Vieri Revaly Prasasta Sudewo[1], Suprehatin Suprehatin[2,*], Anisa Dwi Utami[2]

[1] Master of Science Agribusiness, Faculty of Economics and Management, IPB University, Dramaga, Bogor Regency, Indonesia
[2] Department of Agribusiness, Faculty of Economics and Management, IPB University, Dramaga, Bogor Regency, Indonesia

*) Correspondence email: suprehatin@apps.ipb.ac.id

Understanding Studies on Consumers' Food Choices Using Food Choice Questionnaire: A Scoping Review and Bibliometric Analysis (ScoRBA)

ABSTRACT

Since the development of the food choice questionnaire (FCQ) to assess consumers' food choice motives in 1995, studies using the FCQ have been highly diverse. Despite the abundance of research on the topic, FCQ nevertheless manages to provide deep insights into consumers' food choices—a crucial aspect for the agrifood industry and the formulation of food policies. This study aimed to analyze science mapping and synthesize research implications on the studies of consumers' food choice motives using FCQ. In total, 169 FCQ-related journal articles were retrieved from the Scopus and Web of Science (WoS) databases for this study. The data were analyzed using a scoping review and bibliometric analysis (ScoRBA). The findings disclosed a positive trend in research on consumers' food choice motives using FCQ. Notably, two seminal papers significantly influenced this field. Furthermore, specific research topics emerged and diversified over time, with recent themes encompassing consumer issues, consumer segments, research methods, and contextual factors. Recommendations for future research included: (1) conducting longitudinal studies to bridge the gap between food choice motives and dietary behaviors, with the incorporation of additional new recent factors; (2) longitudinal studies to explore nutrition, psychology, and health study groups in diverse cultural settings and more reliable research; (3) exploring FCQ research through a gender lens within varied cultural contexts, with an expansion of longitudinal research and more parameters; and (4) delving into FCQ research on adolescents, considering various potential influencing factors and utilizing data capable of elucidating causal relationships between variables.

Keywords: Bibliometric analysis; Food choice; Food choice questionnaire; Motive; Scoping review

INTRODUCTION

Global food systems have experienced significant transformations. Accordingly, these rapid transformations, driven by the rise in income, urbanization, and globalization, have led to changes in consumers' diets (Reardon et al., 2019; Reardon & Timmer, 2014). People worldwide have shifted toward better food consumption patterns, expanding food diversity

(Caballero & Popkin, 2022). Indonesian consumers' growing demand for high-value agricultural products, such as fruit, vegetables, meat, fish, eggs, and dairy, illustrates the case (Reardon, Stringer, Timmer, Minot, & Daryanto, 2015; Toiba, Umberger, & Minot, 2015). A report by Food and Agriculture Organization [FAO] (2017) the unveiled a transition in dietary patterns toward increased consumption of meat, fruits, and vegetables compared to grains due to income growth in low- and middle-income countries. The rising consumption and diversification of diets indicate that each person has individual motives for choosing food.

According to Onwezen, Reinders, Verain, and Snoek (2019), food choice motives refer to the reasons or motivations behind someone's food choices or consumption. Different factors, such as health, cost, convenience, and taste, could influence consumers' choices for food (Lyerly & Reeve, 2015; Steptoe, Pollard, & Wardle, 1995). Meanwhile, others consider cultural factors, such as norms and values, to shape their views on the ideal types of food (Cunha, Cabral, Moura, & de Almeida, 2018). Consumers motivated by health-related factors in their food demand favor organic, minimum pesticide-free, and low-sugar food (Lidew et al., 2015).

Understanding consumers' motives for food choices provides basic information for policymakers and businesses to develop policy interventions, strategies, programs, innovations, and campaigns concerning food consumption (P.-J. Chen & Antonelli, 2020). It is also a key to the success of agrifood value chain development since the demand for quality food drives changes in the food supply chain (King & Venturini, 2005; Taylor & Fearne, 2006). In empirical studies, one of the evolving and widely employed tools to predict consumers' food choices is the food choice questionnaire (FCQ) (Pollard, Steptoe, & Wardle, 1998; Steptoe et al., 1995; Steptoe & Wardle, 1999). The FCQ was first developed by Steptoe et al. (1995) and consists of nine primary reasons consumers choose certain foods: health, mood, convenience, sensory appeal, natural content, price, weight control, familiarity, and ethical concerns.

Conducting a literature study of the FCQ is crucial, even amidst numerous literature reviews on agrifood topics like food waste (Schanes, Dobernig, & Gözet, 2018), agrifood traceability (Feng, Wang, Duan, Zhang, & Zhang, 2020), functional foods (Granato et al., 2020), and agrifood transformation (Borsellino, Schimmenti, & El Bilali, 2020). The FCQ serves as a vital tool to delve deeper into understanding the specific factors influencing consumers' food choices, encompassing psychological, cultural, and social aspects. These choices wield significant influence over the entire agrifood industry, impacting production, distribution, and marketing. Furthermore, FCQ research often addresses crucial health and food policy issues, hinting at the identification of evolving food preferences and informing tailored policies promoting healthier eating habits. Moreover, such literature studies provide the foundation for further research by identifying knowledge gaps and facilitating more in-depth investigations. In essence, the study of FCQs offers profound insights into consumers' food behavior, which, despite the extensive literature on related topics, remains critical for both the agrifood sector and food policy development.

An earlier literature review on FCQ was conducted by Cunha et al. (2018) on articles published in the Scopus and Web of Science (WoS) databases until July 2017, focusing on cross-cultural and single-country studies. Therefore, performing an updated literature review of FCQ is crucial. Different from Cunha et al. (2018), this study integrated a scoping review and bibliometric analysis (ScoRBA) (Wijaya, Setiawan, Ahmad, Zakaria, & Othman, 2023) to review studies on consumers' food choices until 2022. The ScoRBA approach was selected over native scoping review or bibliometric analysis methods because it allowed for a more systematic and efficient examination of FCQ research themes and trends. Unlike specific studies such as, which focused on cross-cultural and single-country studies, the ScoRBA approach encompassed a broader scope, capturing the full landscape of FCQ research themes and evolution. By leveraging bibliometric analysis and the pattern, advance, gap, evidence for the practice, and research recommendation (PAGER) framework, this ScoRBA approach enabled a comprehensive exploration of FCQ studies, offering insights into global trends, high-impact journals, leading countries, and content-specific areas. Thus, the approach provided a more holistic and nuanced understanding of the FCQ field, making it the preferred choice for this study. Through a comprehensive examination of existing literature, this study could contribute to the development of FCQs as a valuable tool for understanding and evaluating food choice preferences and behaviors.

RESEARCH METHOD

The study utilized data consisting of FCQ publications retrieved from the Scopus and WoS databases on January 12th, 2023. The core collection of WoS, including its primary citation indexes, encompassed more than 75 million records, and when other regional and subject-specific citation indexes were considered, the total number of records reached 155 million (Birkle, Pendlebury, Schnell, & Adams, 2020). On the other hand, Scopus has stood out as the leading abstract and citation database, encompassing a vast collection of over 20,000 peer-reviewed journals across various disciplines such as science, technology, medicine, social sciences, and arts and humanities (Fahimnia, Sarkis, & Davarzani, 2015; Mishra et al., 2016). These journals were published by renowned publishing houses, including Elsevier, Emerald, Informs, Taylor and Francis, Springer, and Inderscience, asserting coverage of over 76 million records (Baas, Schotten, Plume, Côté, & Karimi, 2020). While WoS has historically been the primary and most widely accessible database for bibliometric analysis, the emergence of Scopus, introduced by Elsevier, has established it as a significant competitor for conducting such analyses (Echchakoui, 2020). Scopus had a 20% greater citation analysis coverage than WoS, while Google Scholar provided inconsistent results (Das & Roy, 2022). However, the citation analysis provided by WoS offered better and more detailed graphs compared to Scopus, as WoS was designed to meet the users' needs in citation analysis (Falagas, Pitsouni, Malietzis, & Pappas, 2008). Therefore, this study involved both Scopus and WoS databases and served as an update to the earlier literature review conducted by (Cunha et al., 2018).

