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Gastro-educational intervention proposal in the classroom with family recipes: Prevention of cardiovascular risk in adolescent students

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ABSTRACT

Nutritional education is key for disease prevention. This project is based in recovery of traditional family recipes and characterization of ingredients. Therefore, the objective of the study was to elaborate a family recipe, discuss their nutritional value and modify with new ingredients in the context of a healthy diet. The intervention has been carried out in two High School Centers in Elche (Spain). A total of 120 adolescent volunteers (16–19 years of age) participated. Then, students freely prepared recipes at home with their family, indicating ingredients, cooking protocol and taking a picture at the end of the elaboration. Finally, 54 recipes were selected and analysed according their cholesterol/saturated fat ratio. The hypercholesterolaemic and atherogenic potential was calculated to classify the recipes into three ranges according to cholesterol/saturated fat ratio as high (range: 50–122), medium (18–46) and low (5–12). The intervention proposal intends to inquire about the knowledge that students have about food, gastronomy and health, particularly to their usual diet. The evaluation of knowledge acquisition is made by using a questionnaire available in Kahoot platform and passed at the beginning and at the end of intervention. Through this activity, we intend that students become aware that an unbalanced diet is a bad habit and it can be modified from adolescence, in order to obtain health benefits in the future. The aim is to give information to prevent possible health problems such as cardiovascular disease as working topic of this educational project. In this context, high schools are appropriate environments and teachers are key actors to work on all these aspects.

1. Introduction

Health education is a cross-cutting topic in schools, which should always be present in the classroom and teachers should support and integrate into their programs. Health education enables the development of skills focused in improving the quality of life. During the last fifty years, the association between correct nutrition and the prevention of the main prevalent diseases has been clearly established (Mozaffarian, 2016). A correct eating behavior is based on a healthy, sufficient and balanced diet. Right eating habits might be introduced from childhood

by parents and acquired day-by-day as a quotidian behaviour. Nevertheless, the influence of family on diet management diminishes as children grow up, and it is during adolescence when eating behavior is mostly influenced by external factors leading to psychological and emotional changes (Low Dog, 2010). Adolescents are a population group displaying a high nutritional vulnerability who dietary decisions are guided mainly by palatability of the food instead of the nutritional benefits provided. In addition, the foods consumed by adolescents are the result of variations from environmental, social, cultural and emotional factors (FEN, 2015a; García et al., 2023; Ramón-Arбуés et al.,

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2019).

Adolescence is a stage that extends from 10 to 21 years of age, and can be divided into three stages: early adolescence (ranging from 10 to 14 years of age), adolescence itself (14–19 years of age) and late adolescence (19–22 years of age) (SEPEAP, 2021). Recently, the World Health Organization (WHO) has extended this period to 25 years of age (WHO, 2020). During this stage, adolescents undergo various changes that affect all areas of their lives. An incorrect transition to adulthood can lead to psychiatric disorders such as anxiety, in which adolescents display higher rates compared to the general population (Keck et al., 2020; AESAN, 2023). Therefore, health promotion, including correct nutrition habits, is a long-term investment that saves major economic, social and health costs in terms of life quality. To this end, "gastro-educational" intervention in schools becomes an essential tool to improve the social, nutritional, culinary and emotional skills of students. In addition, gastro-education favours school coexistence based on respect and equality.

Then, the objective presented in this report is to develop a gastro-educational tool, combining the knowledge of food matrices and ingredients of traditional family recipes. The health contribution comes from the knowledge of food, ingredients and cooking process that are part of the recipe. Then, recipes were categorized according to their hypercholesterolemic-atherogenic profile, determined as cholesterol/saturated fat ratio (Connor et al., 1986). The main idea is to contribute in the prevention of cardiovascular diseases in adolescents, thus responding to a health problem of worldwide concern.

