

High Cost of Gluten Free Products Might be Challenging for People with Celiac Disease in the United Arab Emirates

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Abstract Celiac Disease (CD) is an autoimmune disease triggered by the ingestion of gluten. The only effective treatment available at present is to follow a strict lifelong gluten free (GF) diet, resulting in the need to buy products that are certified gluten free. The aim of this study was to compare the cost of gluten free products in supermarkets with similar regular non-gluten free products. The price and weight of all GF products available in the GF section in two supermarkets in Abu Dhabi, United Arab Emirates, were collected in fall 2017. The GF items were divided into 13 categories (bread, bread mixes, flour, cakes, cake/biscuits mixes, chips, cereals, pasta, chocolates/sweet, crackers/ biscuits, sweet biscuits, seeds, odd products) and the same information was collected for similar regular products. A total of 266 GF products were found and their price/100 gram compared to 117 non-GF products. Most GF products were significantly more expensive than their non-GF equivalents. On average, the price difference was an additional 259% for the GF products, ranging from an additional 5% for chocolates to 1100% for bread mixes. There were no significant price differences found between the supermarkets. Based on the findings in this study, GF products are expensive in comparison to regular products, which is likely leading to an increase in food spending for people with celiac disease in Abu Dhabi. Whether this is impacting adherence to a GF diet among celiac patients requires further studies to be determined.

Keywords: *gluten free food, celiac disease, cost, expensive, Abu Dhabi*

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1. Introduction

Based on recent studies, celiac disease in North Africa, Middle East, India, and Pakistan is an increasingly recognized disorder [1]. In Iran and Turkey, a prevalence of 0.6-0.88% have been reported [2]. In other Middle Eastern countries, like the United Arab Emirates (UAE), Oman and Saudi Arabia, the national prevalence is yet to be established [3]. In Oman and Saudi Arabia, incidents of celiac disease have been reported, as has associated malnutrition [4,5,6,7]. In a cross-sectional study including 1197 healthy UAE nationals it was found that 1:86 showed positive serum results for tTG IgA and anti EMA IgA antibodies [8]. Furthermore, the positive celiac disease tests were independently associated with chronic anemia and female gender [8]. The UAE is multinational country hosting more than 80 nationalities, but there are no reports on the rate of celiac disease among the non-UAE nationals. One of the biggest hospital in Abu Dhabi, UAE, diagnosed 25 children, of which 17 were UAE nationals, with biopsy confirmed celiac disease during a three-year period [9]. These cases were often associated with chronic diarrhea and failure to thrive [9]. Despite the unknown prevalence of celiac disease, gluten free

products are sold in supermarkets and there are at least two completely gluten free bakeries only in Abu Dhabi, the capital city. There are furthermore WhatsApp groups focusing on celiac disease and one of the bigger Facebook groups "gluten free U.A.E" has more than 1000 members, all of which indicate a desire for gluten free products.

While the causes of gluten intolerance are partially still unclear, gluten intolerance can be diagnosed through serological and histological examinations [10]. Once diagnosed, patients are urged to follow a lifelong gluten-free (GF) diet [11]. A strict gluten-free diet is the only way to ameliorate the patient's histological and serological status [11]. Not complying to a gluten free diet has been associated with growth failure and malnutrition in children, and a higher risk of depression, osteoporosis, cancer, infertility and malnutrition in adults [12,13,14]. Thus, adherence to the diet is of the utmost importance.

In many parts of the world, including the UAE, the gluten containing grains, especially wheat, is one of the most common staple food and is often consumed on a daily basis [15]. Wheat is used for bread and noodles and in certain national dishes like Harees, Margoga and Madroba in the Emirati society. Barley or oats are often used in soups and bread. However, rye, which also contains gluten is rarely used in the Emirati kitchen.

A gluten-free diet is restrictive and can be hard to adhere to for several reasons [16,17,18]. A GF diet is often lower in nutrient density than a regular diet and this can negatively impact the experience of following a gluten free diet [19,20]. Insufficient education, support and counseling have been reported as challenges in some studies [18,21,22]. It can also be difficult to find suitable gluten free substitutes while shopping, cooking and baking [23,24]. Furthermore, eating out can also be difficult, due to limited gluten free meal options and the fact that many restaurants do not have necessary knowledge to provide safe meals to customers who require them. Some countries have found gluten-free products to be more expensive than regular products and these financial implications can also impact the adherence to a gluten free diet [17,19,24,25]. Prior to this one, no study had been conducted in the UAE to investigate the cost implications of following a gluten-free diet in the UAE.

