

REVIEW ARTICLE



Food-based dietary guidelines in Spain: an assessment of their methodological quality

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BACKGROUND & OBJECTIVES: Food-based dietary guidelines (FBDGs) have been developed to promote healthy diets and prevent chronic diseases. However, the methodological quality of Spanish FBDGs has not been systematically assessed yet. The objective of this review is to identify and assess the methodological quality of Spanish FBDGs, as well as to describe their food guides and key recommendations.

METHODS: We conducted a systematic search to identify Spanish FBDGs targeted at the general population using multiple sources. Two authors independently screened the references, extracted data, and assessed the quality of the FBDGs using the Appraisal of Guidelines for Research and Evaluation (AGREE) II and the Recommendation Excellence (AGREE-REX) instruments. We performed a descriptive analysis of the FBDGs.

RESULTS: We included 19 FBDGs, published between 2007 and 2019. The median scores for each AGREE II domain were: “scope and purpose” 44% (Q1–Q3: 33–61%); “Stakeholder involvement” 31% (11–44%), “rigor of development” 3% (1–14%); “clarity of presentation” 42% (33–47%), “applicability” 0% (0–6%); and “editorial independence” 0% (0–8%). Six FBDGs (32%; 6/19) were categorized as “recommended with modifications”, and the rest (68%; 13/19) as “not recommended”. None of the FBDGs scored $\geq 60\%$ in three or more domains, including the “rigor of development” domain. FBDGs indexed in literature databases scored significantly higher in overall rating than those not indexed ($P = 0.023$). The majority of FBDGs (74%; 14/19) used the pyramid as a food guide representation with a larger number of food levels (3–7 levels). The majority of FBDGs recommended a daily intake of cereals and grains, vegetables, fruits, olive oil and dairy products; a weekly intake of vegetable and animal proteins; and the occasional and limited intake of other food groups (e.g., ultraprocessed foods).

CONCLUSIONS: Overall, the methodological quality of FBDGs is poor showing that only 32% of FBDGs are “recommended for use with modifications”. Our results highlight the need to revise, systematize and improve FBDG development processes in Spain.

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INTRODUCTION

Poor dietary habits over a life course may increase the risk of chronic diseases, including cancer and cardiometabolic diseases such as cardiovascular disease, and type 2 diabetes [1]. Since a healthy dietary pattern is thought to be one of the most important contributors to health, the Food and Agricultural Organization (FAO) and the World Health Organization (WHO) have published guidelines for the development and implementation of food-based dietary guidelines (FBDGs) [2–4]. FBDGs are one of the most predominant strategies for providing the general public with advice on foods, food groups, and dietary patterns, to promote a healthy diet and prevent chronic diseases [3, 4].

Despite widely accepted standards for the development of clinical practice guidelines, evidence indicates that the methods

and processes used to develop FBDGs are not necessarily optimal [5–10], with subsequent adverse impacts on nutrition public policy [11]. In fact, the methodological quality of existing international guidelines regarding nutrition recommendations differs, and there is a general need for improvement [7]. Specifically, most FBDGs do not meet standards for adequate rigor of development, editorial independence management, stakeholder involvement, and applicability of recommendations [7]. Regarding the rigor of development, a pivotal domain of the methodological quality, there are deficiencies in the current international FBDGs that include the failure to adopt a systematic review methodology of the available evidence, a lack of rigorous systems used to evaluate the certainty of the evidence and to move from evidence to recommendations [12].

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Until now, the overall methodological quality of Spanish FBDGs has not been systematically reviewed. In Spain, the Spanish Agency for Consumer Affairs, Food Safety and Nutrition of the Spanish Ministry of Health, Social Services and Equality (AECOSAN) developed various strategies, among them the strategy for nutrition, physical activity, and the prevention of obesity (the NAOS strategy) in 2005, following the World Health Organization Diet and Physical Activity Strategy (DPAS), adopted in 2004 [3]. Within this strategy, some Spanish autonomous regions and city councils were encouraged to participate in promoting a healthy lifestyle by developing their own programs aimed to promote healthy eating. In that context, several regions developed FBDGs. We therefore aim to identify and evaluate FBDGs developed for the Spanish population, including a systematic assessment of the quality of methods followed for development and the evidence used to support the dietary recommendations. We also aim to describe their food guides and key dietary recommendations.

METHODS

Study design

We conducted a methodological systematic assessment of all FBDGs published in Spain. We followed the Preferred Reporting Items for Systematic reviews and Meta-Analyses statement (PRISMA) reporting checklist for systematic reviews [13]. We registered the research protocol in the PROSPERO database in October 2019 (registration number CRD42019142549) [14].