2. Materials and methods

2.1. Intervention design

The gastro-educational intervention proposal consists in an educational tool made by a multidisciplinary team formed by Professors of the University Miguel Hernández (Elche, Spain), Medicine Doctors of the Health Center El Raval (Elche, Spain), Psychopedagogues and Teachers from the two High Schools (I.E.S Carrús and Devesa School Center, Elche, Spain) participating in the project. The gastro-educational project started in the academic year 2021/2022 with adolescents from the first year of High School. The methodology was divided into different phases (Fig. 1). The first phase consisted in the analysis of nutritional knowledge that adolescents have at the beginning of the project. To this end, the Psychopedagogues of High School Centers and Teachers past a questionnaire (available at Kahoot platform) prepared by the University Professors. The questionnaire consisted in 10 multiple choice questions with 4 options to answer (Table 1). The second phase consisted in workshop sessions provided to adolescents by professors of the University in order to increase their nutritional knowledge. During this phase, the socio-economic family status of adolescents was explored in the classroom using a zip code to preserve anonymity. The second phase

finished with an action plan, implementing the collection of recipes (see next section). Finally, in the third phase, a second questionnaire available in the Kahoot platform (Table 1) was passed to participants for a new evaluation.

2.2. Compilation of recipes

A digital sheet was designed to note and describe both the ingredients and the process of elaboration/cooking of the recipes, including a picture of the final result. Adolescents that freely decided to participate, were informed that recipes have to be elaborated at home with participation of the corresponding family members, including parents and grandparents. The main action consisted of encouraging the practice and recovery of traditional family recipes, and characterization of ingredients. A manual called GastroUMHdiet was developed with the aim of discussing the nutritional value of collected recipes in the context of healthy eating. To focus in the cardiovascular health, the lipid profile was analysed according to the cholesterol/saturated fat index (CSI) (Connor et al., 1986): $CSI \text{ of a food portion} = 1.01 \times \text{Saturated Fat (g)} + 0.05 \times \text{Cholesterol (mg)}$. Higher CSI corresponds to high atherogenic potential of the analysed food.

2.3. Selection criteria

A sample of 187 adolescents from the 1st year of High School from 2 different centers in the city of Elche (Spain) were selected. The choice of the centers is randomized after the request to participate. The recipes were collected from all High School students who agreed to participate voluntarily in the study. Before collecting the recipes, the objectives of the research were explained to them. The informed consent form signed by adolescents and parents was collected from each participant. Authorization and approval from the Ethics Committee of Miguel Hernández University was obtained, according to Declaration of Helsinki.

2.4. Data processing

A database is generated with the information of the ingredients collected from the digital cards completed by participants. Data were transferred to an Excel sheet designed to carry out the lipid profile analysis. The saturated fat/cholesterol index of each preparation was calculated. Looking at food labels, the total amount of saturated fat in the recipe was determined. Labels indicate saturated fat/100 g, but this is translated to the amount of the ingredient used in the recipe. This involves identifying the ingredients containing saturated fats and summing the quantities of each. Next, the total amount of cholesterol in the recipe was determined in the same way. Again, this involves identifying the ingredients containing cholesterol, calculate the amount of cholesterol according to the quantity of ingredient used in the recipe and

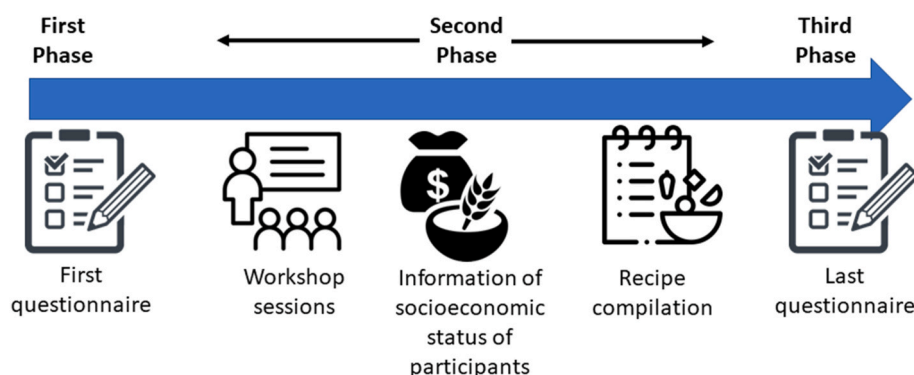


Fig. 1. Scheme of intervention.

