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Relevance of integrating food systems into Brazilian higher education curricula, with a focus on Gastronomy

A relevância da inserção do tema dos sistemas alimentares no ensino superior brasileiro com foco na Gastronomia

Abstract

The scale of the effect and urgency ofaddressing food, health, and environmental challenges haveplaced food systems at the forefront of global agendas. Incorporating food systems into the epistemological foundations of higher education programs, particularly those related to food (e.g., gastronomy), plays a crucial role in elucidating the role of education as a catalyst for social change. The concept of gastronomy and nutrition jointly shaping food systems is proposed herein, indicating the requirement for these fields to collaborate synergistically rather than operate in opposition. Their shared commitment to the human-food relationshipplays a fundamental role inpromoting health and well-being. A narrative literature review was conducted using49 selected materials, encompassing books, articles, and documents. The findings of this review high light the inherent theoretical and practical potential, as well as the relevance, of integrating food systems into undergraduate gastronomy curricula by reforming the Pedagogical-Political Project. However, the knowledge, attitudes, and interests of academic communities in bachelor's and associate degree programs were not investigated herein, which poses a limitation. Thus, future studies must aim to offer a comprehensive analysis complementing the current essay.

Keywords: Sustainable food systems. Professional education. Education.

Resumo

O tamanho do impacto e a urgência de solucionar os problemas relacionados à alimentação, saúde e meio ambiente coloca os sistemas alimentares no centro das agendas globais. Portanto, compreendendo a educação como transformadora social, atesta-se a importância da inserção do tema dos sistemas alimentares nas bases epistemológicas dos cursos de nível superior, de maneira transdisciplinar e especialmente direcionada aos cursos vinculados à alimentação, como a gastronomia. Neste ensaio, constata-se que gastronomia e nutrição impactam os sistemas alimentares conjuntamente, estabelecendo profissões que devem atuar de maneira sinérgica, e não antagônica, defendendo o compromisso de ambas com todos os aspectos da relação humana com a comida, visando a promoção da saúde e do bem-estar. Para isso, foram investigados 49 materiais selecionados por conveniência, por meio de revisão de literatura narrativa, a partir do estudo de livros, artigos e documentos, que indicaram o inerente potencial teórico, prático e a relevância da inserção da temática dos sistemas alimentares nos cursos de graduação em gastronomia, sobretudo mediante uma reforma dos PPP. Há, contudo, limitações relacionadas à não investigação dos conhecimentos, atitudes e interesses das

comunidades acadêmicas dos bacharelados e dos tecnólogos, reconhecendo a importância de pesquisas futuras para este diagnóstico, em complemento ao presente ensaio.

Palavras-chave: Sistemas alimentares sustentáveis. Formação profissional. Educação.

INTRODUCTION

This study examined the significance of integrating food systems (FS) into Brazilian higher education, with a special focus on gastronomy programs developed in close collaboration with nutrition studies. This narrative literature review evaluated analyzed national and international literature, encompassing books, articles, and documents, thereby elucidating the socioeconomic and political contexts of relevant stakeholders.

The interdependent relationship between the environment and nutrition necessitates the engagement of nutrition science in transforming FS. This involvement facilitates a transition from current dietary patterns to sustainable diets, thereby restoring and preserving natural resources.[1] Thus, nutrition professionals make a unique contribution to collaborative initiatives that promote human and planetary health.

Nutrition is inherently multidisciplinary, and it promotes dietary changes that benefit human and environmental health. Linking it with other fields of knowledge will aid in fostering sustainable agricultural practices, reducing food loss and waste, improving food preparation or processing, and conserving resources within food environments and services.[1]

Nutritional science considers all aspects of the relationship between humansand food to foster health and well-being.[2] Thus, an updated approach to nutritional science that enables the development of an integrated practice with social, environmental, and biological sciences, as well as with gastronomy, another facet of food science, is necessary. These interconnected disciplines contribute to nutrition by establishing a direct link between human beings and their diet and health.[2] A transdisciplinary connection has been observed among nutritionists, gastronomes, and gastrologists in multiple areas, such as nutritional recommendations, public policy formulation, academic teaching, research and outreach, culinary practices, and the management of public institutions and food service facilities.

