FOOD FOR COLLECTIVES

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This article comes from the work of completion of a course entitled "Conhecimento de acadêmicos de Gastronomia acerca da doença celíaca" (Knowledge of gastronomy academics about celiac disease) by Vanessa Silva Freitas and directed by Caroline Camila Moreira, presented in November 2019 at the Universidade Federal da Grande Dourados. Dourados, MS, Brasil.

Knowledge of Gastronomy students about celiac disease

Conhecimento de estudantes de Gastronomia acerca da doença celíaca

Abstract

Objective: To evaluate the knowledge of Gastronomy students about celiac disease. ***Methods:*** This is a descriptive study conducted with students from a Technology in Gastronomy course in Dourados, Mato Grosso do Sul, Brazil. Data collection was carried out in April 2019 through the application of a questionnaire organized in three sections with open and closed questions: (1) Sociodemographic issues; (2) Knowledge about celiac disease and gluten-free diet and (3) Knowledge about special care in culinary preparations for people with celiac disease. ***Results****:* Sixty students with an average age of 31.5 years old participated, most of them female (70%) and self-declared white (73.3%). Most of them have heard of celiac disease and gluten (61.7% and 100%, respectively) although the majority (66.1%) answered wrongly or was not able to answer about the concept of celiac disease. Only 15.5% believed that gluten is a protein. Only 24.5% of students correctly mentioned all the gluten-containing cereals and 5.4% correctly indicated all options to replace them. Although most of the students reported converging special care practices in gluten-free preparations, a significant number of students were wrong or not able to answer about sharing oil, utensils, and equipment for gluten and gluten-free foods (31.6% and 41.7% respectively). Approximately one-third of the students (31.6%) did not consider it necessary to verify the presence of gluten on food labels. ***Conclusion:*** The Gastronomy students present unsatisfactory knowledge about celiac disease, gluten-free diet, and culinary practices to prevent cross-contamination by gluten, which may affect the future quality of food services provided by these professionals and, consequently, in the quality of life of celiac consumers. The findings indicate the need to reform the curriculum and create curricular guidelines for Technology in Gastronomy courses in Brazil..

Keywords: Technical Higher Education. Gluten Free Diet. Celiac Disease. Students. Food Services.

Resumo

Objetivo: Avaliar o conhecimento de estudantes do curso de Gastronomia acerca da doença celíaca. ***Métodos:*** Estudo descritivo realizado com estudantes de um curso de Tecnologia em Gastronomia de Dourados-MS. Coleta de dados realizada em abril de 2019, por meio da aplicação de questionário organizado em três seções: (1) Sociodemográfica; (2) Conhecimento acerca da doença celíaca e dieta isenta de glúten; e (3) Conhecimento sobre cuidados especiais em preparações culinárias para celíacos. ***Resultados:*** Participaram 60 estudantes, com média de idade de 31,5 anos, sendo a maioria do sexo feminino (70%) e tendo se autodeclarado branca (73,3%). A maioria já

ouviu falar da doença celíaca e glúten (61,7% e 100%, respectivamente), todavia 66,1% responderam erroneamente ou não souberam responder sobre o conceito da doença. Somente 15,5% acertaram que glúten é uma proteína. Apenas 24,5% dos estudantes mencionaram corretamente todos os cereais que contêm glúten e 5,4% indicaram corretamente todas as opções de substitutos para os cereais com glúten. Embora a maioria tenha relatado práticas convergentes sobre cuidados especiais em preparações isentas de glúten, um número expressivo de estudantes errou ou não soube responder sobre o compartilhamento de óleo, utensílios/equipamentos entre alimentos com e sem glúten (31,6% e 41,7%, respectivamente). Aproximadamente um terço dos estudantes (31,6%) não considera necessário verificar a presença de glúten no rótulo dos alimentos. *Conclusão:* Os estudantes de Gastronomia apresentaram conhecimento insatisfatório acerca da doença celíaca, dieta isenta de glúten e práticas culinárias para evitar a contaminação cruzada por glúten, o que pode implicar futuramente a qualidade dos serviços prestados na área de alimentação por esses profissionais e, consequentemente, na qualidade de vida dos celíacos. Os achados indicam a necessidade de reforma do currículo e criação de diretrizes curriculares para os cursos de Tecnologia em Gastronomia no Brasil.