2. Aim

The aim of this study was to compare the cost of gluten-free products with similar regular non-GF products in two supermarkets in Abu Dhabi, United Arab Emirates.

3. Methodology

This cross-sectional study was conducted in two large supermarkets in Abu Dhabi, between August and September 2017. The data was collected from the GF section in each supermarket. The producer, product name, flavor, price and weight were collected for each product in the GF section. The GF products were then paired with similar regular gluten containing products in the same supermarket, considering the above metrics. In cases where more than one similar regular product was available, the most expensive regular product was selected and used for the paired analysis.

Products in the GF section without a displayed price were excluded, as were products suitable for other health conditions such as lactose intolerance and milk protein allergy. GF products which may have been displayed

elsewhere in the store were not included. For the data analysis, the products were divided and organized into 13 different food groups (breads, bread mixes, cakes, cakes/biscuit mixes, cereals, crisps, chocolates/sweets, crackers/biscuits, flours, pastas, seeds, sweet biscuit, seeds and odd products (i.e. fiber products)). The data was entered into Microsoft Excel for Mac, version 16.10, 2018. The price per 100g product was calculated for each product to allow for comparisons. Paired and unpaired t-tests were performed to compare prices between GF and regular gluten containing products. The significance level was set to $p < 0.05$.

4. Results

A total of 266 GF products were found across the two supermarkets. As shown in Figure 1, the most common products were sweet biscuits, with cake and bread mixes being the least common.

In comparing the prices of GF products between the two supermarkets, the findings were inconclusive. As shown in Table 1, some categories like bread, bread mixes and pasta were more expensive in supermarket A whereas other products were more expensive in supermarket B. Overall, no significant price differences were found between the supermarkets ($p=0.14$).

Table 2 shows the prices of all GF and similar regular products in both supermarkets. The average price/100 gram for the GF products was 9.4 ± 4.9 Dirhams (2.6 ± 1.3 USD) compared to 4.7 ± 2.0 Dirhams (1.3 ± 0.6 USD) for the regular non-gluten free products, which corresponds to an average price difference of 259%. The prices in the chocolate/sweets category were almost the same whereas significant differences between the gluten free and regular products existed for several of the other product categories.

In the paired analysis, GF products were paired and compared with similar regular products e.g. gluten free bake off-baguette being paired with a non-gluten free regular bake-off baguette. A total of 117 pairs were found. As shown in Figure 2, GF products were always more expensive than paired similar regular products, with significant differences being found for nine of the thirteen food categories.

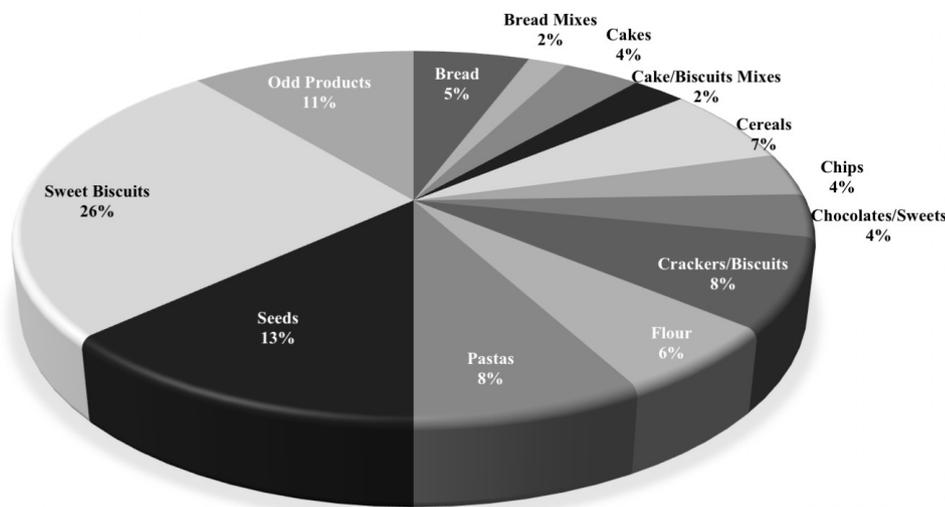


Figure 1. Gluten free products in two supermarkets in Abu Dhabi (N= 266)

Table 1. Price comparison between gluten free products in two super in supermarkets in Abu Dhabi (N=266)