Nutritionists and chefs collaborate in leadership, decision-making, and overseeing processes in culinary settings. Graduate nutrition programs welcome graduates from bachelor's and culinary arts programs, serving as nexus points for interprofessional exchange. The professionals in these fields collectively influence FS through roles that are collaborative in nature. Conflicts among these professionals will have a counterproductive effect. Thus, leadership should be shared, and personnel in these professions must work synergistically, rather than antagonistically, to broaden their potential contributions.

FS has not been included asa topic in Brazilian gastronomy programs. However, measures are being taken to incorporate it into nutrition programs. For instance, the LabNutrir biodiversity and nutrition laboratory at the Federal University of Rio Grande do Norte (UFRN) conducted the third in-person meeting on sustainable food systems[a] in 2023.[1]The Observatory of Inequalities in Food and Nutrition of the Department of Nutrition at the Federal University of Paraíba (UFPB) hosted a lecture on “Citizen science and the sustainability of food systems” in the same year.[b]

The Josué de Castro Chair of Healthy and Sustainable Food Systems and the Sustentarea Outreach Center were established at the University of São Paulo (USP) by affiliating or partnering with the nutrition

[a] Article “UFPB holds lecture on sustainability of food systems with Belgian university researcher”. Available at: https://www.ufpb.br/ufpb/contents/noticias/ufpb-realiza-palestra-sobre-sustentabilidade-de-sistemas-alimentares-com-pesquisador-de-universidade-belga

[b] Article “Event on Sustainable Food Systems receives registrations” Available at: https://www.ufrn.br/imprensa/noticias/71167/evento-sobre-sistemas-alimentares-sustentaveis-recebe-inscricoes

department. These entities foster activities, courses, and communication materials that focus on sustainable FS. USP offered a summer course, "Healthy and Sustainable Food Systems," in 2022. Similarly, a course for graduate students in Public Health Nutrition that addresses this topichas been offered since 2023.

Agrowing need exists to incorporate FS into other higher education programs focused on food, such as gastronomy. FS may not be an inherent part of the epistemological foundations of gastronomy; however, a significant overlap has been observed between FS and this scientific field. Gastronomy offers a unique platform for understanding the processes that shape cultures and societies in their diversity, particularly in relation to social identities and the contexts of production and consumption.[3]

Recognizing the collective influence of gastronomy, nutrition science, and FS on production and consumption patterns will strengthen the connection among them. These interwoven fields shape and change cultures and societies, underscoring the importance of studying them in conjunction.

Tracing the evolution of gastronomy from its origins to its recognition as a science will aid in grasping the association between gastronomy and FS. The term "*gastronomy*" emerged and gained popularity in Europe. Gastronomy became intertwined with various fields of knowledge[4] and was closely associated with the upper classes. These elite groups played aninstrumental role in producing recipe books and gastronomic critiques through their ideologies. These books and critiques have been documented throughout history.[5] However, major contributions to gastronomy often originated from the poorest segments of society as innovative responses to pressing challenges such as food scarcity and perishability.[5] Thus, although elitism permeates the field - as evidenced by celebrity chefs and *haute cuisine* restaurants, which represent gastronomy in the popular imagination - culinary education, especially in public institutions, must transcend this narrow conception.[6]

"The Physiology of Taste"[7] published by Brillat-Savarin has deepened our understanding of the scientific nature of gastronomy despite its association with elitism. Savarin[7] defined gastronomy as "well-founded knowledge of everything that concerns man, insofar as he nourishes himself." Thus, gastronomy systematically encompasses all knowledge related to human beings and their food. This established the specific objective of the study: the relationship between individuals and food.[6,7]

The scientific development of gastronomy in Brazil is arelatively recent phenomenon, spanning roughly two decades that originated with the introduction of a Bachelor's degree in Tourism with a specialization in Gastronomy offered by the University of Southern Santa Catarina in Florianópolis-Santa Catarina. However, its official inception dates back to the establishment of the Specialized Higher Education Program in Gastronomy at Anhembi-Morumbi University in São Paulo-SP in 1999, as reported by Anjos, Cabral, and Hostins.[8]

A significant boost in the development of the program curriculum plans of Associate degree programs in Gastronomy was observed in 2006 (Projetos Pedagógicos de Curso [PPC]). This may be attributed to the guidelines and competencies established in the National Catalog of Associate Degree Programs, published by the Ministry of Education and Culture (MEC) in 2016, which provide a solid foundation for structuring these programs.[9]

The Federal Rural University of Pernambuco (UFRPE) was the first Brazilian public institution to establish a bachelor's degree in gastronomy in 2004. Similar programs were commenced at the Federal University of Bahia (UFBA; 2009), the Federal University of Ceará (UFC; 2010), the Federal University of Rio de Janeiro (UFRJ; 2011), and the Federal University of Paraíba (UFPB; 2013). A total of 392 higher education programs in gastronomy are registered on the E-MEC[1] platform cuttently; however, only 13 of these programs are bachelor's degrees, and only five are offered by public Higher Education Institutions (HEIs).

