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AZIENDA OSPEDALIERO-UNIVERSITARIA "MAGGIORE DELLA CARITÀ" DI NOVARA
UNIVERSITA' DEGLI STUDI DEL PIEMONTE ORIENTALE

UNIVERSITÀ DEL PIEMONTE ORIENTALE

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O-BIA-SITY: Assessment of body composition in pediatric patients suffering from overweight or obesity

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Version 1 (23/10/2023)

TITLE: "O-BIA-SITY study: Assessment of body composition in pediatric patients with overweight or obesity"

BACKGROUND

In recent decades, the prevalence of obesity and overweight has drastically increased globally, thus posing a serious problem for society and the health care system in many countries, estimating an impact of 2-8% on global health care expenditures. Obesity and overweight represent a problem not only for adults but also for children and adolescents: the most recent WHO data estimate that about 340 million children and adolescents between the ages of 5 and 19 are overweight or obese, figures that have increased dramatically since 1975 from 4% of children to 18% in 2016. (1) In Italy, the 2019 national "Okkio alla Salute" survey conducted by the Istituto Superiore di Sanità found that 20.4% of school-age children result to be overweight, while obese children are 9.4%, including severely obese children who account for 2.4%. (2)

The reduction and prevention of overweight and obesity in childhood represent today, one of the main missions of public health globally, both for short-term and long-term implications. Indeed, pediatric-onset obesity predisposes to an increased chance of obesity in adulthood and an early development of related diseases, including hypertension, Diabetes Mellitus, and insulin resistance (3,4). Today, the main treatment of obesity consists of substantial lifestyle modification (diet, physical activity, sedentariness) to achieve a permanent change in habits by involving the entire household [Level of evidence I, strength of recommendation A] (5). The Mediterranean Diet (DM) is one of the most effective tools for the prevention and treatment of obesity for the pediatric population. Obesity and overweight conditions in children and adolescents are established through the use of IOTF growth curves. Specifically, a state of overweight is defined from the 75th percentile and a state of obesity from the 95th percentile. (6)

Recently, the importance of bioimpendenziometric analysis (BIA) in clinical routine has been evaluated, as it allows an estimate of body composition that would not otherwise be provided by growth curves and Body Mass Index (BMI) calculations.

In fact, BIA makes it possible to conduct both quantitative and qualitative analysis of body composition by assessing lean mass, fat mass, and body water percentage (intracellular and extracellular) in a noninvasive and inexpensive manner. In addition, through BIA the phase angle (PA) is assessed, which allows a more precise analysis of an individual's nutritional and hydration status by defining any conditions of malnutrition and/or dehydration (7). However, there are no studies conducted in pediatric settings about modulation of body composition in the literature.

Therefore, with our study we aim to investigate possible clinical and body composition changes in children and adolescents with overweight and obesity with the ultimate goal of reducing related cardio-metabolic risk factors.

PURPOSE OF THE STUDY

The aim of the study is to evaluate the effect of administering a normo/hypocaloric Mediterranean diet regimen on body composition in pediatric children, after 3 and 6 months from the start of the diet. Specifically, we want to evaluate the body composition of children and adolescents with overweight and obesity with respect to adherence to a dietary regimen, according to clinical practice. In particular, we want to evaluate the effect of administration of a normo/hypocaloric Mediterranean diet regimen on pediatric body composition.

MATERIALS AND METHODS

All children and adolescents who come to the SCDU of Pediatrics, Outpatient Endocrinology and Auxology Department of the Maggiore della Carità Hospital in Novara for first visit or checkup for excess weight between January 1, 2024, and May 30, 2024, of both sexes who satisfy the following inclusion criteria will be included in the study:

Inclusion criteria:

1. Ages between 6 and 17 years old;
2. BMI compatible with obesity or overweight according to IOTF criteria (6)
3. Signing of informed consent by parents/legal guardians.

Exclusion criteria:

1. Ages under 6 or over 18 years old
2. Previous diagnosis of type 2 diabetes mellitus already placed on dietary or drug therapy
3. Subjects already placed on a dieto-therapeutic regimen
4. Obesity secondary to diseases: genetic (Prader Willi syndrome, Down syndrome); metabolic and endocrine (Cushing's syndrome, hypothyroidism)

Informed Consent

After reading the study information sheet, patients will be enrolled only after signing the informed consent form by both parents or legal representative and recruited minor subjects (see patient and parent/legal guardian information sheets attached to the protocol).

Body composition measurement and dietary pattern definition

At enrollment (V1), included subjects will undergo a clinical examination as per normal practice, in which a bioimpendenziometric analysis for body composition assessment is planned. Impedenziometric analysis will be performed using a TANITA MC-780MA scale.