Palavras-chave: Formação Superior Tecnológica. Dieta Livre de Glúten. Doença Celíaca. Estudantes. Serviços de Alimentação.

INTRODUCTION

Of the total expenses of Brazilian families with food, almost one third (32.8%) is dedicated to meals out of home.[1] The observed trends for food consumption suggest that Brazilians are looking for convenience/practicality, reliability/quality, and sensoriality/pleasure. Consumers have increasingly opted for foods that ensure sustainability/ethics in the production chain and healthiness/wellness.[2] The trend towards healthiness and well-being has impacted the food service sector, which has adapted its business model, including a menu with healthier preparations[3] and options that provide customers with dietary restrictions.

Professionals in the food area should have their training focused on meeting the new market trends indicated for food consumption. Considering that the formation in Gastronomy in Brazil has, in its great majority (92.7%), a technological nature,[4] whose focus refers exclusively to vocational education, it is inferred that the eyes in this area are primarily focused on the job market, leaving the academic understanding and scientific study of the activity, commonly seen as just a means for food production, to the background.[5] A great challenge for Gastronomy courses is to add to the curriculum technological innovation as a tool for the creation and management of new products, processes, and businesses related to the food sector outside the household. Technological innovation concerns the design of products and services and the improvement, development, and application of new preparation techniques adapted to specific contexts,[6] as the current niche market for feeding people with dietary restrictions. However, in order for technological innovation to be possible, it is necessary to understand Gastronomy as an area of multidisciplinary knowledge that communicates with the other sciences,[6] such as Nutrition.

In Brazil, the higher education course in Technology in Gastronomy does not have a specific curricular guideline established by the Ministry of Education. It is regulated by the National Curricular Guidelines published in December 2002, which characterize the general set of technological courses offered in the country. Each educational institution is responsible for establishing the pedagogical project of the course to be offered.[7] However, the curricular matrix must be elaborated considering the demands of the jobs, this construction being guided by the National Catalogue of Higher Technology Courses.[8] The analysis of the curricular matrix of the Brazilian Gastronomy courses pointed out that the time load offered in the disciplines related to Nutrition is low.[9] Thus, it is questionable whether future food service professionals in Brazil are being trained properly to meet the demands of the current market scenario.

In the current scenario, in which consumers are trying to eat more healthily, a niche market that has proved quite promising in food services is the one of gluten-free food. This international[10] and national[11] trend, whose product sales have increased in the last decade,[10,12] might be explained by the fact that gluten-free foods are perceived as healthier foods compared to conventional versions.[10] Although the consumption of these foods has increased among people with no dietary restrictions diagnosed,[10] in individuals with celiac disease (CD), consumption of gluten-free food is a requirement.

The CD is characterized by inflammatory and autoimmune changes triggered by gluten ingestion in genetically susceptible individuals.[13] Gluten is a protein present in wheat, rye, barley, and oats. Even in minimal amounts, gluten can trigger reactions due to the damage it produces in the small intestine, atrophying its villi and resulting in poor nutrient absorption. The only safe and effective treatment for CD is a lifetime restriction on gluten intake.[14,15] However, adherence to treatment is not easily achievable.[16-18]

Adherence to the gluten-free diet experienced by celiacs leads to a new social behavior that modifies the daily life of the individual, changing not only their dietary habits, but also their social habits.[19,20] Thus, the gluten-free diet presents itself as a complicating factor for the celiac, since it requires a change in social habits in the different areas of coexistence.[17,19-21]