A literature review comprises three steps (Muflikh, Smith, & Aziz, 2021): research question formulation, literature search, and evaluation of search results. In line with the

research objectives, four research questions were formulated as a guide for the literature search in this study: (i) What are the profiles of articles, authors, journals, and main countries in FCQ research? (ii) What are the current trends in FCQ research? (iii) How have the topics in FCQ research developed? Moreover, (iv) What are the implications for future FCQ research? The formulation of research questions served as a limitation in the literature search to ensure that the collected data met the required needs. Furthermore, the data collection was divided into two stages: article identification and screening.

Article Identification

The search strategy utilized the following search terms: TITLE-ABS-KEY ("food choice questionnaire") was employed in Scopus, while "food choice questionnaire" (topic) was applied in WoS. These search terms were crafted to retrieve relevant documents related to FCQ. The keyword "FCQ" was included in the search terms; however, it yielded irrelevant results to FCQ. For example, several studies defined FCQ as a family communication questionnaire, a fear of the coronavirus questionnaire, and a family coping questionnaire. Hence, FCQ was implemented as the literature search term. The data search was carried out on January 12th, 2023, generating 166 publications in Scopus and 155 publications in WoS.

Article Screening

Article screening was run to determine the documents included in the review. Therefore, specific criteria were applied. Only journal articles published in the English language until 2022 and in the final stages were deemed eligible for inclusion. These criteria were established to concentrate on all FCQ literature in both databases and to ensure that language barriers did not obstruct the selection. Document selection was performed following a thorough evaluation of the title, abstract, and keywords to assess their relevance to the scope of this research. Both data were merged by eliminating existing duplications using RStudio software with "mergeDbSources" command after equalizing the data format using the export feature in bibliometrix, producing 169 journal articles ready for review (Page et al., 2021).

The PRISMA flowchart, depicted in Figure 1, was employed to illustrate the search visually and enhance transparency in the document selection. This flowchart delineated the number of documents identified during the initial search, the documents excluded following screening, and the ultimate number of documents incorporated into the bibliometric analysis and scoping review.

To answer the research questions, a ScoRBA approach integrating bibliometric analysis and scoping review was put into practice. Specifically, bibliometric analysis addressed the first to third research questions, while a scoping review answered the fourth research question.

Bibliometric Analysis

Bibliometrics is a well-known quantitative analysis of publications using massive and objective data (Donthu, Kumar, Mukherjee, Pandey, & Lim, 2021). This study utilized bibliometric analysis, including citation and co-occurrence analysis. Citation analysis provided
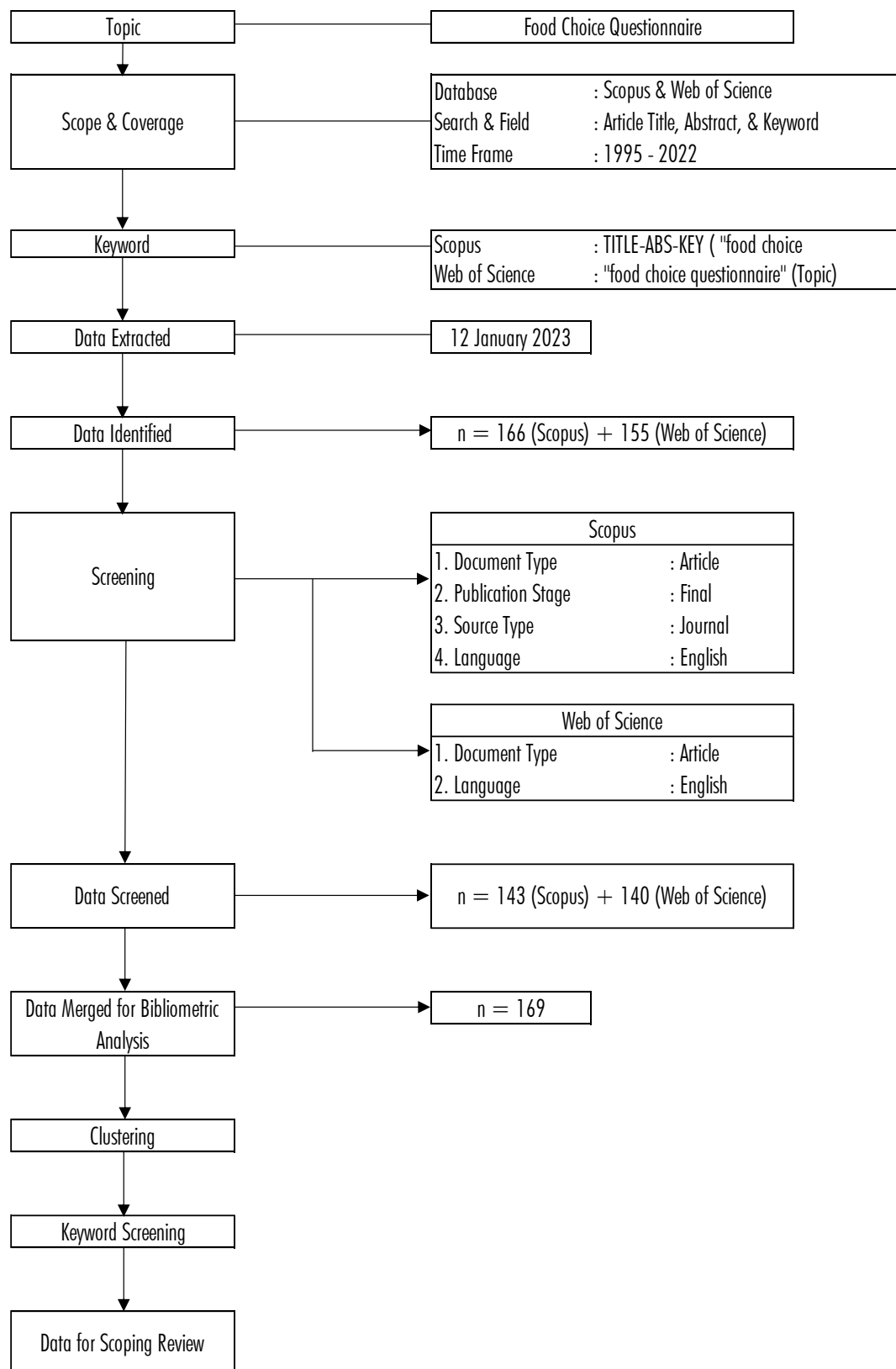
Topic	→	Food Choice Questionnaire

Scope & Coverage	→	Database : Scopus & Web of Science Search & Field : Article Title, Abstract, & Keyword Time Frame : 1995 - 2022

Keyword	→	Scopus : TITLE-ABS-KEY ("food choice Web of Science : "food choice questionnaire" (Topic)

Data Extracted	→	12 January 2023

Data Identified	→	n = 166 (Scopus) + 155 (Web of Science)

Screening	→	**Scopus** 1. Document Type : Article 2. Publication Stage : Final 3. Source Type : Journal 4. Language : English **Web of Science** 1. Document Type : Article 2. Language : English

Data Screened	→	n = 143 (Scopus) + 140 (Web of Science)

Data Merged for Bibliometric Analysis	→	n = 169

Clustering

Keyword Screening

Data for Scoping Review

FIGURE 1. PRISMA FLOW DIAGRAM

insights into three indicators: performance, novelty, and the influence of research publications based on documents, authors, journals, and countries, to address the first research question. Co-occurrence analysis provided an overview of how the determined keywords were related to

each other. This analysis unveiled the latest trend and development of FCQ research, thus answering the second and third research questions. VOSviewer tool was employed for bibliographic coupling and co-occurrence analysis, while Tableau Public was utilized for citation due to its ability to present all three indicators simultaneously compared to VOSviewer.

Scoping Review

The scoping review addressed the fourth research question, mapping the implications for future research on food choice motives using the FCQ. The scoping review was performed using the PAGER framework (Bradbury-Jones et al., 2022)—an extension of the scoping review framework by Arksey and O'Malley (2005). The PAGER framework was employed to overcome the limitations of the Arksey and O'Malley (2005) scoping review method by providing a consistent approach to analyzing and reporting literature review findings. The PAGER framework was applied to each research cluster identified from the previous co-occurrence analysis. The selection of papers reviewed in each cluster was based on the main research themes from clusters generated in the co-occurrence analysis (Wijaya et al., 2023). Furthermore, the reviewed journal articles were selected using the OpenRefine tool based on authors and keywords matching the research clusters.