Table 1

Questionnaires available in Kahoot platform. (*) Correct answers.

 Questionnaire passed at the beginning of intervention Here the first option of each question (option a) should start in a new line.

1. The World Health Organization (WHO) recommend the following amount of fruits and vegetables:
 - a) 5 pieces of fruit and vegetables per day.*
 - b)6 pieces of fruit and vegetables per day.
 - c)3 pieces of fruit and vegetables per day.
 - d)2 pieces of fruit and vegetables per day.
2. The consumption of dairy products servings per day should be?
 - a) 2–4 servings/day.*
 - b)6–8 servings/day.
 - c)3–4 servings/day.
 - d)None is correct.
3. What are the causes of dysbiosis?
 - a) Unbalanced diets.
 - b)Medicalization.
 - c)Excessive consumption of highly processed foods.
 - d)All are correct.*
4. What are the nutritional benefits of legumes?
 - a) Rich in soluble fiber.
 - b)Low sodium.
 - c)They are a source of vegetable proteins.
 - d)All are correct.*
5. Which of the following beverages is considered as milk?
 - a) Soy milk.
 - b)Rice milk.
 - c)Oat milk.
 - d)None.*
6. Which foods provide nutrients that are very beneficial for the digestive system and microbiota?
 - a) Rich in fiber.
 - b)Vegetables and omega-3.
 - c)Probiotics.
 - d) All are correct*
7. How much water do experts recommend to drink per day?
 - a) Less than 1 L
 - b) Between one and 2 L in winter or summer.*
 - c) More than 4 L.
 - d) Between one and 2 L, but only in summer.
8. Which of the following fishes is richest in unsaturated fat?
 - a) Hake.
 - b) Cod.
 - c) Monkfish.
 - d) Salmon.*
9. Which of the following foods is high in vitamin C?
 - a) Rice.
 - b) Peppers.*
 - c) Hake.
 - d) Olive oil.
10. Which fats are unhealthy and experts recommend not to consume in excess?
 - a) Monounsaturated fats.
 - b) Polyunsaturated fats.
 - c) Saturated fats.*
 - d) Vegetable fats.

 Questionnaire passed at the end of intervention Here the first option of each question (option a) should start in a new line.

1. What are the benefits of whole wheat bread?
 - a) Rich in dietary fiber.*
 - b) Low in sugars.
 - c) Low in kilocalories.
 - d) Rich in bioactive compounds.
2. The acronym of the Food and Agriculture Organization of the United Nations is:
 - a) FAO.*
 - b) OMS.
 - c) SENC.
 - d) FESNAD.
3. What are the causes of dysbiosis?
 - a) Unbalanced diets.
 - b) Medicalization.
 - c) Excessive consumption of highly processed foods.
 - d) All are correct.*
4. Which vitamin is water-soluble?
 - a) D.
 - b) E.
 - c) K.
 - d) C.*
5. Regarding legumes, one the following statements is not correct

(continued on next page)

Table 1 (continued)

Questionnaire passed at the end of intervention Here the first option of each question (option a) should start in a new line.

- a) Consumption of legumes leads to weight gain.*
- b) Legumes are recommended in a healthy and/or weight loss diet.
- c) Legumes are rich in fiber and certain vitamins and minerals.
- d) Legumes are a good source of protein.

6. Which of the following foods is considered to be in the miscellaneous group?
 - a) Natural Yogurt.
 - b) Pear.
 - c) Bread.
 - d) Dough Dumplings.*
7. The consumption of ultra-processed products has been related to:
 - a) Arterial hypertension.
 - b) Cardiovascular disease.
 - c) Diabetes Mellitus.
 - d) All are correct.*
8. Which of the following fishes is rich in unsaturated fat:
 - a) Whiting.
 - b) Cod.
 - c) Hake.
 - d) Sardine.*
9. Mediterranean diet recommends to eat a minimum of three servings per week of:
 - a) Fruits and vegetables.
 - b) Pulses and fish.*
 - c) Whole grains.
 - d) Red meat.
10. The main/basic cereal in Mediterranean diet is:
 - a) Rice.
 - b) Wheat.*
 - c) Barley.
 - d) Corn.

summing the quantities of each. Finally, the total amount of cholesterol is divided by the total amount of saturated fat. This provides an index showing how much cholesterol there is per gram of saturated fat in the recipe.