Eating is more than a physiological process of nutrient intake, it also means social interaction, which impacts on the emotions and relationships of celiacs.[14] Because of this, many do not disclose their food restriction and take risks when eating out. Many places usually frequented by celiac individuals before the diagnosis of the disease do not offer gluten-free food options, and there are frequent reports of diet leaks during meals taken away from home.[14] In addition, many establishments do not provide care against gluten cross-contamination,[22] which, together with the recurrent lack of gluten-free food, drives celiac individuals to reduce the frequency of away-from-home meals,[21,23] therefore experiencing the feeling of exclusion.[17,20,22,24]

People who need to restrict their intake of some nutrient should, before consuming the food, consult the service to check the risk of traces present in the preparations. When they do not get the information, they should look for employees who are directly related to the production of the preparations.[17,18,21,25] Inadequate information and education on food-related diseases represent obstacles to the maintenance of restrictive diets, since insufficient knowledge by food professionals may contribute to involuntary transgression of the diet.[18,21,26] In this way, food service professionals play an important role in complying with the diet of customers with CD.[21,27-29]

In this context, Gastronomy students, as future qualified professionals, may present potential improvements in the attention given to consumers with CD and other food restrictions in food services, this scenario being conditioned to the approach of the subject during professional training. Considering that the approach to food restrictions in Gastronomy courses in Brazil is not mandatory, and that for celiac individuals the correct information on food preparation is critical, it becomes relevant to evaluate the knowledge about CD of future professionals who will work in the food market, aiming to ensure the quality of services provided in the current market trend. The objective of the present study was to evaluate the knowledge of students of a Gastronomy course about celiac disease.

METHODS

This is a descriptive study, with a cross-sectional design and quantitative approach, carried out by a convenience sample of students from a Gastronomy course with a technological qualification from a higher education institution in Dourados, State of Mato Grosso do Sul, Brazil. This Gastronomy course is private and offered in the morning and evening options, with a duration of four semesters. Since the Technology in Gastronomy courses do not have specific curricular guidelines established by the Ministry of Education, the higher education institution where the course is offered has autonomy to establish its curricular matrix.

All students regularly enrolled in the course were invited to participate in the study. As an exclusion criterion, questionnaires from students who already had a post-graduate and graduate degree, or had attended subjects related to the health area, were disregarded, due to the possibility of knowledge prior to the Gastronomy course on the research topic.

This research was approved by the Ethics Committee of the Federal University of Santa Catarina (CAAE 08497018.2.0000.0121). All participants have provided written consent before starting data collection.

For data collection, a questionnaire was prepared based on other studies on the subject,[30,31] being previously tested with students from the sector of Food and Beverage (technical course on Cooking, Bakery, and Restaurant and Bar of the Federal Institute of Santa Catarina, campus Florianópolis-Continente) to assess the understanding of the issues and resolve possible inconsistencies of interpretation.

The data collection took place in the month of April 2019 in the facilities of the educational institution. The questionnaire was completed by students under the supervision of the researcher.

The questionnaire, composed of 29 open and closed questions, was organized in three sections: (1) Sociodemographic questions: sex, age, race, and education; (2) Knowledge about CD and gluten-free diet: heard about CD; concept of CD; heard about gluten; concept of gluten; gluten-containing cereals; gluten substitutes for gluten-containing cereals; (3) Practices that prevent cross-contamination by gluten: need for special care in celiac preparations; sharing of utensils/equipment between gluten and gluten-free preparations; sharing of frying oil between gluten and gluten-free preparations; checking the claim for presence or absence of gluten on food labels.

The variable corresponding to the concept of CD was collected through an open question. The concept of CD was considered correct when the student mentioned intolerance to gluten.[16] The other variables were collected through closed questions. When asked if the student had ever heard of CD and gluten, the student could choose between "yes" and "no" options. The concept of gluten was considered correct when the student chose the "protein"[32] option from the "carbohydrate", "protein", "fat", and "enzyme" options.

The student also answered questions about the presence and absence of gluten in food. Among the options of cereals that have gluten, the student should choose between barley, rye, wheat, corn, and rice, the answer being considered correct when all the following options are marked: barley, rye and wheat. The option of oats was not included, since they are originally gluten-free, but are contaminated because they are planted and harvested during the inter-harvest period.[33] Since gluten-free oats are already traded in Brazil, it would not be possible to classify the answer obtained in the question as correct or incorrect.