RESULTS AND DISCUSSION

**Main Articles of Food Choice Questionnaire Publications**

Citation analysis was run to identify the articles employed as the main references in this FCQ research. Figure 2 depicts that the most frequently cited document was the article written by Steptoe et al. (1995) entitled "Development of a Measure of the Motives Underlying the Selection of Food: the Food Choice Questionnaire," with 1,242 citations. The highest number of citations indicated the significant impact of this article on FCQ studies. This paper was the first to introduce the FCQ as a tool for studying the motives behind consumers' food choices. The FCQ included nine main factors considered key influencers of consumers' food choices: health, mood, convenience, sensory appeal, natural content, price, weight control, naturality, and ethical concern.

However, a relatively recent document entitled "The Eating Motivation Survey (TEMS)" by Renner, Sproesser, Strohbach, & Schupp (2012) was also widely cited in studies on food choice motives. This paper received 230 citations and had the highest normalized citations among the 168 other papers (widest bar in the graph), as exhibited in Figure 2. Compared to the paper by Steptoe et al. (1995), TEMS was claimed to provide a more detailed understanding of the motives related to food choices compared to FCQ. However, both FCQ and TEMS focused on assessing consumers' motives for food choices.

**Authors with the Most Published Works on Food Choice Questionnaire**

The citation analysis displayed in Figure 3 uncovered five authors producing two to three papers. In short, no author was the most prolific in FCQ research. Thurecht and Pelly

contributed the most published work on FCQ with three publications: 'Development of a New Tool for Managing Performance Nutrition: The Athlete Food Choice Questionnaire,' 'Key Factors Influencing the Food Choices of Athletes at Two Distinct Major International
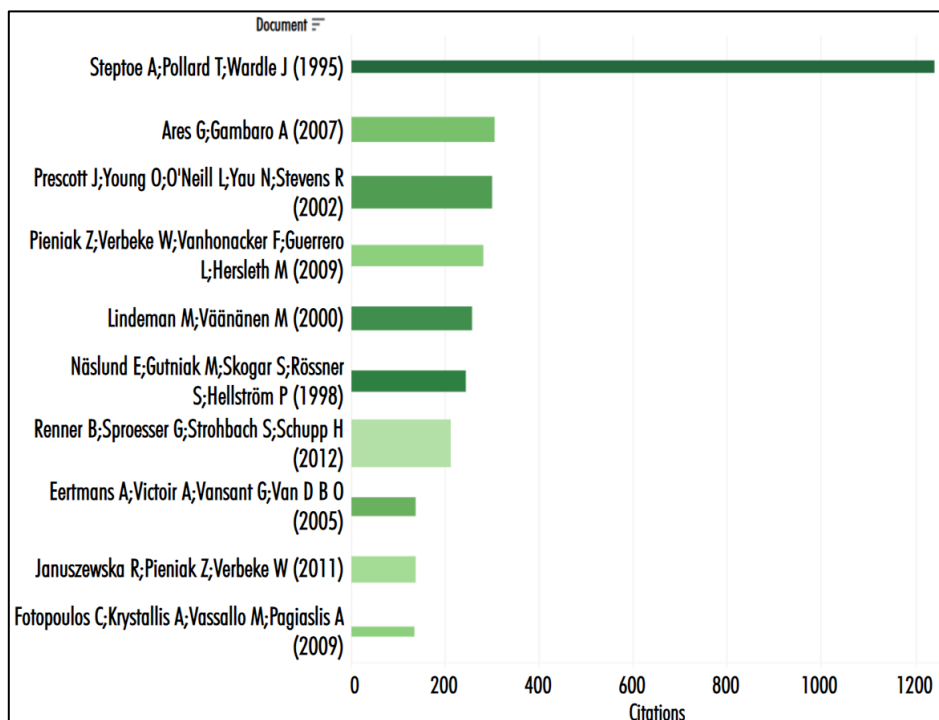
Notes: The length of the chart represents the number of documents citing the publication. The color indicates an article's novelty (the lighter the green, the newer the article). The width of the graph indicates the influence of an article (the wider it is, the more normalized the citations).

FIGURE 2. CITATION ANALYSIS OF FCQ LITERATURE BY DOCUMENTS
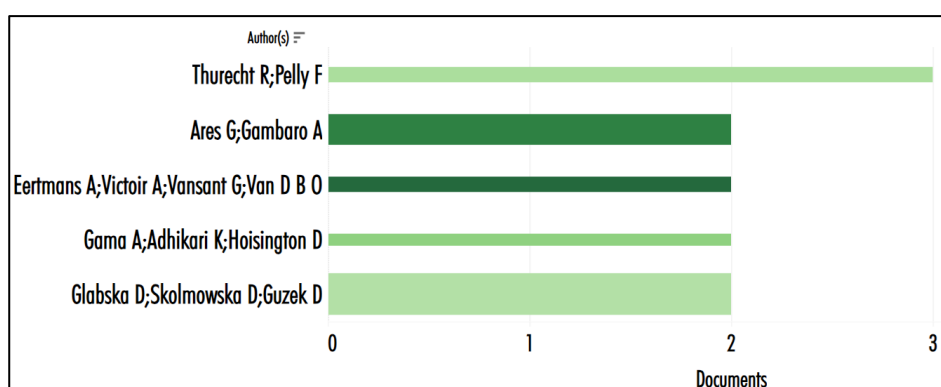
Notes: The length of the chart represents the number of publications by the author. The color indicates the author's novelty (the lighter the green, the newer the author). The width of the graph signifies the influence of an author (the wider it is, the more normalized the citations).

FIGURE 3. CITATION ANALYSIS OF FCQ LITERATURE BY AUTHORS

Competitions,' and 'The Athlete Food Choice Questionnaire (AFCQ): Validity and Reliability in a Sample of International High-Performance Athletes'. However, Figure 6 portrays that, in terms of the most-cited documents for each of the top five authors, Glabska, Skolmowska, and Guzek had the highest influence in FCQ research (widest bar in the graph). For example, their paper entitled 'Population-based Study of the Changes in the Food Choice

Determinants of Secondary School Students: Polish Adolescents' Covid-19 Experience (PLACE-19) Study' received 76 citations from 2020 until the time of this research.

Main Journals of Food Choice Questionnaire Publications

As displayed in Figure 4, the citation analysis results unveiled that 'Appetite', 'Food Quality and Preference', and 'Nutrients' journals published the highest FCQ studies, with 25, 20, and 15 documents, respectively. These journals had also the highest normalized citations, with 36.83, 40.56, and 21.36, respectively. Hence, they were the most influential and often targeted for publications concerning consumers' food choices using FCQ. However, the three most recent journals publishing FCQ studies were 'The International Journal of Gastronomy and Food Science', 'Nutrients' and 'Foods', with an average publication year score of 2021.5, 2020.53, and 2020.5, respectively, as illustrated by color in Figure 4. In other words, these journals could serve as alternative publication destinations for food choice studies in specific fields. For example, 'Nutrients' considered the publication of food choice studies providing novel insights into the impacts of nutrition on human health.
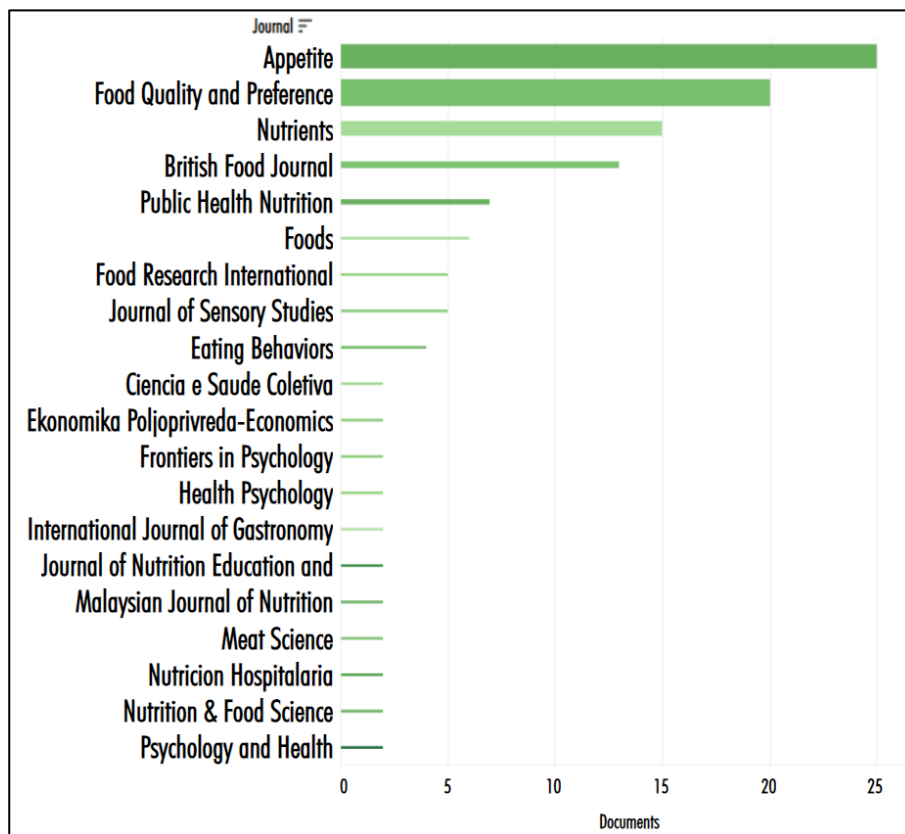
Notes: The length of the chart represents the number of publications in the journal. The color indicates a journal with recent publications (the lighter the green, the newer the publication). The width of the graph and its number demonstrate the influence of a journal (the wider it is, the more normalized the citations)

