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Characteristic of Gluten-Free Products: Latvian Consumer Survey

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***Abstract*—**Celiac disease is a permanent enteropathy caused by the ingestion of gluten, a protein occurring in wheat, rye and barley. The only way of the effective daily treatment is a strict gluten-free diet. From the investigation of products available in the local market, it was found that Latvian producers do not offer gluten-free products. The aim of this research was to study and analyze changes of celiac patient's attitude to gluten-free product quality and availability in the Latvian market and purchasing habits. The survey was designed using website www.visidati.lv, and a questionnaire was sent to people suffering from celiac disease. The first time the respondents were asked to fill in the questionnaire in 2011, but now repeatedly from the beginning of September 2013 till the end of January 2014. The questionnaire was performed with 75 celiac patients, respondents were from all Latvian regions and they answered 16 questions. One of the most important questions was aimed to find out consumers' opinion about quality of gluten-free products, consumption patterns of gluten-free products, and, moreover, their interest in products made in Latvia. Respondents were asked to name gluten-free products they mainly buy and give specific purchase locations, evaluate the quality of products and necessity for products produced in Latvia. The results of questionnaire show that the consumers are satisfied with the quality of gluten-free flour, flour blends, sweets and pasta, but are not satisfied with the quality of bread and confectionery available in the Latvian markets.

***Keywords*—**Consumers, gluten-free products, quality, survey.

I. Introduction

GLUTEN-FREE products exclude all ingredients containing wheat, barley, rye, spelt and kamut proteins. The term *gluten-free* does not refer to the total absence of gluten. In the definition of "gluten-free", some residual amount of gluten is allowed; this amount is strictly regulated by the Codex Alimentarius Standard. The EU Commission Regulation No. 41/2009 recommends that products not exceeding 20 mg kg^{-1} of gluten should be considered gluten-free [1]. In recent years, there is an increased interest in gluten-free products as the number of patients with celiac disease is growing (affecting about 1% of the general population) [2].

Celiac disease is result from an immune response to ingested dietary gluten in genetically susceptible individuals; ingestion of gluten and its related peptides leads to malabsorption in the small intestine. The only way to overcome this problem is a lifelong adherence to a strict gluten-free diet [3], [4].

The gluten-free diet is not an easy undertaking as gluten-containing grains, especially wheat, is the main ingredient in culturally popular foods such as bread, pasta and cakes. But starch is also widely used as an additive, binder and thickener in a vast majority of processed foods such as broths, marinades, processed meat, canned goods, candy and medications [5].

Gluten, found in the endosperm of cereals, is composed of distinct portions of monomer, alcohol-soluble gliadin and polymer, prolamine rich glutenin, which are responsible for flour processing characteristics (good water absorption capacity, cohesiveness, viscosity and elastic properties) in bakery industry [4], [6]–[7]. The development of gluten-free bread with good quality and high nutritional value is a complicated and challenge task to both the cereal technologist and the bakers, because the lack of gluten proteins in gluten-free cereals makes it very difficult to obtain an acceptable yeast-leavened product, such as bread, because of the absence of a proper network necessary to hold the carbon dioxide produced during proofing [7], [8]. Sensory properties (appearance, colour of crumb and crust, and odour) are some of the most important factors for consumer liking and preference; thus it is very important to determine factors affecting the product attributes, acceptance and preference especially for foods [9], [10]. The majority of commercially available gluten-free breads are inferior in quality, which results from the absence of gluten, compared to their gluten-containing counterparts. The major defects in basic gluten-free bread are that they often present poor quality with a crumbling texture, dry and friable crumb, lack of flavour and mouth feel, poor colour, relatively short shelf life and other post-baking defects [7], [11].

The aim of this research was to study and analyze changes of celiac patient's attitude to gluten-free product quality and availability in the Latvian market as well as purchasing habits.

II. Materials and Methods

In the survey there was studied the attitude of a celiac patient' treatment as well as the evaluation of gluten-free products' quality availability in the Latvian market. The questionnaire was used as a basic tool. The survey was performed with celiac patients two times. The first time respondents were asked to fill in the questionnaire from the beginning of December 2010 till the end of July 2011 (2010), but now repeatedly from the beginning of September 2013 till the end of January 2014 (2013).

