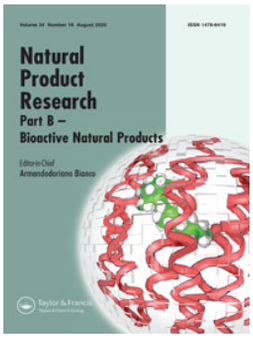

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Mediterranean diet in a Sicilian student population. Second part: breakfast and its nutritional profile

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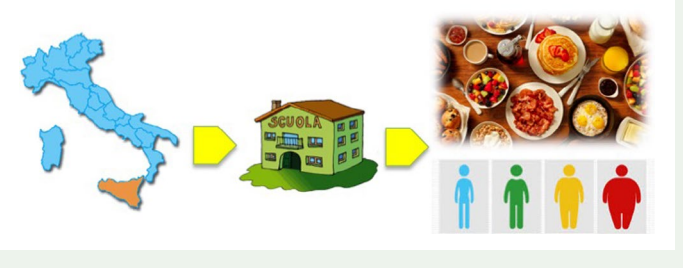
ABSTRACT

Breakfast habits affect the nutritional status and health of people, in particular children and adolescents. This is the second part a previous study about the adherence to the Mediterranean diet in a Sicilian (Italy) student population. The investigation analysed both normal weight and overweight subjects in order to understand how eating habits, number of meals and daily calorie intakes could affect their body mass indexes (BMI). The aim of this second part was to analyse the breakfast nutritional profiles of this student population. The results highlighted that breakfast was regularly consumed by a percentage ranging from a maximum of 84% (in normal subjects) to a minimum value of 57.4% (in overweight/obese students). Milk, yoghurt, sugar, bread/rusk and tea contributed as main foods to the breakfast composition. The results highlighted that subjects who consumed breakfast showed lower BMI values with significant differences between normal and overweight/obese students.



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KEYWORDS
Mediterranean diet; breakfast; student; Sicily

1. Introduction

The role of breakfast in a healthy and balanced diet is demonstrated by numerous scientific observations, which suggest both direct and mediated benefits by its macronutrients and micronutrients. The regular consumption of breakfast, which including the 15–20% of daily