The Program to Support Restructuring and Expansion Plans for Federal Universities (Programa de Apoio a Planos de Reestruturação e Expansão das Universidades Federais; REUNI), an unprecedented initiative that facilitated the broad introduction of disciplines without prior academic tradition in universities, is the factor that most influenced the creation, development, and establishment of gastronomy bachelor's degrees at public institutions.[10] However, this process faces several challenges. For instance, the introduction of new fields of study is not always accompanied by a deep and consistent understanding of their structure to facilitate the delivery of high-quality education.[10] Consequently, additional steps must be taken to consolidate the theoretical and practical framework of gastronomy within academia and fully realize its transformative potential in society.

This situation describes a major challenge in the scientific field of gastronomy, which must uphold the ethical and political character of public universities, efficiently address the socio cultural demands, and incorporate sustainability and health as guiding principles while reexamining the epistemological foundations and methodology of the bachelor's degree program.[10]

FOOD SYSTEMS

The Food and Agriculture Organization of the United Nations (FAO) defines FS as the entire range of actors and their interlinked value-adding activities involved in theproduction, aggregation, processing, distribution, consumption, and disposal of food products that originate from agriculture, forestry, or fisheries, and parts of the broader economic, societal, and natural environments wherein they are embedded.[11]

Producing sufficient amounts of food for the growing world population is difficult even when the current dominant model of FS achieves high levels of productivity.[12] Thus, the efficiency of these models must be enhanced, given the consequences for environmental sustainability, health, and food security.[13]

Sustainable Food System (SFS) models that align with planetary sustainability and public health goals must be developed to address these issues. SFS models guarantee food and nutritional security for the entire population by establishing sustainable economic, social, and environmental foundations, in addition to striving to make healthy food universally accessible now and in the future.[11,14]

Diets, eating habits, and food systems are interconnected. Thus, a sustainable diet is the most significant factor that addresses public health concerns and environmental issues, such as the emission of greenhouse gas (GHG).[15]

Eating practices are social practices. The acts of nourishing and eating transcend biological barriers and serve as builders of identity, interaction, and social distinction.[16] Eating practices include objective and subjective information that provides insights into how groups and communities relate to the biopsychosocial aspects of food. Thus, these practices are embedded in FS, which continually define and redefine them.[17]

The growing debate on the effect of current dominant food systems on human and environmental health—including occupational hazards faced by workers in the global agri-food system; the proliferation of unhealthy dietary patterns, environmental pollution; and the presence of contaminated, unsafe, and adulterated foods - underscores the pivotal role of global agendas addressing FS.[18] This debate emphasizes the importance ofexpanding the practical application of this subject.

Food and nutritional security is facing a global crisis. Approximately 691 and 783 million individuals reportedly faced hunger in 2022, whereas approximately 2.4 billion individuals (29.6% of the population) experienced moderate or severe food insecurity.[19] Agriculture and livestock account for 74% of all climate

pollution and 90–99% of tropical deforestation in Brazil. The dominant model of food production, i.e., human activity, perpetrates the most severe negative effects on the environment.[20]

Thus, FS are one of the main contributors to environmental changes. However, they are strongly affected by these changes, which has important implications for public health as the quantity and quality of food produced are directly related to the levels of environmental degradation or conservation.[21]

The establishment of an alternative and sustainable FS has been proposed to shift this socio-environmentally destructive approach to food production, distribution, consumption, and disposal. This process encompasses the transition to agroecology and the adoption of sustainable diets and eating practices, which involves social activism and grassroots movements.[22]

Transitioning to SFS requires the establishment of economies that prioritize practices centered on care, redistribution, and sharing of resources, rather than those structurally based on the ethics of accumulation.[22]

