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Vegetarian dietary guidelines: a comparative dietetic and communicational analysis of eleven international pictorial representations  
Guías alimentarias vegetarianas: análisis comparativo dietético y comunicacional de once representaciones gráficas internacionales

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## ABSTRACT

**Introduction:** This study aimed to analyze the main pictorial representations of food-based vegetarian dietary guidelines from different countries as a starting point to design a new guide for this specific population in Spain.

**Material and methods:** Searching in evidence-based databases and webs. Associations of dietitians and nutritionists, research groups, universities, and private entities endorsed by nutritionists were chosen. Format, target population, type and number of dietetic (as food grouping, servings, quantities), nutritional and lifestyle messages were **compared**. Messages' content and visual aspects, their position in the illustrations and their esthetic style were also analyzed.

**Results:** Eleven healthy eating guidelines with illustration for the vegetarian population worldwide were selected. Most of the graphics were intended for vegans and vegetarians; eight of them were pyramids, two were plates and one food shelving. Five food groups were always present: vegetables, fruits, cereals and derivative products, pulses and soybean products, and nuts. Messages about physical activity were present in four of them and vitamin B<sub>12</sub> supplementation in five. One of the illustrations contained a message about environmental sustainability; most of them (7 out of 11) reached up to fourteen dietetic and nutritional messages and more than 45 food, supplements and lifestyle icons. None has a hypertext or use digital tools in the online version.

**Conclusions:** There are differences in the position and composition of food grouping in vegetarian food guide illustrations. The main recommendation to consume grains, vegetables, fruits, pulses, soybean products and nuts daily was consistent in all the illustrations included. There is a need for more information on quantities and servings, foods rich in calcium or omega-3, vitamin B<sub>12</sub> supplementation and environmental sustainability. Adding recommendations about the consumption of iodized salt would be important in the Spanish context.

**Keywords:** Diet, Vegetarian; Diet, Vegan; Serving Size; Portion Size; Nutrition Policy; dietary guidelines; food-based dietary guidelines.

## RESUMEN

**Introducción:** El objetivo fue analizar las principales ilustraciones de las guías alimentarias para vegetarianos de diferentes países para diseñar una nueva en España.

**Material y métodos:** Se realizó una búsqueda en bases de datos y sitios web basados en la evidencia. Se eligieron asociaciones de dietistas y nutricionistas, grupos de investigación, universidades y entidades privadas respaldadas por nutricionistas. Se compararon el formato de las ilustraciones, su población objetivo, tipología y número de mensajes dietéticos (grupos de alimentos, porciones, cantidades), mensajes nutricionales y mensajes sobre el estilo de vida. Se analizaron el contenido y los aspectos visuales de los mensajes, su posición en las ilustraciones y su estilo estético.

**Resultados:** Se seleccionaron once guías de alimentación saludable con ilustración para la población vegetariana. La mayoría estaba destinada a veganos y vegetarianos, ocho eran pirámides, dos platos y una estantería de alimentos. Todas mostraban cinco grupos: hortalizas, frutas, cereales y productos derivados, legumbres (incluyendo derivados de la soja) y frutos secos. Cuatro contenían mensajes sobre actividad física y cinco sobre suplementación con vitamina B<sub>12</sub>. Una contenía un mensaje sobre sostenibilidad ambiental, la mayoría (7 de 11) contenía al menos catorce mensajes dietéticos y nutricionales y más de 45 iconos de alimentos, suplementos e imágenes sobre estilo de vida. Ninguna tenía hipertextos o utilizaba herramientas digitales en su versión en línea.

**Conclusiones:** Hay diferencias en la posición y composición de los grupos de alimentos en las ilustraciones de las guías de alimentos para vegetarianos. La recomendación principal de consumir cereales, hortalizas, frutas, legumbres, productos derivados de la soja y frutos secos diariamente fue consistente. La mayoría debería incluir información más precisa sobre cantidades y porciones, alimentos ricos en calcio u omega-3, suplementación con vitamina B<sub>12</sub> y sobre sostenibilidad ambiental. En el contexto español, sería importante agregar recomendaciones sobre el consumo de sal yodada.