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The survey was designed using website www.visidati.lv, which gives an opportunity to get a quick and effective survey distribution and data collection. In order to reach the proper respondents, a link to the web-based questionnaire was sent to people suffering from celiac disease.

The *first survey* (2010) [12] was completed by 131 celiac patients. Respondents answered 15 questions, of which nine questions were related to the gluten-free products, three – to gluten-free diet, while the rest of questions were aimed at obtaining basic information about the respondent. In the questionnaire, respondents were asked to answer both multiple-choice and open-type questions.

One of the most important questions was aimed to find out consumers' opinion about quality of gluten-free products, consumption patterns of gluten-free products. Respondents were asked to name the gluten-free products they mainly buy, give specific purchase locations, evaluate the quality of products and the necessity in products produced in Latvia.

The *second questionnaire* (2013) was completed by 75 celiac patients. Respondents answered to the same 15 questions as in 2010/2011 and 1 new question. The questionnaire was added question about how often respondents take a meal out of home.

Means and standard division of the means were calculated using Microsoft Office Excel 2007.

III. Results and Discussion

The second questionnaire was performed with 75 celiac patients. Men interest in fill in the questionnaire decreased from 9% to 5% of all respondents. Mostly women were filling in the questionnaire – 95% of all respondents. Respondents were from all Latvian regions – Kurzeme (9.3%), Zemgale (13.3%), Vidzeme (21.3%), Latgale (2.7%) and Riga (53.3%). Breakdown of respondents according to their age is presented in the Fig. 1.

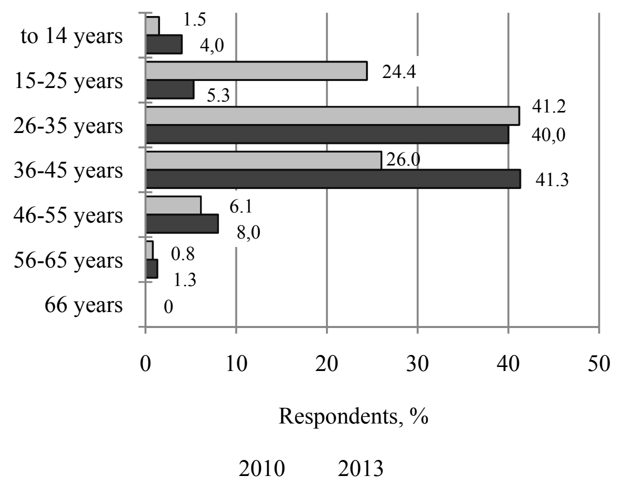

Fig. 1 Respondents' breakdown according to their age, %

The largest respondent groups presented in second research were from age 26 to 35 and 36 to 45. Interest in fill in questionnaire increased in respondent group from age 36 to 45 on 15.2%, but reduces in age group 15 to 25. The smallest presented respondent groups were from age 56 to 65 in both researches. The questionnaire data shows that in majority of the surveyed households, celiac disease affects children, not their parents. In these cases the questionnaire was filled out by the parents who were purchasing gluten-free products. Majority of parents indicated that they prefer to cook gluten-free food at home, that way it is safer and cheaper. Gluten-free products prepared at home exclude the possibility of gluten contain ingredients come into contact with gluten-free products, thus respondents are informed about all used ingredients. Also, parents are worried about composition of commercially available gluten-free products; labels of gluten-free products did not contain detailed information on the composition of the product. This product consumption is a risk to children's health, because mostly children along with celiac disease suffer also with diabetes or lactose intolerance.

Analyses of gluten-free dieting duration show that 9.3% respondents slim gluten-free diet since birth; these are mostly children and teens whose diagnosis of celiac disease are established early. 73.3% of all respondents slim by following a gluten-free diet more than one year – 2–18 years. Most of the respondents slim gluten-free diet for approximately 3–4 years, which could be explained with evolution of diagnostic tools, only few respondents' slim gluten-free diet more than 10 years. The respondents are familiar with the products available in the market and the prevailing situation.

