Associations Between Media Consumption Habits, Physical Activity, Socioeconomic Status, and Glycemic Control in Children, Adolescents, and Young Adults With Type 1 Diabetes

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OBJECTIVE—To evaluate the relationship between media consumption habits, physical activity, socioeconomic status, and glycemic control in youths with type 1 diabetes.

RESEARCH DESIGN AND METHODS—In the cross-sectional study, self-report questionnaires were used to assess media consumption habits, physical activity, and socioeconomic status in 296 children, adolescents, and young adults with type 1 diabetes. Clinical data and HbA_{1c} levels were collected. Risk factors were analyzed by multiple regression.

RESULTS—Youths with type 1 diabetes (aged 13.7 ± 4.1 years, HbA_{1c} 8.7 ± 1.6%, diabetes duration 6.1 ± 3.3 years) spent 2.9 ± 1.8 h per day watching television and using computers. Weekly physical activity was 5.1 ± 4.5 h. Multiple regression analysis identified diabetes duration, socioeconomic status, and daily media consumption time as significant risk factors for glycemic control.

CONCLUSIONS—Diabetes duration, socioeconomic status, and daily media consumption time, but not physical activity, were significant risk factors for glycemic control in youths with type 1 diabetes.

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The pivotal Diabetes Control and Complications Trial (DCCT) and Epidemiology of Diabetes Interventions and Complications (EDIC) study demonstrate that poor glycemic control is associated with an increased risk of developing complications in type 1 diabetes (1). Various factors contributing to glycemic control have been identified (2). Immutable parameters such as age, sex, diabetes duration, and socioeconomic status have a major effect on metabolic control (2–6). Lower socioeconomic status is an important determinant for poor glycemic control (4,5). Modifiable factors influencing metabolic control are diabetes-related knowledge, frequency of blood glucose monitoring, and daily insulin dose (3,4,6,7). Lastly, psychosocial parameters are important in achieving good glycemic control (3–5,8–10). The influence of physical activity on metabolic control is unclear (9,11,12).

Recent research addresses the influence of modern life habits on general health. Youths spend more and more time watching television and using computers. Many studies suggest that sedentary behaviors such as watching television lead to obesity in children (13,14). In one study in youths with type 1 diabetes, Margeirsdottir et al. (15) showed that poor metabolic control was associated with extensive television watching. However, the authors did not examine other covariables, such as socioeconomic status, which is associated with both glycemic control and media consumption (4,5,16,17). Hence, the aim of this study was to examine the impact of media consumption habits, physical activity, and socioeconomic status on glycemic control in youths with type 1 diabetes.

RESEARCH DESIGN AND METHODS

In 2008 and 2009, 296 youths with type 1 diabetes (aged <22 years) attending the diabetes pediatric outpatient clinic were included in the study. Anthropometric and clinical data were recorded. BMI SD score (BMI-SDS) was calculated using national reference data (18). HbA_{1c} levels were determined by the immunoagglutination inhibition assay DCA 2000 (Bayer, Leverkusen, Germany). Self-report questionnaires from the German Health Interview and Examination Survey for Children and Adolescents (KiGGS), Robert Koch Institute, were used to determine time spent watching television and using computers (media consumption time) and to assess physical activity and socioeconomic status (19). Average daily hours of media consumption were used. In addition, questions about weekly hours of physical activity were asked. The Winkler index, with key variables graduation, school and professional education, academic training, profession, and income, was used to quantify socioeconomic status (19). The socioeconomic status index ranged from 3 to 21 points and was categorized as low (3–8 points), moderate (9–14 points), or high (15–21 points). The ethics committee of the medical faculty approved the study. Written informed consent was obtained.

Statistical analysis

We analyzed the impact of sex, age, BMI-SDS, diabetes duration, insulin pump use,

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socioeconomic status, physical activity, media consumption time, and seasonality on HbA_{1c}. We present a sample characteristic for HbA_{1c} and all covariates using mean and SD or proportions, respectively. To analyze associations between HbA_{1c} and covariates, we performed univariate analyses. To obtain adjusted results, multiple regression analysis with all covariates as independent variables was executed. The results should be interpreted in an explorative manner. Analyses were performed using SPSS version 18 (SPSS Inc., Chicago, IL).

RESULTS—Clinical characteristics of the 296 youths with type 1 diabetes were as follows: age 13.7 ± 4.1 years, diabetes duration 6.1 ± 3.3 years, BMI-SDS 0.51 ± 0.90, and HbA_{1c} 8.7 ± 1.6%. Overall daily media consumption time was 2.9 ± 1.8 h. Weekly physical activity was 5.1 ± 4.5 h. Neither physical activity nor media consumption time was associated significantly with BMI-SDS ($P = 0.15$ and $P = 0.21$). Time of sporting activity was not significantly associated with media consumption time ($P = 0.26$). Lower HbA_{1c} levels were significantly associated with younger age, shorter diabetes duration, and higher socioeconomic status (Table 1). Youths who spent >3.9 h per day consuming media had significantly higher HbA_{1c} levels compared with those who spent less time consuming media (9.3 vs. 8.4 and 8.5%, $P = 0.001$) (Table 1). Regression analysis identified diabetes duration, socioeconomic status, and media consumption time as significant risk factors for HbA_{1c} levels (Table 1). Per 1 h more daily media consumption time, we saw a mean enhancement of HbA_{1c} by 0.16% (Table 1).