**Palabras clave:** Dieta Vegetariana; Dieta Vegana; Tamaño de la Porción de Referencia; Tamaño de la Porción; Política Nutricional; guías alimentarias; guías alimentarias basadas en alimentos.

## INTRODUCTION

Food-based dietary guidelines (FBDG) are important tools that help the population to properly choose food to stay healthy and prevent chronic diseases (1,2). To make them easier to understand, they are usually accompanied by an image or a representative graphic of the main contents that serve as a summary and exemplification, help consumers' understanding, and is one of the main communication and dissemination tools for the general public (1,2).

FBDG should promote diets appropriate to the nutritional and energy needs of a specific population according to food availability, consumption patterns and economic conditions and lifestyles (3,4). In this sense, they should be specifically designed, differing in terms of graphics and messages, using the most suitable tool for dissemination and understanding (5). Different technical studies have reviewed and compared the food guides of several countries, showing particular messages of sociological, cultural and religious aspects of each country and common healthy premises as the need to consume fruits and vegetables, the restriction of salt and alcohol intake, the enough water intake and the weight control, as well as on lifestyle especially regarding the practice of enough physical exercise (6-8).

In the development of a FBDG, it is important to identify the relationship between diet and health, the country-specific diet-related problems and the food consumption patterns, and to decide how transform this information into short and clear messages, easily remembered and culturally acceptable (9). It could be necessary to evaluate the effectiveness of other guidelines and to recompile the communication strategies of other countries. According to vegetarian dietary guidelines, some FBDG have been developed and adapted to different populations but a comparative analysis of their pictorial representations has not been carried out to find out which are the common messages to all of them. This comparison of FBDG is necessary as a starting point to design a new guide for this specific population in Spain.

In this work eleven food-based vegetarian dietary guidelines were collected and their pictorial representations, food groupings, and associated messages of healthy eating and behavior were compared, along with visual aspects as the type and number of icons, its position and the presence of hyperlinks. Analyzing the communicative aspects of the FBDG, and more generally any nutritional communication material, is essential to improve their effectiveness.

## MATERIAL AND METHODS

In the first place, it was necessary to conduct a bibliographic review to select the existing healthy eating dietary guidelines for the vegetarian population worldwide. A database and web search were carried out in the English and Spanish languages, in order to identify international vegetarian and vegan FBDG provided with a pictorial representation.

### Selection criteria

The first selection criterion referred to the authority: the most authoritative sources in each country were chosen, at first, through the FAO FBDG webpage (10), as done in the comparative studies of the food guides of Painter et al. (6) and FAO (7). The search was expanded to PubMed, Medline, Scielo and Google Scholar, using as keywords (with and without quotation marks), “vegetarian food guide/guidelines”, “vegan food guide/guidelines”, “vegetarian food pyramid”, “vegan food pyramid”, “vegetarian food plate” and “vegan food plate”.

In some countries, the vegetarian alternative is included in the FBDG for the general population. While their pictorial representations have the great advantage of normalizing the vegetarian diet as a healthy alternative to the omnivore diet for the general population, they are not included in this comparison since they do not consider the possible deficiencies of some nutrients (essential amino acids, vitamin B<sub>12</sub>, calcium or vitamin D).

The second selection criterion referred to the target audience: only the pictorial representation aimed at the final user, with the use of icons being a tool to simplify their interpretation, were selected.

### Data evaluation

The comparison methodology used was based on the comparative study of the FBDG pictorial representations of Painter et al. (6): food guides illustrations were compared according to the food categorization and quantitative recommendations for each food group and included the FBDG pictorial representation format because the figure efficiently transmits the message of proportions to be consumed and the pyramid is one of the easiest icons to understand (11). The figure of the plate/circle, adopted recently in different countries, has been added to this iconic representation, as well as the atypical shelf figure of the Association Végétarienne de France (12).

The comparison included also the type of message used, as defined in the **FAO Latin America and the Caribbean's FBDG comparative study (7)**:

- Textual messages with dietetic, nutritional and lifestyle recommendations.
- Visual message (food icons part of the FBDG graphic representations), whose purpose is to facilitate the communication.

