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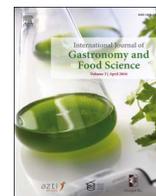
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Scientific paper

We want to be normal! Perceptions of a group of Brazilian consumers with coeliac disease on gluten-free bread buns[☆]



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ABSTRACT

Background: A gluten-free diet is the only available treatment for coeliac disease. Adherence to the strict diet may be compromised by social, economic and sensory aspects. This qualitative study interviewed adult individuals with coeliac disease to identify perceptions on characteristics of available and ideal gluten-free breads. Gathered information could inform the development of an experimental product with optimal sensory characteristics.

Methodology: Individual interviews, thematic analysis of transcripts.

Results: Available gluten-free bread options were unanimously criticised. Ideal characteristics matched the ones of the savoury French bread roll traditionally consumed in Brazil by the general population. Convenience and social life were the main verbalised concerns. Nutritional composition and price were considered secondary to optimal sensory characteristics in a gluten-free bread bun.

Conclusion: Participants had strong views on not being able to eat what they considered normal bread, and a gluten-free bread bun with the right sensory qualities meant more than just food. It represented the possibility of returning to the social routine they had previous to diagnosis. Identifying such expectations can not only contribute to the development of better products intended for their consumption, but also to gain insight on the daily difficulties faced by a good part of the population.

Introduction

Coeliac disease (CD), an immune-mediated systemic disorder elicited by gluten and related prolamins in genetically susceptible individuals, affects around 1% of the world population (Husby et al., 2012). Brazil is a country of more than 200 million people, representing approximately 52% of the South American population and 3% of the world's population. In general, Brazilians trace their origins to the original Amerindians and two main sources of immigration: Africans and Europeans. Northern Brazilians are mostly of Amerindian ancestry while Southern and South eastern Brazilians are mostly of European origin, namely Portuguese, Germans and Italians (Giolo et al., 2012). This probably explains why prevalence of CD in Brazil is around 1%, similar to European countries (Crovella et al., 2007; Oliveira et al., 2007).

To date, the only available treatment is the adoption of a gluten-free

diet on a permanent basis. Adherence to the strict diet however, has been found to be compromised by social, economic and sensory aspects (Green et al., 2015).

An audit-type study conducted in a Brazilian state's capital identified only 188 varieties of gluten-free products (fifteen breads, 9%) available at the few stores certified by the Brazilian Coeliac Association. Products were 26–85% more expensive than gluten-containing similar counterparts available in regular stores. Gluten-free breads were 33% more expensive ($p < 0.01$) (do Nascimento et al., 2014a). Scarce availability and high cost of gluten-free options may difficult regular consumption and compromise the treatment of CD (Estévez et al., 2016; Singh and Whelan, 2011).

Gluten contributes to unique and essential qualities of dough, such as water absorption, cohesiveness, elasticity and viscosity (Wieser, 2007). Its absence from gluten-free formulations results in liquid batters, compromising both texture and colour after baking

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(Gallagher et al., 2004). Gluten replacement in baked products has proven a challenge for the food industry over the years, hence the high number of academic studies on the evaluation of technological properties and development of gluten-free products (Sciarini et al., 2010).

Arendt et al. (2008) report after extensive worldwide market research, that the majority of gluten-free breads currently on the market are of very poor quality, and that good-quality gluten-free bread can only be produced if a range of flours and polymeric substances which mimic the viscoelastic properties of gluten are included in the gluten-free formulation.

It is not enough for a product to present excellent chemical, physical or microbiological characteristics if it does not meet the expectations and needs of the final consumer (Tzia et al., 2015). Although appearance, aroma, taste and texture also play a key role in the appreciation and consumption of foods in general, not much attention has been given to the opinion (e.g. availability and expectancies) of individuals with coeliac disease on products intended for their consumption (Laureati et al., 2012).

Bread, usually made of yeast-fermented wheat dough, is eaten worldwide as a staple food (Hager et al., 2012). As an important source of gluten, regular bread must be avoided by individuals with coeliac disease (Gallagher et al., 2004). A survey-based study regarding availability of gluten-free processed products identified that Brazilian individuals with coeliac disease were very critical of the available gluten-free foods in general, but especially bread (do Nascimento et al., 2014b).

Therefore, the present study's aim was to gather information and insight from coeliac consumers on the ideal characteristics of gluten-free bread, to inform research on the development of a gluten-free bread formulation. After conducting a systematic search to review the international literature on the topic, we were not able to identify studies employing the same design.

Methods

Participants from a convenience sample ($n=91$, 88% women) who took part in a previous survey study employing a questionnaire regarding availability of gluten-free processed products in general (do Nascimento et al., 2014b) were contacted and invited to share their ideas on characteristics of gluten-free breads in the present study.

