

What is the relations between dysgeusia and alterations of the nutritional status? A metanarrative analysis of integrative review

Federica Dellafiore¹, Barbara Bascapè², Irene Baroni³, Rosario Caruso³, Gianluca Conte², Nathasha Samali Udugampolage⁴, Laura Carenzi⁵, Sara Russo⁶, Cristina Arrigoni¹

¹Department of Public Health, Experimental and Forensic Medicine, University of Pavia, Pavia (Italy); ²Nursing degree course, University of Pavia, Istituti Clinici di Pavia e Vigevano S.p.A., Pavia (Italy); ³Health Professions Research and Development Unit, IRCCS Policlinico San Donato, Milano (Italy); ⁴Cardiovascular-Genetic Center, IRCCS Policlinico San Donato, Milano (Italy); ⁵Breast, minimally invasive and urological surgery, ICS Maugeri, Pavia (Italy); ⁶ Department of Emergency Medicine, Humanitas Clinical and Research Center IRCCS, Milan, Italy

Abstract. *Background and aim of the work.* Dysgeusia is an altered or damaged tasting perception of a multifactorial etiology, from polypharmacy, infections to chemotherapy and radiotherapy. Approximately 5% of the population suffer from a diminished taste sensation, which unfortunately remains underestimated by the affected person, creating the conditions for a dramatic underestimation of the incidence of the symptom. The aim of this study is to summarize the evidences present in literature on the relations between Dysgeusia and alterations of the nutritional status. *Methods.* An integrative review with metanarrative analysis of the literature was carried out in August 2020. PubMed, Scopus, Embase and CINAHL databases were examined with keywords and methodological strings. PRISMA flow-chart along with a qualitative evaluation grid (JBI-QARI) were applied in the selection of the studies with a time limitation to the last ten years. *Results.* 10 articles resulted from the literature review were includes and were divided into two macro-categories. The first, concerned 8 articles, reported dysgeusia linked to weight loss. The second, concerned 2 studies relating to dysgeusia in patients with altered nutritional status associated with body weight gain. *Conclusions.* This review represents an initial contribution to summarize the best evidence and knowledge in relation to dysgeusia, with the aim of enabling the identification and treatment of this symptom and facilitating targeted educational interventions. (www.actabiomedica.it)

Key words: Body weight, change in taste, dysgeusia, malnutrition, obesity, parageusia.

Introduction

Dysgeusia is defined as an altered or damaged tasting perception, like an unpleasant change in perception or a distortion of the sense of taste (1, 2). It is a general term used when referring to any taste disorder (3). Dysgeusia has a multifactorial etiology and polypharmacy, inadequate oral hygiene, periodontitis, infections in the oral cavity or upper respiratory system, head and neck tumors, chemotherapy and radiotherapy

are among the main causes (1). Dysgeusia in elderly patients is related to dental prostheses that inhibit the activity of taste receptors by covering the soft palate (1,4). Further causes of dysgeusia are xerostomia and dry mouth, potentially due to the intake of drugs, chemotherapy or radiotherapy, or due to a chronic hypofunction of the salivary glands, known as Sjögren syndrome (1, 4).

Epidemiology of dysgeusia is still improperly outlined: approximately 5% of the population suffer from

a diminished taste sensation, which unfortunately often remains underestimated by the affected person, causing an important underestimation of the incidence of this symptom (3). Quite often, patients with dysgeusia feel dysosmia or altered smell perception (1, 4). Although in the cancer population dysgeusia is estimated in a percentage between 45% and 84%, literature is lacking in specific epidemiology associated to this symptom among the general population (5).

All the interventions aiming at a better management of dysgeusia are closely related to its' etiological factors: for example, in the case of drugs-related dysgeusia, these will be suspended and will be replaced with other drugs with the same therapeutic effect, but with different active ingredients (4). Literature describes coping strategies implemented by patients themselves to deal with diminished taste sensation, by adding food flavorings (e.g. spices), using plastic dishes, sugary drinks, and by brushing teeth before and after meals (6).

