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Original article

Do adolescents accurately evaluate their diet quality? The HELENA study

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SUMMARY

Background & aims: The aim of this study was to assess the diet quality awareness and associated factors in a large sample of European adolescents.
Methods: The study included 3389 healthy adolescents, aged 12.5–17.5 years, who participated in the Healthy Lifestyle in Europe by Nutrition in Adolescence (HELENA) Study. The adolescents' diet quality was based on repeated 24 h recalls and scored into a Diet Quality Index for Adolescents (DQI-A) considering four components: meal, equilibrium, diversity and quality. A self-rated diet quality questionnaire was administered to adolescents to assess their dietary awareness. The association of DQI-A with dietary awareness was studied using a linear mixed model including the center as the random effect and dietary awareness as the fixed effect.
Results: There was a positive association between DQI-A scores and diet quality perception levels ($p < 0.0001$). The mean DQI-A was 59.0 (SD = 14.8) in adolescents with a low dietary awareness compared with 65.4 (SD = 12.6) in adolescents with high dietary awareness ($p < 0.0001$). Similar results were found for all the DQI components. When analyses were stratified, we found a significant heterogeneity across the nutritional status, with no significant association between DQI-A and dietary awareness level in obese adolescents, but a positive association in overweight, normal and undernourished groups. We found also a significant heterogeneity associated with the lunch location (school or home). No other factor affected dietary awareness (gender, pubertal status and maternal educational level).
Conclusion: European adolescents evaluate well their food quality whatever their pubertal status, gender and parental educational level, except for the obese who are not able to assess their diet quality. Improving the dietary awareness in obese adolescents might help to induce behavioral changes.

1. Introduction

The prevalence of obesity has tripled in European countries in the last 30 years, and continues to rise at an alarming rate, especially in young people [1]. Overweight and obesity have many

Abbreviations: HELENA, Healthy Lifestyle in Europe by Nutrition in Adolescence; DQI-A, Diet Quality Index for Adolescent; HELENA-DIAT, HELENA Dietary Intake Assessment Tool; FBDGs, Flemish food-based dietary guidelines; BMI, Body mass index; ISCED, International Standard Classification of Education.

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health consequences, making prevention particularly important [2]. In children, dietary habits are closely related to overweight and obesity [3,4].

Adolescence represents a period during which multiple physiological and psychological changes occur that considerably affect dietary habits [5,6]. The rapid physical growth that occurs during this period is associated with an increase in nutritional needs. Adolescence is marked by an increasing intake of energy-dense foods that are low in nutrients such as snacks and sugar-sweetened beverages and a decrease in intake of nutrient-dense foods such as fruits and vegetables [7–9]. Intervention or promotion programs for a healthy diet have been shown to have limited success in childhood and adolescence [10,11]. Lack of awareness of personal dietary habits has been identified as a major barrier to motivating adults to change to healthier diets [12]. We hypothesized that a similar barrier would apply for adolescents. Indeed, adolescents may think that they achieve healthy dietary habits because they wrongly assess their diet quality.

Therefore, the aim of the present study was to examine the diet quality awareness in a large sample of European adolescents. A secondary aim was to investigate factors associated with diet quality awareness.

2. Methods

2.1. Study design

The Healthy Lifestyle in Europe by Nutrition in Adolescence Cross-Sectional Study (HELENA-CSS) is a multicenter study performed in 10 European cities belonging to nine countries. The HELENA-CSS was designed to obtain reliable and comparable data on nutrition and health-related parameters from a sample of European adolescents aged 12.5–17.5 yr. A sample of 3528 adolescents met the HELENA general inclusion criteria. A detailed description of the HELENA study's methodology and sampling has been published elsewhere [13–15].

Written, informed consent was obtained from the adolescent and the parents. The HELENA study was approved by the local ethics committee in each country, and all procedures were performed in accordance with the ethical standards of the Helsinki Declaration of 1975 as revised in 2008 and the European Good Clinical Practices [16].