People with celiac disease have to following strict gluten-free diet. Celiac diseases alter not only all patients' life, but also his families. Family members support and understanding are important, for that reason family members often adjust their diets to the diets followed by celiac patient excluding from diet products containing gluten. The results of the questionnaire presented that 66.6% of respondents indicate that other family members adapt or partially adapt these diets in this case there is no necessity to cook separate dishes. Past three years did not significantly change that 33.4% of respondents' family members (34.5% in first questionnaire) do not adjust their diet, because gluten-free products are expensive and family cannot afford them for all family members as well as other family members consider gluten-free products unpalatable.

Respondents mostly purchase flour, pasta and sweets such as candy, chocolates and wafer in local markets (Fig. 2). Results of first questionnaire show that respondents mostly purchase flour (24.9%), pasta (21.9%) and confectionery (15.0%) in local markets (Fig. 2). But now respondents mainly buy flour (20.1%), pasta (18.9%) and sweets (15.5%) such as candy, chocolates and wafer. Previously respondents markedly more bought flour and pasta, but at this time gluten-free products consumption smoothing. Consumers mostly choose purchase flour, because 86.6% of respondents choose to prepare gluten-free products at home, as, according their opinion, homemade products are more tasty and varied. But pasta and sweets, because those are difficult prepare at home. Small part of respondents (4.0%) are purchasing other gluten-free products, such as gruel, oatmeal, dressings, rice vinegar, food supplements and special vitamins, but 0.3% does not purchase gluten-free products. They choose to decrease the amount of cereal products, but enlarge fresh fruit, vegetables, meat and fish in their daily menu.

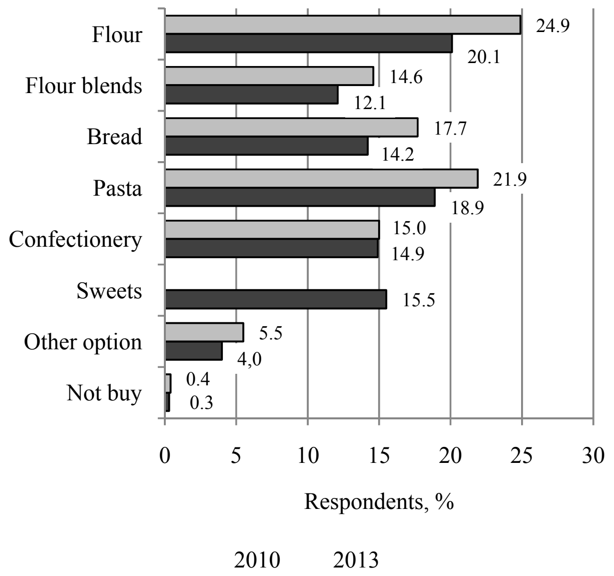

Fig. 2 Gluten-free products, which respondents mainly buy in commercial networks

Assessing consumption of gluten-free products, important to evaluate commercial places where respondents primarily purchase products (Fig. 3). Approximately 30% of first questionnaire respondents purchase gluten-free products in pharmacies, but now amount of respondents which choose use pharmacies to buy gluten-free products decrease for 9%. Mostly respondents mentioning pharmacies are spread all over the territory of Latvia.

