


Abstract

Carbohydrate (CHO) Intake and Quality during Adolescence and Association with HOMA2-IR in Adulthood—The Role of the Chronotype [†]

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Abstract: Background/objectives: Adolescence is associated with two risk markers of Type 2 Diabetes Mellitus (T2DM): insulin resistance and lateness in chronotype. Hence, negative eating behavior during adolescence may increase the future risk of T2DM. We investigated the prospective relevance of carbohydrates (CHO) from high GI sources consumed in the morning and in the evening during adolescence for HOMA2-IR in young adulthood and the role of chronotypes. Methods: Examinations of subjects were performed at the DONALD study centre. Participants provided at least two 3-day weighed dietary records (median = 7 records) during adolescence and one blood sample in young adulthood. CHO quality was classified as low (<55) and moderate (≥55) according to the Glycemic Index. Chronotype was assessed with the Munich Chronotype Questionnaire and defined as age- and sex-adjusted midpoint of sleep on free days corrected for sleep debt on workdays (MSFsc) using all measurements from adolescence up to young adulthood, applying regression analyses. Earlier and later chronotypes were based on the averaged median values of MSFsc. We used the HOMA2 calculator (University of Oxford) to define HOMA2-IR from fasting insulin and glucose measures. Multivariable regression analyses (including, e.g., age, sex, BMI-SDS, physical activity and energy) assessed the longitudinal associations of interest. Testing for trend calculations were based on median values per tertile. We assessed interactions by chronotype and additionally stratified the data according to chronotype. Results: A total of N = 224 (♀n = 58%) participants with a median (Q1:Q3) age of 12 (12:13) yrs during adolescence and 22 (18:26) yrs at blood withdrawal were included. Stratified analyses by chronotype were not different and there was no significant interaction ($p > 0.05$). Only the residual of adolescent CHO consumption in the morning (<11:00 hh:mm) was significantly, inversely associated with adult HOMA2-IR (lsmeans HOMA2-IR T1: 2.96 (2.41–3.55) vs. T3: 1.95 (1.54–2.41), p for trend = 0.01). Discussion: Our data suggest that the consumption of CHO in the morning decreases HOMA2-IR independent of chronotype. The results presented in this article are part of a research project funded by the Deutsche Forschungsgemeinschaft (DFG, German Research Foundation)–AL 1794/1–2.

Keywords: carbohydrates; glycemic index; adolescents; chronotype; type 2 diabetes mellitus



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wrote the abstract; All authors reviewed and edited the abstract and contributed to the interpretation and discussion of the results and approved the final abstract. N.J. had primary responsibility for the final content. Project Administration, N.J.; Funding Acquisition, U.A. and A.B. All authors have read and agreed to the published version of the manuscript.

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Institutional Review Board Statement: The study design of the DONALD study was conducted according to the guidelines of the Declaration of Helsinki, and approved by the Ethics Committee of the University of Bonn (protocol code: 185/20 and date of approval: 29 April 2020).

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: Data of the DONALD study is available upon reasonable request to epi@uni-bonn.de.

Conflicts of Interest: Anette Buyken is a member of the International Carbohydrate Quality Consortium (ICQC), and a co-author of the popular cookbook “Nordisch abnehmen”.

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