FIGURE 4. CITATION ANALYSIS OF FCQ LITERATURE BY JOURNALS

Main Contributing Countries of Food Choice Questionnaire Publications

Regarding publication distribution, Figure 5 exhibits that studies on individual food choice motives using FCQ have been conducted extensively for consumers in both developed

and developing countries. However, many of those studies were conducted in the high- and upper-middle-income countries, with 69.23% and 23.08% of 169 documents, respectively. It was not surprising considering that consumers in middle- and high-income countries led the likelihood of growth in the demand for better quality food, impacting their consumption choices and dietary diversity. The United States of America (USA), the United Kingdom (UK), Spain, Italy, and the Netherlands were the top five countries with the highest production of scientific articles on individual food choices using FCQ, with 26, 19, 13, 12, and 12 articles, respectively. In terms of normalized citations, these five contributor countries also possessed the highest normalized citations, with 19.37, 24.56, 15.01, 18.40, and 21.47, respectively. Other countries such as Belgium, Mexico, New Zealand, Portugal, Denmark, Finland, Malaysia, and Poland each had between six and nine publications.
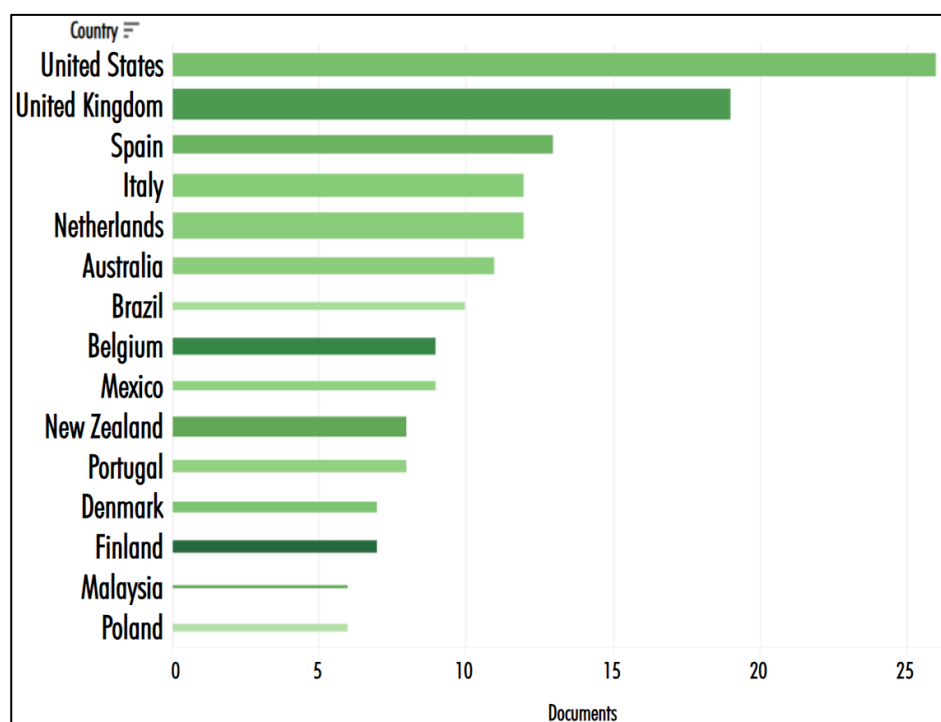
Notes: The length of the chart represents the number of the country's publications. The color indicates a publication in a country's novelty (the lighter the green, the newer the country's publication). The width of the graph and its number signify the influence of a country's publication (the wider it is, the more normalized the citations)

FIGURE 5. CITATION ANALYSIS OF FCQ LITERATURE BY COUNTRIES

FCQ Research Trend

Figure 6 exhibits a rising trend in the number of published articles on food choice motives using FCQ from 1995 to 2022, with an annual publication growth rate of 11.73%. After 2010, a significant annual increase occurred in the number of articles compared to previous years. Ever since its establishment in 1995, researchers have demonstrated great enthusiasm for studying individual food choices using FCQ in the last decade. There were 169 publications utilizing FCQ from 1995 to 2022 in the Scopus and WoS databases.
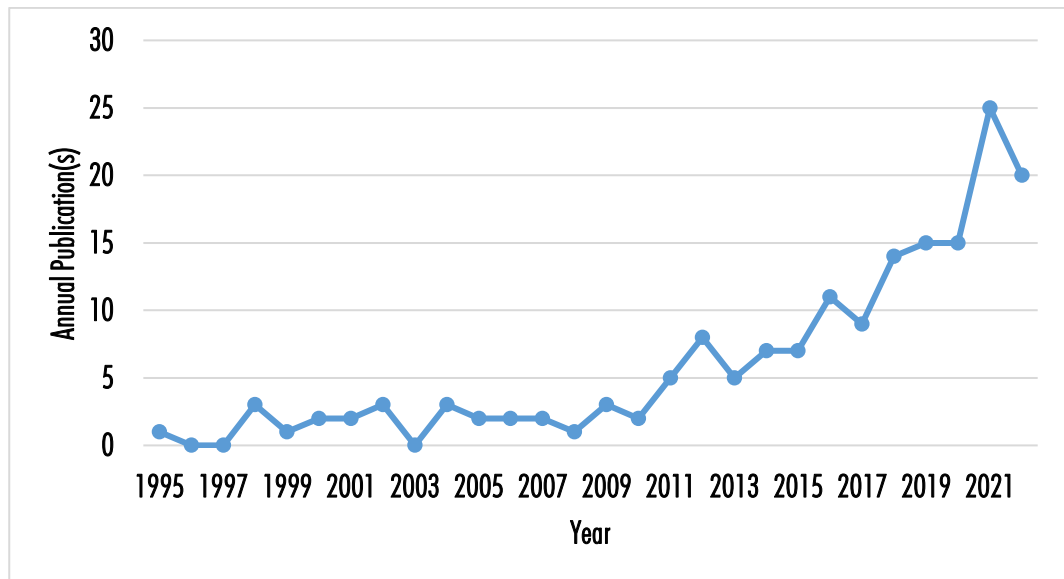
FIGURE 6. ANNUAL PUBLICATION DOCUMENTS FROM 1995 TO 2022

Consumer studies using the FCQ have been conducted by researchers worldwide, such as in Brazil (da Silva, Marôco, Alvarenga, & Campos, 2022), Spain (Canales & Hernández, 2016), Russia (Honkanen & Frewer, 2009), Iran (Roudsari et al., 2020), Taiwan (M.-F. Chen, 2007), Hungary (Szakály et al., 2018), Lebanon (Koksal, 2019), and Indonesia, to understand (Maulida, Nanishi, Green, Shibanuma, & Jimba, 2016)individual food choices. In its development, the use of the FCQ in studies on consumers' food choices varied depending on consumer segments and types of food. For example, Pollard et al. (1998) examined the tendency of food choice motives in specific groups using variables such as gender and education level, while Maulida et al. (2016) investigated the role of gender and family income. Concerning food types, FCQ studies have been conducted on organic food (Tung, Tsay, & Lin, 2015), environmentally-friendly food (Lidew et al., 2015), and low-sugar products (da Veiga, Johann, Lima, Kaushik, & Mitterer-Daltoé, 2021). Moreover, regarding research subjects, FCQ studies have developed a specific focus on certain consumer groups, such as adolescents (Canales & Hernández, 2016; Maulida et al., 2016; Ooi, Taib, Yusof, & Chin, 2015), and comparisons between different groups, such as adults and the elderly (Gong, Li, Xie, & Tan, 2020). Accordingly, the applications of the FCQ were diverse and evolved regarding the factors and measurement items. For example, Neupane (2018) employed the same factors developed by Steptoe et al. (1995). Other studies added factors such as media, friends, and parents (Ooi et al., 2015), as well as satisfaction and mental health (Gong et al., 2020).