Thus, the analyzed messages have been those used to transmit the recommendations for each food group (number of daily servings and quantity in each one to maintain an optimal health, use of household measures) and the type of message used related to cultural elements and lifestyles (aspects related to nutrition, anthropology, agriculture or sociology). It was considered convenient to incorporate to this methodology the study of the presence of messages on sustainability, on specific nutritional recommendations as supplementation (given the need to ensure an adequate intake of some key nutrients, such as vitamins D and B<sub>12</sub>) or grouping of foods according to their quantitative importance in the diet (bases of the pyramids), or function (rich in calcium) and other elements related to communication (use of photography or drawing, number of icons, presence of hyperlinks).

## RESULTS

In the first selection, none of the listed FBDG had a vegetarian pictorial representation. The expanded search gave as a result the identification of five pictorial representations: Loma Linda University Vegetarian Food Pyramid (13), Arizona University Vegetarian Food Pyramid (14), California Department of Health Care Services Vegetarian Food Pyramid (15), Japanese Vegetarian Food Pyramid (16), Justus Liebig University of Giessen Die Gießener vegetarische Lebensmittelpyramide (17). Afterwards, the search list led us to identify seven more pictures: the Unión Vegetariana Española Pirámide de la alimentación vegetariana (18), the Oldways Vegetarian and Vegan Diet Pyramid (19), the ProVeg (vegan German association) Vegane Ernährungspyramide (20), the Vegetarian Resource Group My Vegan Plate (21), the Becoming vegan The Vegan Plate (22) and the Association Végétarienne de France Pyramide alimentaire végétale (12).

The selected data come from countries that provide the vegetarian population with healthy eating FBDG accompanied by illustrations (see [Additional Materials – AM](#)).

### Geographic distribution and authorship of the illustrations analyzed

Most of the analyzed pictorial representations of vegetarian FBDG are from the United States (six out of eleven: [Additional Materials](#) – AM 1-6), two are German ([Additional Materials](#) – AM 7, 8) and the others come from France ([Additional Materials](#) – AM 9), Spain ([Additional Materials](#) – AM 10) and Japan ([Additional Materials](#) – AM 11).

These FBDG and their pictorial representations have been prepared by official institutions, universities, associations of dietitians/nutritionists or vegan and vegetarian associations endorsed by dietitians/nutritionists. Almost all the illustrations analyzed belong to vegetarian associations (five out of eleven) and universities (three out of eleven), and only in one case to a government agency.

### Vegetarian food guide illustration shapes and target audiences

The illustrations have been analyzed according to their format: pyramids in [Additional Materials](#) – AM 2-8, 10 and 11; plates in [Additional Materials](#) – AM 1 and 6; and shelves in [Additional Materials](#) – AM 9. Vegans are the target population in [Additional Materials](#) – AM 1, 6, 8-10.

There are two other groups: graphics for vegans with ovo-lacto vegetarian (OLV) options in the top of the pyramid ([Additional Materials](#) – AM 2-4, 7), and graphics for OLV in which the vegan

option is presented separately and/or accompanied by messages related to the supplementation of B12 and other nutrients ([Additional Materials](#) – AM 5). This type of graphics could cover the needs of different types of vegetarian eating patterns: ovo-lacto vegetarian (OLV), ovo vegetarian, lacto vegetarian and vegan, thus avoiding the need to include more than one illustration in the food dietary guides.

#### Food grouping and type of food messages

As shown in Table 1, the OLV illustrations classified foods into seven to nine groups, and most of the vegan graphics, in five or six groups. Almost all OLV illustrations classify eggs, beans and nuts **in the same group, as “protein food”, whereas vegan graphics separate beans and soy derivatives from nuts and seeds.** Three of the vegan illustrations put calcium-rich foods (green leaves, oranges, fortified foods, soy derivatives, etc.) in a separated group.

Table 1. Food grouping. X means which food groupings are present in the pictorial representation of the analyzed vegetarian FBDG. At the end of the table there is the total number of food grouping in each illustration.