Data sources and searches

We designed and conducted a systematic search strategy in MEDLINE (accessed via PubMed), Web of Science (Institute for Scientific Information), LILACS (Biblioteca Virtual en Salud), and Google Scholar from inception to May 2019. In addition, we searched websites of national and regional institutions, and national scientific societies and associations. We reviewed the Spanish FBDGs in the FAO's FBDGs website [3] and the references lists of the included articles. We also consulted with key experts in this field. The data sources and search strategy are available in Appendix S1. We executed the literature search monthly until the study was submitted for publication. The last search in MEDLINE was conducted in October 2020.

Eligibility criteria

We included Spanish FBDGs targeted at the general population. In this study, we have not considered the recommendations about water consumption and other healthy lifestyle factors, such as physical activity, healthy and sustainable food processing techniques, energy balance and emotional balance/mindful eating.

Our inclusion criteria were: (1) guidelines or consensus documents containing recommendations of foods, food groups and dietary patterns for clinical practice or public health policy; (2) FBDGs intended for the general healthy Spanish population, three years of age or older (children, adolescents, adults or elderly people); (3) FBDGs published in English, Spanish or in the official language of the different Autonomous Communities and; (4) for FBDGs in different versions we selected the most recent one.

Our exclusion criteria were: (1) FBDGs focused only on infants (children under three years) or population groups with nutrient deficiencies (e.g., anemia), diet-related diseases (e.g., diabetes) or special conditions (e.g., pregnant and breastfeeding women); (2) Nutrient reference guidelines that are not part of the FBDGs (e.g., salt reduction guidelines); (3) FBDGs published only as food guides (e.g., food pyramid) without an explicit methodology.

Screening references

We used Endnote version X9 software (Thomson Reuters, New York, USA) to organize and screen identified articles. Two authors independently screened titles and abstracts (first phase) and

full-text (second phase). We resolved disagreements by consensus or, if necessary, with the help of a third author.

Data extraction

We designed a data extraction form to collect the following information from each FBDG (also in supporting documents): (1) general characteristics (e.g., year, author); (2) methods used to review evidence and rate evidence quality (e.g., define the question, assess the risk of bias of included studies, rate the overall quality of the evidence); (3) methods used to formulate recommendations; (4) methods used to disseminate recommendations; (5) methods used to report conflicts of interest and funding sources. We identified and detailed the aspects of evidence considered for the development of FBDGs into groups as follows: diet-health associations (e.g., studies on food, foods groups or dietary patterns and risk of chronic diseases); nutrient and energy supplies (e.g., studies on nutrient and energy requirements on a population level); dietary habits/sociocultural preferences (e.g., documents on Spanish food-consumption data); sustainability (e.g., studies on environmental impact of habitual eating foods or dietary patterns); food-borne contaminants (e.g., documents on dietary exposure data), and; target group segmentation (e.g., documents on age and sex population groups requirements) [15]. In addition, we extracted key messages for food groups present in FBDGs [16].

Using two eligible FBDGs, two authors pilot-tested and refined an ad-hoc data extraction form. Subsequently, we independently extracted the data from each FBDG. We resolved disagreements by consensus or with the help of a third author when required. We contacted authors of FBDGs via e-mail if needed to clarify inclusion criteria or other information, as needed. We distributed a questionnaire through Google Forms to corresponding authors of all the FBDGs by e-mail in order to facilitate the data extraction process (<https://forms.gle/MtGNA6bEnHAAzrXG8>).

Assessment of the methodological quality

Two authors independently assessed the methodological quality for each included FBDGs using the AGREE II instrument, comprised of 23 items grouped into the following six domains: (1) scope and purpose; (2) stakeholder involvement; (3) rigor of development; (4) clarity of presentation; (5) applicability; (6) editorial independence. In addition, two overall quality assessment items were completed for each included FBDGs: a seven-point Likert scale (one—strongly disagree through to seven—strongly agree) and whether the author would recommend using the FBDG ("recommended", "recommended with modifications" or "not recommended") [17].

We entered the AGREE II item scores into the AGREE II score calculator to determine scaled scores for each domain [18]. Then, we calculated the AGREE II domain scores by summing all AGREE II items scores for a given domain, and by scaling the total into a standardized percentage of the maximum possible score for that domain [17]. We standardized domain scores (0–100%) using the following formula: $[(\text{obtained score} - \text{minimum possible score}) / (\text{maximum possible score} - \text{minimum possible score})] \times 100\%$.

To ensure the consistency of the rating process among the authors, first, we conducted a calibration exercise using two FBDGs comparing the AGREE II item scores of each author. We resolved disagreements (i.e., difference of ≥ 3 points on a seven-point Likert scale) by consensus [19] or, with the help of a third author when required.