As for the cereals that can be used as substitutes for those with gluten, the student could choose among the options: corn starch, potato starch, cassava starch, rye flour, cassava flour, and rice flour. The answer was considered correct when all of the following options were checked: corn starch, potato starch, cassava starch, cassava flour, and rice flour.

Regarding the question about the need for special care in the preparation of gluten-free food, the student could choose between the options "yes", "no", and "don't know", and the answer "yes" was considered correct. For questions about the possibility of sharing utensils/equipment and frying oil between gluten and gluten-free preparations, the student could choose between the options "yes", "no", and "don't know", with the answer "no" being considered correct. And for the question about the need to check the label of foods used as ingredients in gluten-free preparations, the student could choose between "yes", "no", and "don't know", the answer "yes" being considered correct.

The information from the questionnaires were inserted into the database, through double entry, with the help of the Microsoft Excel® program, version 2007. The descriptive data were presented by means of absolute and percentage numbers. It should be noted that some variables present different number of participants, due to the absence of answers.

RESULTS

This study invited 112 students of Gastronomy, with an acceptance rate of 53.6%. A total of 60 students participated in the study, with an average age of 31.5 ± 11.6 years (min. 18 years and max. 64 years). The majority were female (70.0%), self-declared white (73.3%), and had incomplete higher education (67.3%). Additionally, 32.7% of the students already had a complete graduate or post-graduate degree (Table 1).

Table 1. Sociodemographic characteristics of Gastronomy students of a higher education institution (n=60). Dourados-MS, 2019.

Variables	n	%
Sex		
Female	42	70.0
Male	18	30.0
Color/Race		
White	44	73.3
Brown	11	18.3
Asian	04	6.7
Black	01	1.7
Indigenous	00	0.0
Schooling (n=58)		
Incomplete higher education	39	67.3
Complete higher education	09	15.5
Post-graduation	10	17.2

In order to check their knowledge about CD and gluten-free diet, students answered if they had ever heard of the disease. Most (61.7%) answered positively, although 66.1% of the students either answered incorrectly or were unable to respond properly about the disease concept. When asked if they had ever heard of gluten, they all answered yes, but only 15.5% agreed that gluten is a protein (Table 2).

Regarding the knowledge about gluten containing cereals, although most students indicated wheat as a cereal containing gluten (92.4%), only half indicated barley (54.7%), and approximately one third indicated rye (32.1%). Only 24.5% of the students correctly marked all the options for gluten containing cereals (data not shown in table).

When asked about substitutes for gluten-containing cereals, only 5.4% of the students marked all the gluten-free options (data not shown in table).

The least recognized food substitute for gluten-containing cereals was cassava flour (27%), followed by corn starch, and cassava starch (43.2% and 48.6%, respectively). Potato starch and rice flour were indicated by more than half of the students (56.8% and 67.6%, respectively) and 16.2% erroneously indicated rye flour as a substitute (Table 2).

Table 2. Knowledge of Gastronomy students from a higher education institution about celiac disease and gluten-free diet (n=60). Dourados-MS, 2019.

Variables	n	%
Heard about celiac disease		
Yes	37	61.7
No	23	38.3

Table 2. Knowledge of Gastronomy students from a higher education institution about celiac disease and gluten-free diet (n=60). Dourados-MS, 2019. (Continues.)

Variables	n	%
What is celiac disease (n=59)		
Correct answer	20	33.9
Incorrect answer	15	25.4
Do not know	24	40.7
Heard about gluten (n=57)		
Yes	57	100.0
No	00	0.0
What is gluten (n=58)		
Correct answer	09	15.5
Incorrect answer	49	84.5
Cereals that have gluten (n=53)		
Barley	29	54.7
Rye	17	32.1
Wheat	49	92.4
Corn	01	1.9
Rice	14	26.4
Substitutes for cereals that have gluten (n=37)		
Corn starch	16	43.2
Potato starch	21	56.8
Cassava starch	18	48.6
Rye flour	06	16.2
Cassava flour	10	27.0
Rice flour	25	67.6

Most students (88.3%) considered that special care was needed when preparing food for celiac individuals, and three practices were observed to avoid cross-contamination by gluten. However, when asked about such care, approximately one-third of the respondents were wrong or unable to say whether utensils and equipment (41.7%) and frying oil (31.6%) could be shared between gluten and gluten-free preparations. In addition, about one-third (31.6%) of the students did not consider it necessary to verify the claim of gluten presence or absence on the food label (Table 3).