	1	2	3	4	5	6	7	8	9	10	11
Food grouping	Spain (18)	France (12)	US Becoming Vegan (22)	US Oldways (19)	Germany Justus Liebig University (17)	Japan (16)	US Loma Linda University (15)	US California Department of Health Care Services (15)	US Arizona University (14)	Germany Proveg (20)	US Vegetarian Resource Group (21)
Vegetables	x	x	x	x (a)	x	x (b)	x	x	x (c)	x	x
Fruits	x	x	x		x	x	x	x	x (d)	x	x
Grains and derivatives	x	x	x	x	x	x	x	x	x	x	x
Protein food	x				x	x		x	x	x	x
Eggs				x	x		x				
Dairy and analogs				x	x	x	x	x	x		
Discretionary calories					x (e)	x	x	x		x (f)	
Vegetables oils	x	x		x	x	x	x	x	x	x	
Salt / condiments	x		x			x (g)					
Nuts and seeds		x	x	x	x		x		x		
Beans / soy derivatives		x	x	x			x				
Calcium-rich foods			x							x	x
Total food groups	6	6	7	7	9	8	9	7	7	5	5

(a) In the same group with fruits.

(b) And algae.

(c) Separated in general vegetables and leafy green vegetables.

(d) And dried fruits

(e) Sweets and wine.

(f) Idem.

(g) Miso, salt, soy sauce.

Potatoes are placed in different food groups: vegetables ([Additional Materials](#) – AM 2, 3, 11) or with cereals ([Additional Materials](#) – AM 8-10) and are not present in five out of eleven pictorial representations ([Additional Materials](#) – AM 1, 4-7).

The textual messages referring to food groups were also analyzed (Table 2). As expected, the messages are aimed at a daily consumption of vegetables (vegetables, fruits), cereals, pulses and nuts. Other very frequent messages are those referring to daily consumption of eggs and dairy products or their analogs (enriched vegetable drinks), as well as to the consumption of healthy fats and water. Most of the illustrations recommend the consumption of whole grains (eight out of eleven). Only one illustration does not include written messages.

Table 2. Textual and visual food groups recommendations included in the illustrations. X means which food group's written and visual (icons) food groups are present in each FBDG' pictorial representations.

	1	2	3	4	5	6	7	8	9	10	11
Textual and visual food groups recommendations	Spain (18)	France (12)	US Becoming Vegan (22)	US Oldways (19)	Germany Justus Liebig University (17)	Japan (16)	US Loma Linda University (13)	US California Department of Health Care Services (15)	US Arizona University (14)	Germany Proveg (20)	US Vegetarian Resource Group (21)
Eat vegetables	x	x	x	x	x	x (a)	x	x	x	x (b)	x
Eat fruits	x	x	x	x	x	x	x	x	x	x (b)	x
Eat grains			x						x	x (b)	
Eat whole grains	x	x		x	x	x	x	x		x (b)	x
Eat potatoes/tubers	x	x			x					x (b)	
Eat beans, soy and derivatives	x	x	x	x	x	x	x	x	x	x (b)	x
Eat nuts and seeds	x	x	x	x	x	x	x	x	x	x (b)	
Eat eggs				x	x	x	x				
Eat dairy				x	x	x	x	x	x		
Eat dairy analogs								x	x	x (b)	x
Eat calcium-rich foods			x						x		x
Eat healthy fats	x	x		x	x	x	x	x	x	x (b)	
Drink water	x	x		x	x		x		x	x (b)	
TOTAL	8	8	6	9	10	8	9	8	10	10	6

(a) And algae.

(b) Only in visual format (icons).

## The basis of diet

In most of the analyzed illustrations that accompany the vegetarian FBDG, vegetables and fruits are in the bottom of the pyramid or occupy the largest section of the plates ([Additional Materials](#) – AM 1, 2, 6-9, 11).

Four pictorial representations place cereals and derivatives in the basis ([Additional Materials](#) – AM 3-5, 10). Beans, soy and derivatives are placed in the same level of cereals, at the bottom, in the Loma Linda University's vegetarian pyramid ([Additional Materials](#) – AM 3); in the Spanish vegan pyramid vegetables, fruits, cereals and other tubers occupy that place ([Additional Materials](#) – AM 10).

