

## Introduction

Celiac disease is a permanent intolerance to gluten with typical inflammatory changes of the mucosa of the small intestine. This disease is most frequently encountered in infancy, but it can manifest any time in the adult age. The incidence in central Europe is expected 40 000 – 50 000 persons, but only 10 % of these are diagnosed and subsequently treated. The only possible causal treatment of CD is a lifelong gluten-free diet. It is therefore necessary to avoid all foods containing constituents from wheat, rye, barley and related species. The intake of oat grains is a widely discussed question. The aim of the study was to evaluate the gliadin intake in the diet by the determination of gliadin content in patients' food.

Decree No. 54/2004 Coll., dealing with foods for special dietary purposes and the ways of their use, treats gluten-free foods in the Czech Republic in part 7. This decree proceeds from the descriptions and statements of Codex Alimentarius document. In this decree the limits of gluten content are expressed in mg per kg of food ready for consumption. Gluten-free foods must not contain more than 100 mg gluten per 1 kg of food ready for consumption. Foods labelled as „naturally gluten-free“ must not contain any ingredients from wheat and other wheat related species, such as spelt, kamut or durum wheat; barley, rye and oat and their crossbred varieties. Gluten level has not to exceed 20 mg per 1 kg of food ready for consumption. The last changes of Codex Standard for Foods for Special Dietary Use for Persons Intolerant to Gluten (CODEX STAN 118-1979) were adopted in 2008 and this time they are not included in Czech food legislation.

## Method

The patients were provided with instructions, survey forms, digital scales, polyethylen bottles and sacks. This trial was scheduled for 30 days. The patients took out the stipulated amount, which served as a sample of each of their daily meals. The samples included both homemade meals as well as commercial products. Each sample had an unique label or code. The samples were analyzed by Gliadin ELISA kit (SEDIUM R&D). After analysis, the results of gliadin content in relevant commercial foods were added to the existing freely-available database of gluten-free foods (www.vupp.cz)

## Results

The results of monitoring revealed a good quality of gluten-free diet at 14 celiacs. The average value of gliadin intake ranged from 0.8 to 5.5 mg of gliadin per day depending on the age of followed patients. The value of 5.5mg gliadin reached by one of the patients was obtained as result of inadvertent dietary mistakes Other random dietary mistake were caused by purchase of contaminated flours. The best recommendation is not to buy unlabeled products from small and unknown producers and prefer confidential suppliers of gluten-free foods. Determined daily intake is lower than 10 mg per day. Some authors consider daily intake of 10 mg as the safe level.

Table 1 Example of a form filled in by the patient

Meal	Code	Name	Amount (g; mL)	Producer
Breakfast	1A	Homemade toast-bread	103g	homemade
		Flour Mantler	ingredient	Mantler Mühle
		Dried yeast	ingredient	Dr.Oetker
	1B	White cream yogurt	150g	Dairy company (CZ)
	1C	Orange jam	90g	Scandic Food
	1D	Vitamins	1 tablet(1.36 g)	Wyeth company
Snack	1E	Anavelon (medicine)	1 tablet(0.098 g)	Zentiva company
Lunch	1F	Gingerbread	47g	Dr.Schär
	1G	Vegetable soup	307g	home made
		Oil, frozen vegetables	ingredient	
		fresh vegetables, amaranth pasta	ingredient	
	1H	Wild rice	188g	the mill (CZ)
	1I	Fresh salmon with butter	135g	Delvita
	1J	Olives filled with pepper	34g	Agro Sevilla
Snack		Anavelon (1E)	1 tablet	Zentiva company
Dinner		Bread (1A)	34g	home made
	1K	Hard cheese for frying	54g	Delvita
Others		Anavelon (1E)	1 tablet	Zentiva company
		Fresh fruit & vegetables		
	1L	Tea biscuits	23g	private bakery

Table 3 Example of a filled in form with calculated daily gliadin intake, indicating a dietary mistake