Following the bioimpendenziometric analysis and clinical examination, a dietary pattern based on the Mediterranean Diet will be delivered. The composition of the diet will be distributed as follows: 55-60% carbohydrates (45-50% complex carbohydrates and no more than 10% simple sugars), 25-30% lipids and 15% protein. It will be studied according to the LARN guidelines (Italian Society of Human Nutrition, 2014).

Follow-up

Patients will be evaluated at the time of enrollment (V1), after 3 months (V3) and after 6 months (V6) as per clinical practice.

At the recruitment visit (V1), the following demographic and medical history data of the patient and family will be collected:

sex, gender, age (years), ethnicity, weight and length at birth, type and duration of breastfeeding, parents' age (years), family history of previous diseases (Arterial Hypertension, Dyslipidemia, Hepatic Steatosis, Diabetes (specify whether type I or II and oral or insulin therapy) and cardiovascular disease, parents' smoking habit, presence of maternal gestational diabetes), socioeconomic level of the household.

The following assessments will be made at all times (V1,V3,V6):

1. **Anthropometric measurements**
   - Height
   - Weight
   - BMI and BMI SDS
   - Growth percentile according to Cacciari curves (8)
   - Waist-to-hip circumference, waist-to-height ratio
   - Bioimpedance analysis
   - PA and heart rate

- Tanner Stadium (9)

2. **Eating habits and anamnestic characteristics**
   - Semi-quantitative food frequency questionnaire (24h recall)
   - KIDMED Mediterranean diet adherence questionnaire (10)
   - IPAQ-A Physical Activity Questionnaire

Biochemical assessments will also be performed at the beginning and end of the protocol (V1 and V6), according to normal clinical practice (baseline hematochemical tests and/or OGTT). The tests will be performed at the clinical biochemistry laboratory of the AOU "Maggiore della Carità" in Novara.
During the biochemical evaluations, two serum and two plasma samples will be taken for Asprosine, Irisin, and Ghrelin dosage to search for new markers related to obesity and its complications. The analyses will be carried out at the Laboratory of Biochemistry at Eastern Piedmont University.

The determination of clinical parameters will be performed locally at the Pediatric Auxology and Endocrinology outpatient clinic of the Pediatric Clinic of the Maggiore della Carità Hospital in Novara, while the BIA examination will be performed at the Endocrinology outpatient clinic of the Maggiore della Carità Hospital in Novara.

EXPECTED RESULTS

A change in body mass index is expected, based on the BMI z-score and an improvement in body composition 6 months after the first visit and then the implementation of the dietary pattern. In addition, an improvement in metabolic parameters (insulin resistance, glycemic intolerance, dyslipidemia, hepatic steatosis) is expected.

DATA COLLECTION AND ANALYSIS

Data will be collected by the Principal Investigator, Prof. Simonetta Bellone, at the outpatient clinic of Pediatric Endocrinology and Auxology at the AOU "Maggiore della Carità" in Novara and will be collected on an Excel file protected by username and password; each patient will be registered and identified by a code in order to ensure anonymity. Statistical analysis will be conducted by a Researcher from the University of Eastern Piedmont.

Calculation of sample size

Assuming a power of 80%, a first-type error of 0.05, a mean BMI z-score at V1 of 2.81, a corresponding standard deviation of 0.9 (12) a correlation between the measurements at V6 and V1 of 0.5, 70 children will be enough to be able to observe a change in BMI z-score of 0.3.

STATISTICAL ANALYSIS

Descriptive statistics will be used to summarize demographic and anamnestic characteristics, anthropometric measures, and adherence to the Mediterranean diet and physical activity at V1.
Specifically, for numeric variables the mean and standard deviation or median and interquartile range will be reported if not distributed according to a Gaussian distribution in accordance with the Shapiro-Wilks test while categorical variables will be reported as absolute and percentage frequencies. T tests for paired data will initially be used to assess the presence of variation in anthropometric measures between V6 and V1. Next, linear mixed-effects models will be used to assess the effect of Mediterranean diet adherence and time on anthropometric measures, adjusting for anthropometric measures at V1 and demographic and clinical characteristics at baseline. A random intercept will be included in the models to account for correlation of within-patient measures. The stepwise method will be used for the selection of variables to be included in the multivariable model.
All tests will be two-tailed, and the first-type error will be set at 0.05. The analyses will be performed with SAS version 9.4 (SAS Institute, Cary, NC, USA).

ETHICAL ASPECTS AND GOOD CLINICAL PRACTICE

All essential clinical records will be retained to demonstrate the validity of the study and the integrity of the data collected.

The study is designed and will be conducted according to the international and national ethical standards on biomedical research with human beings, specifically:

- *Ethical principles for medical research involving human subjects* (Declaration of Helsinki - World Medical Association, current version);
- European Union *Standards of Good Clinical Practice* (ICH/GCP);
- *Convention on Human Rights and Biomedicine* (Oviedo Convention of 04/04/1997);
- Italian codes of ethics for health professions and specific current national regulations on clinical trials.