



# Culinary nutrition in gastronomic sciences. A review

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## ABSTRACT

Culinary nutrition is proposed as a new terminology that can be a useful resource to consider when trying to provide nutritional education to gastronomy students. Here, we present a bibliographic review of the literature related to the terms Culinary Nutrition and/or Culinary Medicine. This review has focused on the culinary nutrition education provided to students, especially gastronomy students. The future direction of this novel term is uncertain yet, so it is necessary to critically reflect and investigate about this issue, where nutrition and gastronomy must go together and with a common goal, which is the promotion of health and the prevention of diseases associated with an unbalanced diet.

## 1. Introduction

Culinary nutrition, also known by Marcus (2013) as the science and practice of healthy cooking, results in an interdisciplinary approach to food, ranging from nutrition and dietetics to culinary arts and gastronomic sciences. The education on this field improves the learner's skills to integrate all this knowledge so and allow them to face a healthy and enjoyable diet (Fredericks et al., 2020). This term is synonymous with culinary medicine, which is used to define more frequently the education of medical personnel and medical students (La Puma, 2016).

When we talk about culinary nutrition education, we are undoubtedly moving into the field of interprofessional education for health. The interprofessional education, which is defined by the World Health Organization (WHO), occurs when two or more professions learn about, from and with each other to enable effective collaboration and improve health outcomes (World Health Organization, 2010).

The available literature has shown the association between nutritional knowledge and a better health status as it is related to better food choices (Worsley, 2002). In addition, other studies have shown that this association is established due to the acquisition of culinary skills (Utter et al., 2018).

Whereas cooking skills are associated with health parameters and incorporated into dietary guidelines (Bartrina et al., 2016), culinary nutrition has been used less. Therefore, the combination of cooking skills with nutritional knowledge seems to have a multiplier effect on people's health, the same could happen with culinary nutrition.

There are several intersecting areas of knowledge in culinary

nutrition because of the interaction among culinary arts, nutritional knowledge, and dietary skills, something that also occurs and is characteristic of gastronomic sciences (Becerril, 2019).

It is essential to ensure that professionals acquire a superior education in culinary nutrition as health stakeholders. This is what we observe from doctors (culinary medicine) and to a minor extent from nutritionists. Actually, this education will be a powerful tool for chefs and other food personnel (Gillis et al., 2020). Unfortunately, there is few information in relation to the usefulness of culinary nutrition education for chefs or gastronomic science students.

The aim of our research was to review the scientific bibliography that was related to the terms culinary nutrition and/or culinary medicine, to evidence how much limited is the information about the relation between culinary nutrition and gastronomic science and also the great perspectives that culinary nutrition has in the education of gastronomy students.

## 2. Methodology

### 2.1. Search strategy

A bibliographic review of the studies published about culinary nutrition was carried out. The Web of Science database (Nov 19, 2020) was reviewed, using the keywords: "Culinary nutrition", "Culinary medicine", "Nutrition culinary" and "Medicine culinary". The review followed some of the recommendations of the PRISMA statement (Urrútia and Bonfill, 2010).

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The search and study selection process were conducted by two members of the research team, who have been working independently, selecting those studies with information related to the objective of the review. Only original articles reported in the scientific literature were included and the search did not use time constraints.

## 2.2. Inclusion and exclusion criteria

The review included studies published in Spanish or English and was limited to manuscripts that were not articles or reviews. Therefore, those that did not accomplish this requirement were excluded (abstracts, early access, case report, news and corrections). All database search results were imported into EndNote, where duplicate entries were removed before screening. After a brief reading of the title and abstract, some articles were excluded because their main field of knowledge was not related to the objective of the review (Agriculture, Plant Sciences, Biochemistry, Molecular Biology, Pharmacology, Pharmacy and Mathematics). Finally, a more in-depth reading of the documents was made and those that did not include the combination of nutritional knowledge and culinary arts were discarded; for instance, articles related with nutritional coaching and mindful eating were excluded. The number of included studies and excluded studies were shown in Fig. 1.

## 3. Results

The bibliographic review shows that the first articles were published in 2011 and they have increased mainly since 2017, being 2020 the year that includes a greater number of articles with these new term (Rothman et al., 2020) (Fig. 2).

