Original Article

Awareness of coeliac disease among chefs and cooks depends on the level and place of training

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Background and Objectives: Coeliac disease is triggered by gluten. The only treatment is lifelong avoidance of dietary gluten. Dining out and travelling are particular challenges with a huge impact on quality of life. We examined the knowledge about coeliac disease and gluten-free food preparation among chefs and cooks, and culinary students in Dunedin, New Zealand. **Methods and Study Design:** Outlets serving gluten-free food were identified. The head chefs or cooks were invited to complete a questionnaire regarding demographics, education, qualification, experience and knowledge of coeliac disease and gluten-free food preparation. Ninety restaurant chefs and cooks, and 35 first-year culinary students participated. **Results:** Half of participating chefs and cooks had received no formal training, but all were aware of the term gluten-free diet. Twelve (13%) were unaware of coeliac disease, all of whom were non-European and worked at an ethnic restaurant which did not have gluten-free policies in place. There was no significant difference in awareness of coeliac disease between chefs and students (p=0.36). However, students were significantly more aware of necessary gluten-free food preparation (p=0.007) and scored better in the gluten-free quiz (p=0.01) than chefs and cooks. **Conclusions:** Awareness of coeliac disease did not necessarily mean that policies were in place to prepare contamination-free gluten-free meals. Chefs and cooks from countries with a low incidence of coeliac disease lacked knowledge about gluten-free food preparation and had difficulties recognising gluten containing foods. Patients with coeliac disease wanting to dine out should be advised to choose a restaurant with care.

Key Words: coeliac disease, gluten-free diet, quality of life, restaurants, chefs

INTRODUCTION

Coeliac disease (CD) is a multi-system, autoimmune-mediated disorder, affecting genetically predisposed people. It is triggered by the ingestion of gluten, a protein derived from wheat, barley and rye, and the only treatment currently is strict lifelong avoidance of dietary gluten. CD is a common disorder affecting approximately 1% of the worlds' population, although reported prevalence rates vary from 0.6 to 1.99%.[1] The prevalence is similar among Europeans and people of European ancestry, and those from the Middle East, South Asia, Africa and South America,[2] whereas CD is presumed rare among East and South East Asians, African Americans and subsaharan Africans who do not have the high risk HLA-DR3-DQ2 haplotype.[3,4]

Gluten triggers an immune response in the proximal small intestine resulting in the destruction of the villi in the small intestine and subsequent malabsorption and clinical symptoms. The clinical manifestations are multiple and can affect many organ systems.[1] The elimination of gluten usually induces clinical improvement within days or at least weeks, although histological recovery usually takes much longer.[5] However elimination of gluten from the diet is challenging, and referral to a knowledgeable dietitian and the provision of accurate information is essential especially regarding the preparation of food to avoid gluten contamination.[6]

The restrictions of a gluten-free diet have potentially far reaching effects much beyond the choice of foods. Whether gluten-free food is available, hidden sources of gluten and gluten contamination can restrict the lifestyle of a person with CD and can have an impact on the lifestyle and quality of life for those with CD.[7] Dining out and travelling are particular challenges that have been described worldwide.[7-9] Among 936 members of the New Zealand Coeliac Society aged 16 years and over, more than one-third (36.3%) avoided travelling because of CD at least some of the time, and one-quarter (25.6%) never or rarely ate at restaurants because of the risk of inadvertent gluten ingestion.[9]

Several recent studies, for example one in England in 2003[10] and one in the US in 2010,[11] have demonstrated that the perceived concerns about eating out at restaurants described by people with CD are justified. The first study found chefs were less likely to be aware of CD than the general public and that patients avoided take-out foods

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but not restaurants,[10] whereas in the second study, chefs were more likely to have heard about CD, but patients with CD still avoided both restaurants and take-out foods.[11] A follow-up survey in England in 2013 found that there has been a marked increase in the awareness of gluten-related disorders among both chefs and the general public over the last 10 years, and that this may alleviate the concerns of patients with CD about eating out.[12] However, while awareness of CD has increased, none of these studies enquired about gluten-free food preparation practices at restaurants, and many patients continue to avoid eating out.[8,9]