Assessment of the quality of recommendations

As a complement to AGREE II, two authors would have also independently assessed the quality of all recommendations of each included FBDGs by using the AGREE-REX (Recommendation EXcellence) instrument. However, unfortunately, none of the included FBDGs met the minimal methodological threshold (i.e., a minimum of 50% on all six AGREE II domain scores)

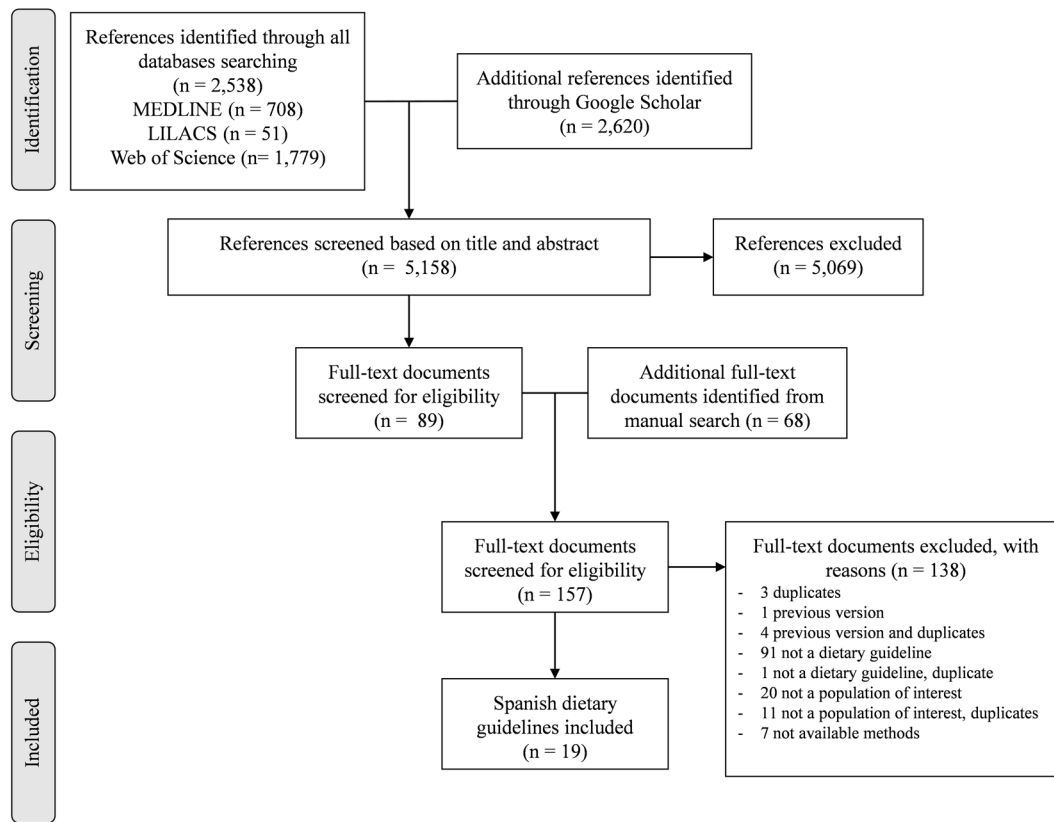


Fig. 1 PRISMA flow diagram. Flow diagram about the search and selection process of food-based dietary guidelines.

[20, 21]. The AGREE-REX instrument consists of nine items grouped into three domains for quality and for suitability for use: (1) clinical applicability; (2) values and preferences; (3) implementability. This instrument also includes two overall quality assessment items: a seven-point Likert scale (one—strongly disagree through to seven—strongly agree) and the overall assessment for use in the appropriate context or in the authors' context ("yes", "yes, with modifications", or "no") [20].

Data synthesis and analysis

We performed a descriptive analysis of the FBDGs. Regarding the AGREE II, we calculated the mean domain or overall score and the standard deviation (continuous variables with a normal distribution) or the median domain or overall score and the quartiles (Q1–Q3) (continuous variables with a non-normal distribution), as appropriate. We dichotomized the AGREE II overall recommendation as "recommended" ("recommended" plus "recommended with modifications") or "not recommended". We also defined high methodological quality as having three domains with scores 60%, including the domain of rigor of development [7, 19].

We calculated the inter-rater agreement using the intraclass correlation coefficient (ICC) with corresponding 95% confidence interval (95% CI). We classified the degree of agreement between reviewers on the basis of the ICC as follows: poor (0.01–0.20), fair (0.21–0.40), moderate (0.41–0.60), good (0.61–0.80), or very good (0.81–1.00) [22].