Based on the peculiar features of dysgeusia, it is possible to understand how people at high risk of malnutrition (a term that underlies an alteration of body weight, both in excess and in deficiency, and a consequence of an incorrect nutritional intake) are the most exposed (7). The duration of the symptom is also important: in some cases, like in drugs-related dysgeusia, it disappears as soon as the medicine is suspended (4). In dysgeusia caused by chemotherapy or radiotherapy, literature has different opinions on the specific definition of the period; however it is generally described as a "protracted over time" disorder which predisposes to malnutrition (8).

For this reason, the assessment and monitoring of the characteristics of dysgeusia are essential, due to the fact that not only it has a severe impact on the nutritional status alterations by influencing dietary intake and exposing for malnutrition, but also, it can lead to severe consequences such as worsening of prognosis, reduced quality of life (5), increased length of hospitalization, morbidity and mortality (9). Another relevant factor worthy of consideration in presence of dysgeusia, is how it affects, de facto, peoples' daily life: dysgeusia that arises as a result of chemotherapy treatment can even lead to an aversion, not only to food, but also to preparing food for loved ones (6).

Dysgeusia has indeed a huge impact on affected peoples' health, namely, complex consequences on their nutritional status. However, there is no evidence of contribution in literature that summarizes the best evidences and knowledge on the subject of dysgeusia, which can potentially undermine the identification and treatment of this symptom, hinder targeted educational interventions and dramatically fuel the aforementioned underestimation of the phenomenon, both by patients and health-care providers. Hence, aim of this study is to outline and evaluate the primary sources in the literature on the subject of dysgeusia.

Material and methods

Aims

Specifically, this literature review presents three specific objectives, described as following: firstly, authors define the search strategy in order to discover on electronic biomedics databases the literature focusing on relations between dysgeusia and alterations of the nutritional status. After that, researchers evaluate the papers' methodology and rigour by search strategy, excluding papers present some imprecisions. Finally, the results of each paper included are describe in general, offering an overall pint of view on the topic.

An integrative review of the literature was performed, using a meta-narrative analysis of the articles included (10), in order to identify and evaluate primary evidences from different studies to explore the impact that the symptom of dysgeusia has on the alteration of nutritional status. This review includes primary studies published between August 2020, don't choose an initial temporal limit.

Inclusion criteria applied in the review were: a) Preeminent studies with the topic of dysgeusia and its' consequences on nutritional status; b) Studies adopting quantitative methodological approach; c) Studies written in Italian or in English Language. Contrariwise, the exclusion criteria were: literature reviews, qualitative studies, case reports or research protocols.

Articles were identified in accordance with the PRISMA Flow Chart, which provided a rigorous documentation of the various stages of the review

process (11) (Figure1). Notably, the different phases of the PRISMA flow chart were: 1. *Identification*: of the databases used in the review with the relative results; 2. *Screening*: removal of double results or non-pertinent ones; 3. *Compatibility*: definition of inclusion and exclusion criteria; 4. *Inclusion*: articles deemed suitable for the purpose of the research (11).

Phase one: identification

Research strings were generated by using key words (Table 1) applied to query the main bibliometric databases: PubMed, Scopus, Embase e CINAHL. Selected key words included: “Malnutrition”, “Obesity”, “Body weight”, “Altered Taste”, “Dysgeusia”,