Meal	Code	Name	Amount (g; mL)	Gliadin (mg/100g)	Gliadin per portion (mg)
Breakfast		Cupcake (7A)	111	0.42	0.47
		Butter	17		
		Fruit tea	300		
Snack		Roll (7C)	40	0.45	0.18
	9A	Billberry puree	190	0.00	0.00
		1 Tangerine	217		
		Syrup (7CR)	33	0.00	0.00
Lunch	9B	Cream sauce with dill	281	0.42	1.18
		Oil, butter, milk, water, dill, vinegar, flour			
		Dumplings (6B)	135	0.33	0.45
		1 egg	60		
Snack		Chocolate dessert (7D)	90	0.00	0.00
		Rice bread with chocolate (4D)	25	0.30	0.08
		1 Tangerine	65		
	9C	Bonbon JOJO	18	0.33	0.06
Dinner 1	9D	Pancakes made from buckwheat flour	208	8.99	18.70
	9E	Cherry jam	56	0.00	0.00
	9F	Whipped cream	20	0.31	0.06
Dinner 2	9G	Soluble cocoa	1	0.33	0.00
		Homemade smoked meat (5C)	95	0.29	0.28
	9H	Wholemeal bread	132	0.39	0.51
		Butter	29		
		Cucumber	92		

Daily gliadin intake 22.0 mg

Table 5 Example of a filled in form with calculated daily gliadin intake, indicating a dietary mistake

Meal	Code	Name	Amount (g; mL)	Gliadin (mg/100g)	Gliadin per portion (mg)
Breakfast	1a	Bread Pan Carré	24	0.00	0.00
	1b	Honey	13	0.15	0.02
Snack	7b	Apricot puree	166	0.00	0.00
	19a	Black cake with icing	34	11.90	4.05
		Gluten-free mixture	ingredient	12.80	
	19c	Cocoa powder	ingredient	0.00	0.00
	19d	Cocoa for baking	ingredient	0.00	0.00
	19e	Maize starch	ingredient	0.00	0.00
	19f	Cake decorating dark chocolate	ingredient	0.00	0.00
Lunch	16d	Potato dumplings with egg	49	0.00	0.00
Snack	19a	Black cake with icing	72	11.90	8.57
Dinner	19b	Fish filet	34	0.00	0.00
		Potatoes			
Others	5h	Menthol bonbons	3.5	0.19	0.01
	7e	Haribo bonbons sauer Apfel	4	0.27	0.01

Daily gliadin intake 12.7 mg

Table 2 Example of a filled-in form with calculated daily gliadin intake, indicating a dietary mistake

Meal	Code	Name	Amount (g; mL)	Gliadin (mg/100g)	Gliadin per portion (mg)
Breakfast	1A	Rolls	127	0.00	0.00
	1B	Carob	ingredient	0.30	
		Gluten-free mixture, millet flour	ingredient		
		Xanthan	ingredient		
	1C	Butter spread	57	0.36	0.21
Snack	1D	Cake with lemon icing	110	3.84	4.22
	1E	Maize flour	ingredient	0.36	
	1F	Buckwheat flour	ingredient	52.2	
Lunch	1G	Chicken soup with noodles	200	0.37	0.74
	1H	Noodles	ingredient	0.34	
	1CH	Flavour-enhancer	ingredient	0.00	
	1I	Beef with leak	130	0.00	0.00
	1J	Ginger	ingredient	0.41	
		Potatoes	140		
Snack	1D	Cake with lemon icing	110	3.84	4.22
Dinner	1A	Rolls	118	0.00	0.00
		Butter, honey			

Daily gliadin intake 9.4 mg

Figure 1 Survey of average daily gliadin intake (children)