Most of the published articles have been carried out in USA (47). Other countries with less than 3 articles and even a single published article were from the United Kingdom (Condrasky et al., 2015), Spain (Condrasky et al., 2015), Australia (Becerril, 2019), Canada (Becerril, 2019), Israel (Becerril, 2019), Brazil (Bartrina et al., 2016), Indonesia (Bartrina et al., 2016), New Zealand (Bartrina et al., 2016), South Africa

(Bartrina et al., 2016) and South Korea (Bartrina et al., 2016).

The greatest research areas for these articles have been Nutrition and Dietetics (Pang et al., 2019), Public, Environmental & Occupational Health (Parks and Polak, 2020), Educational Research (Fredericks et al., 2020) Integrative & Complementary Medicine (Eisenberg et al., 2013), Endocrinology & Metabolism and Psychology (Drewnowski, 1997) other research areas that did not reach 3 articles have been classified as minorities (Fig. 3).

Table 1 shows the 3 different groups in which the total reviewed articles have been divided. 36 of the articles involved general population (non-academic group), 17 involved students and an academic person (academic group) and 11 were other types of studies where no people participated.

12 articles of the non-academic group studies involved adults, 9 articles involved children, 9 articles involved people who suffer from a chronic disease related to specific conditions and lifestyle (heart disease, cancer and diabetes), 4 articles involved doctors and healthcare professionals and 2 articles involved chefs (Table 1).

Regarding the academic group, 12 articles involved medical students, 3 articles involved nutrition students, 2 articles involved gastronomy students and 1 article involved university students without specifying the type of academic degree. 6 of these studies were pilot tests, 5 were cohort studies, 4 were the implementation of culinary nutrition courses, 1 was randomized controlled trial and 1 was cross-sectional study.

The outcomes assessed in the academic studies were highly variable. Studies mainly estimated the possibility of increasing culinary skills, nutritional knowledge, and patient counseling of the students. The relevance and the benefits of applying culinary medicine courses in medical students were also evaluated in several studies, something that we did not observe in nutrition or gastronomy students yet.

The most frequent limitations that have been found in the academic

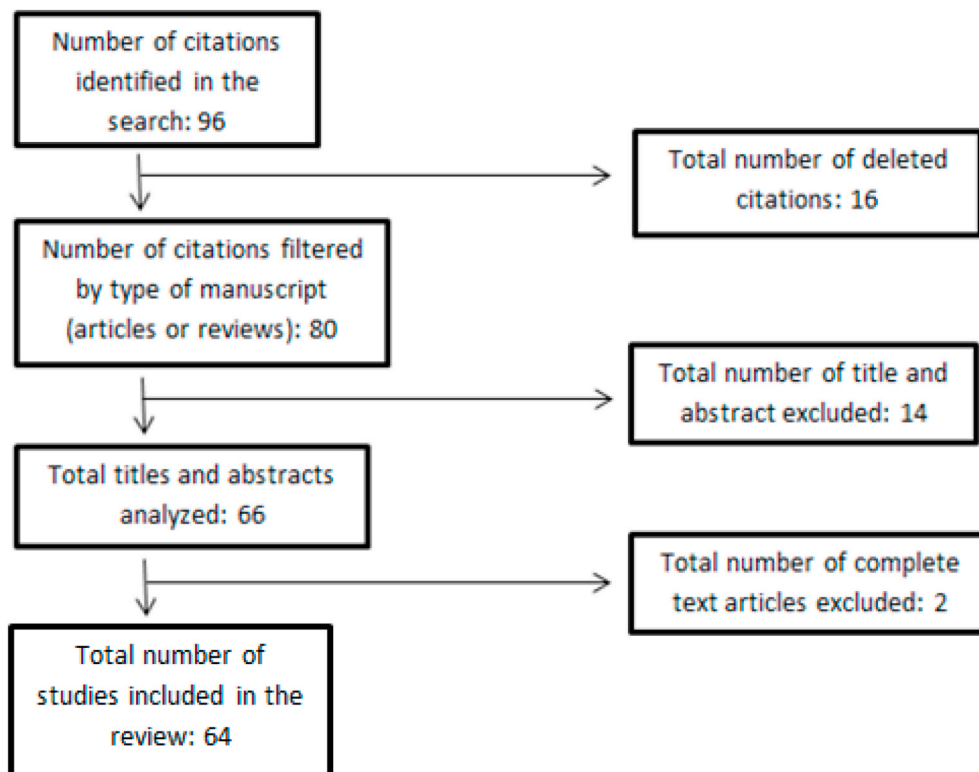


Fig. 1. Flowchart showing the information with the different phases carried out during the bibliographic review.