Ethical approval for the study was obtained from the institution's research committee, and participants were recruited via the Brazilian Coeliac Association. All were aged 18-plus, with confirmed diagnosis of coeliac disease. All lived in the capital city of a southern Brazilian state, inhabited by over 400,000 people. Only three supermarkets and six natural product stores were listed by the Brazilian Coeliac Association as reliable gluten-free product retailers in the city (do Nascimento et al., 2014a).

Face-to-face interviews were conducted and audio recorded by the same trained researcher (first author) in a place, date and time set by each participant. No time limits were established. A piloted open-ended question guide was employed. The first question was 'Let's talk about bread... what you can say about the gluten-free breads you know? Following questions were designed to get individuals thinking about and describing characteristics of the bread they would like to eat (Fig. 1). Questions were based on literature-reported issues found to hamper the consumption of gluten-free products and the health of individuals with coeliac disease. Recordings were transcribed verbatim and evaluated by thematic analysis method, using systematic and objective procedures (Braun and Clarke, 2013).

Repeated careful readings of the transcribed material were carried out by the interviewer (first author) while listening to the audio feature to assess intonation and inflexion of speeches. This enhanced familiarity with the transcript's content. The material was then coded so that raw data (words or phrases) were flagged according to their meaning. Identification of patterned meanings across the dataset led to central

concepts which were revised and refined to generate themes (Braun and Clarke, 2013) (Fig. 1).

Results

Twenty-one individuals (18 women) aged 24–78 years old were interviewed. Time of diagnosis ranged from 11 months to 20 years, none of the participants had been diagnosed in childhood. Participants' characteristics are described in Table 1.

Thematic analysis of the interview transcripts led to the creation of four general themes. "Physical characteristics" and "social impact" were the ones with the highest number of comments. The "social impact" theme emerged voluntarily from participants speeches. Other two themes were nutritional value, and economic aspects.

When generally talking about available gluten free breads, participants mentioned mostly derisive characteristics. Texture received the highest number of negative comments. All participants, but especially those more recently diagnosed, described it as *crumbly, rubbery, hard, heavy, dry, and doughy*. Other aspects mentioned were that most breads available were sweet-tasting, mostly sold frozen, had high energy and fat content, and possibly contained great amounts of additives and preservatives.

There was general agreement among participants that the ideal gluten-free bread should have a crispy crust and a soft crumb. The French bread roll traditionally consumed in Brazil was often mentioned as the best example, and reported as a much missed staple food.

"Probably because [bread] is the worst gluten-free product available... because it is awful most of the time... I think the ones I eat are not so bad if I purchase them fresh or toasted... if not, it is quite impossible to eat. Not to mention that at breakfast it is what we're culturally used to eating..." (Female, 30 years, 5 years of diagnosis).

"Oh I think if I had to choose one it would have the texture of French bread, meaning a crunchy crust and soft crumb, because the only type of bread we see around is in fact rubbery looking bread. I think if I had to choose the ideal bread it would be the traditional French bread, crunchy on the outside and soft on the inside". (Male, 39 years, 2 years of diagnosis).

Participants stressed the need of a practical, versatile savoury bun, suitable for sandwich making – and again mentioned the French bread roll as a reference. Easy access to a ready-to-eat freshly baked product was also considered important, preferably from a good number of establishments, in order to avoid the need for heating or toasting bread before consumption.

"Most gluten-free breads I know [...] are sold frozen, and I want fresh bread. I do not want frozen bread, which I will take out of the freezer, microwave and it will taste like micro waved rubber". (Female, 37 years old, 5 years of diagnosis).

Regarding taste and smell, once again French bread was the example. Because of the wider variety of gluten-free sweet products in the market, according to the interviewees there is a greater need for savoury breads, not stuffed or seasoned, suitable for sandwich-making. Convenience and versatility were highly praised. It was also mentioned that sliced bread could be sold in small packages with few slices, due to the fact that in many households there is only one person with coeliac disease.

"Shape is very important, it is essential... to make a sandwich... a roll or a bun to make a hamburger or a hot dog"(Male, 39 years, 2 years of diagnosis).

Although no questions addressing specific social issues were asked, participants spoke passionately about not being able to eat the same bread as the population in general. Such comments were voluntarily shared, mentioning the importance of socialisation among people with and without coeliac disease. At various times participants mentioned the word "normal" or expressed a desire for "normality" to describe and express the difficulties regarding food intake and food's social aspects.