Collected preparations were categorized using the CSI obtained as objective data. The expectation maximization (EM) algorithm has been used, which automatically proposes 4 categories or clusters from the data. This served as the basis for applying the k-means algorithm, which requires indicating the number of desired categories, obtaining the corresponding groups. Starting with the reference value obtained automatically in the previous stage, the solution for values 3, 4 and 5 groups was generated. Reviewing these results from the technical nutrition perspective, grouping into 3 categories was considered to be more appropriate. The 3 definitive clusters of cholesterol/saturated fat ratio were designed as high (CSI range: 50–122), medium (CSI range: 18–46) and low (CSI range: 5–12).

3. Results

3.1. Initial nutritional knowledge of participants (1st phase) and evolution of this knowledge (3rd phase)

Nutritional knowledge of participants was evaluated at the beginning of the project through a questionnaire available in the Kahoot platform (Table 1). Certain observations are indicated when correct answers were compared to the questionnaire passed in the 3rd phase (Table 2). First, the percentage of participation decreased around 50% in the 3rd phase compared to the 1st phase. The decrease might be due to the proximity of the final evaluation of the course and some students were absent in order to prepare better the final examination probes at

home. However, the percentage of correct answers increased around 10–15% in the 3rd phase compared to the correct answers obtained in the 1st phase. This result suggests that workshops performed during the 2nd phase were a valid tool to increase knowledge of students. Nevertheless, this activity should be performed longer to assess nutritional knowledge with more optimal results. On the other hand, students with mixed competences (science + social sciences) displayed better results than students with only scientific formation in both phases. A possible explanation is that Science speciality students present greater knowledge of Nutrition at the beginning, showing more stable improvements and remembering concepts easily at the 3rd phase. Finally, students of mixed competences at La Devesa High School displayed better results than students of the same speciality at Carrús High School, at both 1st and 3rd phases. A likely explanation is that students of Carrús High School displayed a lower socio-economic status compared to Devesa High School according to the data extracted during the 2nd phase. Nevertheless, other variables in addition to the socio-economic family status should be considered in future research to interpret more accurately the obtained results.

3.2. Second phase: workshops and compilation of recipes

Once questionnaire answers were revised, students (n = 187) passed to the second phase. All assisted to the workshops, although only 54 agree to participate in the recipe compilation. A database of recipes was performed, including photographs of the final elaboration with a clear and quick description of the culinary techniques used, time management, temperatures, ingredients, basic equipment and preparation processes. The recipes were analysed according to their nutritional information focusing particularly on lipidic component: total fat

Table 2

Participation (n) and number of correct answers with percentage (%) in the 1st and 3rd phase. The study competences are indicated for each High School: Scientific speciality (Science) or mixed: science and social sciences (Mix).

High School	November 2022 (1st phase)	May 2023 (3rd phase)	High School	November 2022 (1st phase)	May 2023 (3rd phase)
La Devesa (Science)	27 (53.0%) n = 51	22 (60.3%) n = 36	Carrús (Science)	32 (50.6%) n = 63	31 (60.3%) n = 51
La Devesa (Mix)	18 (66.1%) n = 27	16 (78.5%) n = 20	Carrús (Mix)	25 (54%) n = 46	15 (67.3%) n = 22

Table 3Categorization of the 54 selected recipes according their cholesterol/saturated fat index (CSI) expressed as mean \pm standard deviation.