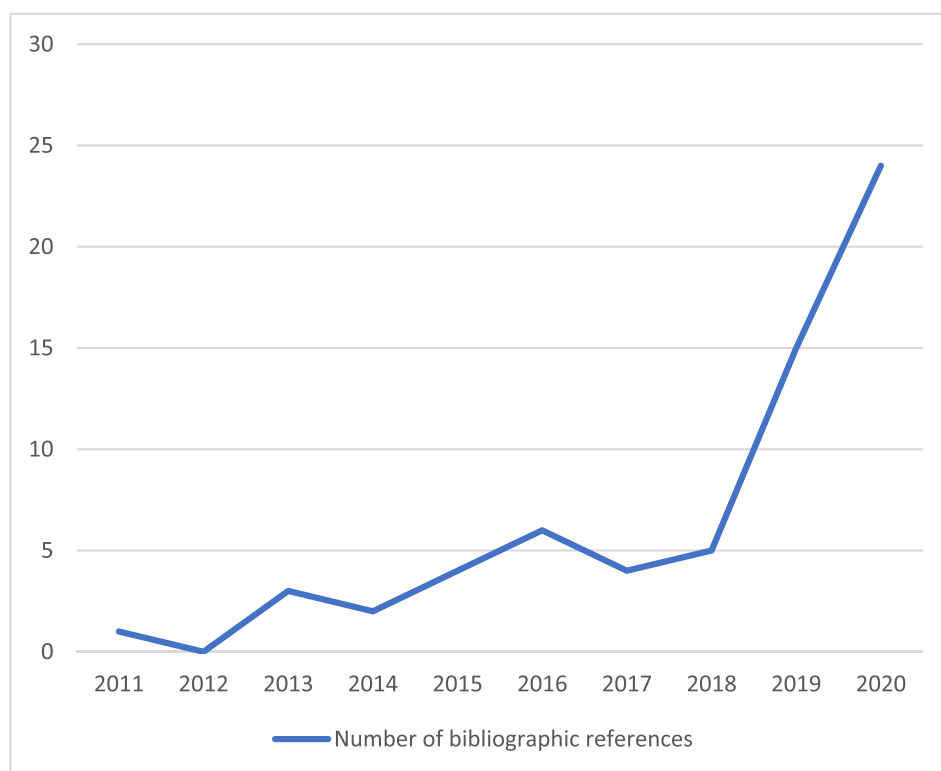


Fig. 2. Evolution in the number of bibliographic references on culinary nutrition.