## The discretionary foods messages

As shown in the Table 3, five of the 11 analyzed illustrations offer messages about discretionary foods using text or/and icons –such as ultra-processed products, foods rich in simple sugars, fats and/or sodium– and about alcoholic beverages. It is worth noting the text next to the French illustration ([Additional Materials](#) – AM 9) that recommends limiting also processed vegan imitations of meat and cheese.

Table 3. Visual (v) or textual (t) messages about discretionary foods and their position in the analyzed vegetarian FBDG illustrations.

1	2	3	4	5	6	7	8	9	10	11
Spain (18)	France (12)	US Becoming Vegan (22)	US Oldways (19)	Germany Justus Liebig University (17)	Japan (16)	US Loma Linda University (13)	US California Department of Health Care Services (15)	US Arizona University (14)	Germany Proveg (20)	US Vegetarian Resource Group (21)
CONTENT OF VISUAL (V) OR TEXTUAL (T) MESSAGES ABOUT DISCRETIONARY FOODS										
	Sugar and sugared food, alcohol, salt, processed food as meat and cheese analogues (t)			Foods rich in refined sugars (desserts and sweets), sodium-rich foods/salty snacks and alcohol (wine) (t, v)	Foods rich in refined sugars (sugar and cookies), sodium-rich seasonings and fats (t, v)	Foods rich in refined sugars (sweets) (t, v)	Foods rich in refined sugars (desserts and sweets) (t, v)		Foods rich in refined sugars and alcohol (wine) (v)	
POSITION OF DISCRETIONARY FOODS IN THE ILLUSTRATION										
	Out of the illustration			Top of the pyramid	Top of the pyramid	Top of the pyramid	Minor proportion of the pyramid			

(t): textual message  
(v): visual message (icons)

## Specific nutrients and supplementation

As mentioned above, it has been deemed appropriate to incorporate in this analysis the presence of recommendations about specific nutrients, including the supplementation of vitamins D, B<sub>12</sub>, and the consumption of iodized salt. The messages on vitamin B<sub>12</sub> supplementation, extremely important for vegans, are present in 6 of 11 graphics, as shown in Table 4. In the same Table, other food messages have been analyzed, including privileging skimmed dairy products, reducing salt, using herbs and spices to add flavor and consuming teas and infusions.

Table 4. Text and visual messages about specific nutrients, supplementation and other food included in the analyzed FBDG' pictorial representations. X means which messages are present in the corresponding illustration.

	1	2	3	4	5	6	7	8	9	10	11
Text and visual messages about nutrients, foods and supplementation	Spain (18)	France (12)	US Becoming Vegan (22)	US Oldways (19)	Germany Justus Liebig University (17)	Japan (16)	US Loma Linda University (13)	US California Department of Health Care Services (15)	US Arizona University (14)	Germany Proveg (20)	US Vegetarian Resource Group (21)
Privileging skimmed dairy products								x (t)			
Reducing salt intake						x (t)					
Using herbs and spices				x (t, v)							
Consuming teas and infusions					x (t, v)					x (v)	
Consuming iron-rich products daily (pulses and soy derivatives)		x (t)									
Consuming products rich in Omega-3 fatty acids		x (t)	x (t, v)								
Supplementing with calcium									x (t)		
Exposing to the sunlight or supplementing with vit. D			x (t, v)				x (t, v)		x (t)		x (t)
Supplementing with B <sub>12</sub>	x (t, v)	x (t)	x (t, v)				x (t)		x (t)		x (t)
Using iodized salt	x (t, v)		x (t, v)								x (t)
TOTAL	2	3	4	1	1	1	2	1	3	1	3

(t): textual message  
(v): visual message (icon)

## Quantitative recommendations

The information about frequency and amounts of foods that should be eaten is not always available. Only a few graphics include textual messages indicating the specific quantities of foods servings (Table 5).

Table 5. Textual messages about quantity and frequency of consumption included in the analyzed FBDG' pictorial representations. X means which textual messages are present in the corresponding illustration.