METHODS

The survey was conducted in the Dunedin city centre, New Zealand during December 2013 and January 2014. Dunedin is the 5th largest city in New Zealand, a university city with a population of just over 120,000 people, of which about 21% are aged 15-24 years. The population is predominantly of European origin (88.3%) with the other main ethnic groups being Maori (7.7%), Asian (6.2%) and Pacific (2.5%).[13] In New Zealand ethnic groups are reported using total response standard output, which means that where a person reported more than one ethnic group, they have been counted in each applicable group. Therefore percentages add up to more than 100. The study was approved by the Ethics Committee of the Department of Medicine, Dunedin School of Medicine, University of Otago (D12/418).

Study populations

Chefs and cooks at food outlets

Outlets serving food located within the Dunedin City Council boundaries were identified from the local phone book and a Dunedin City Council list. For this study, only those outlets with a physical address in the central city area were included. A list of 130 restaurants, pubs and fast-food outlets and the contact details (physical address and phone number) was compiled. Each of the 130 food outlets was visited in person (by SS) without a prior phone call. The reason for visiting without prior contact is that we did not want the food outlet to change their practice in any way prior to participating in the study or their chefs or cooks to prepare for the interview. Food outlets that did not offer any gluten-free options on their menu were excluded.

Each place offering a gluten-free meal option, was invited to participate in the survey. The head chef or cook at each restaurant responsible for the running of the kitchen was asked to complete the survey. In New Zealand the titles, chefs and cooks, can be used interchangeably, although chefs usually work at restaurants, hotels, cafes and bars, and cooks usually work at cafes, bars and fast food outlets. Both chefs and cooks in New Zealand may or may not have received formal training.

An information sheet was given to each participant, a consent form signed and a short questionnaire completed under the supervision of an investigator (SS) on site. Each participating chef or cook was also asked to classify their restaurant as either 'Café', 'Family/fine dining', 'Pub/bar', 'Ethnic' or 'Fast-food franchise'. The City Council Food Premises Grades which must be displayed in view of the public (A – Excellent, B – Good, C – Acceptable, D – Poor) was recorded but no information identifying the restaurant. (http://www.dunedin.govt.nz/services/environmental-health/food-premise-grade-search/grades-and-classes)

Chef trainees

The Otago Polytechnic Cooking and Culinary Arts Course is a 3-year full time culinary course in Dunedin. A class of first year chef trainees enrolled in this course was visited and invited to participate in the study. All students agreed to participate and they were all given an information sheet, and asked to sign a consent form. Each student completed a questionnaire under the supervision of an investigator (SS).

Questionnaire

The questionnaire included five main areas: (1) Demographics - date of birth, sex, and ethnicity; (2) Details of the restaurant - type, opening hours, meal pricing and number of staff; (3) Culinary education, qualification and experience - time, duration, place and type (no formal proof was requested); (4) Knowledge of CD and a gluten-free diet; (5) Restaurant policies and protocols in place for the preparation of gluten-free meals. The latter was determined by asking three questions regarding the practical implementation and safe preparation of gluten-free food to avoid contamination (choice of ingredients for gluten-free food, separate cooking surfaces and equipment, any other policies or practices). A food outlet with all three criteria in place was considered safe. The questionnaire also included colour photographs of six different food items (sausages, chicken with gravy, tomato sauce on pasta, pavlova dessert, garlic bread and lettuce salad). All participants were asked to identify which was most likely to contain gluten.

Statistical analysis

The questionnaire data were entered into an excel spreadsheet and data entry checked. Proportions and means, and a chi-square test for trend were calculated, as appropriate.

RESULTS

Of the 130 restaurants visited, 40 restaurants either did not offer gluten-free meals or declined to participate. All 35 first year chef trainees agreed to participate. A description of the participating restaurants is shown in Table 1. Among the 18 ethnic restaurants, eight were Japanese, four were Korean, four were Thai and two were Philippine. The fast-food outlets did not include any fish and chips takeaways as none of them offered gluten-free meal options.