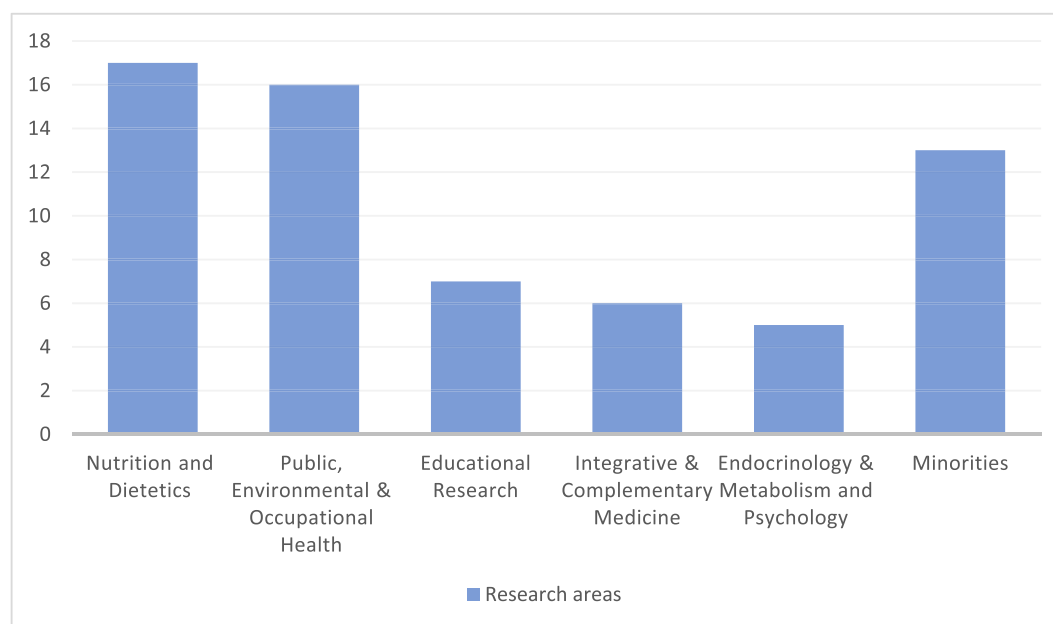


Fig. 3. Number and types of research areas associated to the different articles reviewed.

group articles were the absence of control groups, the absence of validated surveys, small study samples, insufficient representativeness of the study population and poor response rates.

Several articles that have studied how students understand culinary nutrition affirm that knowledge is lacking in the training of medical students, nutrition students and future chefs. Medical students perceived that they should understand culinary nutrition issues related to specific conditions and chronic lifestyle diseases, whereas nutrition and gastronomy students perceived that incorporating culinary nutrition

formation into practice is relevant. Studies have concluded that the nutritional learning received by medical students is not enough to develop confidence in providing nutrition care. Among gastronomy students, low levels of knowledge in nutrition were founded. In addition, a study that have been carried out in Puerto Rico, observed that most of students had an inadequate body mass index (BMI) (Rivera Medina et al., 2020).

2 articles involving medical students and 1 involving gastronomy students (Rivera Medina et al., 2020; Rothman et al., 2020; Pang et al.,

**Table 1**  
Type of articles reviewed.

Non-academic (36)	Children and adolescents	12
	Adults	9
	CVD, cancer, diabetes patients	9
	Doctors	4
	Chefs	2
Academic (Pang et al., 2019)	Medicine	12
	Human Nutrition and Dietetics	3
	Gastronomy students	2
	Students	1
Other (Jaroudi et al., 2018)	No people participated	

2019) observed that the self-perceived nutrition knowledge has improved after taking a culinary nutrition course. Moreover, 4 studies involving future doctors and 1 involving future nutritionists (Pang et al., 2019; Kerrison et al., 2017; Jaroudi et al., 2018; Hauser, 2019; Vanderpool et al., 2020) have concluded an increase in culinary skills and knowledge of culinary techniques in students after the intervention with a culinary nutrition course. Another study has shown that a culinary medicine course in medical students was associated with an increase in Mediterranean Diet adherence and improved knowledge of healthful eating (Stauber et al., 2019). Other relevant findings assessed in the academic studies were self-efficacy for using fruits and vegetables, increasing medical students' confidence in nutrition and in their ability to use nutrition and cooking for personal self-care, an increase in confidence in overall culinary skill level, knowledge of ingredients and ability to use kitchen supplies.

#### 4. Discussion

This bibliographic review investigated the relationship between culinary nutrition and gastronomic sciences. More in depth it has focused on the investigation of the culinary nutrition education provided to gastronomic science students, in order to gain insight into how culinary nutrition education can be enhanced to meet the needs of future chefs and culinary professionals. The reviewed studies showed that culinary nutrition is barely incorporated into gastronomic education, regardless of country, setting, or year of formation. Although the literature often focuses on the role of healthcare providers in mitigating potential food-related illnesses, chefs and foodservice workers are an overlooked group when it comes to promoting health through food. As front-line food providers, chefs play a key role in the impact of the consumer experience in food service surroundings (Gillis et al., 2020). Therefore, a multidisciplinary education is required for these professionals, which is partly encompassed by this new vision of culinary nutrition that tries to integrate the best culinary practices to achieve the highest nutritional quality (Lawrence et al., 2019). Gastronomic sciences careers cover a wide spectrum of areas of knowledge and practical disciplines in which culinary nutrition could be of considerable importance for the training and education of future professionals, with this education, they could work to promote the health of the diners. In this way, culinary nutrition professionals may achieve expertise in preparing reformulated foods in hospitals (Spence, 2017) or in the food industry as a part of the solution to some chronic diseases (Scott et al., 2017). Culinary nutrition professionals could make significant contributions in the preparation of diets, devise and develop new recipes according not only with gastronomic but also with nutritional criteria, planning of the menus, as well as modifying the presentation of the food on the plate in order to increase the eye appeal of the dish (Parks and Polak, 2020).