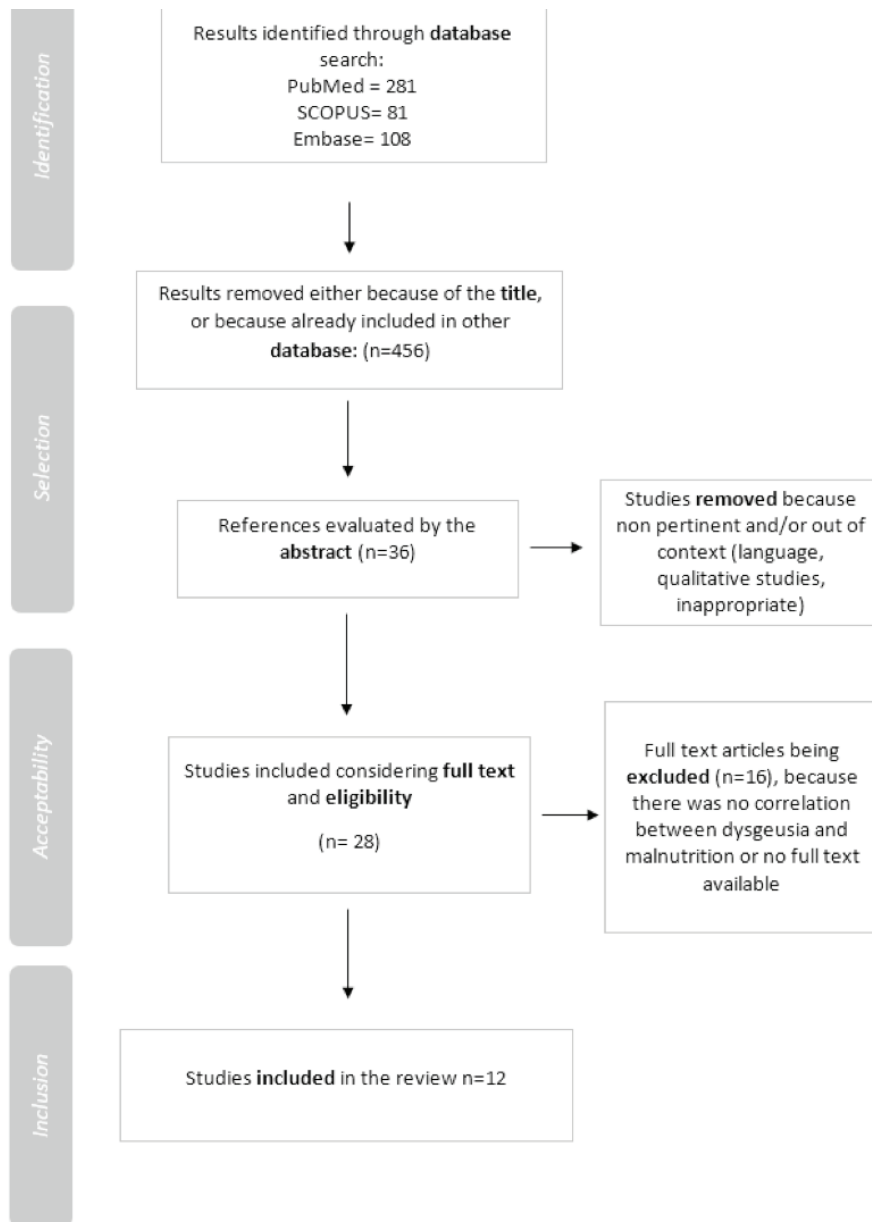


Figure 1. PRISMA Flow Chart

“Parageusia”. 492 articles were created in this stage of the process: 218 belonged to Pubmed, 81 to Scopus, 108 were from Embase and 22 were the results of Cinahl database.

Phase two: screening

In this state of the process, a preliminary selection of the results was performed and the articles that