As depicted in Figure 7, the most recent topics based on keywords were presented by co-occurrence overlay visualization, with average publication year scoring in VOSviewer. New and more specific research topic clusters have emerged since the establishment of FCQ in 1995, depicting individual food choices using FCQ as a new and growing field of study. With the years of publication ranging from 2018 to 2022 (on average), the most recent topics of studies on individual food choices were related to various topics such as consumer issues (e.g., delay discounting, health, body mass, consumption, eating disorder, psychology), consumer

segments (e.g., athlete, young adult), methods (e.g., food frequency questionnaire, survey, observational study, cross-sectional study), and research context or situations (e.g., Covid-19, Mexico). Supplementary Material 1 provides the detailed keywords for each cluster, along with their average publication year.

FIGURE 7. CO-OCCURRENCE OVERLAY VISUALIZATION BY AVERAGE PUBLICATION YEAR OF FCQ LITERATURE IN EACH CLUSTER

Main Topics of Food Choice Questionnaire Studies

A keyword co-occurrence analysis was conducted using VOSviewer software to determine the main and most recent research topics on FCQ studies. From 169 documents on FCQ studies related to food choice motives from the Scopus and WoS databases, 1,395 keywords were obtained. Many of these 1,395 keywords had similar meanings but appeared as different keywords due to differences in writing (for example, "attitude" and "attitudes," "adolescent" and "adolescents"). Therefore, keywords with similar meanings were merged using a thesaurus. The criteria for selecting these keywords was that they appeared at least three times in VOSviewer, generating 252 keywords from the original 1,395 keywords to be processed using the thesaurus. In the end, 79 final keywords with different meanings were retrieved. The keyword "food choice questionnaire" was excluded from the co-occurrence analysis. In this study, a visualization map was constructed with a threshold of six keyword co-occurrences.

The network visualization results of the keyword co-occurrence analysis yielded four clusters of research topics on FCQ, as displayed in Figure 8. Each cluster consisted of a set of different keywords. The occurrence of keywords (links between keywords) within the same cluster was typically higher (stronger) than those between distinct clusters. The keyword

examination uncovered clear groupings within the keyword network with VOSviewer, as depicted in Figure 8. Table 1 lists the research themes for each cluster, organized by considering all keywords and their level of dominance within the cluster.
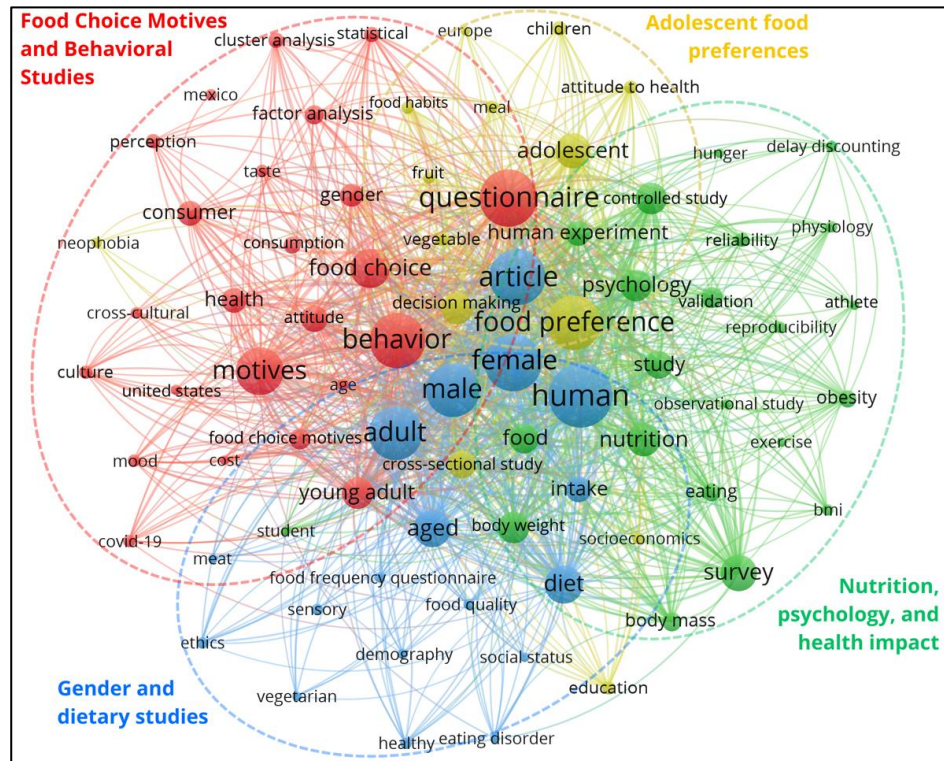

FIGURE 8. CO-OCCURRENCE NETWORK VISUALIZATION OF FCQ LITERATURE

TABLE 1. CLUSTERS AND THEMES IN FCQ RESEARCH

Cluster	Theme	Description
1. Red	Food choice motives and behavioral studies	The red cluster, comprising 24 keywords, centered on research related to food choice motives and behavioral aspects in dietary decisions. It explored the various reasons behind food choices and the behavior patterns influencing the dietary preferences of individuals.
2. Green	Nutrition, psychology, and health impact	The green cluster, with 22 keywords, delved into the psychological factors behind food choices, nutrition, and their impact on health, especially related to weight and nutrition outcomes.
3. Blue	Gender and dietary studies	The blue cluster, consisting of 18 keywords, examined the influence of gender on dietary choices and preferences, with a particular emphasis on gender-related aspects in food preferences.
4. Yellow	Adolescent food preferences	The yellow cluster, with 14 keywords, concentrated on the food preferences of adolescents, exploring decision-making, attitudes toward health, and various factors affecting food choices among young individuals.

The detailed keywords with their occurrence and total link strength for each cluster from 169 publications are provided in Supplementary Material 1. Furthermore, the four clusters of research topics on FCQ were employed as a basis for formulating recommendations for future FCQ research using a scoping review. Following the PAGER framework, these clusters represented pattern components.

Research Implications

A scoping review mapped the research implications for the future direction of consumers' food choice motives using FCQ. Supplementary Material 2 exhibits the reviewed articles for each cluster. Table 2 lists the results of the scoping review using the PAGER framework on the reviewed articles in each cluster.

Notable gaps existed in food choice motives and behavioral themes from the red cluster. These gaps primarily revolved around understanding the linkage between food choice motives and actual dietary behaviors (Schliemann et al., 2019). Furthermore, the FCQ did not fully encapsulate the latest developments in norms related to food choice motives and other associated measurements (Konttinen et al., 2021). Hence, future research endeavors should focus on translating the reasons behind food choices into actual eating behaviors. Additionally, researchers should also consider incorporating new factors and expanding the range of items in their assessments to reflect recent developments in food choice patterns. The implementation of longitudinal studies was advised, allowing for the examination of consumers' behavior over extended periods. These recommendations contributed to a more comprehensive understanding of food choice motives and behaviors.