Community Supported Agriculture (CSA) is an illustrative example that operates within the current system of accumulation while using strategies of care, redistribution, and community. CSA aims to reshape the nature of buying and selling agricultural products by revealing the true costs of production by fairly distributing them among the end consumers. This approach takes environmental management costs into account and ensures fair returns for labor.[22] CSA provides an interesting approach compared with conventional capitalist methods of production and organization by prioritizing food sovereignty over capital accumulation.[22]

Sustainable diets are intrinsically linked to SFS. From an environmental standpoint, diets include combinations of foods that require finite natural resources for production. Thus, they exert an effect on natural ecosystems.[21]

The adoption of alternative diets could reduce the global emissions of GHG from agriculture, decrease deforestation and the extinction of animal and plant species, and help prevent diet-related chronic diseases.[23]

Sustainable dietary changes achieved by adopting this approach can potentially reduce GHG emissions and land demand by up to 50% compared with that associated with the current dominant FS. However, the extent of this potential reduction depends on the quantity and type of meat included in the sustainable diet and the environmental effect of plant-based foods.[21]

Food practices are another essential aspect that aids in understanding the interaction between FS and the consumption stage. These dynamics are shaped by various social agents, such as rural and urban social movements, farmers, consumers, civil society leaders, and government officials at different levels and within various spheres of bureaucracy.[24]

The effect of sociocultural factors on the eating habits of individuals is evident, as these practices cannot be viewed as solely individual processes.[18] Sustainability measures are likely to be effective only when linked to the collective realm and the environment. The integration of sustainability and FS discussions within educational frameworks is a prime example of an approach that represents this principle.[25]

Higher education provides an ideal platform for introducing the topics of FS and sustainability, particularly in programs directly or indirectly related to food and nutrition. The epistemological foundations of these programs must be reformed to guarantee that graduates move beyond a narrow perspective of problems related to their professional practice and operate from a broader analytical standpoint as thinkers of SFS.[18,26]

Examination of FS in higher education curricula

The Law of Guidelines and Bases of Education (LDB)[27] recommends that higher education should foster research and scientific inquiry to advance science, technology, and culture to enhance our understanding of human beings and their environment. Furthermore, it should raise awareness regarding contemporary global challenges, particularly those at national and regional levels, in addition to providing specialized services to the community and fostering a mutually beneficial relationship with it.

Thus, integrating these two perspectives, higher education, in its largest sense, can serve as a crucial catalyst for developing sustainable FS. This transformative approach is crucial, given the importance of upholding its inherent commitment to addressing sociocultural and environmental challenges.

Education is not merely a transfer of knowledge; rather, it is a forum for dialogue that enhances the creativity of individuals and groups, thereby fostering political engagement and social change.[28] Education emphasizes the capacity ofindividuals to uncover their core interests and enables them to freely articulate their own insights based on their experiences and discoveries.[28]

Universities should develop methodologies that foster critical sustainable thinking by implementing measures that establish an environmental management system within the institution, as well as innovative approaches promoting sustainable awareness among faculty, students, and the academic community.[29]

Piecemeal changes may not yield a satisfactory effect in the dialogue between higher education institutions and FS. Thus, a comprehensive reevaluation of dominant academic values and a revision of the Cartesian paradigm are imperative, as emphasized by Sugizaki.[30] Consequently, this study aimed to address the controversies and debates within this field, thereby recognizing that the systematization of technical and scientific discourse in higher education is rooted in Eurocentric, elitist paradigms that are influenced by racial and sexbiases.[30]

Freire[31] proposed that education should unmask the dominant ideology by acting as a form of intervention. This validates the necessity of engaging in discussions about hegemonic FS. These measures must be implemented in a manner that fosters the development of sustainable alternatives, as integrating FS into the epistemological foundations of higher education should encourage the practical involvement of students in their fields and enhance critical thinking about food production, distribution, consumption, and disposal. Freire[31] reported that the human learning process involves "constructing, reconstructing, and verifying to effect change."[31] Thus, this topic is transformative and highly relevant in the context of today's society, necessitating its inclusion in higher education curricula.

Professors should advocate for the integration of sustainability principles into the thoughts and behaviors of individuals,[32] as well as their incorporation into political-pedagogical projects (PPP), curriculum design, faculty meetings, instruction, research, and community outreach programs.

