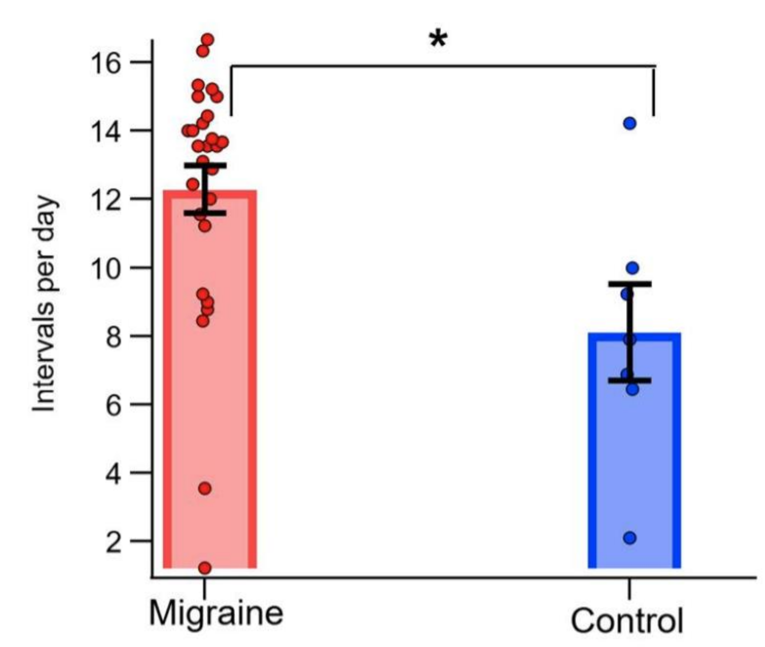




Figure 9 (left) and Figure 10 (right): Preliminary analyses of glucose velocities (changes in blood glucose per hour) show a control average velocity that seems to depend on average mealtimes, whereas migraine average velocity doesn't seem to reflect the same trends.

Figure 11 (leftmost): Average glucose velocities overlaid between groups. Velocities are statistically different at hours 1200 (mig: 0.55 mg/dL, con: -7.79 mg/dL; p=0.040) and 1300 (mig: 5.20 mg/dL, con: −2.84 mg/dL; p=0.021)

Figure 12 (right): The migraine group had more intervals of significant change (more than +/- 10 mg/dL) per day (mig: 12.3, control: 8.3; p=0.013)

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