CONCLUSIONS—The current study is the first to demonstrate that extensive media consumption is a significant risk factor for poor metabolic control in youths with type 1 diabetes irrespective

Table 1—*Univariate and multivariate analysis of HbA_{1c}*

	Univariate analysis			Multivariate analysis (linear regression model)	
	Percentage	HbA_{1c} (%)*	*P* value†	Regression coefficient β (95% CI)	*P* value
Sex					
Female	48	8.7 ± 1.5	0.782	−0.272 (−0.667 to 0.123) (male vs. female)	0.177
Male	52	8.7 ± 1.7			
Age (years)					
1st quartile (2.9–10.9)	25	8.0 ± 0.9	<0.001‡	0.035 (−0.019 to 0.089)	0.198
2nd quartile (>10.9–14.5)	25	8.6 ± 1.3			
3rd quartile (>14.5–17.0)	25	9.1 ± 1.8			
4th quartile (>17.0–22.0)	25	9.1 ± 1.9			
BMI-SDS					
1st quartile (−2.36 to 0.05)	25	8.8 ± 1.8	0.262	−0.004 (−0.213 to 0.205)	0.970
2nd quartile (>0.05–0.55)	25	8.4 ± 1.5			
3rd quartile (>0.55–1.16)	25	8.8 ± 1.7			
4th quartile (>1.16–2.85)	25	8.7 ± 1.5			
Diabetes duration (years)					
1st quartile (1.0–3.4)	25	8.0 ± 1.3	0.001‡	0.066 (0.002–0.131)	0.045‡
2nd quartile (>3.4–5.6)	25	8.8 ± 1.8			
3rd quartile (>5.6–8.4)	25	8.9 ± 1.5			
4th quartile (>8.4–16.7)	25	9.1 ± 1.7			
Insulin pump					
No	79	8.8 ± 1.7	0.204	−0.253 (−0.696 to 0.191) (yes vs. no)	0.262
Yes	21	8.4 ± 1.1			
Socioeconomic status					
Low	30	8.9 ± 1.7	0.004‡	0.801 (0.291–1.312) (low vs. high)	0.002‡
Moderate	37	8.5 ± 1.4			
High	33	8.0 ± 1.0		0.565 (0.117–1.013) (moderate vs. high)	0.014‡
Media consumption (h/day)					
1st quartile (0–1.6)	25	8.5 ± 1.5	0.001‡	0.158 (0.034–0.283)	0.013‡
2nd quartile (>1.6–2.6)	24	8.5 ± 1.6			
3rd quartile (>2.6–3.9)	26	8.4 ± 1.3			
4th quartile (>3.9–9.0)	25	9.3 ± 1.8			
Physical activity (h/week)					
1st quartile (0–2)	33	8.8 ± 1.6	0.465	0.014 (−0.030 to 0.057)	0.619
2nd quartile (>2–4)	19	8.6 ± 1.8			
3rd quartile (>4–7)	26	8.6 ± 1.5			
4th quartile (>7–30)	22	8.9 ± 1.7			
Seasonality					
Warm season	12	8.6 ± 1.6	0.731	0.241 (−0.830 to 0.348)	0.420
Cold season	88	8.7 ± 1.6			

*Calculation of mean HbA_{1c} ± SD for different subgroups related to covariates. Normal range HbA_{1c}: 4.3–5.6%. †Kruskal-Wallis test. ‡$P < 0.05$.

of socioeconomic status and physical activity. Several mechanisms possibly explain why media consumption time was associated with glycemic control. First, watching television promotes snacks between meals (20). Adolescents who reported watching more television had greater unhealthy food intake (20,21). Administering the correct insulin dose for ongoing eating during television time is probably more difficult compared with a shared family meal where parents support the child in calculating and injecting the insulin. It is regrettable that our study did not include questions about eating behavior or frequency of snacks during television watching. Second, family structure (e.g., single-parent household), family dynamics, and communication are important determinants of HbA_{1c} in youths with type 1 diabetes (8,10,22). Furthermore, depression of the child and depressive disorders in families are reasons why children watch more or extensively television (23). Regrettably, and as one limitation of our study, we had no detailed data about family structures or coping abilities in families. Lastly, sedentary behavior is associated with less physical activity and overweight status (13,14). Obesity possibly increases insulin resistance with a negative influence on metabolic control (24). However, in our study we did not find any associations between media consumption time and physical activity or BMI. In addition, physical activity in our study was not correlated with glycemic control. Other studies examining physical activity and its influence on metabolic control show controversial results (9,11,25).

In summary, identifying determinants for poor glycemic control is important. However, in many studies, factors such as age, sex, socioeconomic status, frequency of glucose monitoring, and diabetes knowledge together explain only <20% of the variance in HbA_{1c} (4). This is similar to our study, in which 18% of the variance of HbA_{1c} was explained by the examined factors. Therefore, extensive media consumption and many of the risk factors known to date can explain only part of the variance in HbA_{1c} and part of the risk for poor glycemic control. Further studies (e.g., intervention studies) are needed to improve on our understanding of metabolic control.

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