Questions	Raw data - Initial codes	Meanings	Themes
1) 'Let's talk about bread... A survey-based study identified that Brazilian individuals with coeliac disease were very critical of the available gluten-free processed food options, especially bread. What do you think of this? 2) What you can say about the gluten-free breads you know?	"[...] bread is ingrained in Brazilian culture..." "because it is the most difficult food to replace" "because it is the worst gluten-free product"	Normality Texture Quality	Social impact Physical Characteristics
3) Think about the bread that you would like to eat. What makes you crave a loaf of bread? 4) Is it sweet or savoury? 5) What about texture? [Crunchy? Does it have a crust? Is it soft?] 6) What about colour? 7) What about shape? 8) What would be the ideal size?	"a bread roll, crunchy and with a soft crumb..." "ah, the perfume of freshly baked bread you smell when you go near a bakery shop" "savoury... I need it to be savoury" "I know I will not be able to eat French rolls again, so if it tasted like French bread it would be wonderful!" "soft, airy, light, not that heavy dough – and crusty on the outside" "adequately shaped to make a sandwich" "like a French roll, that would be the ideal format"	Normality Texture Colour Smell Flavour Freshness Format	Social impact Physical Characteristics
9) What about wholemeal bread? 10) And if wholemeal with higher nutrient content means more expensive? 11) How much more would you pay for a product of higher nutritional and sensory quality? 12) On a daily basis, what do you consider more important: nutritional value; sensory quality (e.g. taste, texture, and flavor); or price?	"[nutritional quality] is important, but not especially for bread – the important thing is to taste good. I can eat salad, wholegrain rice, can eat healthily in so many other ways" "it is opportunism to charge so much for food made with cheap ingredients" "coeliac people are used to pay more for everything they eat" "I like to buy what I like to eat, no matter what the price tag is - nutritional value comes second. I worry about sodium content, but if it is convenient I will end up paying more"	Quality Nutrient/ Nutrition Price	Nutritional value Economic aspects Social impact

Fig. 1. Questioning route, initial codes, meanings and final themes.

"What I am most excited about eating bread is not the actual taste, but being able to interact – I also eat bread, you know? And people will not say "Oh, you don't eat bread, so what do you eat?" Because bread is cultural, you see what I mean? Bread is everywhere, as I was saying, and people will not come to you and think you don't eat anything else in your life. When you say "I do eat bread!" that's it, you are no longer sick." (Female, 25 years, 3 years of diagnosis).

When prompted to describe nutritional characteristics of the ideal gluten-free bread, participants were reticent and stumbled upon mentioning what they would consider important. Some said they would like if ingredients such as flax or sesame seeds were added to bread formulations to increase fibre content, others reported dissatisfaction with energy-dense fat-rich gluten-free breads. Despite considering the nutritional quality an important feature, subjects revealed this was not a priority.

"It would be good to add something, because most gluten-free breads are white, we almost don't have the option of wholemeal bread. Then... it would lose the characteristics that I talked about before, but if it had some characteristic that could add some benefits, not only processed flour, it would be a major breakthrough". (Female, 24 years, 5 years of diagnosis).

Comments on the price of available gluten-free breads did not emerge voluntarily in the description of products' characteristics.

When prompted, subjects were unanimous in reporting that the prices were high. Some were resigned, others felt exploited - a few comments expressed concern for low-income people.

Interviewees considered gluten-free breads expensive, but unanimously agreed they would be willing to pay a high price if sensory characteristics were ideal. Taste was the most important attribute, seconded by nutrient content and price.

"I am so used to overpaying for these products that if a good tasting one comes around the market and I want to eat it I will buy it, regardless of the price. I'm already used to it, there are people who look at the prices and say "My God it is absurdly expensive, look how much you are paying". But it's the only chance I have to eat this product, so I'll pay the asked price. It will not stop me". (Female, 24 years, 5 years of diagnosis).

Discussion

Study participants were not satisfied with available gluten-free bread options. Texture was the most disqualified and widely criticised feature of the products, described as crumbly and dry. Emphasis on textural properties was observed both regarding unsatisfactory characteristics of real breads and desirable characteristics of the ideal bread. In fact, texture is one of the main factors which determine the

Table 1
Profile of participants.

Participants	Age (years)	Sex	Time of diagnosis (Years/months)	Level of education	Occupation
01	34	F	4 y	Postgraduate	Teacher
02	28	F	11 m	Postgraduate	Social Educator
03	42	F	4 y	Secondary school	Housewife
04	39	M	2 y	Postgraduate	Lawyer
05	78	F	20 y	Secondary school	Retired teacher
06	32	F	3 y	Graduate	Manager
07	30	F	5 y	Postgraduate	Dentist
08	30	F	2 y 6 m	Postgraduate	Public servant
09	67	F	15 y	Graduate	Retired architect
10	55	F	3 y	Secondary school	Housewife
11	49	F	1 y	Graduate	Entrepreneur
12	24	M	4 y	Graduate	Hairdresser
13	42	M	2 y 8 m	Graduate	Physical educator
14	65	F	13 y	Secondary school	Housewife
15	24	F	5 y	Graduate	Nutritionist
16	46	F	12 y	Postgraduate	Teacher
17	33	F	6 y	Postgraduate	Physiotherapist
18	25	F	1 y 6 m	Secondary school	Undergrad student
19	37	F	5 y	Postgraduate	Administrator
20	25	F	3 y	Graduate	Nutritionist
21	39	F	17 y	Secondary school	Oral health technician