Table 3. Knowledge of Gastronomy students from an institution of higher education about special care in culinary preparations for celiacs (n=60). Dourados-MS, 2019.

Variables	n	%
Specific care when preparing foods for celiac individuals		
Yes	53	88.3
No	01	1.7
Do not know	06	10.0
Sharing of utensils/equipment in gluten and gluten-free preparations		
Yes	10	16.7
No	35	58.3
Do not know	15	25.0
Sharing oil for frying food with and without gluten		
Yes	05	8.3
No	41	68.4
Do not know	14	23.3
Checking the presence of gluten on food labels		
Yes	41	68.4
No	05	8.3
Do not know	14	23.3

DISCUSSION

This study found that most of the participants were female and declared themselves white, similar to another study also conducted with students from the Gastronomy course, where the majority (67%) of whom were also female.[34] Due to the new social configuration, in which women began to occupy positions outside the domestic space, the arrival of women in higher education and the labor market has increased significantly.[35] In addition, sex can be a determining factor in the choice of higher education courses. In the case of the present study, women, even assuming a professional role outside home, continue to accumulate responsibility for family food,[36] with Gastronomy still being a topic of interest.

Even though the majority of the Brazilian population declares themselves black or brown, the socioeconomic scenario shows that only 6% of this population have higher education and that the monthly salary is lower when compared to those of whites.[37] Considering the private nature of the present Technology in Gastronomy course, the accessibility of black or brown people might be jeopardized due to the strong social differences in Brazil.

Another result that should be highlighted is that approximately one third of the students already had a complete graduate or post-graduate degree. A similar result was found in a study conducted in Costa Rica with 184 Gastronomy students from a private university, in which 20.7% of them had a complete graduate degree.[38] One of the reasons that may explain this phenomenon is the fact that people increasingly eat outside home,[39] which contributes to the growth of food services,[40] enhancing a wide area of expertise and job opportunity. Combined with this, the glamour of the profession of chef, whose figure is increasingly

popular in culinary programs, may also be contributing to this percentage of students with higher education who seek a promising new area of expertise, such as Gastronomy.

Most of the evaluated students have already heard about CD. The data corroborated a study conducted in New Zealand, with 35 first year Gastronomy students, in which 94.3% of the respondents reported hearing about CD.[41] However, in the present study, most students were unable to respond or misanswered about the concept of the disease. This outcome is in line with a study conducted in Araçatuba (São Paulo - Brazil), with students of Gastronomy, in which 70.7% claimed to know what CD is, but no one presented a complete definition.[34]

Similar results have also been found not only at the academic level, but also in the labor market. A study of 30 self-service restaurant chefs in Brasília (Federal District - Brazil) found that 70% of the professionals could not define the concept of CD.[30] A study of 322 chefs in the United Kingdom found that 82.9% of the food handlers did not know the concept of CD.[31]

Regarding the knowledge about gluten, the current study showed that all students have already heard about this nutrient. However, when asked about the concept, a minority agreed that gluten is a protein. A study that assessed the knowledge about CD in 534 celiacs registered at the Brazilian Association of Celiacs (ACELBRA) found that the majority (67.1%) answered that gluten is a protein.[16] However, it should be noted that the appropriate knowledge about gluten by most participants in this study may be related to the fact that they are celiacs, who tend to have greater interest and knowledge about CD when compared with the non-celiac population. The results of this study suggest that students, although familiar with the terms "celiac disease" and "gluten," do not know their meanings, and make no connection between the terms. This reinforces the hypothesis that the fact that students have heard of gluten is probably due to the mass media of the food industry, which appropriates the term as a nutritional marketing strategy,[42] and not of the relationship between gluten and CD.