Gluten-free meals were more likely to be requested at cafés and fast-food franchises, and requests were less frequent at pubs (hotels). Although all participating restaurants said they offered gluten-free food options, this was indicated on the written menu at only 54 (60%) of the participating restaurants and this was most commonly done at cafés and fast-food franchises. Gluten-free options were more expensive than non-gluten-free options at almost one-third (28.9%) of the restaurants.

The characteristics of the chefs and cooks at each of the

Table 1. The characteristics of participating restaurants (n=90)

	N	%
Type		
Café	18	20.0
Family/fine dining	20	22.2
Pub/bar	18	20.0
Ethnic[†]	18	20.0
Fast-food franchise	16	17.8
Hours open per week		
<51	39	43.3
51-60	11	12.2
61-70	18	20.0
>70	22	24.4
Average price per meal ($NZ)		
<11	18	20.0
11-20	38	42.2
21-25	15	16.7
>25	19	21.1
Number of staff		
<3	18	20.0
3-4	42	46.7
>4	30	33.3
Estimated number of meals served per week		
<201	30	33.3
201-499	17	18.9
≥500	43	47.8
Dunedin City Council food premises grade		
A	66	73.3
B	24	26.7
C	0	0
D	0	0

[†]Japanese, Thai, Korean, Philippine.

90 participating restaurants are shown in Table 2. Almost two-thirds were female and most (85.6%) were aged less than 50 years. Half of the participants had received no formal training and the majority had worked mostly in New Zealand. Those who worked in non-ethnic family or fine dining restaurants tended to be middle-aged NZ Europeans with a cookery qualification and long experience, while those who worked in fast food franchises tended to be young NZ Europeans with little experience and no cookery qualification (data not shown).

While all participants were aware of the term gluten-free diet, 12 (13%) were unaware of CD, all of whom were non-European and worked at an ethnic restaurant which did not have gluten free policies in place (Table 3). The 'gluten-free quiz' demonstrated their knowledge of gluten-free foods to be noticeably less than those who worked at the other types of restaurants. Also, only 2 (11.1%) participants working at an ethnic restaurant knew someone with CD compared with 77.8% of those cooking at cafés, 60.0% at family or fine dining restaurants, 66.7% at pubs/bars and 50.0% at fast food outlets (data not shown). Table 3 shows there was a clear association between the duration of experience and awareness of CD (p=0.002), but being aware of CD did not necessarily mean the restaurant had the necessary food policies in place to prepare gluten-free meals.

Table 4 shows that overall, there was no significant difference in awareness of CD between chefs and cooks, and students (p=0.36). However, students were significantly more aware of necessary gluten-free food preparation (p=0.007) and scored better in the gluten-free quiz (p=0.01) than chefs.

DISCUSSION

CD is an autoimmune disease characterised by small intestinal inflammation resulting in malabsorption upon ingestion of gluten containing foods. In New Zealand the prevalence of CD is about 1%. Currently the only treatment is adherence to a lifelong and strict gluten-free diet which many patients find difficult to follow.[14] Most patients avoid eating out for fear of involuntary consumption of gluten-contaminated food.[8,9]

Our New Zealand study indicates that although 87% of all chefs and cooks had heard about CD, many had difficulties determining which foods might contain gluten and the majority of participating food outlets had inadequate policies in place to guarantee contamination-free food preparation. This finding was particularly prevalent amongst those working in non-European restaurants and who had gained their qualification and most of their experience overseas, mainly in countries with a very low incidence of CD such as Thailand, Korea and the Philippines.[2]

Our findings are in broad agreement with a recent study by Aziz et al who found that 78% of chefs were aware of CD and this awareness had significantly increased over the last decade.[12] This was attributed to an increasing media coverage of CD and gluten-free diets, and possibly training. However no difference in awareness between qualified and non-qualified chefs was observed. While we too did not find a difference in awareness between chefs and cooks with and without a qualification, we observed

Table 2. The characteristics of participating chefs and cooks (n=90)