Table 1. Search strings used for literature reviewed

Database	Search string	Date of the research	Number of articles
PubMed	(((((“Malnutrition”[Mesh] OR “Protein-Energy Malnutrition”[Mesh] OR malnutr* OR “Nutritional Deficiency” OR “Nutritional Deficiencies” OR “Undernutrition” OR marasmus OR “Obesity”[Mesh] OR “Obesity, Abdominal”[Mesh] OR “Obesity, Morbid”[Mesh] OR “Obesity Management”[Mesh] OR “Obesity, Metabolically Benign”[Mesh] OR “Appetite Depressants” [Mesh] OR “Body Weight” [Mesh] OR “Diet, Reducing” [Mesh] OR “Skinfold Thickness” [Mesh] OR “Nutritional and Metabolic Diseases” [Mesh] OR “Nutrition Disorders” [Mesh] OR “Overnutrition” [Mesh] OR obesi* OR overnutr*)))) AND (((“Dysgeusia”[Mesh] OR “Dysgeusias” OR “Taste, Distorted” [Mesh] OR “Distorted Taste” [Mesh] OR “Taste, Altered” [Mesh] OR “Altered Taste” [Mesh] OR “Taste, Distorted” OR “Distorted Taste” OR “Taste, Altered” OR “Altered Taste” OR “Parageusia” [Mesh] OR “Parageusias”[Mesh] OR “Parageusia” OR “Parageusias”))))))	3 rd August 2020	281
Scopus	TITLE-ABS ((“Malnutrition” OR “Protein-Energy Malnutrition” OR malnutr* OR “Nutritional Deficiency” OR “Nutritional Deficiencies” OR “Undernutrition” OR marasmus OR “Obesity” OR “Obesity, Abdominal” OR “Obesity, Morbid” OR “Obesity Management” OR “Obesity, Metabolically Benign” OR “Appetite Depressants” OR “Body Weight” OR “Diet, Reducing” OR “Skinfold Thickness” OR “Nutritional and Metabolic Diseases” OR “Nutrition Disorders” OR “Overnutrition” OR obesi* OR overnutr*) AND (“Dysgeusia” OR “Dysgeusias” OR “Taste, Distorted” OR “Distorted Taste” OR “Taste, Altered” OR “Altered Taste” OR “Taste, Distorted” OR “Distorted Taste” OR “Taste, Altered” OR “Altered Taste” OR “Parageusia” OR “Parageusias” OR “Parageusia” OR “Parageusias”)))	3 rd August 2020	81
Embase	(‘malnutrition’:ab,ti OR ‘protein-energy malnutrition’:ab,ti OR malnutr*:ab,ti OR ‘nutritional deficiency’:ab,ti OR ‘nutritional deficiencies’:ab,ti OR ‘undernutrition’:ab,ti OR ‘nutritional and metabolic diseases’:ab,ti OR ‘obesity’:ab,ti OR ‘obesity, abdominal’:ab,ti OR ‘obesity, morbid’:ab,ti OR ‘obesity management’:ab,ti OR ‘obesity, metabolically benign’:ab,ti OR ‘appetite depressants’:ab,ti OR ‘body weight’:ab,ti OR ‘diet, reducing’:ab,ti OR ‘skinfold thickness’:ab,ti OR ‘nutrition disorders’:ab,ti OR ‘overnutrition’:ab,ti OR obesi*:ab,ti OR overnutr*:ab,ti) AND (‘dysgeusia*’:ab,ti OR ‘distorted taste’:ab,ti OR ‘altered taste’:ab,ti OR ‘parageusia’:ab,ti OR ‘parageusias’:ab,ti)	3 rd August 2020	108
CINAHL	((“Malnutrition” OR “Protein-Energy Malnutrition” OR malnutr* OR “Nutritional Deficiency” OR “Nutritional Deficiencies” OR “Undernutrition” OR marasmus OR “Obesity” OR “Obesity, Abdominal” OR “Obesity, Morbid” OR “Obesity Management” OR “Obesity, Metabolically Benign” OR “Appetite Depressants” OR “Body Weight” OR “Diet, Reducing” OR “Skinfold Thickness” OR “Nutritional and Metabolic Diseases” OR “Nutrition Disorders” OR “Overnutrition” OR obesi* OR overnutr*) AND (“Dysgeusia” OR “Dysgeusias” OR “Taste, Distorted” OR “Distorted Taste” OR “Taste, Altered” OR “Altered Taste” OR “Taste, Distorted” OR “Distorted Taste” OR “Taste, Altered” OR “Altered Taste” OR “Parageusia” OR “Parageusias” OR “Parageusia” OR “Parageusias”))	3 rd August 2020	22

did not have a title related with the research question were removed: according to these criteria, 456 results were excluded from the study. Consequently, all the abstracts of the 36 articles were examined and 8 of them were dismissed as they did not meet inclusion criteria. Notably, these articles were not written in English, were either based on qualitative research methodology or they were not related to the research question.