Regarding the knowledge of which foods are sources of gluten, this study found that few students mentioned all the correct options. Although most students indicated wheat as a gluten containing cereal, only half of the students indicated barley, and less than a third indicated rye as a gluten containing cereal. The literature shows that similar results have been commonly found in research with Gastronomy and Technical Course on Food, food handlers, chefs, restaurant owners, and health professionals.[41,43-47] A study conducted in the countryside of São Paulo (Brazil) with Gastronomy students from a private educational institution found that the majority (84%) indicated wheat as a source of gluten, but less than half indicated barley and rye (45% and 47.8%, respectively).[41] In addition, a study with 44 high school students of a Technical Course on Food integrated to high school, in the city of Barretos (São Paulo - Brazil), found that 77.3% of respondents assertively indicated wheat flour as a source of gluten. However, 13.6% and 4.5% of the students pointed out erroneously potato starch and cassava flour, respectively, as having gluten.[43]

Among food handlers, a study of 18 gluten-free restaurant employees in Brasília (Federal District - Brazil) found that 17% of them wrongly chose barley as an option without this nutrient.[44] A study conducted with 36 cookers in Varginha (Minas Gerais - Brazil) showed that 66.1% of the respondents listed wheat as the food responsible for causing symptoms in celiac disease, but none of them agreed on all four options.[45] Similarly, a study conducted with owners of 14 restaurants in Paraná (Brazil) found that only 7% reported oatmeal, wheat meal, and barley as gluten-source foods.[46]

Among health professionals, a study conducted in Ponta Grossa (Paraná - Brazil) with 82 Primary Care professionals (doctors, nurses, and pharmacists) showed that only half of the professionals answered correctly about the presence of gluten in food.[47]

It is noteworthy that one in four students in this study misrepresented rice as a source of gluten. This is relevant since rice has been used as a preferential substitute for wheat flour in the preparation of gluten-free foods.[30] As for corn starch, only one student erroneously indicated this food as a source of gluten, unlike the result found in a study conducted with restaurant owners, which found that half of the respondents mentioned corn starch as a source of gluten.[46]

Most students recognized rice flour as a substitute for gluten-containing cereals, but did not identify cassava flour for this purpose. Approximately half of the students recognized corn starch, cassava starch, and potato starch as an alternative substitute. The fact that the students confused sources and substitutes of gluten-containing cereals is a cause for concern, since this lack of knowledge may limit the variability of gluten-free preparations offered in commercial establishments. It has already been shown in the literature that the supply of gluten-free foods is limited in supermarkets.[48] If students do not acquire the correct knowledge about alternative foods to cereals that contain gluten, the scenario of limited gluten-free foods observed in the supermarkets might also be found in the restaurants.

Regarding the special care required during the production of culinary preparations for celiacs, an expressive number of students were observed who made mistakes or were not able to answer about the practice of sharing utensils/equipment and frying oil between gluten and gluten-free foods. Corroborating this study, a work conducted with chefs in Brasília (Federal District - Brazil) showed that 72% of these professionals share utensils and equipment between gluten and gluten-free preparations. In addition, 32.1% of these professionals share frying oil between gluten and gluten-free preparations.[30] Unlike the results found in this study, a work conducted with 90 chefs and 35 Gastronomy students in New Zealand showed that students were more familiar with the care taken in preparing gluten-free food compared to chefs. The authors attributed this fact to the education received by the students, since only 50% of the chefs were qualified.[41] In addition, a study that assessed the perceptions of food handlers regarding the supply of food to schoolchildren with celiac disease in two municipalities in Santa Catarina (Brazil) found that all participants (n=6) felt well oriented and trained in pre-preparation, preparation, handling, and storage of products and utensils to avoid cross-contamination by gluten,[49] reinforcing the importance of constant training of food handlers.[18,28,49]

