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Changes in body image and onset of disordered eating behaviors in youth with type 1 diabetes over a five-year longitudinal follow-up☆

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ABSTRACT

Objective: To examine changes over a five-year period in body image accuracy and dissatisfaction, as well as relationships with disordered eating behaviors (DEBs), in young patients with type 1 diabetes.
Methods: Of 81 children (42 male, 39 female) with type 1 diabetes first assessed at ages 5.1–10.06 years, 67 (83%) were re-enrolled and interviewed as adolescents (aged 10.07–15.08 years) at follow-up. DEBs were assessed using a parent-report standardized measure. Height and weight were determined, and BMI was calculated. Glycemic control was assessed by glycated hemoglobin.
Results: BMI increased from childhood to adolescence. The general tendency towards body size underestimation (i.e., perceiving the body to be smaller than it is) and dissatisfaction, already described at baseline, was found unchanged at follow-up, revealing continuing attitude towards body image problems. Body-size perception accuracy, degree of body-size dissatisfaction, and HbA1c did not increase significantly over five years, but the presence of DEBs was observed. Degree of body dissatisfaction was found to be a significant predictor for DEBs (standardized beta = 0.272, $p < 0.05$).
Conclusion: Body image problems persisted over the five-year study period and were found associated with higher levels of DEBs. Identification of such body image characteristics may be useful in developing strategies for intervention early in the course of illness.

1. Introduction

Type 1 diabetes mellitus (T1D) is a chronic disease resulting from the cell-mediated autoimmune destruction of the β-cells in the pancreatic islets of Langehrans that consequently causes absolute insulin deficiency [1,2]. This autoimmune condition requires continuous medical care, life-long monitoring and strict control of blood glucose levels and is treated with a complex regimen of insulin injections (wherein a prescribed dose of insulin matches the carbohydrate intake and endogenous glucose), dietary management and exercise, with the aim of achieving an HbA1c level near the normal range and near normoglycemia. An HbA1c target level of 48 mmol/mol (6.5%) or lower is ideal for minimizing the risk of long-term complications [2].

Individuals with T1D and their families face complex, multifaceted challenges in integrating diabetes care into their daily lives. Unsurprisingly, young people with the disease are therefore considered to be at an increased risk for psychological difficulties such as anxiety symptoms, behavioral disorders, and psychological distress [3–6]. Additionally, experts generally agree that there is a greater incidence and persistence of disordered eating behaviors (DEBs) in individuals with T1D, as compared to their peers without diabetes [7–9]. DEBs were defined as the presence of eating disorders symptoms not yet at a level of severity to be diagnosed as eating disorders, including decreasing dietary intake to lose weight, binge-eating, self-induced vomiting for weight control, the use of diuretics, laxatives, intense excessive exercise for weight control, and insulin restriction or omission [4,10]. The restriction of insulin is the practice of purposefully under-dosing, or completely omitting, the prescribed dosage of insulin, in order to purge calories via glycosuria. Because insulin misuse renders the body incapable of processing glucose, it is excreted in the urine and the consequent loss of water results in weight loss [11,12].

In adolescent and young-adult females with T1D, estimates of diagnosable eating disorders and DEBs range from 3.8% –27.5%, a range that increases to 38%–40% when insulin omission is considered purging

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[13].

Depression, weight and shape concerns, body dissatisfaction, higher BMI, adolescence, gender have been identified as predictors of DEBs in individuals with T1D [2,4]. In particular, despite the predictive power of body-image dissatisfaction for DEBs onset, which was acknowledged both in adolescents with chronic disease [14] and with T1D [15–17], the literature regarding body image in individuals with T1D still remains somewhat underdeveloped and presents inconsistent results [9,18,19].

In a case-control study analyzing body image in Italian children with T1D aged 5.6–10.6 years [20], we found that both children with T1D and controls showed body underestimation (i.e., perceiving their bodies as smaller than they were) and dissatisfaction with body size; in addition, the subjects—especially girls—were more accurate in their perception of body size than the control group. The greater accuracy shown by children with T1D in evaluating their body size was thought to demonstrate, in our opinion, the presence of differences in awareness and perception of the body as well as possible cues of problems of adaptation. Therefore, we considered such accuracy as a factor that, in time, might contribute to the onset of DEBs.

To explore this subject further, we followed the same young patients and reassessed them about 5 years after the original study. To our knowledge, no existing literature has investigated changes in body image during the crucial transition from childhood to adolescence in individuals with T1D.

Our aims were to: 1) examine the participants' changes in body-image perception and satisfaction, 2) assess the presence of DEBs, and 3) explore the relationship between DEBs and body image problems verifying the assumption that body image concerns predict DEBs.