Characteristics (e.g., year of publication period) were selected a priori on the basis of previously studies [7, 23]. We described and compared characteristics of FBDGs against AGREE II domains and overall rating and recommendation. We explored the differences between categories of characteristics of FBDGs for categorical and continuous variables of AGREE II domains and overall rating and recommendation using the corresponding tests (χ^2 tests for categorical variables, Mann–Whitney and

Kruskal–Wallis for continuous variables with non-normal distribution or T-test and ANOVA for continuous variables with normal distribution). We dichotomized the year of publication as "recent" (≥ 2010) or "not recent" (< 2009); because the AGREE II instrument was published in 2010 [23]. We performed data analysis using SPSS statistical software (version 25; IBM, Armonk, NY). The significance for all tests will be two-tailed $P < 0.05$.

RESULTS

Search and selection of the food-based dietary guidelines

The search and selection process of FBDGs is summarized in a flow diagram (Fig. 1). We initially identified 5158 references. After title and abstract screening, we included 89 references. In addition, we retrieved 68 references from manual search. After full-text screening, we excluded 138 references. Finally, we included 19 FBDGs [24–43]. We contacted all authors to obtain additional information, but only four questionnaires were returned [29–31, 35].

Description of the food-based dietary guidelines

The characteristics and methods of the included FBDGs are reported in Table 1. Included FBDGs were published between 2007 and 2019. General population was the most frequently target population (53%; 10/19), followed by children and adolescents (21%; 4/19), children only (16%; 3/19) and elderly (10%; 2/19). Geographic scope in almost half of FBDGs assessed was Spain (32%; 6/19), and the majority were published by regional institutions (63%; 12/19). Diet-health associations and dietary habits were considered in 16 (84%; 16/19) and 15 (79%; 15/19) FBDGs, respectively. Aspects related to energy and/or nutrients intake and sustainability were considered in 11 (58%; 11/19) and 7 FBDGs (37%; 7/19), respectively. Only three FBDGs (16%; 3/19) were indexed in biomedical databases, which were published by professional organizations (Table S1).

Table 1. Characteristics and methods of food-based dietary guidelines.

ID (Reference) ^a	Year	Target population	Geographical scope	Aspects of evidence	Type of evidence	Methods	Funding
Gil (24)	2015	General population	Spain	Diet-health associations, nutrient and energy supplies, dietary habits, sustainability, food-borne contaminants	Other's FBDGs, authoritative bodies reports, other type of evidence documents	Review of scientific literature	Externally funded.
Gonzalez-Gross (25)	2008	Children and adolescents	Spain	Diet-health associations, nutrient and energy supplies, dietary habits	Other' FBDGs, dietary reference intake documents	Review of scientific literature	Externally funded. One private funder had role in the edition of the FBDG.
CODNIB (26)	NR	General population	Balearic Islands	Diet-health associations, dietary habits, sustainability, food-borne contaminants	Other' FBDGs, authoritative bodies reports, previously systematic reviews, other type of evidence reviews, individual primary studies, dietary reference intake documents	Review of scientific literature	Not reported
Barrios González (27)	2011	Children and adolescents	Canary Islands	Diet-health associations, nutrient and energy supplies, dietary habits, segmentation	Other' FBDGs, authoritative bodies reports, previously systematic reviews, dietary reference intake documents	Review of scientific literature	Internally funded.
ASPCAT (28)	2012	General population	Catalonia	Not reported	Not reported	Not reported	Not reported
ASPCAT (29)	2019	General population	Catalonia	Diet-health associations, nutrient and energy supplies, dietary habits, sustainability, food-borne contaminants	Other' FBDG, authoritative bodies reports, previously systematic reviews, other type of evidence reviews, individual primary studies, dietary reference intake documents	Review of scientific literature, consensus, COI form	Not reported
ASPCAT (30)	2017	Children only	Catalonia	Diet-health associations, nutrient and energy supplies, dietary habits, sustainability, food-borne contaminants	Previous version of own FBDG, other' FBDGs, authoritative bodies reports, previously systematic reviews, other type of evidence reviews, dietary reference intake documents	Review of scientific literature, consensus	Not reported
Galicia (31)	2012	Elderly	Galicia	Diet-health associations, nutrient and energy supplies	Other' FBDGs, authoritative bodies reports, other type of evidence documents	Review of scientific literature	Not reported
Vilas Herranz (32)	2007	Children only	Madrid	Diet-health associations, nutrient and energy supplies, dietary habits	Other' FBDGs, individual primary studies, dietary reference intake documents	Review of scientific literature	Not reported
Belmonte (33)	2010	General population (adolescents)	Madrid	Dietary habits, food-borne contaminants	Other' FBDGs, authoritative bodies reports	Not reported	Not reported
Delikatuz (34)	2010	Elderly	Basque Country	Diet-health associations, nutrient and energy supplies, dietary habits	Other' FBDGs, authoritative bodies reports, individual primary studies	Review of scientific literature, consensus	Not reported
Valencia (35)	2008	General population (adolescents)	Valencian community	Diet-health associations, nutrient and energy supplies	Other' FBDGs, authoritative bodies reports, dietary reference intake documents	Review of scientific literature	Not reported
Valencia (36)	2009	General population	Valencian community	Not reported	Other' FBDGs	Not reported	Not reported
Valcárcel Alonso (37)	2019	Children only	Basque Country	Diet-health associations, nutrient and energy supplies, dietary habits, sustainability	Other' FBDGs, authoritative bodies reports, other type of evidence	Review of scientific literature, consensus	Not reported