Concerning the practice of food label analysis, most students found it necessary to verify the claim of presence or absence of gluten. However, it should be stressed that this study did not reveal a habit of reading the claim of presence or absence of gluten on the food label. A study carried out in Araçatuba (São Paulo - Brazil), with Gastronomy students showed that the majority of them (70%) did not observe the presence of gluten on the labels of packages before starting a culinary preparation.[34] A study conducted in Brasília (Federal District - Brazil) showed the same neglect, in which most chefs (76.7%) did not observe such information.[30] In Brazil, although the declaration of the presence or absence of gluten is mandatory on food labels,[50] the law does not apply to preparations in commercial establishments, resulting in some conflict in the social interaction of celiacs due to the poor knowledge and information about the disease by the owners of commercial establishments and food handlers.[44-46]

Therefore, the findings of this study reinforce the concern of celiacs when eating outside home. In their perception, restaurants do not meet the needs related to a gluten-free diet, as employees often lack knowledge about CD and are unaware of the importance of gluten cross-contamination during food preparation.[18,23] Because of fear of gluten cross-contamination and lack of safe food options, celiacs frequently report the need to avoid or reduce the frequency of eating in restaurants.[21,23]

A systematic meta-analysis review of gluten cross-contamination in food products with a claim of being gluten-free found a prevalence of 13.2% (95% CI: 10.8%-15.7%) of contamination in industrialized products,

and an even higher prevalence (41.5%; 95% CI: 16.6%-66.4%) in non-industrialized products, as in the case of food services.[28] Corroborating this result, a study that evaluated samples of beans from self-service restaurants in Brasília (Federal District - Brazil) identified that 45% (n=9) of the facilities evaluated had samples contaminated with gluten.[29]

Given this worrying scenario, the lack of knowledge of employees about the proper handling of celiac preparations plays a central role as a predictor of this type of contamination.[18,51] The sharing of ingredients (e.g. salt, oil), utensils (e.g. mold, cutlery), and even equipment (e.g. oven) between gluten and gluten-free preparations may lead to gluten contamination. Since the treatment is based on the removal of gluten from the diet, it is essential that the celiacs obtain reliable information about the preparations,[46] since wrong information can lead to involuntary transgression of the diet.[28,29,52]

In this sense, the results obtained in this study are relevant, since students of Gastronomy will be the future professionals responsible for providing safe and adequate food to celiacs[34,41] and suggest that knowledge about CD should be learned throughout the academic life. Reinforcing the premise that academic education has a positive impact on knowledge about CD, a study conducted in Minas Gerais (Brazil) that assessed the knowledge about this subject in 120 students in the Biomedicine course found that the graduate course contributed to the acquisition of this knowledge.[53] In addition, a study conducted in João Pessoa (Paraíba - Brazil), which compared the previous knowledge about CD by Nutrition students at the beginning of the course with those at a more advanced level, concluded that the previous knowledge of the students was unsatisfactory, but that as the disciplines progressed, it was gradually acquired.[54] A study conducted in Mato Grosso (Brazil), assessing the level of knowledge about CD in 210 university students from different areas (Exact Sciences, Biological and Health Sciences, and Humanities), concluded that the level of knowledge of course graduates was higher compared to those students beggining the course, except for the Humanities area, indicating that, depending on the area, the graduate degree is essential for the training of these professionals.[55]

The analysis of the curricular matrix of the current Technology in Gastronomy course allows us to infer that out of the 23 disciplines offered, only two represent disciplines related to Nutrition, representing 10% of the total workload of the disciplines offered in the course (excluding the workload of the internship and complementary activities). The syllabus of the Microbiology, Food Hygiene and Biosafety, and Food Science and Nutrition disciplines suggest contents essentially focused on the control of the development of microorganisms in food through good practices in food service and methods of food conservation.