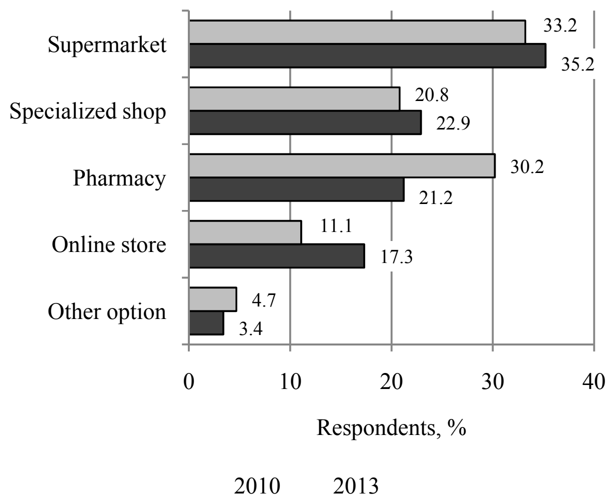

Fig. 3 Commercial places where gluten-free products mainly are purchased

Increase quantity of those respondents who prefer purchase gluten-free products in online shops (17.3%), supermarkets (35.2%) and specialized s hops (22.9%). Respondents prefer to buy products online (www.bodebode.lv, www.pirkumins.lv, www.bezglutenaprodukti.lv), because some products are cheaper in online stores than in supermarkets or specialized shops. Specialized shops offer different varieties of gluten-free products (frozen products, candy, beer, etc.) unlike from supermarkets. One third of respondents are purchasing gluten-free products in supermarkets, which store chain network is spread all over the territory of Latvia, while supermarkets which located in capital city of Latvia offers the one of the largest choice of gluten-free products. The rest of respondents (3.4%) prefer to choose other option – ordering gluten-free products from foreign countries (England, Poland and Germany) where their relatives or friends live. Previously respondents declare that it is almost impossible to buy gluten-free products in rural areas, situation doesn't improve in last two years.

Consumers purchase not only gluten-free products which are mention in Fig. 2, but also visit public catering companies. It's difficult have a meal out of home, because gluten-free products are not included in the menus, but it does not exclude the possibility does that. Approximately 19% of respondents once in a week have a meal out of home (Fig. 4), 16% of respondents visit public catering companies every day or once in month.

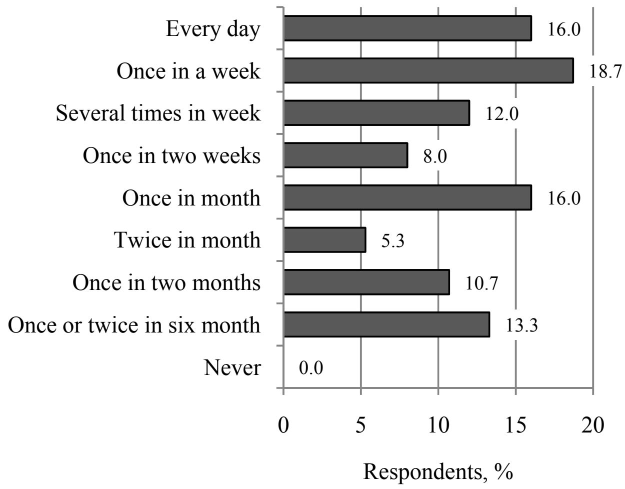

Fig. 4 A characteristic of public catering companies visits frequency

Respondents mentioned that, the public catering system should include gluten-free flour products in the menu, make special marks which indicate gluten-free dishes or be ready to offer such dishes upon request.

Consumption of gluten-free products is closely related to the consumer's solvency. Consumer opportunities to buy gluten-free products are affecting by high prices of gluten-free products and economic situation in the country.

Fig. 5 presents average monthly expenses of respondent households spent for the purchase of gluten-free products.