Table 1 continued

ID (Reference) ^a	Year	Target population	Geographical scope	Aspects of evidence	Type of evidence	Methods	Funding
López Nondedeu (38)	2010	Children and adolescents	Spain	Diet-health associations, dietary habits	Other' FBDGs, authoritative bodies reports, individual primary studies	Review of scientific literature	Not reported
Tur Marí (39)	2010	General population	Spain	Diet-health associations, dietary habits	Other' FBDGs, authoritative bodies reports	Review of scientific literature	Not reported
AECOSAN (40)	2007	Children and adolescents	Spain	Diet-health associations, nutrient and energy supplies, dietary habits	Other' FBDGs, authoritative bodies reports	Review of scientific literature	Not reported
Rivera (41)	2018	General population	Andalusia	Diet-health associations, dietary habits, sustainability	Other' FBDGs, authoritative bodies reports, individual primary studies	Review of scientific literature, consensus	Not reported
Aranceta-Bartrina (42)	2019	General population	Spain	Diet-health associations, dietary habits, sustainability, segmentation	Previous version of own FBDG, other' FBDGs, authoritative bodies reports, previously systematic reviews, individual primary studies	Review of scientific literature, consensus, COI form	Internally funded. The funder had not role in any part of the FBDG.

FBDGs food-based dietary guidelines, COI conflict of interest
^aCited reference order.

Of the 19 included FBDGs, 16 FBDGs (84%; 16/19) reported some general information about the methods used. However, none of the FBDGs specified in detail the steps typically required (e.g., identifying and searching for evidence, extracting data, assessing the risk of bias, evaluating the quality of the evidence, or rating the strength of recommendations). Almost all of the included FBDGs (95%; 18/19) were based on other FBDGs, and most FBDGs (79%; 15/19) were based on authoritative bodies' reports. Only two FBDGs (10%; 2/19) were updates of the previously published FBDGs. Only six FBDGs (32%; 6/19) were based on systematic reviews.

In six FBDGs (32%; 6/19), the recommendations were formulated through a consensus process. None of the FBDGs graded the direction and strength of the recommendations. Two FBDGs (10%; 2/19) reported the conflict of interest (COI) disclosure and four FBDGs (21%; 4/19) reported the funding sources; only two of them (10%; 2/19) reported the role of the funders.

Description of the food-based dietary recommendations

The characteristics of the food guides are summarized in Table 2. Most FBDGs (79%; 15/19) used a food guide representation with the exception of four (21%; 4/19), which lacked a graphical presentation. The pyramid was the most frequently adopted food guide (74%; 14/19).

Numerous examples of foods in each different food group were illustrated with photographs or drawings. Nearly all FBDGs presented levels of the consumption frequency of different food groups or by food groups (3–7 pyramid levels), with the majority starting at the base with cereals and grains products. The most common food groups represented were: cereals and grains products, potatoes and other tubers, vegetables, fruits, olive oil or other vegetable oils, legumes, nuts, milk and dairy products, and animal protein-rich foods such as fish, meat, and eggs. Only four FBDGs (21%; 4/19) specified recommended number of servings of food groups in the food guide.

In general, FBDGs suggest a daily intake of cereals and grains ["preferably whole grains" were suggested in four FBDGs (21%; 4/19)], vegetables, fruits, olive oil and dairy products; a weekly intake of vegetable (legumes and nuts) and animal (fish, meat and eggs) proteins; and occasionally and in moderation consumption of sugar-rich foods, fats and other oils, salt- and fat-rich foods, alcoholic and non-alcoholic beverages, and ultraprocessed foods. The key dietary recommendations, which were organized by food groups commonly present in food guides, are listed in Appendix S2.