Significant gaps and challenges within the green cluster dealt with topics like nutrition, psychology, and health impact themes. The challenges encompassed data incompleteness, missing data hampering key calculations, and the inherent limitations tied to cross-sectional study designs (Dias et al., 2021). Additionally, concerns about the use of self-reported data, particularly regarding weight and height, introduced biases that could undermine the accuracy of prevalence estimates (Locher et al., 2009; Mardon et al., 2015). To mitigate these challenges and enhance the quality of research within this cluster, future studies should adopt a longitudinal approach. The incorporation of mixed-method designs could help overcome the limitations associated with cross-sectional methods. Furthermore, researchers should explore innovative techniques like multiple imputation to improve data completeness and enhance the precision of key calculations. More robust and accurate research in the fields of nutrition, psychology, and health impact could be advanced by implementing these recommendations.

Noteworthy gaps and challenges within the blue cluster included gender and dietary studies. There was a need to recognize gender distinctions within specific dietary profiles (Dorard & Mathieu, 2021) and the importance of expanding the inclusion of socioeconomic factors and parameters in future research (Jáuregui-Lobera & Ríos, 2011). However, acknowledging the limitations associated with self-reported and memory-dependent data was crucial (Bryła, 2021; Dahal et al., 2022). Hence, future studies should replicate their investigations in diverse cultural contexts. It was essential for ensuring the generalizability of findings. Moreover, longitudinal research spanning various demographic categories, including age, ethnicity, income, and education levels, was also crucial. This approach provided comprehensive insights into food choices and dietary behaviors among different groups, helping to fill the identified gaps and challenges.

TABLE 2. PAGER FRAMEWORK ANALYSIS ON FCQ LITERATURE

Pattern	Advance	Gap	Evidence for Practice	Research Recommendation
Food choice motives and behavioral studies (red)	There were variations in eating behaviors among specific population groups or subpopulations, including age differences, socioeconomic backgrounds, or differences between men and women (Konttinen et al., 2021; Plichta, Jezewska-Zychowicz, & Małachowska, 2020; Schliemann et al., 2019).	There was a need to understand how food choice motives were translated into dietary behavior (Schliemann et al., 2019). Additionally, FCQ studies were somewhat limited in reflecting the most recent developments in norms related to food choice motives and other measurements (Konttinen et al., 2021).	For healthcare practitioners, policymakers, and food retailers, creating better optimized and customized interventions for promoting diets that positively impacted both human well-being and the health of the planet across diverse sociodemographic groups (Konttinen et al., 2021; Schliemann et al., 2019).	Future studies could translate reasons for food choices into eating behavior and include new factors and more items reflecting recent food choice development. Longitudinal studies were also recommended to ensure consumers' behaviors over a specific period.
Nutrition, psychology, and health impact (green)	There were psychosocial factors in food choices, including body image concerns among adolescents (Dias et al., 2021) and age-related shifts toward health and mood motives in older individuals (Locher et al., 2009). Advocating nutrition programs with practical strategies to facilitate behavioral changes and tackle acknowledged obstacles to healthy eating (MacKenzie-Shalders, Matthews, Dulla, & Orr, 2020).	Issues with data completeness, missing data for key calculations, and limitations associated with cross-sectional study designs (Dias et al., 2021). Concerns about self-reported data, especially weight and height, introduced biases that could impact the accuracy of prevalence estimates (Locher et al., 2009).	Governments and healthcare professionals had interventions promoting physical activity while reducing sedentary behaviors among middle school students (Dias et al., 2021)and also improving the knowledge about healthy foods in the population (Mardon et al., 2015).	Future longitudinal studies should conduct mixed-method designs to reduce cross-sectional limitations, minimize self-reported data biases, and explore innovative techniques like multiple imputation to improve data completeness and accuracy of key calculations.
Gender and dietary studies (blue)	There were gender differences in various food choice factors, particularly in mood, health, natural content, weight control, and convenience, with such distinctions varying across regions (Jáuregui-Lobera & Ríos, 2011) but not in eating practices (Dahal, Basnet, Khanal, Baral, & Dhakal, 2022).	Acknowledging gender distinctions in specific profiles like vegetarian (Dorard & Mathieu, 2021) and emphasizing broader inclusion of socioeconomic factors and parameters in future studies (Jáuregui-Lobera & Ríos, 2011). Limitations in self-reported and memory-dependent data (Bryła, 2021; Dahal et al., 2022).	Customizing marketing messages based on gender was advised to account for the distinct dietary preferences and choices between men and women (Bryła, 2021). Health educators could develop strategies and implement interventions based on research findings (Dahal et al., 2022).	Replicating this study in diverse cultural contexts was also crucial for generalizability. Moreover, longitudinal research across various demographic categories, including age, ethnicity, income, and education levels, was essential to gain comprehensive insights into food choices and dietary behaviors among different groups.
Adolescent food preferences (yellow)	There was a link between food preferences and the determinants of food choices among adolescents (Głąbska, Skolmowska, & Guzek, 2021). A connection between insulin resistance, metabolic risk factors, and food behaviors and preferences was depicted among European adolescents (Sesé et al., 2012).	Challenges related to recall bias, limited population representation confined to a single country, and the omission of influential factors (Głąbska et al., 2021). Additionally, it might not establish causal relationships due to cross-sectional study designs (Sesé et al., 2012).	The public health department should educate adolescents, particularly a cluster referred to as "hedonists" (Głąbska et al., 2021). Additionally, proper planning and intervention programs were required to address metabolic risk factors and prevent insulin resistance among adolescents (Sesé et al., 2012).	Future longitudinal studies should adopt a more comprehensive approach. To mitigate recall bias, objective measurements should consider choices and their implications for health.

Significant gaps and challenges were evident in the adolescents' food preference themes in the yellow cluster. These challenges comprised issues related to recall bias, limited

population representation confined to a single country, and the omission of influential factors (Głąbska et al., 2021). Furthermore, cross-sectional study designs could hinder the establishment of causal relationships, requiring acknowledgment (Sesé et al., 2012). Hence, future studies should employ more comprehensive approaches focusing on longitudinal designs to address these gaps and enhance the quality of research within this cluster. The inclusion of objective measurements was essential to mitigate recall bias. These measures shed light on adolescents' food preferences and the implications for health, allowing future research to address the observed issues and gaps.

Limitations

There were a few caveats to this study, but overall, it presented valuable insights into the prevailing research trends and themes in FCQ studies. To begin with, it only included papers published in English and accessible through the Scopus and WoS databases during this research period, potentially excluding relevant research from other databases, non-indexed journals, and non-English sources. The identification of research themes was based on keyword co-occurrence analysis without an in-depth examination of the content. However, these themes encompassed the majority of keywords within each cluster, gaining a comprehensive overview of FCQ literature. Finally, it was crucial to note that bibliometric analysis might not provide insights into the content and context of all studies, as this study focused on selected studies most relevant to the research objectives. To overcome this limitation, the PAGER framework was employed to ensure a more comprehensive scoping review of FCQ research.

CONCLUSION

Research on consumers' food choice motives using FCQ revealed various aspects of dietary preferences and behaviors, with recent studies enriching the understanding of consumers' motivation in food selection. Nevertheless, challenges related to data accuracy and study design persisted, prompting the need for further exploration. Seminal papers by Steptoe et al. (1995) and Renner et al. (2012) played pivotal roles in FCQ studies, while journals such as 'Appetite,' 'Food Quality and Preference,' and 'Nutrients' were influential platforms for this work. High-income countries, including the USA, UK, Spain, Italy, and the Netherlands, took the lead in FCQ research. Over time, specific research topics on individual food choices emerged, with recent themes focusing on consumer issues and segments, methods, and research contexts.

Critical implications emerged across various food choice research clusters. Hence, bridging the gap between motives and dietary behaviors by translating motivations into habits and employing longitudinal approaches was essential. To address data issues, mixed-methods, longitudinal, and innovative approaches were highly required in nutrition, psychology, and health studies. Concerning gender and dietary research, recognizing gender differences and expanding across diverse contexts through longitudinal studies was vital. For adolescents' food

preferences, comprehensive research with long-term measurements was crucial to combat challenges. As the agrifood industry has evolved, especially in developing countries, updated FCQ studies focusing on specific foods or countries became necessary to understand changing consumers' preferences in the agrifood landscape.

Authors' Contributions: VRPS: Conceptualization ideas, data collection, formal analysis, writing, review, and editing preparation, and addressed the reviewer's comments; SS: Conceptualization ideas, adviser and supervisor of data collection and analysis, writing, reviewed the manuscript, and reviewed literature; ADU: Conceptualization ideas, reviewed the manuscript and reviewed literature.