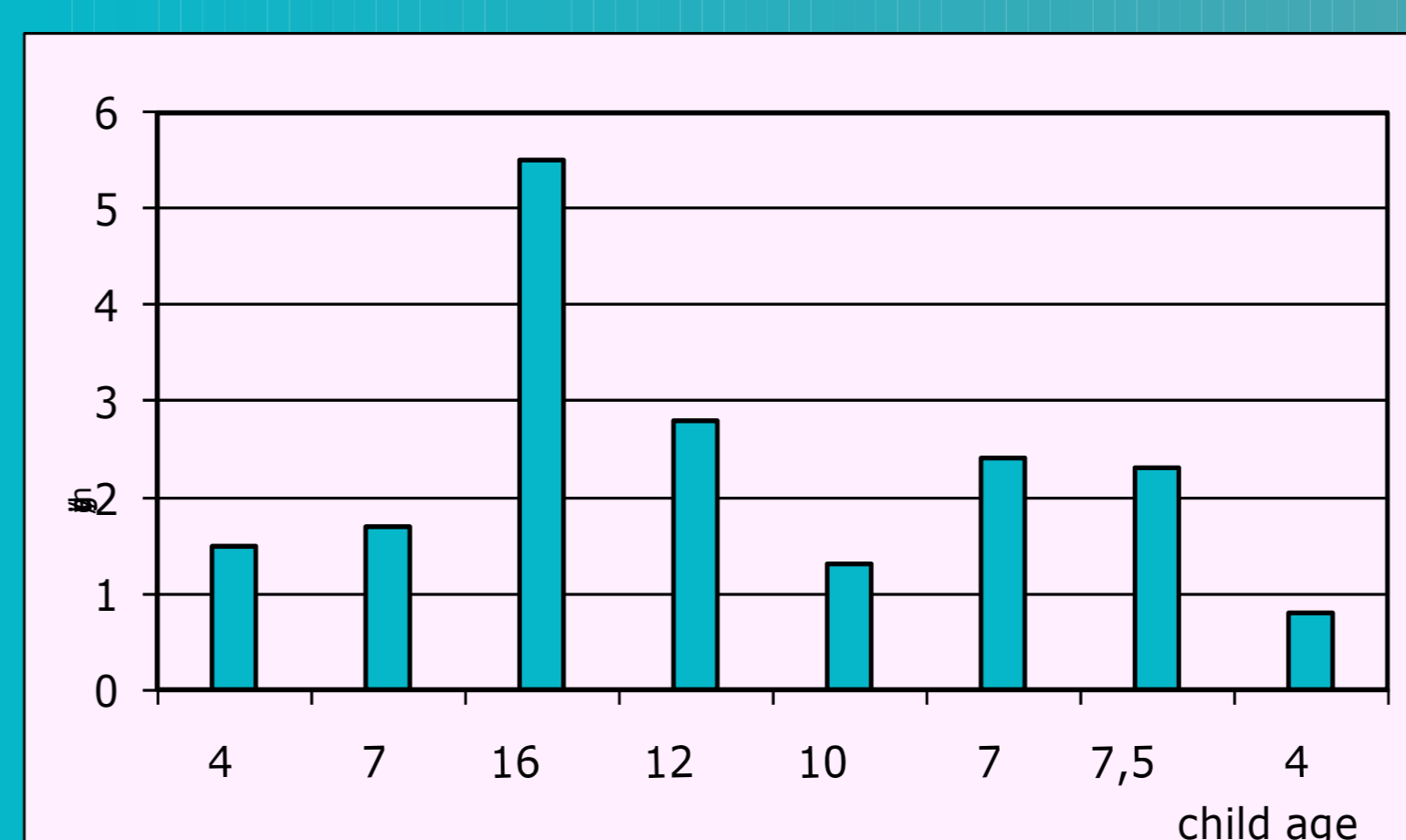


Figure 2 Survey of average daily gliadin intake (women)