2.2. Measurements

2.2.1. Self-rated diet quality

Self-rated diet quality was assessed using a questionnaire. The adolescent was asked the single question: “Your diet is: rather unhealthy, not healthy or unhealthy, rather healthy, healthy, very healthy”. A healthy eating was defined as “a healthy diet is a well-balanced diet which contains a lot of fruit, vegetables and dairy products, a good portion of starchy foods like bread, potatoes and pasta, a moderate portion of meat or fish, and not too much fat and sugar. Also the intake of a large amount of fluid is very important in a healthy diet. The energy content of a healthy diet is in accordance with the needs of the human body” [17]. For the assessment of diet quality, the answers were classified *a priori* into three categories: low when the answer was “rather unhealthy” or “not healthy or unhealthy”, medium when the answer was “rather healthy” and high when the answer was “healthy” or “very healthy”. This question about awareness was extracted from a healthy diet determinants questionnaire that has been previously found to be reliable and valid, specifically awareness question correlated well with fresh fruit, soft drinks and ascorbic acid [18].

2.2.2. Diet quality assessment

Dietary intake was assessed by two nonconsecutive 24-h recalls performed on any two convenient days of the week [19]. The 24-h recalls were recorded using a self-administered, computer-based HELENA Dietary Intake Assessment Tool (HELENA-DIAT) that has been validated in European adolescents [20]. Detailed descriptions of data collection and analysis have been published elsewhere [20–24].

2.2.3. Participants' characteristics

Weight was measured in light clothes, without shoes, to the nearest 0.1 kg using an electronic scale (SECA 871; SECA, Hamburg, Germany). Height was measured without shoes to the nearest 0.1 cm using a telescopic height-measuring instrument (SECA 225; SECA). Body mass index (BMI) was calculated as weight (kg)/height^2 (m^2). Nutritional status was assessed according to the International Obesity Task Force scale [25]. Pubertal status was assessed by a physician through direct observation according to Tanner and Whitehouse [26].

Maternal educational level was classified into one of four categories using a specific questionnaire adapted from the International Standard Classification of Education (ISCED) (http://www.uis.unesco.org/Library/Documents/isced97-en.pdf), and was scored as 1: primary and lower education (levels 0, 1 and 2 in the ISCED classification); 2: higher secondary (levels 3 and 4 in the ISCED classification); and 3: tertiary (levels 5 and 6 in the ISCED classification).

2.3. Statistical analysis

Data are presented as percentages for qualitative variables and mean ± standard deviation (SD) for quantitative variables. Normality of distribution was checked graphically and using the Shapiro–Wilk test.

To assess the selection bias related to missing or incomplete data, the main characteristics of the included and nonincluded adolescents were compared using a Student *t*-test for quantitative variables, a chi-square test for categorical variables and the Mantel–Haenszel trend test for qualitative ordinal variables.

The association of DQI-A with dietary awareness was studied using a linear mixed model including the center as a random effect and diet quality perception level as the fixed effect (treated as an ordinal factor). We performed key subgroup analyses based on gender, pubertal status, nutritional status, maternal educational level and place adolescents used to have lunch (school or home). Heterogeneity in the association of DQI-A with dietary awareness level across subgroups was assessed by adding a multiplicative term into the linear mixed model.

All statistical tests were performed at a 2-tailed α level of 0.05. Data were analyzed using SAS version 9.4 [SAS Institute Inc., Cary, NC 27513, USA].

3. Results

Of 3528 adolescents meeting the inclusion criteria, 3389 (96%) were finally included in the statistical analysis after excluding those with missing or incomplete data for self-rated quality of diet. Characteristics of the population studied are presented in Table 1. Except for maternal educational level, there were no significant differences found between the included and nonincluded groups.

As shown in Fig. 1, the DQI-A score increased gradually with the adolescent's dietary awareness level ($p < 0.0001$). The mean DQI-A was 59.0 (SD = 14.8) in adolescents with a low dietary awareness compared with 65.4 (SD = 12.6) in adolescents with a high dietary awareness. Similar results were found for all the DQI components.

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