2. Materials and methods

2.1. Participants

The sample consisted of 81 subjects first assessed in 2011–2012 [20]. In the initial evaluation to be included in the study, patients had to satisfy the following criteria: aged 5–10 years, diagnosis of T1D and absence of other illnesses. The follow-up assessment took place from September 2016 to May 2017 and consisted of 67 subjects (34 males and 33 females), 83% of the original subjects who attended Regional Center of Pediatric Diabetology “G. Stoppoloni” (University of Campania “Luigi Vanvitelli”). Each patient was accompanied by a parent. Among those not re-assessed were four subjects who refused to participate because they were in a hurry or their parents said that they were not interested, and ten subjects who could not be traced because they did not regularly attend the diabetology service.

2.2. Measures

A brief interview schedule was specifically designed and completed by clinicians (i.e., diabetologists or psychologists) to record demographic and clinical data, including height, weight, current HbA1c values, and other medical conditions. Possible missing data were obtained by reviewing medical charts.

2.3. Weight status

BMI was used as a measure of the actual weight status and was calculated as weight/height^2 (kg/m^2). Children were classified as underweight, normal weight, overweight, or obese based on international age- and sex-specific cutoff points indicated by Cole et al. [21,22]. BMI was transformed into Z-scores using the age- and sex-specific cutoffs based on national norms, using the Centers for Disease Control and Prevention's pediatric growth charts as a reference population [23].

2.4. Body image

In the initial evaluation, using Truby and Paxton's Children's Body Image Scale [24] for children aged 7 to 12 years, figural drawing scales were adopted to measure aspects of body image disturbances. For the current study, a body silhouette chart designed by Collins [25] was believed to be a measure more appropriate for the age of subjects. Although this measure is apt to be used with preadolescent children, features of Collins's drawings were considered adequate for the aims of the study due to the use of more adolescent-like silhouettes than those of Truby and Paxton's scale. Additionally, using Collins's scale allowed measurements based on the same number as Truby and Paxton's scale for evaluating the same aspects of body image (i.e., body size perception and satisfaction), which enabled comparing baseline and follow-up data. In line with the present methodological approach, other studies in the literature used Collins's silhouettes to assess adolescents' [26] and even adults' body images [27]. Collins's body silhouettes chart consists of seven male and seven female figures corresponding to different body weights, ranging from very thin to obese. Each participant was asked to choose the picture (same-gender figure) that looks the most similar to the way he/she looks (body weight perception/self/actual figure) and then the figure that shows the way he/she desires to look (ideal self/ideal figure).

Since the body silhouette chart designed by Collins [25] does not directly correspond to BMI percentile, the procedure adopted by Maximova et al. [28] was used in order to assess deviation of perceived weight status from the actual weight status. Therefore, values from the seven-item visual analog scale (silhouettes) of perceived weight status were assigned corresponding Z-scores (-3, -2, -1, 0, 1, 2, 3). To make the body-image data derived from the initial study [20] comparable to the data from the current study, the same categories were used for Truby and Paxton's silhouette.

Following this procedure, the Misperception score can be calculated as the arithmetic difference between the perceived weight Z-score and the BMI Z-score. This score ranges from positive values (the self figure was bigger than their measured BMI, i.e. the subject overestimates his/her weight status, perceiving themselves to be fatter than their real BMI) to negative values (the self figure was thinner than their measured BMI, i.e. the subject underestimates his/her own weight status, perceiving him/herself to be thinner than his/her real BMI). A Misperception score equal to 0 indicates no discrepancy between perceived and real weight (Misperception score = Z-perceived weight - ZBMI).

Similarly, the discrepancy between the actual figure and the ideal figure was measured as the degree of body-image dissatisfaction (FID or Feel minus Ideal Discrepancy). This score is computed by subtracting the score of the figure selected as the ideal figure from the score of the figure selected as the self figure (FID score = Z-perceived weight – Z-ideal weight). This score ranges from positive values (the self figure was bigger than self ideal figure, i.e. the subject would like to be thinner) to negative values (the self figure was thinner than self ideal figure, i.e. the subject would like to be fatter). FID score equal to 0 indicates no discrepancy.

2.5. DEBs

Since, to our knowledge, no Italian-validated measure assessing eating disorders and DEBs for school-age subjects was available at the time of this study, a parent-report measure was adopted. A parent-report measure was considered to be an appropriate instrument for assessing DEBs also on the basis of evidence suggesting that adolescents with T1D may not wish to overtly reveal their own problems [29], sometimes rating fewer behavioral problems than their parents did [30] or diverging from their parents' reports regarding their diabetes [31].

The Problematic Eating Behaviors Examination Questionnaire (PEBEQ) [32] is a 22-item true-false parent-report inventory developed

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