	1	2	3	4	5	6	7	8	9	10	11
Textual messages about quantity and frequency of consumption	Spain (18)	France (12)	US Becoming Vegan (22)	US Oldways (19)	Germany Justus Liebig University (17)	Japan (16)	US Loma Linda University (13)	US California Department of Health Care Services (15)	US Arizona University (14)	Germany Proveg (20)	US Vegetarian Resource Group (21)
TEXTUAL MESSAGES THAT INDICATE EXACT QUANTITIES											
Drinking water							x		x		
Exposure to sunlight							x				
Vitamin B12 supplementation									x		
Vitamin D supplementation									x		
Calcium supplementation									x		
Vegetables, fruit, nuts, dairy and/or equivalents, eggs, healthy fat intake		x					x	x	x		
Fat, sugar and salt intake						x					
TEXTUAL MESSAGES THAT INDICATE MODERATION (DISCRETIONARY FOODS)											
Saturated fats								x			
Sugar and sugary foods					x		x	x		x	
Alcohol					x					x	
TEXTUAL MESSAGES THAT INDICATE EXACT FREQUENCIES											
Water intake							x		x		
Vegetables, fruit, nuts, dairy products and/or equivalents, eggs, healthy fat intake		x	x			x	x	x	x		
Fat, sugars and salt intake						x					

## Lifestyle and sustainability

Regarding the messages related to lifestyle, only 4 graphics of 11 recommend doing physical activity ([Additional Materials](#) – AM 2, 3, 5 and 8). Only one recommendation about sustainability has been found in two of the analyzed graphics ([Additional Materials](#) – AM 8 and 10): consuming tap water. [Additional Materials](#) – AM 2 recommends cooking/eating with family or friends.

## Number of messages

According to the information gathered, the analyzed graphics have a wide range of nutritional messages, from 9 ([Additional Materials](#) – AM 6) to 14 ([Additional Materials](#) – AM 5 and 8), excluding those referring to portions and frequency of consumption. Some illustrations have explanatory texts or bulleted lists outside the main design, with a small font size: these texts have been included in the analysis, if integrated into the graphics. The reported number of total messages is obtained from Table 2, 3 and 4.

## Number and types of icons

Most of the analyzed graphics are composed of many icons (from <30 to >45) in drawing ([Additional Materials](#) – AM 1-5, 8-10) or photography ([Additional Materials](#) – AM 6, 7 and 11) format that allows transmitting the wide variety of products included in the dietary pattern. Occasionally, they could generate confusion, especially if the illustrations are reproduced in small formats or with low resolution or if it is positioned within the pyramidal form. This is the case of food groups that share the same position; this can lead to a misinterpretation of the recommended daily consumption for each of them.

## DISCUSSION

Although the recommendations on the consumption of cereals, vegetables, fruit, pulses and nuts are present in all the pictorial representations of the selected vegetarian food guides, this analysis evidences a series of differences in the composition and position of these food groups and in the dissemination of other information.

Several differences exist, the major ones with food grouping, position, number and type of other food messages. This reflects different approaches to communicating choices within some foods. For example, pulses are placed as part of protein food (with nuts, seeds and in OLV guides with eggs) in seven illustrations and are represented as a separated group in four.

**Potatoes are placed with vegetables or with cereals and their icon doesn't appear in five out of eleven pictorial representations.** In fact, potatoes have a high glycemic load (23) and, over the long term, diets high in potatoes and similarly rapidly-digested, high carbohydrate foods can contribute to obesity, diabetes, and heart disease (24).

Regarding other messages, privileging skimmed dairy products is a message included only in one illustration and is a recommendation that recent scientific research has belittled (25,26).

Regarding sustainability, vegetarian (and especially vegan) eating patterns are the most sustainable, since they eliminate or reduce the consumption of foods whose production needs more natural resources and causes greater greenhouse gases emissions (27-32). In fact, according to Food and Agriculture Organization, all dietary guidelines should provide guidance for those who wish to adopt vegetarian or vegan diets in order to have a real positive impact on the environment (29). Vegetarian diets already contribute to the latter, but it can be useful for the vegetarian population to receive other recommendations on sustainability. Some of them are: reducing the consumption of highly processed foods; drink tap water; reducing food waste and managing it sustainably; using efficient cooking methods; knowing the impact on the environment of the production of eggs and dairy products (for OLV); avoiding unnecessary packaging.