Phase three: compatibility

The remaining 28 articles underwent compatibility phase. The full texts were evaluated and critically read by two independent experts (LC and FD), in accordance with the guidelines to determine their quality and adopted the standardized checklist for cross-sectional analytical studies of critical evaluation tool, and in particular we used the Joanna Briggs Institute for the use of JBI Systematically Reviews (12). The JBI checklist is made up of eight criteria to assess the quality of the research reported in the article. The overall score is the sum of the specific quantitative assessments assigned to each item: Yes=1, No=2, Unclear =3 and Not Applicable = 4. For every primary study, the final classification of the methodological quality was based on the overall score and reported as “high” (score ≥ 6), “medium” (score 4–5) or “low” (score ≤ 3).

N° 10 articles investigated the level of JBI QARI. Scoring. So, they were included in the final phase of the literature review. Table 2 highlights JBI check list evaluation for each article.

Results

The query of the database produced 492 articles, and 10 of them were considered relevant and inherent to the research of the study. The 10 articles included in the literature review were primary quantitative studies, of which: three were cross-sectional observational studies, two were preliminary studies, two were prospective studies, one was a randomized quantitative study, another one a case-control and one a longitudinal study. These studies were carried out in several geographical areas, such as: America, Brazil, France,

England, Italy and China. People enrolled in the studies were mainly cancer patients: two of the studies involved patients with head and neck cancer treated with radiotherapy, three studies dealt with dysgeusia in oncological patients that underwent chemotherapy (solid tumors in different parts of the body); another article evaluated dysgeusia in people who had been previously treated with aggressive chemotherapy and then had a bone marrow transplant; one study was carried out in patients that had not been under antitumor therapy for a long period and were admitted to a hospice. A single study assessed dysgeusia and malnutrition with different etiology, being the symptom as a consequence of oral cavity disease, head trauma, inflammation of the upper respiratory tract and polypharmacy.

The results coming from the current study showed two relevant types of relationship between dysgeusia and alteration in nutritional status: the former described different levels of malnutrition, whereas the latter highlighted obesity-linked alteration of taste.

Dysgeusia and weight loss

In the first section, eight articles were identified as to be related to dysgeusia and weight loss. Seven of these describe the symptom in oncological patients and one study assesses patients with oral cavity disorders, such as concussions, upper airways inflammations and multiple pharmacological therapies. In the latter of the studies, Mattes and colleagues identified that the control of dietary adjustment reveals a small but significant effect on the taste and smell abnormalities on food intake and body weight (13).

For the most part, dysgeusia is a symptom recognized and studied mostly in patients with head and neck cancer receiving radiotherapy; forasmuch as 28% of the people report alterations in taste sensations, 19% have experienced metallic taste, whereas 20% have completely lost taste perception. Consequently, these patients, who have experienced a diminished interest in food and in eating, are representative of the 22% of people who reported missing meals regularly.

On account of these reasons, people experienced poor nutritional intake and weight loss (9). These results are confirmed by Jin and colleagues, that