Methodological quality

The methodological quality scores of each FBDG by domain and the overall assessment of the AGREE II instrument are presented in Table 3. The overall agreement among authors on the overall quality rating of the FBDGs with the AGREE II instrument was moderate (ICC: 0.42; 95% CI: -0.52 to 0.77).

Scope and purpose. This domain includes the overall objective(s), the health questions and the target population of the FBDGs [17]. The median score in this domain was 44% (Q1–Q3: 36–61%) (Table S1). Five FBDGs (26%; 5/19) scored above 60% (Table 3). The main limitation across almost of all FBDGs was that the health questions covered by the FBDGs were not clearly reported.

Stakeholder involvement. This domain focuses on the extent to which the FBDG was developed by the appropriate working groups and represents the views of the target users [17]. The median score in this domain was 31% (11–44%) (Table S1). Only two FBDGs (10%; 2/19) scored above 60% (Table 3). The main limitation across FBDGs was that FBDGs did not report how they sought the views and preferences of their target population (children, adolescents, adults or elderly people).

Table 2. Elements and foods represented in food-based dietary guidelines.

ID (Reference) ^a	Food guide representation shape	Levels represented	Food groups represented	Frequencies or amounts of food groups recommended
Gil (24)	Pyramid	6 levels	Cereals and grains (>50% whole products) at the base	Not reported
Gonzalez-Gross (25)	Pyramid	4 levels	Cereals and grains, potatoes, banana, and sugar-sweetened beverages and juices at the base	Number of servings of food groups are included
CODNIB (26)	Pyramid	3 levels	Vegetables, olive oil, cereals and grains, potatoes, fruits, and milk and dairy products at the base	Not reported
Barrios González (27)	Not available			
ASPCAT (28)	Pyramid	3 levels	Cereals and grains, potatoes, vegetables, fruits, olive oil, legumes, nuts, and milk and dairy products at the base	Not reported
ASPCAT (29)	Traffic light	Three key messages	Fruits, vegetables, legumes, nuts, whole cereals and grains, olive oil, salt and sugar-rich products, red and processed meat, ultraprocessed foods are represented Potatoes, milk and dairy products, fish, eggs, fats and other oils are not represented	Not reported
ASPCAT (30)	Pyramid	4 levels	Cereals and grains, potatoes, vegetables, fruits, olive oil, legumes, nuts, and milk and dairy products at the base Herbs and spices are mentioned	Not reported
Galicia (31)	Not available			
Vilas Herranz (32)	Pyramid	7 levels	Cereals and grains at the base	Not reported
Belmonte (33)	Pyramid	7 levels	Cereals and grains, and potatoes at the base	Not reported
Delikatuz (34)	Pyramid	4 levels	Whole cereals and grains, and potatoes at the base	Number of servings of food groups are included
Valencia (35)	Not available			
Valencia (36)	Pyramid	4 levels	Cereals and grains, potatoes, and nuts at the base	Not reported
Valcárcel Alonso (37)	Not available			
López Nondedeu (38)	Pyramid	3 levels	Cereals and grains, potatoes, vegetables, fruits, olive oil, and milk and dairy products at the base	Not reported
Tur Marí (39)	Pyramid	3 levels	Cereals and grains, potatoes, vegetables, fruits, olive oil, and milk and dairy products at the base	Not reported
AECOSAN (40)	Pyramid	6 levels	Cereals and grains, tubers and fruits at the base	Number of servings of food groups are included
Rivera (41)	Pyramid	3 levels	Fruits, vegetables, potatoes, olive oil, whole cereals and grains, legumes, and nuts at the base Alcoholic beverages are also represented	Not reported
Aranceta-Bartrina (42)	Pyramid	5 levels	Whole cereals and grains, potatoes, fresh legumes, and chestnuts at the base Alcoholic beverages, supplements and other items are also represented	Number of servings of food groups are included

^aCited reference order.

Table 3. Methodological quality of food-based dietary guidelines.

ID (Reference) ^a	Scope and purpose (score, %)	Stakeholder involvement (score, %)	Rigor of development (score, %)	Clarity of presentation (score, %)	Applicability (score, %)	Editorial independence (score, %)	Overall rating	Overall recommendation
Gil (24)	44	11	1	39	4	0	2	No
González-Gross (25)	50	36	9	33	0	8	3	No
CODNIB (26)	39	0	2	42	0	0	2	No
Barrios González (27)	67	47	4	50	2	29	3	Yes, with modifications
ASPCAT (28)	28	0	0	44	10	0	2	No
ASPCAT (29)	39	28	29	72	23	17	4	Yes, with modifications
ASPCAT (30)	44	44	14	42	8	0	3	Yes, with modifications
Galicia (31)	64	67	34	47	6	88	4	Yes, with modifications
Vilas Herranz (32)	44	11	1	33	0	0	2	No
Belmonte (33)	33	36	3	33	0	0	2	No
Delikatuz (34)	64	19	4	42	2	0	3	No
Valencia (35)	53	39	3	31	0	0	2	No
Valencia (36)	22	14	0	22	0	0	2	No
Valcárcel Alonso (37)	39	53	0	42	0	0	3	No
López Nondedeu (38)	33	25	3	39	0	0	2	No
Tur Marí (39)	36	33	4	39	13	0	2	No
AECOSAN (40)	56	11	0	44	0	8	3	No
Rivera (41)	61	31	17	47	2	0	3	Yes, with modifications
Aranceta-Bartrina (42)	67	67	26	50	0	83	5	Yes, with modifications

