

Glucose regulation beyond HbA1c in Type 2 Diabetes treated with insulin

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Background—We investigated the glucose variations behind HbA1c in a real-world setting in insulin treated patients with type 2 diabetes, the differences in time in range (TIR), time below range (TBR) and time above range (TAR) between different HbA1c categories used in clinical practice and whether there are differences in glucose variability. Because hypo- and hyperglycemic episodes are of special interest, we evaluated the frequency, duration and start time of the TBR and TAR episodes in different HbA1c categories.

Methods—Patients included in the Diabetes and Lifestyle Cohort Twente (DIALECT)-2 were categorized in three HbA1c categories: low, intermediate and high (≤ 53 ; 54–62 and ≥ 63 mmol/mol or 7, 7.1–7.8, 7.9%). Blood glucose TIR, TBR, TAR, glucose variability parameters and day and night duration and frequency of TBR and TAR episodes were determined by continuous glucose monitoring (CGM) and compared between HbA1c categories.

Results—No differences were found between low and intermediate HbA1c categories for TIR (76.8% [68.3–88.2] vs 76.0% [72.5–80.1]), whereas in the low category TBR was higher and TAR was lower (7.7% [2.4–19.1] vs 0.7% [0.3–6.1], and 8.2% [5.7–17.6] vs 20.4% [11.6–27.0], respectively, $p < 0.05$). Patients in the highest HbA1c category have lower TIR (52.7% [40.9–67.3]) and higher TAR (44.1% [27.8–57.0]) compared to the other HbA1c categories ($p < 0.05$), but do not have less TBR during the night. All patients had more ($0.06 \pm 0.06/h$ vs $0.03 \pm 0.03/h$, $p = 0.002$) and longer (88.0 [45.0–195.5] vs 53.4 [34.4–82.8] minutes, $p < 0.001$) TBR episodes during the night than during the day.

Conclusion—The findings, a high HbA1c does not protect against hypoglycemia and low HbA1c does not provide highest TIR, demonstrate that personalization of glycemic control requires new tools such as CGM-derived parameters.