	N	%
Sex		
Men	34	37.8
Women	56	62.2
Age group (years)		
<30	31	34.4
30-49	46	51.1
≥50	13	14.4
Self-Reported Ethnicity		
NZ European	59	65.6
Non-NZ European	31	34.4
Country of qualification		
New Zealand	35	38.9
Asia	6	6.7
Other	4	4.4
No qualification	45	50.0
Duration of qualification		
nil	45	50.0
<3 months	13	14.4
3 months to 1 year	8	8.9
1–2 years	12	13.3
>2 years	12	13.3
Work experience as a chef or cook (length of time)		
<1 year	4	4.4
1-5 years	24	26.7
6-10 years	42	46.7
11-20 years	14	15.6
>20 years	6	6.7
Place of most experience		
New Zealand	77	85.6
Asia	6	6.7
Other	7	7.8
Knows someone with coeliac disease		
Yes	48	53.3
No	42	46.7

longer work experience seemed to increase the likelihood of awareness which is in contrast to others.[11] Furthermore, we found that first year cookery students were more familiar with gluten-free cooking policies to ensure contamination-free food preparation than employed chefs and cooks. Simpson et al. in the U.S. found a significant difference between trained and non-trained chefs.[11] In this survey, trained chefs were more likely to have heard of CD or gluten intolerance than untrained chefs and were also more likely to know which foods were likely to contain gluten.[11] Taking these findings together, it seems that training and increasing length of experience increases the awareness of gluten sensitivity, CD and gluten-free food preparation.

Simpson et al. also noted, in agreement with several other authors that patients with CD ate out significantly less than the general public.[8,9,11] This discrepancy between seemingly high levels of awareness of CD and a gluten-free diet among chefs and the preference by patients to eat at home is an interesting observation, but can be explained. As concluded by Aziz et al, despite the rising awareness of CD and a gluten-free diet, appropriate policies need to be put in place to avoid gluten contamination and ensure safe food preparation.[12] The danger of contamination is highlighted in a study by McIntosh et al who found traces of gluten despite the foods being sold as gluten-free in approximately 10% of the samples.[15] Similar results were found by Thompson and Simpson with approximately 4% of certified gluten-free products containing ≥20 ppm gluten.[16] There have also been reports of gluten contaminated products in New Zealand.[17] Given these observations and the inadequate knowledge of gluten-free food preparation observed in our study, it is therefore of no surprise that dining out is avoided by many patients with CD.[7-9] However it is encouraging that gluten-free food preparation is included in the curriculum for trainee chefs in Dunedin.

To our knowledge, we are the first to have explored a correlation between the origin of the chef or cook, their place of training and their knowledge of CD and gluten-free food preparation. In our study chefs originally from countries with a very low incidence of CD, mainly South and East Asian countries, while being aware of the term gluten-free diet, [12] had not heard of CD. They all worked in ethnic restaurants and furthermore demonstrated poor knowledge about gluten-free food and its preparation. In contrast, New Zealand trained chefs and current cookery students were all familiar with the term CD. This finding is a particular concern as we deliberately only sampled restaurants offering gluten-free food options. The prevalence of CD is increasing[18] and gluten-free diets have been popularised in the media. The prevalence of those consuming a gluten-free diet because it is perceived to be "healthier" or to lose weight or for another non-coeliac reason is reported to be about 3%, higher than the prevalence of CD (1%). Thus gluten-free food is big business

Table 3. A comparison of the characteristics of those who had and had not heard of coeliac disease (n=90)