^aCited reference order.

Rigor of development. This domain relates on the methods used to identify and synthesize the evidence, the methods used to formulate and update the recommendations for FBDG development [17]. The median score in this domain was 3% (1–14%) (Table S1) and none of the FBDGs scored above 60% (Table 3). The main limitation across FBDGs was that the most items for this domain were not described.

Clarity of presentation. This domain assesses whether recommendations are specific and unambiguous, and easily identifiable in the FBDG [17]. The median score in this domain was 42% (33–47%) (Table S1). Only one FBDG scored above 60% (Table 3). The main limitation in this domain was that the different options for prevention of the condition or health issue were not clearly presented.

Applicability. This domain considers the aspects related to implementation such as facilitators and barriers, advice and/or tools, potential resource implications, and monitoring and/or auditing criteria [17]. The median score in this domain was 0% (0–6%) (Table S1) and none of the FBDGs scored above 60% (Table 3). The main limitation across FBDGs was that none of the items for this domain were described.

Editorial independence. This domain addresses whether the views of the funding sources influenced the content, and whether the competing interests of panel members have been recorded and reported [17]. The median score in this domain was 0% (0–8%) (Table S1) with only two FBDGs (10%; 2/19) scored above 60% (Table 3). The main limitations across almost of all FBDGs were that they did not report their funding sources and their possible influence, or they did not clearly report the potential COIs of authors.

Overall assessment. The median of overall rating was 3 (2–3) (Table 3), scores ranged from 2 to 5 (Table S1). None of the FBDGs (0%; 0/19) was categorized as “recommended”, six FBDGs (32%; 6/19) were categorized as “recommended with modifications”; and 13 (68%; 13/19) were categorized as “not recommended”. Nevertheless, none of the FBDGs scored $\geq 60\%$ in three or more domains, including “rigor of development” domain (Table 3).

Methodological quality according to the food-based dietary guidelines characteristics

There was an improvement over time in the “overall recommendation” ($P=0.003$) and in the “clarity of presentation” domain ($P=0.001$) (Table S1). Statistically significant differences were also observed in some AGREE II domain scores or overall rating or overall recommendation according to some FBDGs characteristics (Table S1). For example, FBDGs indexed in biomedical literature databases scored significantly higher in the “stakeholder involvement”, “rigor of development” and “editorial independence” domains, and in “overall recommendation” than those not indexed ($P=0.023$, $P=0.023$, $P=0.008$, $P=0.023$, respectively). Similarly, FBDGs developed by professional organizations scored significantly higher in the “rigor of development” domain and overall rating ($P=0.032$ and $P=0.048$, respectively) than those developed in national or regional institutions.

DISCUSSION

Summary of the main findings

Our review identified 19 Spanish FBDGs, published between 2007 and 2019. Most FBDGs used the pyramid as a food guide representation, with a larger number of food groups or levels of the consumption frequency of different food groups. The most common food groups represented were cereals and grains products, potatoes, vegetables, fruits, olive oil, nuts, milk and

dairy products, and vegetal (legumes) and animal protein-rich foods (fish, meat and eggs). Although the overall direction of food-based dietary recommendations (i.e., key messages of a healthy diet) was consistent, the evidence used to make these recommendations was general and vague. For instance, for the minority of FBDGs informed by systematic review, dose-response meta-analysis was not used to justify any recommendations and value and preference data was not captured to inform any food-based dietary recommendations.

In our overall quality assessment of the development of the FBDGs using the AGREE II instrument, only 32% of FBDGs were categorized as “recommended with modifications”, while the rest (68%) were categorized as “not recommended” for use. The domains with the highest score were “scope and purpose” and “clarity of presentation”, and the domains with the lowest score were “stakeholder involvement”, “rigor of development”, “editorial independence” and “applicability”. None of the FBDGs were classified as high quality (i.e., scores $\geq 60\%$ in three or more AGREE II domains, including “rigor of development” domain). Further, we could not assess the quality of the recommendations due to the low methodological quality of the FBDGs.