Low CSI: 8.72 \pm 3.86	Medium CSI: 32.83 \pm 14.17	High CSI: 91.08 \pm 41.77
1. Egg salad	2. Mixed ham and cheese sandwich	7. Sunday sandwich
3. Ham and cheese pizza	5. Chicken with chilindron sauce	9. Crusty rice
4. Shrimp salad	6. Valencian paella	10. Madrid-style stew
13. Delights of Elche	8. Rice with soy	20. Gratin leeks
14. Squid and onion-braised asparagus	11. Chicken breast with sauce	23. Stew with dumplings
17. Andalusian gazpacho	12. Chicken in almond and saffron sauce	30. Beef stew
18. Manchego ratatouille	15. Broken eggs with ham	32. Tagine
19. Sole in cider	16. Tuna pasta salad	34. Breadcrumbs
24. Avocado salad	21. Salmon tartare	38. Asturian bean stew with chorizo
26. Foolish eggs	22. Salmorejo	40. Bread crumbs with meat
27. Rice and lentils with green beans	25. Stew soup	49. Savory crepes
29. Bay sar	28. Stuffed eggplants	52. Stew with various ingredients
33. Lentils with chorizo	31. Grandmother's lentils	
35. Bread crumbs with vegetables	36. Rabbit and snail paella	
39. Rice and lentils	37. Rabbit and chicken paella	
41. Potatoes with cumin	44. Stew	
42. Manchego gazpacho	46. Rabbit paella	
43. Pumpkin stew	48. Stew soup with egg yolks	
45. Cuban-style rice	50 Harira	
47. Chicken soupy rice	51. Meat with sauce	
53. Murcian salad		
54. Cadiz fish stew		

(saturated/unsaturated: mono- and poly-unsaturated) and cholesterol. These nutrients were selected because they play a key role in cardiovascular health.

Therefore, we analysed the atherogenic potential of each recipe by calculating the cholesterol/saturated fat index or CSI (Connor et al., 1986). In this context, recipes were categorized into 3 CSI clusters as high (range: 50–122), medium (range: 18–46) and low (range: 5–12) (Table 3). High range includes recipes with more atherogenic potential. On the other hand, the ingredients of all the recipes have been classified by food groups, obtaining a categorization in 13 groups (Table 4). In this line, the ingredients that have the greatest presence in the set of recipes, were: olive oil (in 37 recipes), garlic (in 23), tomato (in 22), onion (in 21), bell pepper (in 17), rice (in 11), egg (in 10), potato (in 10), black pepper (in 10) and chicken (in 10).

After the nutritional analysis, a dietary model was established with the recipes, aiming to enhance an anti-hypercholesterolemic/atherogenic metabolic status, being the basis for a heart-healthy and sustainable diet. This tool used in the classroom was explained to adolescents in various ways with the objective to reduce the risk of cardiovascular disease through a lower intake of saturated fat and total cholesterol. Then, recipes with higher CSI were corrected introducing alternative ingredients in order to reduce the CSI (Table 5). To this end, the table of traditional ingredients of each recipe was presented to classroom groups. Next, groups are asked to indicate the ingredients that contribute to a high CSI. Then, groups are requested to provide new alternatives to reduce CSI but disturbing minimally the traditional

component and meaning of each recipe. To this end, the new ingredients were proposed as substitution or alternative suggestion. Substitution indicates a total change in the ingredient in order to diminish the CSI. Alternative suggestion refers to possible changes in ingredients that do not contribute to significant increase in the CSI, but make the final recipe healthier.

4. Discussion

Cardiovascular disease is the first cause of death in Europe. The latest reports of the State of Food Security and Nutrition in the World indicate that poor nutrition correlates positively with the increase of chronic non-communicable diseases in adults. In this context and according to WHO, non-optimal lifestyle pattern that includes poor nutrition, can lead to cardiovascular pathology (Townsend et al., 2022). Lifestyle is based on identifiable patterns of behavior, determined by the interaction between individual actions, social interactions, and socioeconomic and environmental living conditions. Therefore, cardiovascular prevention should start with lifestyle changes, including nutrition improvements through educational tools (AESAN, 2023).