Table 2. Description of the 10 articles emerged from literature review

Author, title and year of publication	Aim	Population/ geographical area and study design d	Results
Markley EJ, A classification of dysgeusia. 1983 (14)	Evaluation of patients with dysgeusia considering the altered perception of food and beverages in quantity and variety and relate this classification to weight loss.	America; Observational and cross-sectional study that included 65 patients (39 women and 26 men)	The type of dysgeusia was significantly related to weight loss. Hence, as the severity of the dysgeusia increased, there was an increase in weight loss. Indeed, patients with type IV dysgeusia had significantly greater weight loss than the other groups.
Mahmoud F.A., A pilot study of taste changes amongst hospice patients with advanced cancer 2011 (16)	Relationship between taste abnormalities and nutritional intake.	America; Pilot study where 15 patients have been included (7 men and 8 women)	The majority of people with taste abnormalities experienced weight loss.
Ferreira M., Association of oral toxicity and taste changes during hematopoietic stem cell transplantation: a preliminary study 2019 (17)	To characterize the changes in taste and atrophy of the taste buds observed in the period of neutropenia of stem cell transplantation and to determine the influence of transplant toxicity on these changes.	Brasil; Preliminary study with 51 patients included	Both weight loss and poor quality of life have been associated with taste abnormalities and reduction in salivary flow. In fact, there is a significant correlation between alteration in bitter taste in T1 (period of neutropenia) and weight loss. Thirteen patients have showed hypo or hypergeusia concerning sour taste and a weight loss $\geq 3\%$ to body weight.
Mattes RD, Dietary evaluation of patients with smell and/or taste disorders 1990 (13)	To evaluate the impact of smell and taste on nutritional habits and nutritional status.	USA; Cross-sectional observational study which included 118 patients e 40 healthy subjects	Dietary responses to chemosensory disturbances can manifest themselves as increased or decreased nutritional intake. The analysis of dietary adjustment reveals a small but significant effect of taste and smell abnormalities on food intake and body weight.
Le Moigne M, Dysgeusia and weight loss under treatment with vismodegib: benefit of nutritional management 2016 (7)	To observe nutritional status pf patients under Vismodegib treatment. Secondary objective of the study was to evalutae the incidence of dysgeusia and the benefits of an early nutritional management.	France; Prospective study with 45 patients enrolled	In the present study dysgeusia affects more than two thirds of the patients. Taste alteration due to chemotherapy seems to be responsible of reduction in nutritional intake, namely, of weight loss and malnutrition. To make matters worse there is the reduced number of cells expressed in taste receptors after being exposed to Vismodegib.
Lees J., Incidence of weight loss in head and neck cancer patients on commencing radiotherapy treatment at a regional oncology centre 1999 (9)	To observe the incidence of weight loss in head and neck cancer patients when starting radiotherapy treatment.	England; Prospective study with 100 patients enrolled (71 men and 29 women)	Of the 28% of patients that experienced alterations in taste perception, the 19% showed metallic taste perception whereas the 20% reported a complete loss of taste feeling. Of these, a relevant proportion showed reduced interest on food and eating, causing an inadequate nutritional intake and weight loss.

Author, title and year of publication	Aim	Population/ geographical area and study design d	Results
Pugnali S., Modifications of taste sensitivity in cancer patients: a method for the evaluations of dysgeusia 2019 (15)	To study modifications of taste sensitivity in cancer patients compared to that of the control group, also in relation to gender.	Italy, Case-control study where 45 patients were under chemotherapy (28 men and 27 women) and 32 were healthy subjects (14 men and 18 women)	Dysgeusia is associated with an increased morbidity and mortality due to an inadequate nutritional and energetic intake, weight loss and malnutrition.
Noel C., Participants with pharmacologically impaired taste function seek out more intense, higher calorie stimuli. 2017 (18)	To investigate the influence of taste impairment on nutritional status in obese patients.	America; Randomized quantitative study with 51 subjects	Response to decreased taste has been linked to overweight or obese people. Therefore, the researchers assume that a weakened taste response is associated with an increased craving for higher calorie foods to counterbalance a weakened food perception.
Jin S., Relationship between subjective taste alteration and weight loss in head and neck cancer patients treated with radiotherapy: A longitudinal study 2018 (2)	To conducts a complete and dynamic evaluation on subjective taste alteration (STA) and to identify the relationship between STA and weight loss in head and neck cancer patients treated with radiotherapy	China; Longitudinal study with 114 patients enrolled.	The study revealed that STA in one of the most important symptoms resulting in weight loss. Notably, the reason for weight loss may be discomfort (a consequence of STA) which interferes with nutritional intake.
Rawal S., Structural equation modeling of associations among taste-related risk factors, taste functioning, and adiposity 2017 (19)	To establish whether the functioning of taste mediates the association between taste-related risk factors and adiposity	America; Observational cross-sectional study which included 407 healthy women	In this study, tonsillectomy and otitis media have been associated with both reduced taste and excessive adiposity. These tow chronic infections result in diminished taste sensitivity the tip of the tongue. The reduction in taste intensity in this surface is related to an increase in adiposity.

showed a significant weight loss caused by the alterations in taste, dysgeusia, parageusia and fantageusia had (2).