Food category	Supermarket A (A)		Supermarket B (B)		Supermarket A/B Price Ratio
	N	Mean price/100g (AED)	N	Mean price/100g (AED)	
Bread	4	11.51	11	9.78	1.18
Bread Mix	2	7.5	3	3.41	2.2
Cakes	3	5.35	7	8.85	0.6
Cake/Biscuits Mix	2	4.43	5	3.93	1.13
Cereals	11	8.36	7	10.35	0.81
Chips	8	12.25	2	23.81	0.51
Chocolates/Sweets	4	9.53	6	15.14	0.63
Crackers/Biscuits	11	7.62	10	14.9	0.51
Flour	7	4.78	9	4.29	1.11
Pastas	13	7.77	8	3.98	1.95
Seeds	10	11.33	25	9.92	1.14
Sweet Biscuits	42	12.55	27	13.6	0.92
Odd Products	16	9.42	13	17.42	0.54

Table 2. Glutenfree (GF) and similar non-GF products in two supermarkets in Abu Dhabi

Category	GF Products		Non-GF Products		Price difference between GF and non-GF products (%)
	N=266	Price/100g (AED) Mean±SD	N=117	Price/100g (AED) Mean ±SD	
Bread	15	10.2 ±3.9	4	1.1 ±0.6	866
Bread Mix	5	5.0 ±5.0	5	0.4 ±0.1	1100
Cakes	10	7.8 ±3.6	6	4.4 ±2.0	77
Cake/Biscuits Mix	7	4.1 ±0.4	6	2.1 ±0.4	91
Cereals	18	9.1 ±5.2	13	3.4 ±0.8	167
Chips	10	14.6 ±7.3	6	8.2 ±3.8	77
Chocolates/Sweets	10	12.9 ±4.9	4	12.3 ±1.7	5
Crackers/Biscuits	21	11.9 ±5.6	12	4.7 ±1.7	153
Flour	16	4.5 ±3.6	14	1.2 ±1.5	272
Pastas	21	6.3 ±3.5	20	1.5 ±0.6	323
Seeds	35	10.2 ±6.0	6	4.9 ±2.1	106
Sweet Biscuits	69	13.0 ±5.3	16	5.9 ±2.6	120
Odd Products	29	13.0 ±9.8	5	11.3 ±8.5	15