Conflict of interest: The authors declare no conflict of interest.

REFERENCES

Arksey, H., & O'Malley, L. (2005). Scoping studies: towards a methodological framework. *International Journal of Social Research Methodology*, *8*(1), 19–32. https://doi.org/10.1080/1364557032000119616

Baas, J., Schotten, M., Plume, A., Côté, G., & Karimi, R. (2020). Scopus as a curated, high-quality bibliometric data source for academic research in quantitative science studies. *Quantitative Science Studies*, *1*(1), 377–386. https://doi.org/10.1162/qss_a_00019

Birkle, C., Pendlebury, D. A., Schnell, J., & Adams, J. (2020). Web of Science as a data source for research on scientific and scholarly activity. *Quantitative Science Studies*, *1*(1), 363–376. https://doi.org/10.1162/qss_a_00018

Borsellino, V., Schimmenti, E., & El Bilali, H. (2020). Agri-Food Markets towards Sustainable Patterns. *Sustainability*, *12*(6), 2193. https://doi.org/10.3390/su12062193

Bradbury-Jones, C., Aveyard, H., Herber, O. R., Isham, L., Taylor, J., & O'Malley, L. (2022). Scoping reviews: the PAGER framework for improving the quality of reporting. *International Journal of Social Research Methodology*, *25*(4), 457–470. https://doi.org/10.1080/13645579.2021.1899596

Bryła, P. (2021). Selected Predictors of Consumer Ethnocentrism in the Food Market (Gender Differences). *Energies*, *14*(22), 7667. https://doi.org/10.3390/en14227667

Caballero, B., & Popkin, B. M. (Eds.). (2022). *The Nutrition Transition: Diet and Disease in the Developing World*. London: Academic Press.

Canales, P., & Hernández, A. (2016). Nutrition among Adolescent Spaniards: Healthy and Non-healthy Motives of Food Choice. *Journal of Food and Nutrition Research*, *4*(3), 178–184.

Chen, M.-F. (2007). Consumer attitudes and purchase intentions in relation to organic foods in Taiwan: Moderating effects of food-related personality traits. *Food Quality and Preference*, *18*(7), 1008–1021. https://doi.org/10.1016/j.foodqual.2007.04.004

Chen, P.-J., & Antonelli, M. (2020). Conceptual Models of Food Choice: Influential Factors Related to Foods, Individual Differences, and Society. *Foods*, *9*(12), 1898. https://doi.org/10.3390/foods9121898

Cunha, L. M., Cabral, D., Moura, A. P., & de Almeida, M. D. V. (2018). Application of the Food Choice Questionnaire across cultures: Systematic review of cross-cultural and single country studies. *Food Quality and Preference*, *64*, 21–36. https://doi.org/10.1016/j.foodqual.2017.10.007

da Silva, W. R., Marôco, J., Alvarenga, M. dos S., & Campos, J. A. D. B. (2022). What are the motives underlying Brazilians' food choices? An analysis of the Food Choice Questionnaire and its relationship with different sample characteristics. *Journal of Sensory Studies*, *37*(5). https://doi.org/10.1111/joss.12775

da Veiga, G. C., Johann, G., Lima, V. A., Kaushik, N., & Mitterer-Daltoé, M. L. (2021). Food Choice Questionnaire and PLS-Path modeling as tools to understand interest in low sugar products. *Journal of Sensory Studies*, *36*(5). https://doi.org/10.1111/joss.12667

Dahal, M., Basnet, A., Khanal, S., Baral, K., & Dhakal, S. (2022). Gender Difference in Food Choice and Eating Practice and Their Association with Health among Students of Kathmandu, Nepal. *Journal of Obesity*, *2022*, 1–10. https://doi.org/10.1155/2022/2340809

Das, N. K., & Roy, A. (2022). COVID-19 and agri-food value chain: a systematic review and bibliometric mapping. *Journal of Agribusiness in Developing and Emerging Economies*, *12*(3), 442–462. https://doi.org/10.1108/JADEE-07-2021-0188

Dias, S. S., Lages, M., Frontini, R., Luís, L., Dixe, M. dos A., & Sousa, P. (2021). Association Between Food Choices Motivators and Physical Activity in Body Image (dis)Satisfaction in Portuguese Adolescents. *Frontiers in Public Health*, *9*. https://doi.org/10.3389/fpubh.2021.651228

Donthu, N., Kumar, S., Mukherjee, D., Pandey, N., & Lim, W. M. (2021). How to conduct a bibliometric analysis: An overview and guidelines. *Journal of Business Research*, *133*, 285–296. https://doi.org/10.1016/j.jbusres.2021.04.070

Dorard, G., & Mathieu, S. (2021). Vegetarian and omnivorous diets: A cross-sectional study of motivation, eating disorders, and body shape perception. *Appetite*, *156*, 104972. https://doi.org/10.1016/j.appet.2020.104972

Echchakoui, S. (2020). Why and how to merge Scopus and Web of Science during bibliometric analysis: the case of sales force literature from 1912 to 2019. *Journal of Marketing Analytics*, *8*(3), 165–184. https://doi.org/10.1057/s41270-020-00081-9

Fahimnia, B., Sarkis, J., & Davarzani, H. (2015). Green supply chain management: A review and bibliometric analysis. *International Journal of Production Economics*, *162*, 101–114. https://doi.org/10.1016/j.ijpe.2015.01.003

Falagas, M. E., Pitsouni, E. I., Malietzis, G. A., & Pappas, G. (2008). Comparison of PubMed, Scopus, Web of Science, and Google Scholar: strengths and weaknesses. *The FASEB Journal*, *22*, 338–342. https://doi.org/10.1096/fj.07-9492LSF

Feng, H., Wang, X., Duan, Y., Zhang, J., & Zhang, X. (2020). Applying blockchain technology to improve agri-food traceability: A review of development methods, benefits and challenges. *Journal of Cleaner Production*, *260*, 121031. https://doi.org/10.1016/j.jclepro.2020.121031

Food and Agriculture Organization [FAO]. (2017). *The future of food and agriculture-Trends and Challenges*. Rome: Food and Agriculture Organization. Retrieved from https://www.fao.org/3/i6583e/i6583e.pdf

Głąbska, D., Skolmowska, D., & Guzek, D. (2021). Food Preferences and Food Choice Determinants in a Polish Adolescents' COVID-19 Experience (PLACE-19) Study. *Nutrients*, *13*(8), 2491. https://doi.org/10.3390/nu13082491

Gong, Y., Li, J., Xie, J., & Tan, Y. (2020). Relationship between types of food choice motives and well-being among young and middle-aged Chinese adults. *International Journal of Consumer Studies*, *44*(4), 369–378. https://doi.org/10.1111/ijcs.12573

Granato, D., Barba, F. J., Bursać Kovačević, D., Lorenzo, J. M., Cruz, A. G., & Putnik, P. (2020). Functional Foods: Product Development, Technological Trends, Efficacy Testing, and Safety. *Annual Review of Food Science and Technology*, *11*(1), 93–118. https://doi.org/10.1146/annurev-food-032519-051708

Honkanen, P., & Frewer, L. (2009). Russian consumers' motives for food choice. *Appetite*, *52*(2), 363–371. https://doi.org/10.1016/j.appet.2008.11.009

Jáuregui-Lobera, I., & Ríos, P. B. (2011). What motivates the consumer's food choice? *Nutricion Hospitalaria*, *26*(6), 1313–1321.

King, R. P., & Venturini, L. (2005). Demand for Quality Drives Changes in Food Supply Chains. In A. Regmi & M. Gehlhar (Eds.), *New Directions in Global Food Markets*. United States Department of Agriculture. Retrieved from https://www.ers.usda.gov/webdocs/publications/42581/30125_aib794_002.pdf?v=0

Koksal, M. H. (2019). Food choice motives for consumers in Lebanon: a descriptive study. *British Food Journal*, *121*(11), 2607–2619. https://doi.org/10.1108/BFJ-09-2018-0580

Konttinen, H., Halmesvaara, O., Fogelholm, M., Saarijärvi, H., Nevalainen, J., & Erkkola, M. (2021). Sociodemographic differences in motives for food selection: results from the LoCard cross-sectional survey. *International Journal of Behavioral Nutrition and Physical Activity*, *18*, 71. https://doi.org/10.1186/s12966-021-01139-2

Lidew, L., Jusoh, Z. M., Sulaiman, N., Rahim, H. A., Bakar, E. A., & Jamaluddin, A. (2015). Food Choice Factors Affecting Green Food Attitude In Klang Valley. *Malaysian Journal Of Consumer and Family Economics*, *18*, 103–113.