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calories, is associated with a reduction in the risk of developing obesity, cardiovascular diseases and diabetes. In fact, several studies have highlighted an association among the consumption of breakfast with a better overall nutritional status, a reduction in the risk of developing obesity and a higher probability of achieving a healthy body weight in children, adolescents and adults (Timlin and Pereira 2007). Recently, the National Longitudinal Study of Adolescent Health has highlighted that skipping breakfast is an increasing trend worldwide and that such behaviour implies higher values in body mass index (BMI) in young people and adults (Niemeier et al. 2006; Reutrakul et al. 2013; Nilsen et al. 2017). However, not only breakfast is associated with BMI, but also the type of food consumed during breakfast can affect BMI values. In fact, the results of the Third National Health and Nutrition Examination Survey (NHANES III) showed that the use of cereals or bread is associated with significant lower BMI values, compared to those who 'skip' breakfast or consume meat and/or eggs for breakfast, even taking into account that eggs consumption and their cholesterol content do not impact significantly on cholesterol total intake (Cho et al. 2003; Naviglio et al. 2012). Foods consumed during breakfast have been individually associated with health: the most relevant results concern milk and cereals (Cho et al. 2003; Rampersaud et al. 2005). Furthermore, the fibers contained in cereals are important, since a diet rich in fiber is associated with a reduction in body weight (de Carvalho et al. 2017) and a better glycemic response (Mcintosh and Miller 2001; Slavin 2005) reducing the risk of obesity and type II diabetes (Cho et al. 2003; Rampersaud et al. 2005). Observational studies carried out in both United States and Europe on eating habits related to breakfast revealed that about 10–30% of children and adolescent population regularly 'skip breakfast' and that this habit tends to increase passing from childhood to adulthood (Rampersaud et al. 2005). This paper represent the second part of an investigation on the Mediterranean diet in a Sicilian student population. According to the previous study the adherence to above mentioned diet is inversely associated with an overweight-obesity status (Metro et al. 2017). The Mediterranean diet is a source of healthy constitutes such as grains, cereals, legumes, fresh fruits, vegetables, dried fruits, olive oil, spices and wine. As reported by several authors, the chemical fingerprinting of these food matrices has a key role to guarantee their genuineness and traceability (Dugo et al. 2014; Mallamace et al. 2014; Tuttolomondo, Dugo, Leto et al. 2015; Tuttolomondo, Dugo, Ruberto et al. 2015; Cacciola et al. 2016; Cannas et al. 2016; Corsaro et al. 2016; Gervasi et al. 2016; Albergamo et al. 2017). The opportunity of avoiding the use of chemicals on field by using natural compounds to control weed for foodstuff cultivated would benefit to the food risk assessment (Cimmino et al. 2012). The chemical analysis is crucial also in order to obtain their safeness, with particular attention to toxic chemical elements, pesticides, natural toxins, veterinary drugs. The monitoring of toxicant amounts in food products is a fundamental aspect that should be taken into account together with the nutritional aspects (Cangialosi et al. 2013a, 2013b; Mikušová et al. 2013; Santini et al. 2013; Arukwe et al. 2014;; Naccari et al. 2015; Bua et al. 2016; Salvo et al. 2016; Cammilleri et al. 2017; Cicero et al. 2017; Graci et al. 2017). The most used foods during Italian breakfast are milk, coffee, tea, yoghurt, bread, cereals, pastries, biscuits, honey, sugar, jam, fruits, nuts and seeds. Some of these products are also important sources of healthy macronutrients, micronutrients and other beneficial constituents (Cicero et al. 2015; Corsaro et al. 2015; Pantano et al. 2016; Mottese et al. 2017). In fact, among the beneficial constituents, the vegetable fibers have a significant cholesterol-lowering effect, while vitamins (β-carotene, vitamin C, vitamin E), phytochemicals (polyphenols) and minerals such as Selenium (Se) exert antioxidant and anti-inflammatory activities (Tosti et al. 2017). Breakfast highly rich in

whole grain intake is associated with a reduced risk of many diseases, with positive effects on cardiovascular system, diabetes, gut microbiota and body weight. The bakery products usually consumed are prepared with olive oil a fundamental ingredient of Mediterranean cooking processes (Dugo et al. 2015; Mallamace et al. 2017; Salvo, La Torre et al. 2017; Salvo, Rotondo et al. 2017). Furthermore, the consumption of nuts and seeds during breakfast and out of meals is a good source of omega-6 and omega-3 fatty acids and plant sterols, which contribute in lowering LDL-cholesterol and coronary hearth disease events (Tosti et al. 2017). In the light of all the above consideration, breakfast and an appropriate selection of its constituents play a key role in human diet. The globalization process with its packaged snacks, ready-to-eat products and fast meals combined with modern lifestyles are deeply modifying the eating habits worldwide. In this study, the foods most frequently selected in a typical Italian breakfast and during mid-morning or mid-afternoon snack among a Sicilian student population together with their impact on the BMI values have been evaluated.

2. Experimental

Experimental details related to this article are available online (see supplementary data).

3. Results and discussion

This study shows that breakfast is regularly consumed by a percentage ranging from a maximum of 84% (in normal subjects attending the primary school in Messina) to a minimum value of 57.4% (in overweight/obese students attending the primary school in Ragusa) as reported in Table 1. Among the normal weight subjects attending the primary school, 18.0% do not eat breakfast, while the normal-weight subjects attending secondary school 23.5% skip breakfast (Table 1). In overweight/obese subjects attending primary school 35.4% do not consume breakfast, while among the overweight/obese subjects attending secondary school 38.3% skip breakfast (Table 1).

The caloric intake of breakfast in the examined subjects was 18.5% of the overall daily calories in normal-weight subjects and the 10.8% in overweight/obese subjects. The foods consumed by the subjects examined are typical of an Italian breakfast and are reported in a decreasing percentage order as their contribution to the total composition of the breakfast: sugar, bread/rusks, milk, biscuits were consumed for 89, 77, 70, 49%, respectively; followed by jam, yoghurt, tea, brioches, cereals, chocolate milk, honey with 35, 32, 28, 22, 20, 11, 10% respectively. The greatest contribution of individual foods compared to total breakfast composition were milk (46.2%), yoghurt 11.4%, sugar (7.8%), bread and rusks (7.7%), tea (6.2%);

Table 1. Student population breakfast consumption (%).