Currently there is a predominant Western dietary pattern characterized by excessive consumption of red meat, processed foods, saturated fats, refined sugars and very little intake of fiber and vitamins. This type of diet weakens health and immune system (Ramón-Arбуés et al., 2019; AESAN, 2023). Several studies conducted in Spain such as the ENALIA survey (López-Sobaler et al., 2019) or the ANIBES study (FEN,

Table 4

Most commonly used ingredients in the recipes, classified in different food groups according to questionnaires used during workshops.

Food Group	Most used ingredients in the recipes
1 Grains and tubercles	Rice, potato, white bread, wheat flour, pasta
2 Vegetables	Tomato, onion, chickpea, stew
3 Fruits	Avocado, strawberry, date, orange juice, banana
4 Meat, fish, eggs	Chicken, egg, veal, rabbit, canned tuna fish
5 Sausages	Fresh chorizo, serrano ham, bacon, black pudding, white sausage, red sausage
6 Fats	Olive oil, fresh bacon
7 Alcoholic beverages	White wine, natural cider
8 Milk and dairy products	Grated cheese, cooking cream, whole cow's milk, gruyere cheese, fatty processed cheese
9 Spices	Garlic, black pepper, sweet paprika, parsley, saffron
10 Sauces	Soy sauce, vinegar, mustard, mayonnaise
11 Processed broths	Poultry stock, meat stock
12 Processed foods	
13 Miscellaneous	Honey, roasted almond, raw almond

Table 5

Proposed changes in ingredients of recipes with higher CSI (Table 1) and new CSI obtained considering only the substitution of ingredients.

Traditional ingredients	Modification Substitution (Sb)/ Suggestion (Sg)	Old/New CSI
Sunday sandwich		134.90/ 47.91
Bread	Wholemeal bread (Sg)	
Chicken		
Cheddar cheese	Tofu (Sb)	
Tomato		
Lettuce		
Pickle		
Mustard	Turmeric (Sb)	
Mayonnaise	Avocado puree (Sb)	
Extra-virgin olive oil		
Crusty rice		132.27/ 39.42
Rice	Integral rice (Sg)	
Chicken soup		
Chickpeas		
White sausage	Chicken (Sb)	
Red sausage	Rabbit (Sb)	
Tomato		
Eggs		
Extra-virgin olive oil		
Madrid-style stew		188.73/ 14.43
Chickpeas		
Blood sausage	Chicken (Sg)	
Bacon	Chicken (Sg)	
Fresh chorizo	Leek (Sb)	
Potato		
Carrots		
Gratineed leeks		135.16/ 13.19
Leeks		
Cooked ham	Chicken (Sg)	
Grated cheese	Tofu (Sg)	
Flour	Whole wheat flour (Sb)	
Whole milk	Skimmed milk (Sg)	
Pepper		
Nutmeg		
Rosemary		
Stew with dumplings		163.14/ 37.95
Chickpeas		
Meatballs	Chicken (Sb)	
Pork ribs	Turkey (Sb)	
Bacon	Chicken (Sg)	
Carrot		
Pepper		
Nutmeg		
Rosemary		
Beef stew		125.66/ 24.65
Ham	Chicken (Sb)	
Onion		
Carrot		
Garlic		
Port		
Red pepper		
Thyme		
Flour		
Sweet pepper		
Fryed tomato		
Extra-virgin olive oil		
Tagine		135.65/ 9.22
Lamb	Chicken (Sb)	
Onion		
Black pepper		
Turmeric		
Ginger		
Garlic		
Sweet paprika		
Extra-virgin olive oil		

Table 5 (continued)