Locher, J. L., Ritchie, C. S., Roth, D. L., Sen, B., Vickers, K. S., & Vailas, L. I. (2009). Food choice among homebound older adults: Motivations and perceived barriers. *The Journal of Nutrition, Health and Aging*, *13*, 659–664. https://doi.org/10.1007/s12603-009-0150-6

Lyerly, J. E., & Reeve, C. L. (2015). Development and validation of a measure of food choice values. *Appetite*, *89*, 47–55. https://doi.org/10.1016/j.appet.2015.01.019

MacKenzie-Shalders, K., Matthews, C., Dulla, J., & Orr, R. (2020). Law enforcement personnel are willing to change, but report influencing beliefs and barriers to optimised dietary intake. *BMC Public Health*, *20*(1), 1638. https://doi.org/10.1186/s12889-020-09716-z

Mardon, J., Thiel, E., Laniau, M., Sijtsema, S., Zimmermann, K., & Barjolle, D. (2015). Motives underlying food consumption in the Western Balkans: consumers' profiles and public health strategies. *International Journal of Public Health*, *60*, 517–526.

https://doi.org/10.1007/s00038-015-0684-9

Maulida, R., Nanishi, K., Green, J., Shibanuma, A., & Jimba, M. (2016). Food-choice motives of adolescents in Jakarta, Indonesia: the roles of gender and family income. *Public Health Nutrition*, *19*(15), 2760–2768. https://doi.org/10.1017/S136898001600094X

Mishra, D., Gunasekaran, A., Childe, S. J., Papadopoulos, T., Dubey, R., & Wamba, S. (2016). Vision, applications and future challenges of Internet of Things: A bibliometric study of the recent literature. *Industrial Management & Data Systems*, *116*(7), 1331–1355. https://doi.org/10.1108/IMDS-11-2015-0478

Muflikh, Y. N., Smith, C., & Aziz, A. A. (2021). A systematic review of the contribution of system dynamics to value chain analysis in agricultural development. *Agricultural Systems*, *189*, 103044. https://doi.org/10.1016/j.agsy.2020.103044

Neupane, D. (2018). Food Choice Motives of Guardians of Trilok Academy Kathmandu with Reference to Gender. *Nepal Journal of Multidiplinary Research (NJMR)*, *1*(1), 73–81.

Onwezen, M. C., Reinders, M. J., Verain, M. C. D., & Snoek, H. M. (2019). The development of a single-item Food Choice Questionnaire. *Food Quality and Preference*, *71*, 34–45. https://doi.org/10.1016/j.foodqual.2018.05.005

Ooi, S. Y., Taib, N., Yusof, B. N. M., & Chin, Y. (2015). Validation of a food choice questionnaire among adolescents in Penang, Malaysia. *Malaysian Journal of Nutrition*, *21*(1), 25–35.

Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., … Moher, D. (2021). The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. *BMJ*, *372*. https://doi.org/10.1136/bmj.n71

Plichta, M., Jezewska-Zychowicz, M., & Małachowska, A. (2020). Relationship between Psychosocial Impairment, Food Choice Motives, and Orthorexic Behaviors among Polish Adults. *Nutrients*, *12*(5), 1218. https://doi.org/10.3390/nu12051218

Pollard, T. M., Steptoe, A., & Wardle, J. (1998). Motives underlying healthy eating: Using the food choice questionnaire to explain variation in dietary intake. *Journal of Biosocial Science*, *30*(2), 165–179. https://doi.org/10.1017/S0021932098001655

Reardon, T., Echeverria, R., Berdegué, J., Minten, B., Liverpool-Tasie, S., Tschirley, D., & Zilberman, D. (2019). Rapid transformation of food systems in developing regions: Highlighting the role of agricultural research & innovations. *Agricultural Systems*, *172*, 47–59. https://doi.org/10.1016/j.agsy.2018.01.022

Reardon, T., Stringer, R., Timmer, C. P., Minot, N., & Daryanto, A. (2015). Transformation of the Indonesian Agrifood System and the Future beyond Rice: A Special Issue. *Bulletin of Indonesian Economic Studies*, *51*(3), 369–373. https://doi.org/10.1080/00074918.2015.1111827

Reardon, T., & Timmer, C. P. (2014). Five inter-linked transformations in the Asian agrifood economy: Food security implications. *Global Food Security*, *3*(2), 108–117. https://doi.org/10.1016/j.gfs.2014.02.001

Renner, B., Sproesser, G., Strohbach, S., & Schupp, H. T. (2012). Why we eat what we eat. The Eating Motivation Survey (TEMS). *Appetite*, *59*(1), 117–128. https://doi.org/10.1016/j.appet.2012.04.004

Roudsari, A., Vedadhir, A., Amiri, P., Kalantari, N., Omidvar, N., & Eini-Zinab, H. (2020). Developing and validating food choice determinants questionnaire: An instrument for exploring food choice determinants in Iran. *International Journal of Preventive Medicine*, *11*, 141. https://doi.org/10.4103/ijpvm.IJPVM_250_19

Schanes, K., Dobernig, K., & Gözet, B. (2018). Food waste matters - A systematic review of household food waste practices and their policy implications. *Journal of Cleaner Production*, *182*, 978–991. https://doi.org/10.1016/j.jclepro.2018.02.030

Schliemann, D., Woodside, J. V., Geaney, F., Cardwell, C., McKinley, M. C., & Perry, I. (2019). Do socio-demographic and anthropometric characteristics predict food choice motives in an Irish working population? *British Journal of Nutrition*, *122*(1), 111–119. https://doi.org/10.1017/S0007114519000941

Sesé, M. A., Jiménez-Pavón, D., Gilbert, C. C., González-Gross, M., Gottrand, F., de Henauw, S., … Moreno, L. A. (2012). Eating behaviour, insulin resistance and cluster of metabolic risk factors in European adolescents. The HELENA Study. *Appetite*, *59*(1), 140–147. https://doi.org/10.1016/j.appet.2012.04.011

Steptoe, A., Pollard, T. M., & Wardle, J. (1995). Development of a measure of the motives underlying the selection of food: The food choice questionnaire. *Appetite*, *25*(3), 267–284. https://doi.org/10.1006/appe.1995.0061

Steptoe, A., & Wardle, J. (1999). Motivational factors as mediators of socioeconomic variations in dietary intake patterns. *Psychology & Health*, *14*(3), 391–402. https://doi.org/10.1080/08870449908407336

Szakály, Z., Kontor, E., Kovács, S., Popp, J., Pető, K., & Polereczki, Z. (2018). Adaptation of the Food Choice Questionnaire: the case of Hungary. *British Food Journal*, *120*(7), 1474–1488. https://doi.org/10.1108/BFJ-07-2017-0404

Taylor, D. H., & Fearne, A. (2006). Towards a framework for improvement in the management of demand in agri-food supply chains. *Supply Chain Management: An International Journal*, *11*(5), 379–384. https://doi.org/10.1108/13598540610682381

Toiba, H., Umberger, W. J., & Minot, N. (2015). Diet Transition and Supermarket Shopping Behaviour: Is There a Link? *Bulletin of Indonesian Economic Studies*, *51*(3), 389–403. https://doi.org/10.1080/00074918.2015.1111997

Tung, S.-J., Tsay, J. C., & Lin, M.-C. (2015). Life course, diet-related identity and consumer choice of organic food in Taiwan. *British Food Journal*, *117*(2), 688–704. https://doi.org/10.1108/BFJ-11-2013-0334

Wijaya, A., Setiawan, N. A., Ahmad, A. H., Zakaria, R., & Othman, Z. (2023). Electroencephalography and mild cognitive impairment research: A scoping review and bibliometric analysis (ScoRBA). *AIMS Neuroscience*, *10*(2), 154–171. https://doi.org/10.3934/Neuroscience.2023012