	Normal weight				Overweight			
	Primary school		Secondary school		Primary school		Secondary school	
Breakfast (%)	Daily (%)	Non daily (%)	Daily (%)	Non daily (%)	Daily (%)	Non daily (%)	Daily (%)	Non daily (%)
Messina	84.20	15.80	74.60	25.40	66.70	33.30	60.00	40.00
Ragusa	76.50	23.50	78.40	21.60	57.40	42.60	65.60	34.40
S. Piero Patti	85.30	14.70	76.50	23.50	69.60	30.40	59.50	40.50
Median value	82.00	18.00	76.50	23.50	64.60	35.40	61.70	38.30

a minor contribution, jam, biscuits, cereals, brioches, chocolate milk, honey (percentage lower than 4.3%) (Table 2).

The surveys also highlighted the consumption food out of meals such as snacks and soft drinks/non-alcoholic drinks in the student population examined. Snacks were generally assumed during mid-morning and/or mid-afternoon: 54% mid-morning, 87% mid-afternoon. The 85% of the student population choose sweet snacks (biscuits, ice creams, industrial single packed bakery products, pastry or brioches that may contain jam or chocolate filling), 10% choose salty snacks and fruit consumption was modest 5%. The 75% of the student population examined consumed sweetened soft drinks such as cola and fruit juices, both with and without meals.

The caloric intake of snacks contributed for the 4.5% of the overall daily calories in normal subjects attending the primary school and for the 5.2% attending secondary schools. In overweight/obese students the caloric intake of snacks was the 9.8% of the total daily caloric intakes for those attending the primary school and the in the fifth grade and the 12.1% for those attending the secondary school. The caloric intake of soft drinks affected normal weight students for 3.2% of the overall daily calories attending the primary school and for 4.15% those attending the secondary school, while in overweight/obese students the caloric intake related to soft drinks was higher with a 6.6% in primary school students and a 7.15% in secondary school student population (Table 3).

Consequently, the caloric intake of snacks and soft drinks affected normal students for the 7.7% of the overall daily calories in primary school and for the 9.35% in secondary school. In overweight/obese students, contribution of snacks and soft drinks was the 16.10% in primary school and 19.25% in secondary school taking into account that the consumption of food out of meals (snacks and soft drinks) should provide a total of 13–15% of daily calories. Both the caloric intake of snacks and the BMI values (Table S2) in the examined population were lower in normal-weight subjects with respect to those reported in overweight/obese ones.

Table 2. Food consumed during breakfast.

Food	Intake (%)	Single food/total breakfast (%)
Sugar	89	7.8
Bread/Rusk	77	7.7
Milk	70	46.2
Cookies	49	3.6
Jam	35	4.3
Yoghurt	32	11.4
Tea	28	6.2
Brioches	22	3.2
Cereals	20	3.5
Chocolate milk	11	3.9
Honey	10	2.3

Table 3. Caloric intakes expressed as % of snacks and soft drinks on overall daily calories.

	Normal weight		Over weight	
Caloric intake (%)	Primary school	Secondary school	Primary school	Secondary school
Snacks	4.50	5.20	9.80	12.10
Soft drinks	3.20	4.15	6.30	7.15
Snacks + Soft drinks	7.70	9.35	16.10	19.25

4. Conclusion

In conclusion, Italian breakfast with its typical foods such as sugar, bread/rusks, milk, biscuits, jam, yoghurt, tea, brioches, cereals, chocolate milk and honey affects positively the BMI values. Normal weight students showed lower BMI values in comparison with those reported by overweight or obese students both in primary and secondary schools. Furthermore, the absence of breakfast and mid morning/afternoon high caloric snacks and soft drinks intakes highlighted a tendency to increase the BMI values especially in overweight students, affecting negatively their lifestyle and healthy growth.

Disclosure statement

No potential conflict of interest was reported by the authors.

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