Traditional ingredients	Modification Substitution (Sb)/ Suggestion (Sg)	Old/New CSI
Breadcrumbs		79.69/ 13.28
Flour	Whole wheat flour (Sg)	
Read sausage	Chicken (Sg)	
White sausage	Chicken (Sb)	
Broad beans		
Garlic		
Bacon	Turkey (Sb)	
Sweet paprika		
Water		
Asturian bean stew with chorizo		155.45/ 4.52
White sausage	Chicken (Sg)	
Blood sausage	Chicken (Sb)	
Ham	Chicken (Sb)	
Bacon	Turkey (Sg)	
Garlic		
Onion		
Tomato		
Potato		
White beans		
Peppers		
Bread crumbs with meat		141.67/ 10.21
Stale bread	Whole wheat bread (Sg)	
White sausage	Chicken (Sb)	
Red sausage	Rabbit (Sb)	
Onion		
Extra-virgin olive oil		
Savory crepes		106.36/ 26.42
Flour	Whole wheat flour (Sg)	
Eggs		
Whole Milk	Skimmed milk (Sg)	
Frankfurter sausage	Chicken (Sg)	
Grated cheese	Tofu (Sb)	
Stew with various ingredients		136.50/ 60.56
Chicken		
Veal	Rabbit (Sb)	
Pork	Chicken (Sg)	
Banana		
Yucca		
Potato		
Onion		
Garlic		
Cumin		
Pepper		
Cilantro		

2015b), suggest a change in the diet of the adolescent population. Actual Western diets put at risk adolescent health when they will reach adulthood. For this reason, the aim of the presented project is to use traditional family recipes as an educational tool, working in their elaboration and discussing their nutritional value in the context of healthy eating. Only by educating and empowering adolescent students in knowledge about food, gastronomy and health, it will be possible to improve and prevent cardiovascular diseases.

Classification of ingredients in each recipe according to the cholesterol/saturated fat ratio was performed to show how certain foods influences the inflammatory and atherogenic process (Connor et al., 1986). Atherogenesis is a chronic inflammatory process that contributes to artery narrowing, leading to serious cardiovascular events (Geovanini and Libby, 2018). Inflammation is a physiological process that is essential to maintain homeostasis, but the problem becomes evident when this process is chronic, contributing to the development of cardiovascular pathology (Mizuno et al., 2011). In this context, consumption of whole grains, fruits, fish and vegetables are associated with a lower degree of inflammation and atherogenesis (Tuso et al., 2015). Therefore, the knowledge of nutritional composition of recipe

ingredients is instrumental to classify each recipe in the context of a healthy pattern.

Considering that the strategies of the WHO point towards health improvement through the promotion of healthy environments (healthy eating and healthy lifestyles), the educational tool presented in this report can be a very motivating option to acquire knowledge and enhance social responsibility towards a healthier nutrition. In this line, social learning is the result of personal and environmental factors and the individual's own behavior. With the recipes, the dialogic language can be used, allowing to establish egalitarian interchanges, discovering the cultural intelligence between people. Altogether, the present educational project can favor the creation of personal and social sense guided by solidarity principles where equality and difference are compatible and mutually enriching values.

One of the results of this project is the elaboration of a guide, an educational tool, in principle for adolescents, to see the fruit of their effort. The guide entitled "Providing learning opportunities with Historical Family Recipes" (García et al., 2023) was a collection of traditional family recipes made by the participating adolescents to promote physical-mental and social well-being. The guide is an academic tool under supervision of health professionals that aims to provide adolescents with knowledge about the ingredients of the recipe and other issues that may influence decision-making related to their diet. Furthermore, the main purpose of this guide is to serve as a tool in prevention and to help the adolescent to achieve a gain of responsibility and food awareness.

Finally, some limitations have been found. First, the availability of ingredients is a significant limitation, as some specific ingredients may be difficult to find outside of their original region. For example, certain spices, fresh herbs, or particular types of agricultural products may not be readily available worldwide. Another limiting aspect to consider is that although cultural and culinary differences have been addressed, the interpretation of a recipe can vary according to the culinary traditions of each region. Some ingredients may have different meanings in different cultures, and preparation methods can vary significantly. Over time and across different regions, recipes may have been adapted to fit locally available ingredients or preferred tastes. This limitation can make challenging to reconstruct an authentic or traditional recipe. Seasonal changes cannot be ignored, as some ingredients may be seasonal and not available year-round outside of their original region. This may require recipe adaptations or the search for substitutes. Translation difficulties also arise when translating recipes from one language to another due to differences in culinary terminology, ingredient measurements, and cooking techniques. Health and dietary aspects are also important, as some recipes may contain ingredients that are not suitable for certain dietary requirements or restrictions. For example, there may be religious considerations, food allergies, or dietary preferences that limit the inclusion of certain ingredients. Limited access to authentic information can also be a constraint. In addition, it is challenging to access authentic or traditional recipes, especially if they are primarily transmitted orally within a community or family. Finally, some recipes may require specific technology or equipment that is not universally available. This may include specialized kitchen utensils, specific cooking methods, or even particular types of ovens. However, these limitations can provide an opportunity for a new approach, as they can help address the study of Mediterranean and other country recipes with greater sensitivity and understanding of the complexities involved.