The context of our results with previous research

Previous studies found methodological deficiencies in the development of FBDGs [7, 12]. For example, Blake et al. [12] described that <20% FBDGs were based on systematic reviews, <15% disclose the conflicts of interest, and <10% have a policy for managing conflicts [12]. These findings are similar to our study, with very low scores in the “rigor of development” (e.g., use of systematic review methods) and “editorial independence” (e.g., strict management of conflicts of interest) domains.

Although the number of FBDGs included in our review is low, we found a slight improvement in the overall quality of FBDGs over time. This finding is consistent with two overviews of the quality of clinical guidelines according to the AGREE for different health care areas [43, 44], but not with a more recent overview of the quality of guidelines in the nutrition field [7]. While more eligible FBDGs are required to draw more definitive conclusions, in general, there is substantial room for improvement in terms of development standards for dietary and nutritional recommendations [7].

Previous studies suggest that the majority of the FBDGs adopt pyramids as a food guide [45, 46] as well as classify the foods into five or seven groups [45–47]. One recent review found a consistency on several dietary recommendations among 90 global FBDGs [45], including: high consumption of vegetables, fruits, grains and cereals; consumption of healthy sources of proteins; whereas they recommend the avoidance of ultraprocessed foods, typically with excessive salt, sugar, and saturated fat; and substantial reductions in the consumption of red and processed meats. Nevertheless, dietary recommendations on dairy, other meats, oils and other fats, and nuts are less consistent. In general, these findings are also similar to our study.

Strengths and limitations

Our review has several strengths. We registered the protocol using a rigorous and explicit methodology. We adopted a sensitive and comprehensive literature search strategy and an explicit eligibility criterion. We did a pilot testing and calibration of the data extraction process. We performed in duplicate the study selection, the data extraction, and the data evaluation. Our review also included experts who have extensive experience in the fields of nutrition, clinical practice guidelines, evidence-based medicine, and public health.

Our review has some limitations. First, the methodological quality and recommendations quality assessment is somewhat subjective, and there are no defined thresholds for distinguishing between high or low in quality FBDGs. However, the AGREE II tool

has been tested for reliability and validity [17]. Second, some methods for FBDG development may have not been adequately reported by authors of the FBDGs. However, we attempted to minimize this by searching additional supporting documents related to FBDG development, and when important information was not reported, we contacted the corresponding authors of the FBDGs. More recently, we identified a new edition of one of the FBDGs included in this review [48]. Unfortunately, this latest version was not considered; however, our overall results are unlikely to change based on the results of this FBDG alone, primarily because the methods of the development of this FBDG were almost remained unchanged.

Implications of our results for practice and research

FBDGs users need to be mindful of the methodological deficiencies of most published Spanish FBDGs. FBDGs developers need to systematize and improve the development process of FBDGs using several resources like the Guidelines International Network-McMaster Guideline development checklist [49], and the AGREE II tool [17]. FBDGs developers could use the Grading of Recommendations Assessment, Development and Evaluation (GRADE) approach to assess the certainty of evidence for all outcomes considered, and to move from the summary evidence to the recommendations [50]. If insufficient resources are available to conduct systematic reviews, FBDGs developers could use or update existing systematic reviews; however, the quality of the reviews should be assessed using an instrument such as AMSTAR 2 [51]. In addition, the COIs and funding sources should be stated.

Regarding research development, more efforts should be made to develop and consolidate networks for researchers, to facilitate the evaluation and synthesis of all available nutrition evidence for FBDG development. More collaborative efforts by national institutions, regional institutions and professional organizations should be made to develop FBDGs. In this line, an online international repository of FBDGs and associated resources is available [3]; nevertheless, we suggest that a Spanish repository would help harmonize the FBDG methods.

CONCLUSION

Our results suggest that the methodological quality of Spanish FBDGs is poor in regard to scientific standards for evidence-based practice guidelines. Only 32% of FBDGs were “recommended for use with modifications”. Our results highlight the need to revise, systematize and improve FBDG development processes in Spain.

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AUTHOR CONTRIBUTIONS

MR envisioned and designed the study; MR drafted the protocol, which was reviewed and approved by all authors. MR designed and executed the search strategy. MR and SG-R screened references for eligibility, which were reviewed by SC-G, MM, M-G, MA, MR, and YHP extracted data from eligible FBDGs, which was reviewed by SG-R, MR, and YHP assessed the methodological quality of FBDGs. MR performed the statistical analysis. MR drafted the paper, which was critically reviewed and approved by all authors.

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COMPETING INTERESTS

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ADDITIONAL INFORMATION

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