	Knew about coeliac disease (n=78) n (%)	Did not know about coeliac disease (n=12) n (%)	*p*-value
Sex			
Men	30 (38.5)	4 (33.3)	0.98
Women	48 (61.5)	8 (66.7)	
Age group (years)			
<30	31 (39.7)	0	0.01
30-49	38 (48.7)	8 (66.7)	
≥50	9 (11.5)	4 (33.3)	
Self-reported ethnicity			
NZ European	59 (75.6)	0	<0.001
Non-NZ European	19 (24.3)	12 (100)	
Restaurant type			
Café	18 (23.1)	0	<0.001
Family/fine dining	20 (25.6)	0	
Pub/bar	18 (23.1)	0	
Ethnic[†]	6 (7.7)	12 (100)	
Fast-food franchise	16 (20.5)	0	
Country of qualification			
No qualification	41(52.6)	4 (33.3)	<0.001
New Zealand	33 (42.3)	2 (16.7)	
Asia	1 (1.3)	5 (41.7)	
Other	3 (3.8)	1 (16.7)	
Duration of qualification			
No qualification	41 (52.6)	4 (33.3)	<0.001
<3 months	11 (14.1)	2 (16.7)	
3 months to 1 year	8 (10.3)	0	
1–2 years	8 (10.3)	4 (33.3)	
> 2 years	10 (12.8)	2 (16.7)	
Work experience			
<1 year	2 (2.6)	2 (16.7)	0.002
1-5 years	18 (23.1)	6 (50.0)	
6-10 years	38 (48.7)	4 (33.3)	
11-20 years	14 (17.9)	0	
>20 years	6 (7.7)	0	
Country of most work experience			
New Zealand	70 (89.7)	7 (58.3)	0.003
Indo-Asia	2 (2.6)	4 (33.3)	
Other	6 (7.7)	1 (8.3)	
Gluten-free policies in place			
Yes[‡]	22 (28.2)	0	0.08
No	56 (71.8)	12 (100)	

[†]Japanese, Thai, Korean, Philippine
[‡]Defined as having three of three policies in place

Table 4. Knowledge of coeliac disease and gluten free food preparation amongst chefs/cooks and culinary students

	Chefs/cooks (n=90) n (%)	Students (n=35) n (%)	*p*-value
Heard of coeliac disease?			
Yes	78 (86.7)	33 (94.3)	0.36
No	12 (13.3)	2 (5.7)	
Aware of necessary gluten-free food preparation policies			
Yes	22 (24.4)	18 (51.4)	0.007
No	68 (75.6)	17 (48.6)	
Gluten-free food quiz score			
0	0	0	0.01
1	2 (2.2)	0	
2	3 (3.3)	0	
3	2 (2.2)	0	
4	10 (11.1)	2 (5.7)	
5	19 (21.1)	3 (8.6)	
6	54 (60.0)	30 (85.7)	

with sales for 2014 in the US estimated to be $10.5 billion,[19] but a substantial proportion of those eating a gluten-free diet will not suffer undue adverse health effects, if they consume accidentally contaminated gluten-free foods. Because of the ill effects for those with CD, there has been interest in trying to improve the knowledge of

the absolute food requirements for those with CD. Recently, there have been some initiatives with reported improved outcomes. In New York City, the local health authority has authorised awareness posters to be placed in restaurants[20] and in Italy, the government has promoted awareness with the results being chefs are well-informed.[21] Furthermore, a successful Gluten-Free Certification Program has been launched in the UK and North America.[12] No such program has yet been established in New Zealand.

A key strength of our study is that, in contrast to the study by Simpson et al,[11] we conducted all interviews in person, but did not pre-arrange an appointment, thereby avoiding preparation for the interview. Simpson et al found that chefs interviewed in person were not as knowledgeable compared with those filling out the online survey.[11] There are limitations to our study. We only sampled restaurants in central Dunedin and therefore our results might not be representative of areas of New Zealand beyond central Dunedin city. Further, we are unaware of the content of other cooking courses within New Zealand, but it is unlikely that gluten-free food preparation is not included given CD is relatively common in New Zealand.

In conclusion, while we found in general a high level of awareness of CD and the gluten-free diet, there was a significant knowledge gap among those who had not received training and those born overseas who worked in ethnic restaurants, particularly among immigrant chefs and cooks from countries with a very low incidence of CD. It was commendable that current cookery students received training on and had good knowledge of safe food preparation for patients with CD or gluten sensitivity, and this should continue. However, at present, we would still recommend that patients with CD are careful when dining out and to choose a restaurant with care.

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AUTHOR DISCLOSURES

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