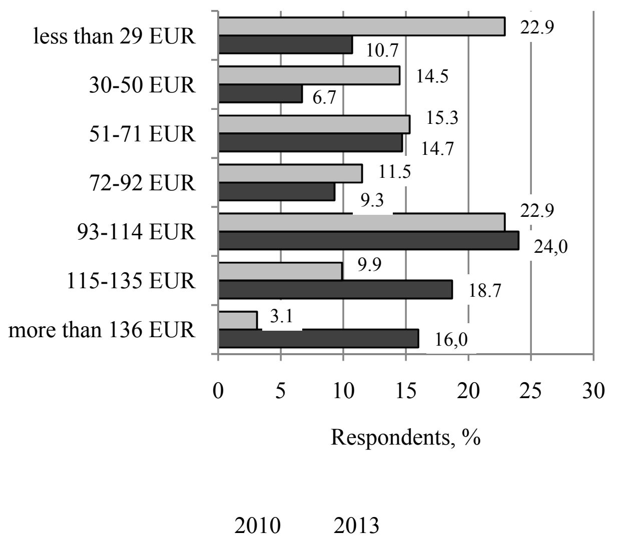

Fig. 5 Monthly household expenses for the purchase of gluten-free products

TABLE I
CELIAC PATIENTS` OPINION ON THE QUALITY OF COMMERCIAL GLUTEN-FREE PRODUCTS AVAILABLE IN MARKET

Gluten-free products	Quality characterizing parameters	2010/2011, %	2013/2014, %
Flour	Very poor	0.8	0
	Poor	3.1	2.7
	Average	22.9	16.0
	Good	54.2	60.0
	Very good	19.1	21.3
Flour blends	Very poor	1.5	0
	Poor	3.8	8.0
	Average	27.5	25.3
	Good	54.2	49.3
	Very good	13.0	17.3
Bread	Very poor	10.7	4.0
	Poor	26.0	17.3
	Average	36.6	45.3
	Good	20.6	25.3
	Very good	6.1	8.0
Pasta	Very poor	3.1	0
	Poor	9.2	10.7
	Average	21.4	29.3
	Good	51.1	49.3
	Very good	15.3	10.7
Confectionery	Very poor	6.9	5.3
	Poor	9.9	17.3
	Average	37.4	37.3
	Good	30.5	30.7
	Very good	15.3	9.3
Sweets	Very poor	-	8.0
	Poor	-	14.7
	Average	-	46.7
	Good	-	26.7
	Very good	-	4.0

Results of survey showed that consumers spend more money for the purchase of gluten-free products. Increase those who spend 115–135 EUR per month for purchasing of gluten-free products; it was only 9.9% of respondents in 2010 questionnaire, but now this amount grown to 18.8% of respondents. Also five time increases percentage of respondents who spend more than 136 EUR per month (16.0%), reduces percentage of respondents who spend less than 29 EUR per month. Increase of expenses for the purchase of gluten-free products explains improvement of economic situation in the country, growth of availability and range of gluten-free products.

The group of respondents who spend 51–71 and 93–114 EUR per month has remained unchanged. The group of respondents who spend 93–114 EUR per month mostly includes families with children suffering from celiac disease, which receive some allowance. According to the section 13 (paragraph 8) of the Social Services and Social Assistance law, the children suffering from celiac disease which do not have a disability can receive allowance. The Cabinet of Ministers Regulation No. 261 ‘Provisions of State support to children with celiac disease who do not have a disability’ [13] has established the amount and conditions of allowance. State support can receive only children up to 18 years; amount of allowance is 106.72 EUR per month.

Significant changes of celiac patients’ opinion on the quality do not found (Table I). Some changes have been between gluten-free product quality characterizing parameters. The results of the questionnaire show that the celiac patients mainly evaluate the quality of gluten-free flour blends, just like the quality of pasta as good (49.3%). Flour blends as average was characterized by 25.3% of respondents, while pasta got average evaluation in 29.3% cases. 60% of respondents evaluate flour quality as good, but 21.3% as very good. About 45% of respondents evaluate bread quality as average, 25.3% – as good, but confectionery – as average (37.3%) or good (30.7%). New in survey was evaluation of sweets, such as chocolate and caddies, 46.7% of respondents evaluate sweets quality as average, 26.7% – as good.

Consumers are satisfied with the quality of gluten-free flour, flour blends and pasta available in the markets and mainly characterize it as good, but they are not satisfied with the quality of bread, sweets and confectionery and mainly evaluate it as average. Compared 2010/2011 with 2013/2014 quality of flour is improved according with celiac patient opinion, who mainly characterizes it as good and very good. Therefore, this is a great opportunity to producers develop new gluten-free products.

All respondents noted that it is necessary to increase the range and assortment of gluten-free products. Respondents (28.0%) would like to have cheaper products, 52.0% of them are interested in products produced in Latvia and hope that it would reduce prices of gluten-free products

Respondents were asked to leave a comment; they mentioned that the live with celiac disease are complicated, because large part of society does not understand disease and consequences of consumption of gluten. It would be necessary to educate community about celiac disease, especially employees in the commercial sector and catering companies, teachers and staff in kindergartens and school. Consumers are not satisfied with labels of gluten-free products; they mentioned that labels should include more detailed information of product ingredients. Also producers should add information about product ingredients in internet homepage. The government could support companies that want to produce gluten-free products in Latvia.

III. Conclusion

1. The Latvian consumers mainly buy gluten-free flour, pasta and sweets in supermarkets and specialized shops, pharmacies and online shops.
2. The results of the questionnaire show that the Latvian consumers are satisfied with the quality of gluten-free flour, flour blends and pasta available in the Latvian markets and mainly characterize it as good, but they are not satisfied with the quality of bread, sweets and confectionery and characterize it as average.
3. Latvian celiac patients has started spend more for purchase of gluten-free products.
4. It is necessary educate community about celiac disease, improve labelling system, it could improve the life of the patients with celiac disease.

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