LINKS BETWEEN GASTRONOMY DEGREE PROGRAMS AND FS

Dialogues between gastronomy and health should be guided by an up-to-date understanding of the topic. Furthermore, these dialogues must be conducted in an engaging manner that is consistent with current realities to ensure recognition of their correlation with SFS. Health is considered an intersect oral issue in this context that results from the following factors linked to quality of life: diet; eating habits and food environment; nutrition; housing conditions, sanitation, and lifelong education; employment; income; land access; mobility; environment; family and social settings; leisure; and access to healthcare services.[33,34]

The expanded concept of *health*, as defined by the eighth National Health Conference (CNS), identifies nutrition as the primary aspect related to health. Furthermore, it acknowledges that health is largely a result of the social organization of production, which generates significant disparities in living standards[34] and is connected to all its material aspects. Thus, health is not an abstract concept. Moreover, it can be defined within the historical context of a specific society at a particular stage of its development and must be achieved by the population through daily struggles.[34] Professionals from various fields must collaborate to achieve common goals by working in distinct yet complementary ways to address this complex issue.[35]

Sá and Figueiredo[35] assessed the incorporation of health promotion into the gastronomy bachelor's programs at UFBA and UFRJ and revealed that a significant portion of the faculty maintained a health perspective based solely on biomedical concepts. They noted "a lack of understanding that gastronomes can promote health through aspects such as taste, appearance, the celebration of food culture, and respect for the land and producers."[35]

The updated perspective on the relationship between gastronomy and health acknowledges the effect of diet on planetary sustainability.[21] Dietary practices play a crucial role in maintaining human health and preserving and supporting the environment and SFS.

Thus, linking gastronomy to the development of SFS-associated practices is considered a relevant approach as it enables gastronomy to serve as a political tool for affirming cultural identities and empowers it to challenge the industrialization and commodification of food.[5] Petrini[5] asserted that "harnessing the science of culinary pleasure in service of environmental preservation will guide humanity towards producing the highest quality food possible."

Jacob and Araújo[18] proposed guidelines for the relationship between nutrition, nutrition degree programs, and SFS. These propositions provide an excellent foundation for examining the specific connection between gastronomy and this subject, given the interplay between gastronomy and health.

Gastronomes, as proponents of SFS, must move beyondthe views of their professional role and adopt a multidisciplinary approach similar to those adopted by nutritionists. These professionals must aim to understand the social factors influencing eating habits, considering the collective nature of diets and addressing the role of diverse FS.[18]

Certain formative aspects reveal the value orientation and political stance embedded in higher gastronomy education from its inception to the present. The curricular emphasis on courses covering Italian, French, and Mediterranean culinary techniques and theoriesis well-known. In contrast, courses that explore Afro-diasporic, indigenous, vegan, and vegetarian cuisines are marginalized. Moreover, topics such as agroecology, the human right to adequate nutrition, health, and food security, and FSas a whole are often overlooked.[30,36,37]

Bachelor's degree programs in gastronomy often adopt a Eurocentric model that puts a disproportionate emphasis on cuisines from the Global North.[30] Sugizaki[30] recommended that this approach "should not be applied in public universities, whose primary role is to cultivate critical thinking in citizens."[30] However, this approach can be applied to associate degree programs in gastronomy. This may be partially attributed to the increased market pressure on curriculum development for these programs[38] to produce skilled workers with a focus on technical professional training. This approach disseminates a form of (gastronomic) domination rooted in colonial thinking.

This study contends that associate degrees stress technical professional education; however, they engage in research and should be committed to the political aspects of education.[39] Thus, public institutions,

such as Federal Institutes, public-private partnerships (e.g., the National Service for Commercial Learning), and private colleges offering associate degree programs in gastronomy must aim to "develop professionals with critical thinking skills who are aware of their role in both their professional field and society at large."[40]

This perspective is further supported by De Abreu and Salles[38] who stated that associate degree programs should cultivate professionals with critical thinking skills, capable of engaging with their environment. Moreover, they advocated for the integration of sustainability into the curriculum. Similarly, Mendes and Faleiros[40] supported this reasoning stating that scientific thinking, critical and reflective abilities, and the production of scientific research are essential components of associate degree programs according to the CNE/CES 436/2001 opinion.