Three other studies have evaluated dysgeusia secondary to chemotherapy treatments, focusing on the fact that the type of dysgeusia was strongly related to weight loss. To prove these results, different alteration in taste sensations have been evaluated and classified: Type I corresponded to light/tolerable dysgeusia, whereas type IV was representative of a severe symptom of dysgeusia. Studies show that as the severity of dysgeusia increased, there was an increase in weight loss. Therefore, patients with type IV dysgeusia had a significantly higher weight loss than patients with other types of dysgeusia (14). Mutations in taste perception due to chemotherapy seem to be responsible of a diminished food intake and therefore, to weight

loss and malnutrition. To further compromise the condition, it has been identified that Vismodegib (chemotherapy drug whose effects have been studied prospectively and because of which more than two thirds of the patients suffer from dysgeusia) exposure brings to a reduction of the expressed cells on taste receptors (7).

Considering these results, it is possible to understand how the relation between malnutrition and dysgeusia has an unfavorable effect on the patient: alteration in taste is linked to a higher morbidity and mortality for a scarce energy and nutritional intake, weight loss and malnutrition. This can lead to cancer anorexia-cachexia syndrome, which is characterized by muscle wasting and loss of appetite (15).

Mahmood and colleagues have appraised dysgeusia in hospice patients with advanced cancer, and

focused on subjective changes in their appetite, taste sensations, and food preferences (16). None of the patients at the time of their study enrolment were neither under radiotherapy nor chemotherapy treatments. Weight loss was observed in the majority of those who had alteration in taste. Of the twelve people who reported taste alteration, half were associated with anorexia, weight loss and reduced energy intake (16). Lastly, Ferreira and colleagues have investigated on dysgeusia in patients with staminal cells transplant and observed that poor quality of life along with weight loss were associated with change in taste and reduced salivary flow. In fact, there was a significant association between change in sour taste perception in T1 (period of neutropenia) and weight loss. The majority of the patients (90,5%) showed alterations in taste, especially hypogeusia of bitter aroma, with a relevant impact on the appetite and loss of body weight (17).

Dysgeusia and increased body weight

Two studies included in the present review have identified a significant correlation between dysgeusia and body weight, specifically showing that obese or overweight people have a reduced taste perception (18,19). In light of these considerations, researchers gave patients varying concentrations of tea containing *gymnema sylvestre* to reduce temporarily and selectively the perception of sweet taste (18). The analysis of taste acuity in these patients showed a reduced sweet taste perception and an increased craving for sucrose content. Since the literature relates a reduction in taste perception to overweight or obese people (18), it is possible hypnotized that, the weakened taste response is associated, through a compensatory mechanism, with an increased desire for higher-calorie foods. Therefore, a common assumption is that a person with a diminished sense of taste may desire or habitually consume foods with a more intense flavor (18). These foods are most likely to be higher in calories, because both sweet and greasy tastes express the calorie content in their common forms. Concluding, a depleted taste response in people with obesity can affect their diet, namely, it can trigger a form of eating disorder, causing unhealthy eating habits. Overall in the present study, researchers believe that taste dysfunction should be taken in to account for its' correlation with obesity (18).

Similarly, there are different causes of reduction in taste, which can influence and change peoples' eating habits. Therefore, tonsillectomy and otitis media have been associated with both the reduction and alteration of taste and excessive adiposity. This is because these two chronic infections decrease gustatory sensitivity at the tip of the tongue. Reduction in taste sensitivity at the tip of the tongue is related to differences in preferences and in the intake of vegetables, alcoholic beverages, fatty and sweet foods (19).