5. Conclusion

In conclusion, transforming eating habits into a better quality of life is key to continue designing educational strategies such as the one presented in this report. This project does not include only information regarding nutritional parameters associated with different biomarkers of lipid profiles, but in addition provides social and emotional learning. Altogether, this gastro-educational tool serves to prevent cardiovascular

diseases, promote gender equality, promote teamwork skills, critical observation and conscious learning about the ingredients of the recipe and composition of food in the framework of educational centers. In this new teaching environment, students can redirect their gaze towards their own emotions and feelings. This situation can facilitate self-knowledge to enhance personal initiative when choosing food, promoting heart-healthy diets. The collection of traditional family recipes provides tangible information to generate more real results, preserving and enhancing the value of the traditional gastronomic culture of our environment and having a tangible tool for discussing the nutritional adequacy of the diet of adolescents and their families (García et al., 2023). Finally, High Schools are the optimal context to explain to adolescents that nutrition to maintain cardiovascular health needs to be complemented with regular physical activity and smoking exclusion.

6. Implications for gastronomy

This project demonstrates that it is compatible to enjoy health with traditional family recipes. New flavors can be enjoyed with the modified healthy recipes. Since participants were from different ethnic cultures, this diversity can be used to enrich the knowledge of new ingredients and flavors. Therefore, it is possible to recover a healthy eating pattern using food education. This recipe globalization provided to the classroom can promote at the same time respect for the difference of thoughts, values, preferences, attitudes, within a framework of human rights.

The action plan developed in the present project proposes to include in the professional teaching practice, the knowledge about healthy eating to transmit to adolescents. Social and emotional education is essential to prevent diseases in adolescents, not only cardiovascular but mental as well. In addition, different aspects can be implemented in the learning process, such as the development of ethical values, citizenship and respect to the environment.

Implications for gastronomy

Nutrition education in school, university and special education settings is a necessity. The use of recipes as a learning tool and the ingredients used are of great importance. This art that we enjoy every day and that also fulfills a basic biological function, that of nutrition, is the synthesis of several phenomena that enclose in the simplicity of a moment of tasting a complex evolution in time and space governed by the Law of causality; here the author of the manuscript will know how insistent I have been about its consideration in any scientific analysis, from the most abstract and distant study of the behavior of matter in the Universe, to the configuration of the behavior of an entire society in the intimacy of the domestic stove. For all this it is fundamental to give a relevant space to the art forms of cooking that bring to the present all the accumulated wisdom of thousands or millions of people who imitated, perfected and survived and allow us that same survival. I deeply appreciate, as a wise taster, as a conscious imitator, as an artist of the conditioning of physics and admirer of the Universe that surrounds us, that this work highlights this piece of the Universe that is the sum of all the young people who have participated in the study of their own essence through the art of cooking and I hope that it will serve so that many others feel the temptation to explore this wonderful art in a conscious way and through it or through the imitation of others and themselves perfect this great legacy that passes from generation to generation.

CRediT authorship contribution statement

Juan Manuel Zazo: Resources, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Javier Aranceta:** Supervision. **Ángel A. Carbonell-Barrachina:** Writing – original draft, Supervision, Resources, Project

administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **David López-Lluch:** Writing – review & editing, Supervision, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Daniel García-Peinado:** Methodology, Conceptualization. **Enrique Roche:** Writing – review & editing, Writing – original draft, Supervision, Resources, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **José Robledano-García:** Methodology, Investigation, Conceptualization. **Elena García-García:** Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Resources, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data will be made available on request.

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