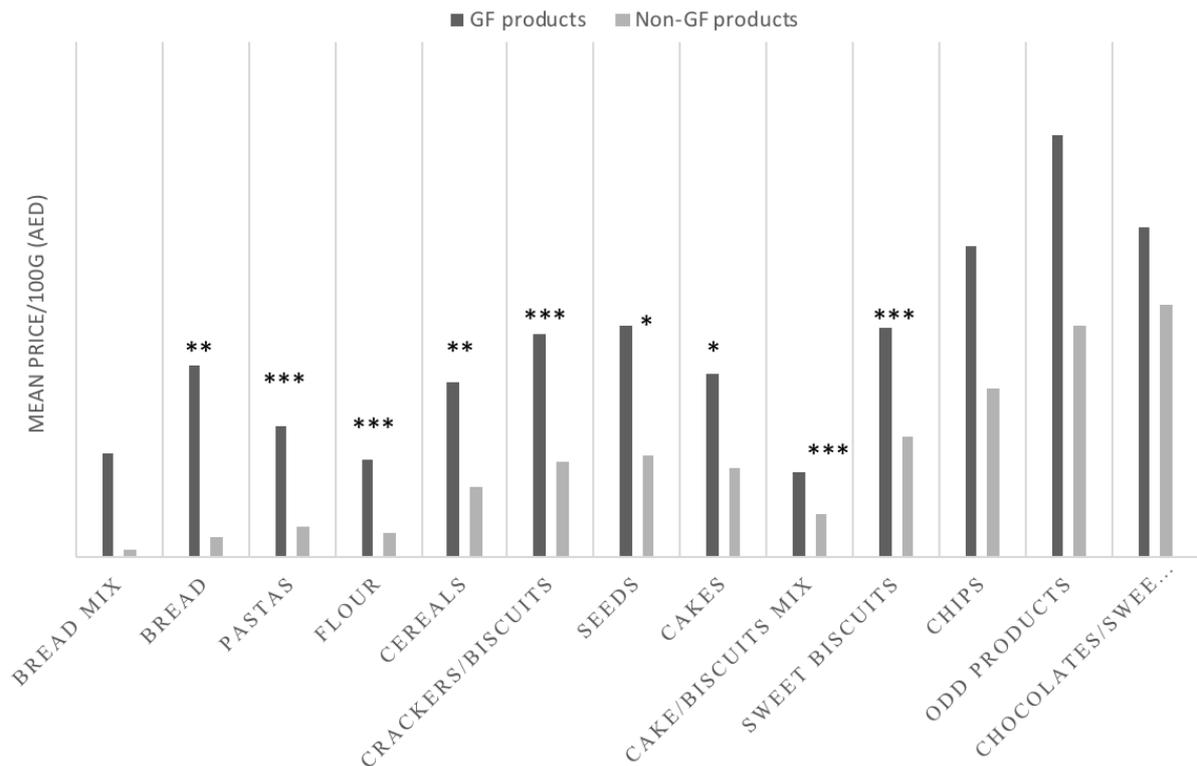


Figure 2. Price in dirham/100g product for gluten free (GF) and or non-gluten free paired products N=234 (n=117 GF, n=117 Non-GF)

5. Discussion

This is the first study that investigates the prices of gluten free products in the UAE. On average, gluten free products were twice as expensive as regular products. The biggest price differences were found in products like bread and flour which are often consumed on a daily basis.

In this study the gluten products were between 30- 1100% more expensive than their non-GF equivalents. Other studies have had similar findings; a study done in Australia comparing price between GF and non-GF products showed that GF products were more expensive by 316-574% [25]. A study conducted in the UK showed that glutenfree products were at least four times more expensive [26]. In Canada gluten free products were, on average, 242% higher in price compared to non-gluten free products, which is similar to what this study found [27]. Others have found that gluten free products are less available, fewer in quantity, and higher in cost than regular products [17,19].

The categories where the most drastic differences were found were staple food categories such as bread mixes, bread, pasta, and flour. Similar findings have been reported in Australia, where gluten free flour was the most expensive product relatively. It is highly plausible that this makes it difficult for many to afford GF versions of food part of daily intake [25]. There are food items like flax, chickpeas, quinoa, millet which are naturally GF which could be used to replace gluten containing cereals and grains. However, these products have also been found to be more expensive and less available than more common grains and may therefore not be a better option from a price perspective [28].

Nowadays, gluten free food is not only consumed by people with celiac disease but also those without, as the diet has become fashionable in some parts of the world [29]. Globally, the market of GF products is increasing rapidly, not only because of demand from people with celiac disease, but also because of non-necessary intake of such products [17]. By 2018, the global gluten free market was valued to \$14.94 billion, with an expected annual growth of 9.3% between 2017 to 2025 [30]. In this study, no differences were found in price between different supermarket brands, indicating that the GF prices are higher in general.

A strict gluten free diet is the only treatment option for celiac disease, but in North America studies show that the high price of gluten free products compared to their non-gluten free equivalents is becoming an economic burden for families who need to adopt a gluten free diet [19,25]. In some parts of the world, gluten free products are included as part of the national health coverage. In most parts of the UK, gluten free staple products are included in the pharmaceutical prescriptions that are covered by the national health care system [31]. Canada and Ireland offer tax deductions for gluten free products and Italy offer financial support for people with celiac disease [32]. In the UAE, patients with celiac disease get some support from the government, receiving gluten free flour for free, but other products have to be purchased by the patients themselves.

A strength of the study is that it covers all gluten free products displayed in the gluten free section. On the other

hand, gluten free products that potentially were displayed on shelves where regular products were displayed were not included in this study and this could be seen as a limitation. Hence, this would be a point to consider in future studies. The study covered only one geographical area of the UAE which limits the ability to generalize the results to the whole country. Despite this, the data, the first of its kind in the Middle East, provides useful information about the potential financial implications of living with celiac disease in the UAE.

To conclude, this first study assessing gluten free products in Abu Dhabi showed that prices for gluten-free products are significantly higher than for regular products. A GF diet is a lifelong medical treatment, but unlike other medical treatments in the UAE it is not totally covered by the government, and the result of this study suggest that living with gluten intolerance may thus be a significant economic burden. Other studies have shown that the high cost of a GF diet can negatively impact adherence to the diet, which can lead to severe health consequences for people with CD [2,13]. Considering the importance of adhering to the diet, it is important to bring the authorities' attention to this issue.

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