It is striking that only 4 graphics of 11 recommend doing physical activity, no one give messages about its exact quantity of time. Most international guidelines recommend a goal of 150 min/week of moderate-to-vigorous intensity physical activity, but marked health benefits are observed with relatively minor volumes of physical activity and people might benefit from simply becoming more active (33).

Regarding the presence of specific nutrients and supplementation it's important noting that in Spain, the deficit of iodine is not exclusively linked to the vegetarian food pattern, since the intake of this mineral is deficient among the general population (34). On the other hand, the use of herbs and spices as a strategy to reduce salt intake is especially important in the Spanish context, since the daily salt consumption of Spanish population exceed the recommended amount (35). Only 6 out of the 11 analyzed graphics include the recommendation to supplement with vitamin B<sub>12</sub>, which is very important not only for the vegan population, but also for OLV (36).

Most of the illustrations analyzed do not indicate exact quantities or frequencies of servings; the complexity of quantitative messages lies in the difficulty of the population to understand the concept of ration. Regarding this, Carlos and colleagues suggest including photos of real food portions in the guides (37) while Marques-Lopes and associates propose to use household measures (38).

Five of the 11 analyzed illustrations offer messages about discretionary foods and place them at the tip of the pyramids. This depiction usefully transmits the little presence that these foods should have within a healthy diet, but its positioning above other foods, at the pinnacle of the graphics, could lead to misunderstandings (39).

Moreover, messages and/or icons about foods high in saturated fat, added sugars, salt, and/or alcohol) are often accompanied by terms such as "moderate consumption" or "occasional consumption": these types of messages are probably ambiguous and are not easily interpreted by the population (40). In this sense, a recent publication included a simple criterion for incorporating occasionally foods into a national dietary guideline, adapted to the Spanish population (41).

To facilitate the food guides' dissemination strategy, as a general recommendation these should not include more than ten messages (9,42), however most of the analyzed pictorial representations (7 out of 11) exceed this recommendation, reaching up to fourteen messages and more than 45 icons in most of the analyzed graphics.

Although most of the analyzed graphics are available on webpages, none of them has hypertext or hyperlinks. The analogical graphic format requires the creation of very brief messages and the inclusion of very different foods, at a nutritional level, in the same frequency group of consumption. The application of the composite approach is a strength because it allows us to compare the eleven graphics using the same standard, or measure. Strength of this analysis is that also the aspects

strictly related to visual communication, such as the type and number of icons and the format of the graphics, have been analyzed.

Nonetheless, it is not a comprehensive comparison and, since the subject is constantly evolving, this comparative analysis will need future updates: it is plausible that new vegetarian FBDG accompanied by pictorial representations will be published worldwide in the near future.

## CONCLUSIONS

The findings reported will be of interest for the creation of a pictorial representation of a FBDG for Spanish vegetarians. It would be useful to formulate more accurate messages (short texts and/or icons or photos) that indicate the frequency and exact amount of food that should be consumed. These texts and icons should be easily understandable for the population and include the servings in grams and in easily quantifiable domestic measures. Messages about sun exposure, consumption of iodized salt, foods rich in calcium or omega-3, and vitamin B<sub>12</sub> supplementation should also be accompanied by recommendations on the exact quantities and frequencies. The evidence base for optimal diets continues to evolve towards plant-based diets. However, these dietary patterns are not exempt from suffering imbalances and require transmitting clear messages to the population. Further analysis of this type of guides provides direction for future research in vegetarian diets and communication science. Regarding the link between sustainability and diet, The future configuration of the FBDG (vegetarians or not) should reflect the evidence in nutrition sciences, but also consider the consequences of food production on the economy, the environment, climate and the society as a whole, in the different countries. Likewise, digital communication tools in the nutritional field can offer many opportunities to promote interactivity, to facilitate the understanding and to increase the dissemination of the messages. The use of hypertexts, hyperlinks and pop-up windows could be useful to integrate more information in the web version of the food guides, avoiding the use of an excessive number of icons, offering the user a personalized and entertaining navigation. Further analysis of these aspects would shed new light on the development of FBDG and, more in general, of any nutritional communication tools.

## CONFLICT OF INTERESTS

Authors state that there are no conflicts of interest in preparing the manuscript.

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