quality of any given food, and plays an important role in the acceptance of food products by consumers (Sahin and Samnu, 2006). In a study which compared perceptions of coeliac and non-coeliac individuals on gluten-free breads, Laureati et al. (2012) found that preferences in both groups were positively correlated to "porosity" and "softness", and negatively correlated with "rubbery" and "adhesive" sensory descriptors. Morais et al. (2014) found the texture of gluten-free bread to be crucial in determining consumer acceptability - while softness was a desirable characteristic, hardness and chewiness were drivers of disliking.

Interviewed subjects who were more recently diagnosed were the ones who missed the most the kind of bread they were used to eating. Possibly due to their more recent memory of the sensory properties of foods containing gluten, they found it more difficult to accept the sensory characteristics of gluten-free products (Pagliarini et al., 2010).

Described characteristics of an ideal gluten free-bread converged to a freshly baked, ready-to-eat savoury bun which could easily be made into a sandwich and found in the highest possible number of establishments. Participants wished for convenience, i.e., being able to simplify the tasks involved in meal preparation. Convenience is a multifaceted concept, but in the food domain it usually suggests that some kind of effort is saved or reduced (Scholderer and Grunert, 2005). It has become part of contemporary food consumption patterns of families from different social groups, affecting meal preparation and eating habits (Daniels et al., 2015).

Although recognising available gluten-free breads' less than optimal nutritional composition and high prices, participants considered that availability of a reasonably priced/nutritionally balanced product served to no purpose if it did not meet their sensory expectations. Such behaviour is consistent with previous studies' results reporting that sensory characteristics, represented by the integrated response of chemical and physical stimuli transmitted by food's appearance, smell, flavour and texture, are the main factors for the acceptance of a food

product (Forde and Delahunty, 2004; Laureati et al., 2012).

Without being prompted, participants of the present study reported feeling segregated because of not being able to eat what they considered as normal bread, especially when socialising. Social discomfort among people with coeliac disease has been reported, and seems not to be age-related. Olsson et al. (2008) reported the same in their study with teenagers with coeliac disease. According to the interviewed subjects, their eating habits elicited comments and curiosity from others, as well as questions about the disease, what negatively increased the visibility of their predicament. Since socio cultural influences like dining out and attending social events have been found to be correlates of gluten-free diet adherence (Lefler et al., 2008), they must not be neglected.

Participants of the study had strong views regarding social aspects of their lives, due to not being able to eat what they considered as normal bread. For them, a gluten-free bread with the right sensory qualities meant more than just food. It represented the possibility of returning to the routine and social life they had before diagnosis. Identifying such expectations can not only contribute to the development of better products intended for their consumption, but also to gain insight on the daily difficulties faced by a good part of the population.

The study has limitations, one of them being the recruitment of participants among members of an association. Those who agreed to participate may have been more invested in their health and diet than others diagnosed with CD who were not members of the association. Additionally, the population of Florianopolis is not representative of broader populations, due to the city's higher than average quality of life standards, being the Brazilian capital city with the highest Human Development Index score (0.905) (United Nations Development Programme - Institute for Applied Economic Research, 2010). Furthermore, due to convenience sampling, participants' occupations and educational backgrounds were consistent with good socioeconomic conditions.

In spite of aforementioned limitations, the study's exploratory design might be useful as a starting point to investigate why stakeholders of the gluten-free bread producing sector are not interested in investing in high quality gluten-free products. Although incidence of CD in the general population is stable, a gluten-free diet is now used to treat a host of symptoms, and is often pursued without medical supervision (Moore, 2014). Whatever the real motivation to consume gluten-free foodstuff, a rising demand for gluten-free products is observed in market trends, and major demand is anticipated to come from countries such as U.K., Italy, U.S., Spain, Germany, Australia, and even Brazil (Rosell and Matos, 2015).

Authorship

Amanda Bagolin do Nascimento was involved in study design, data collection and analysis, and manuscript preparation. Giovanna M. R. Fiates was involved in study design, edited and approved the final version. Evanilda Teixeira was involved in study design, edited and approved the final version. All authors critically reviewed the manuscript and approved the final version submitted for publication.

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