It is on the course description of the Food Science and Nutrition discipline, which addresses the topic of "functional foods", but since there is no detail of the sub-topics that would be addressed, it is not possible to ensure that students are being instructed in the identification of food-related diseases, as well as on the adequate dietary and culinary techniques to meet the specific needs of people with dietary restrictions. This audience is represented not only by celiacs, but by a diversity of people with other dietary restrictions, such as the consumption of sugar, sodium, milk, and dairy products, among others. Assuming that a considerable percentage of the population has this profile or may develop some dietary restriction over the course of their lives, meeting this specific niche may represent a major competitive differential in food retailing, either by adapting an ongoing business model or even developing a new business model in food service. A study that analyzed the curricular matrix of 20 Gastronomy courses in Brazil found that the disciplines related to Nutrition area represented only 6.6% of the total disciplines offered in the analyzed courses,[9] a result similar to the present study. This suggests that probably not only the students of the current investigation, but future food service professionals in Brazil are not being sufficiently qualified to meet the trends and demands of the current market.

Although the sample used in the present study is a convenience sample, not being representative of all students of Technology in Gastronomy in Brazil, this work aimed to fulfill a gap that exists in the literature and the understanding of the phenomenon investigated. Based on the results presented, new studies may be developed in order to verify, in a representative sample of students of Technology in Gastronomy courses in Brazil, the overview of their formation regarding CD and other food restrictions. This allows the discussion about the topic and the future development of a unique curricular guideline for the Brazilian Technology in Gastronomy courses.

It is important to note that, although a significant number of students already had completed higher education, the selection bias was controlled, to the extent that students with graduate or postgraduate courses in areas related to the CD topic, such as health, were excluded from the study. Thus, any previous knowledge about CD was probably not acquired during the corresponding university course, but out of personal interest on the discipline.

Another probable limitation of the study refers to the responses of the participants, which may not correspond exactly to the knowledge and behavior of these individuals, due to the social desirability bias. The trend to transmit a culturally acceptable image and in accordance with the social norms, avoiding criticism in test situations, may impair the quality of the information obtained from research.[56]

However, a strong point of this study is to start a reflection on the importance of establishing curricular guidelines for Technology in Gastronomy courses, since the topic is little addressed in the literature and the formation of students may not contemplate important themes that should be common to all higher education institutions where they are offered. Moreover, a scientific gap on the subject is filled, since few studies have been identified in the literature that have investigated the knowledge about CD in Gastronomy students, both nationally and internationally.

The relevance of the study is also highlighted, since more and more people are seeking to know more about food, and it is the right of the consumer to have access to secure information about the products and services available in the market. In the case of celiac disease, ensuring correct information is of fundamental importance for the success of the treatment. In addition, it reinforces the relevance of future professionals of this area to have autonomy and confidence to produce, in a safe way, food for customers with some type of food restriction, as in the case of celiacs.

CONCLUSION

This work showed that most Gastronomy course students have an unsatisfactory knowledge of celiac disease, gluten-free diet, and culinary practices in order to prevent gluten cross-contamination, which can negatively influence their performance as food professionals.

The creation of specific curricular guidelines for Technology in Gastronomy courses is recommended in order to provide adequate profissional qualification and to improve the quality of life of celiac individuals and, in general, of those with some type of dietary restriction. The preparation of the document should consider the mandatory inclusion, in an adequate discipline, of a topic not only about CD, but also on other diseases related to food restrictions. It is recommended that not only theoretical contents should be addressed, but also alternative culinary techniques for the production of gluten-free preparations and food without other nutrients, as well as good practices in food handling, in order to avoid cross-contamination by gluten and other substances.

While the curricular guidelines for Gastronomy courses are not implemented, it is believed that changing the curricular matrix by creating Health/Nutrition-oriented disciplines or by including this topic in the existing disciplines is a more viable and rapid option.

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Contributors

Freitas VS participated in the interpretation of the data and elaboration of the article; Machado ML took part in the conception and design of the study, tabulation and analysis of the data, and revision and approval of the final version of the article; Giaretta AG was involved in the conception and design of the study and in the revision and approval of the final version of the article. Moreira CC participated in the conception and design of the study, collection, tabulation and interpretation of data, and review and approval of the final version of the article.

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