Discussion

This literature review aims at providing the latest evidences present in literature about alterations in nutritional status, which patients suffering from dysgeusia go through. The results of the 12 articles included in the present review provide an overview of a symptom studied so far with primary study designs. De facto, overall perspectives on this filed have not yet been made. Moreover, the present literature review highlights the importance of dysgeusia and the need for a better understanding of it, as well as the consequences experienced by the patients affected. Our contribution could therefore provide an improvement on tailored and efficient health care for people with dysgeusia, considering how much the information provided to the patient can influence his response to the symptom and improve his nutritional status.

In light of these considerations, it is possible to assume that dysgeusia can have negative influence on patients' nutritional status and both weight gain and weight loss. Variation in taste can, indeed, change dietary intake and have severe consequences such as reduced quality of life and a worsening of prognosis (5), protracted hospitalization and increased morbidity and mortality (9). Hence, dysgeusia represents a real burden to those who suffer from it, with a relevant impact both on their nutritional status and on quality of life. It's need promote the assessment of dysgeusia by health-care provider, in order realize tailored intervention to take care of this symptom.

Based on the analysis of the first category of studies, it is possible to assume that the relationship between weight loss and dysgeusia is secondary to different medical treatments to which oncological patient

can be subjected to, like chemotherapy (either general or specific), radiotherapy and staminal cell transplant, with impending consequences on the decrease in body weight and further aggravation of the clinical status. Moreover, malnutrition and unwitting weight loss during and after radiotherapy treatment are associated with poorer clinical outcomes, increased morbidity, mortality, and reduced quality of life. Furthermore, weight loss superior to 20% significantly increases rates of infection, hospitalization and early death (20).

Dysgeusia can have different consequences: patients may lose weight due to the discomfort caused by the subjective alteration of taste, which interferes with the nutritional intake (2). The studies reviewed confirm the importance of considering these aspects. Hence, it is highly recommended to take into consideration interventions highlighted by different studies, in order to prevent the patient from experiencing fateful results caused by excessive weight loss. The majority of these studies seem to uphold the need of an early nutritional management for patients with dysgeusia.

Likewise, another area of clinical interest is obesity secondary to dysgeusia: a patient affected by this symptom is at risk for developing hypertension and diabetes, namely, a reduced quality of life (18,19). However, this is still an underestimated sphere and studies in literature are sometimes controversial, as only two studies are present in literature (18,19). Therefore, more studies should be carried out to provide more accuracy, offer a clear and definitive vision of patients' needs and implement interventions to limit excessive weight gain. New scientific contributions in this direction, through the construction of new knowledge, can help patients with dysgeusia to lessen the symptom, have an early treatment, prevention and recovery to the basic ability to distinguish flavors, even if only partially.

Conclusions

Dysgeusia is a health problem of great impact and is greatly underestimated, both by patients and by healthcare personnel. This literature review provides first contribution aimed at summarizing the current evidence on the subject of dysgeusia, in order to help the identification and treatment of this symptom by

promoting targeted educational activities. Our results describe the impact that dysgeusia has on alteration of the nutritional status, both in excess and defect. However, this literature review has some limitations due to the methodological approach chosen for the analysis, which can be potentially attributable to the language inclusion criteria as well as the articles selection during the research and the search strings terminology. Furthermore, only one study was purchased in the field of dysgeusia related to weight loss in the non-cancer population, and two articles evaluated taste alterations relative to weight gain. The heterogeneity of the included study designs is likely to be a further limitation to the present review even if it is consistent with the integrative nature of the study. Finally, new scientific improvements need to be done so that it would be possible to help patients regain the ability, even partially, to distinguish flavors thanks to a better knowledge, early diagnosis and prevention of this symptom.

Conflict of Interest. Each author declares that he or she has no commercial associations (e.g. consultancies, stock ownership, equity interest, patent/licensing arrangement etc.) that might pose a conflict of interest in connection with the submitted article.

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Correspondence:

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Federica Dellafiore, RN, PhD, Research Fellow

Department of Public Health, Experimental and Forensic Medicine, University of Pavia

Phone: +39 0382987282; Fax: +39 0382987290

E-mail: federica.dellafiore@unipv.it