Incorporating more comprehensive discussions at all levels of higher education in Gastronomy is imperative. These discussions should encompass reflections on FS, debates about the Human Right to Adequate Food (HRAF), and food and nutrition security (FNS) policies, in addition to acknowledging the role of social movements in promoting food sovereignty. Other aspects that improve understanding of gastronomes about their role in power dynamics within the food sector should be included.[30]

These findings emphasize the importance of moving beyond the reductionist view of gastronomy as a merely technical and Eurocentric field that is disconnected from its social responsibilities.[30] Measures should be taken to embrace the complex, transdisciplinary nature of gastronomy to develop an academic approach that is deeply rooted in its essence and cultural context.[30]

Thus, connecting food-related higher education programs, such as gastronomy, to the development of practices associated with SFS is a relevant approach. This connection can be used to establish these programs as political tools for affirming cultural identities and challenging the industrialization and commodification of food.[5]

RECOMMENDATIONS

Incorporating FS into higher education in gastronomy will aid inaddressing the sociopolitical needs for paradigm shifts and the development of SFS, which is recognized as a counter-hegemonic approach. Sugizaki[30] emphasized the importance of linking gastronomy to Food and Nutrition Security and Safety (FNSS):

> [...] there is a need to redefine the field of Gastronomy. A paradigm shift is occurring in the dominant understanding of Gastronomy, giving rise to a counter-hegemonic perspective.[30]

The curriculum was considered non-neutral in the current study, which was influenced by the perspectives of nutritionists and gastronomy professors who developed the PPP for bachelor's and associate degrees. These curricula reflect their interpretations of FS and the role of gastronomes in society.[26]

The political understanding of FS gained by these agents influences decisions pertaining to the curriculum and shapes the ideal graduate profile envisioned by the university.[26] Simultaneously, in a cyclical process, this approach improves awareness of the importance of integrating this topic into the theoretical foundations of the programs among students.

A survey of curricular structures from five public bachelor's degrees in gastronomy in Brazil and five associate degrees, one from each Brazilian macro-region, revealed the absence of FS in the syllabus. Optional subjects (e.g., ICA3396 - Ecological Gastronomy [UFC] and NUT110 - Education and Environment [UFRJ]) and mandatory courses (e.g., Social and Environmental Responsibility [UNOPAR], Fundamentals of Sustainability Applied to Gastronomy [IFB], and ECO021905 – Ecogastronomy [IFSC]) were minimally represented in the technological degrees surveyed. This indicates a potentially stronger commitment to sustainability in education from the latter category, despite having a shorter training period and fewer courses compared with bachelor's degrees.[36,37,41–48]

The context provided hereinaids in understanding the theoretical and practical potential, as well as the relevance of incorporating FS into undergraduate gastronomy programs - particularly through PPP reform. However, the limitations of this study must be acknowledged: the knowledge, attitudes, and interests of academic communities in the bachelor's and associate degree programs regarding the integration of FS into their epistemological foundations were not investigated. Thus, future research must aim to complement this essay with a comprehensive diagnosis of these factors.

The process of recognizing the need to integrate FS into higher education must be undertaken with the understanding that education is a contested field. Transitioning from dominant FS to sustainable FS is the primary means of averting the looming climate crisis.[49]

CONCLUDING REMARKS

In conclusion, the insights herein highlight the importance of incorporating FS into the gastronomy curriculum in higher education. Adopting a comprehensive, interdisciplinary approach to gastronomy and FS equips students with the tools for social transformation, in addition to enhancing the overall quality of their education.

FS education provides students and future professionals with a comprehensive understanding that connects food production, distribution, consumption, and disposal. This holistic perspective enables individuals to make informed and sustainable decisions that benefit society on multiple levels - from the mindful selection of ingredients to the implementation of practices that enhance consumer health and environmental conservation.

Therefore, higher education institutions must recognize the significance of this topic and integrate it into their curricula. These measures will shape the perspectives of the students regarding the environmental and social dimensions of gastronomy, equipping them with the tools necessary for ethical and responsible practice. Thus, FS education plays an important role in training food professionals who are aware and capable of contributing to a sustainable food future..

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Contributors

Bittencourt MC participated in the idealization of the study design; in the collection, analysis and interpretation of data and in the writing of the study; Teixeira AR participated in the idealization of the study design, in the final revision and approval of the manuscript for submission.

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