A better characterization of the program is necessary for educating chefs, as is already being done in the medical field (Hauser et al., 2020). The reviewed studies reported that culinary nutrition education provided in medical students should enable graduates to begin conversations with patients and recognize when it is required to referral to other health-care professionals (Ring et al., 2019).

Furthermore, the bibliographic search has reflected the novelty of the term. The scarce existing bibliography and the growing interest of the scientific field to develop this new area of knowledge are giving visibility to the gastronomic sciences, where Sciences and Letters come together, knowledge and skills also (Becerril, 2019).

It should be noticed that both, the origin of the bibliography references and the emergence of this new concept, clearly started in the United States, showing the origin of the first authors who worked on the subject, for example Margaret Condrasky. The new terminology was successfully because during the last 40 years there has been a strong relationship between food, eating and cooking with health and wellness professionals (Terry and Hanchard, 1979). Although it is not until 2011 when it begins to be published in scientific journals.

One of the reasons why this new concept arose is due to the increase in obesity rates and overweight related to an unbalanced diet, where the resources offered by multiple organizations were useless, since making nutrition principles easily accessible will not work for the overall population without also making them applicable. Therefore, A nutritional intervention based on the principles of nutrition in a practical way is needed to improve health parameters, consequently, hands-on culinary nutrition outreach programs have focused on improving healthy and sustainable eating behavior through culinary confidence and nutritional alertness.

In recent years, there have been an increasing number of educational initiatives which have focused on culinary nutrition and have been designed for health professionals and chefs or directly for patients (Polak et al., 2016), something which could be related to the increase in scientific publications in the years 2018–2020 (Fig. 2). These initiatives range from professional education trainings (Eisenberg et al., 2013; Polak et al., 2018) to live online courses, and remote video coaching for general population (Polak et al., 2017).

Looking at the two large groups in which we can divide the studies (academic group and non-academic group), we obtain two points of view where the learning of culinary nutrition is very useful: firstly, as a part of the basic food culture (food literacy), which is incorporated into the general education plan of population; and secondly, as a scientific discipline that allows students to work together in the same direction with its own resources and tools.

More intervention studies are needed to confirm the impact of culinary nutrition education for chefs. Studies with a lower level of evidence obtain positive results through opinion surveys (Condrasky et al., 2015). Nutrition educators and dietitians can help chefs learn about food science and recipe modification as they apply to healthful cooking practices that are not time consuming (Reichler and Dalton, 1998).

Culinary skills and nutritional knowledge are factors that influence food choices (Daniels et al., 2012; Wardle et al., 2000), even though the taste will always be more relevant than the other two factors mentioned (Drewnowski, 1997). Nutrition and gastronomic pleasure need to work together to place health on the same level as taste, making them compatible as much as possible.

Ultimately, few data show a lack of culinary nutrition education on chefs that will have to be confirmed with other studies, in other locations, and also if this is related with poor health status.

#### 5. Conclusions

This review of the literature provides clear evidence on the need for future research. Further work should be done to incorporate nutritional knowledge and dietary skills in the same way as culinary arts are taught for gastronomy students. It would, we believe, be desirable to have a transversal subject shared by dietitians and chefs, for instance, what has been done in some courses and education degrees such as in Complutense University.

Additionally, the interprofessional education provides students with useful knowledge that could be applied in their future jobs, where, we believe, collaborative practice between nutritionist and chefs will be

important. It is essential to consider that when we are developing collaborative practice, the individualization of each case should be taken into consideration to make a correct transition from education center to the workplace.

To conclude, we do believe that the time is right for increasing the importance of culinary nutrition educators now and onto the future. New subjects must address health-oriented competencies and skills without forgetting some aspects such as pleasure, sustainability, or new trends in gastronomy.

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No funding was associated with this study. All authors had access to all data and all authors were responsible for the decision to submit the manuscript.

### Implications for gastronomy

Nowadays, the importance of nutrition in the culinary arts is increasingly evident, for this reason, an education in culinary nutrition for gastronomy students could be very useful since they could apply this acquired knowledge in their future jobs, where collaborative practice between nutritionist and chefs will be important. Interprofessional and multidisciplinary education in this field is something interesting that needs further investigation.

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