Abstract The aim of our work was to assess the level of fruit and vegetable consumption in the meal provided by the school canteen, also assessing the degree of appreciation for the different fruit and vegetable types. Our focus was on school children in grades 1 (6 year olds) and 5 (10 year olds) so as to cover a broad age range and to assess how tastes and fruit and vegetable intake vary as a function of age. The children’s liking of fruit was not homogeneous; oranges were the most appreciated fruits among 6 year olds while apples and kiwis were the least appreciated. The 10-year-old school children showed no statistically significant differences in their liking of certain fruit types. Fruit intake during the school meals was enough to meet a considerable amount of the vitamin C requirements, above all when oranges, kiwis and strawberries were eaten. Eating apples makes it possible to cover more than 10% of the fibre requirements. This is of great importance given its fundamental role. Although to a lower extent than vitamin C, fruit intake also allows a considerable percentage of the K nutritional requirements to be met, covering up to 28% in the case of bananas. As far as vegetables are concerned, tomatoes are the most popular among 10 year olds; given their high vitamin C content they make it possible to significantly cover the vitamin C requirements (24.5–34.1%). An important role is also played by the intake of carrots in relation to covering the retinol requirements (43.45% in grade 1 and 66.58% in grade 5).

Keywords School children · Fruit · Vegetables · Vitamin C · Index of appreciation

Introduction

School canteens are a branch of the catering sector where special preventive, educational and nutritional strategies must be combined with hygiene, health and safety measures in a total quality approach. The educational and training aspects of any action undertaken at school level must also be combined with the most up-to-date indications of nutritional prevention.

Fruit intake is a major nutritional aspect since it is not only a source of vitamins and minerals but also of polyphenols, whose consumption has an important protective function against cardiovascular and chronic degenerative disorders [1–3]. Eating fruit not only increases satiety but also reduces the intake of food with higher energy content, thus contributing to the prevention of obesity [4].

Turrini et al. [5] examined the nutritional habits of the Italian population from 1993 to 2000, with a special focus on the young age groups. Their survey pointed out that children aged from 6 to 10 are those with the least “healthy” habits compared to the rest of the study population.
In general, the data from this survey show a reduction in the number of consumers and in the level of consumption of certain products (poultry meat, fruit and vegetables). Some of these trends go very much against the current dietary indications, which suggest at least 5 servings/day of fruit and vegetables and recommend the consumption of “white” rather than “red” meat.

The healthy nutrition guidelines proposed by national and international research institutes recommend an increase in the intake of fruit and vegetables up to a minimum of 5 servings/day, since they protect against degenerative diseases such as lung cancer, as pointed out by Jansen et al. [6] in a cohort study with a 25-year follow-up carried out on 3108 men (of whom 1578 were smokers) recruited in Italy, Finland and Holland. Additional confirmation of these findings came from Miller et al. [7] and from the EPIC study [8]. An inverse relation was also observed between gastric cancer and the intake of fruit and vegetables [9].

Nevertheless, in spite of the positive evidence in favour of the consumption of fruit and vegetables, the Health Behaviour in School Aged Children [10] study found that on average only 30% of males and 37% of females state that they eat fruit every day.

The highest levels of intake are found in Israel (49% of males and 54% of females) while the lowest are reported in Estonia (17% of males and 23% of females).

The overall percentages of young people eating fruit five or more days a week are 45% for males and 51% for females, with response rates in the range between 30% and 67%.

In 16 countries and regions, over 25% of young people rarely eat fruit (only once a week or even less).

The situation does not seem to improve with age: in Project EAT (Eating Among Teens) – a large population-based study of eating patterns among adolescents in Minnesota – fruit and vegetable intake was considerably lower than the recommendations, with only 45% of subjects eating 2 or more servings a day [11].

The aim of our work was to assess the overall level of appreciation of fruit and vegetables in the school canteen as a function of the children’s age and of the type of products as well as to assess the impact of this level of appreciation on the intake of some nutrients that are particularly abundant in fruits and vegetables: dietary fibre and vitamins A, C and potassium.

Materials and methods

Study population

The study was carried out at the primary school of Sant’Antonio (Piacenza) after obtaining authorisation from the School Authorities. The survey was about the intake of fruit and vegetables during lunch.

The school children’s preferences and nutritional consumption of fruit and vegetables were assessed for 2 weeks from Monday to Friday, in order to calculate the average daily intake of nutrients from these foodstuffs served in the school canteen. Seventy-six children were enrolled in the study: 36 in grade 1 (6 years old) and 40 in grade 5 (10 years old). All the children’s parents gave written approval for their involvement in the study.

Level of appreciation, food and nutrient intake

Fruit and vegetables were weighed before being administered to each child and at the end of the meal. This made it possible to assess the intake level and the index of appreciation (IG) [12], which was calculated as follows:

The value of the index may therefore range from 0 (completely rejected) to 1 (eaten up).

The research focused on the intake of dietary fibre, vitamin A (as retinol equivalent), vitamin C and K. The food composition data provided by INRAN [13] was used to estimate nutrient intake. Due to a lack of information in the Italian database, the USDA National Nutrient Database for Standard Reference [14] was used for K content in squash.

To assess the daily nutrient intake, the consumption of each individual foodstuff was added up and then divided by the number of foodstuffs; this calculation was made separately for fruit and vegetables. Average daily intake of each nutrient was assessed by adding up the average intake of fruit and vegetables.

The nutrient requirements were those proposed in Italy by the Italian Society of Human Nutrition (SINU). Since the fibre requirements in the paediatric age group are not established by SINU, reference was made to the requirements set forth by the American Health Foundation (AHF) [15], which recommends that the intake should be equal to the age increased by 5–10 g.

Statistical analysis

Data are expressed as mean ± SD. The levels of foodstuff appreciation and intake were analysed by means of the GLM procedure of the SAS statistical package (Statistical Analysis System, Cary, NC) using the Bonferroni test with a significance level <0.05.