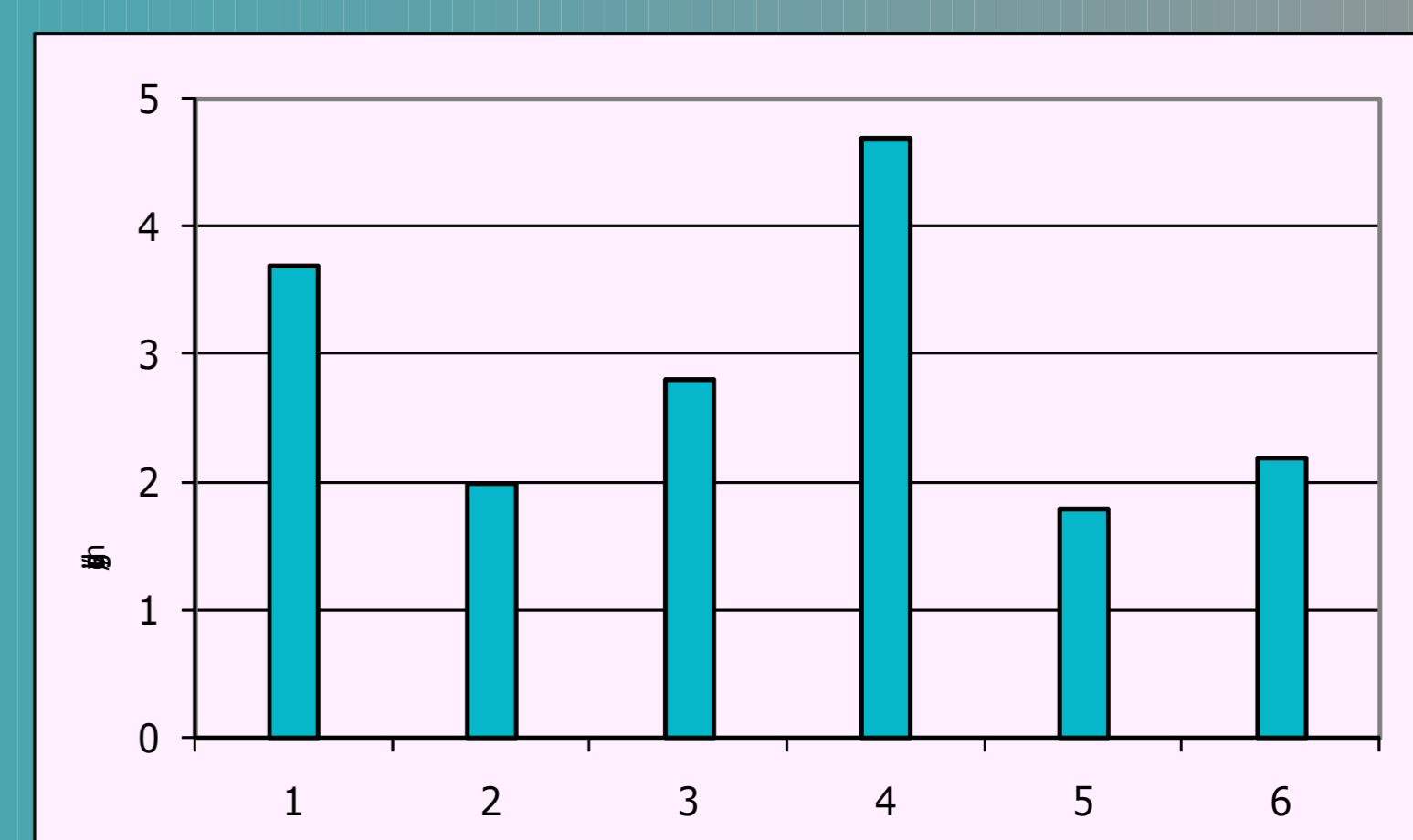


Table 4 Example of a filled in form with calculated daily gliadin intake, indicating dietary mistakes

Meal	Code	Name	Amount (g; mL)	Gliadin (mg/100g)	Gliadin per portion (mg)
Breakfast	5A	Maize crispbread	4	0.25	0.01
		Butter, tea			
Snack	28A	Bon Matin - sweet rolls	58	0.98	0.57
	13D	Vanilla soy bio milk	200	0.22	0.44
Lunch	27B	Tomato soup with pasta	123	0.00	0.00
	27G	Strawberry yeast dumplings	70	0.00	0.00
Snack	9G	Cheese Babybel	20	0.00	0.00
	11B	Crispbread with buckwheat	12	0.00	0.00
	19C	Fruit bonbon	7	0.00	0.00
	28B	Vanilla cottage cheese cream from goat milk	44	0.0	0.00
		Potato pancake	45	4.15	1.87
Dinner	28D	Whole-grain chickpea flour	ingredient	22.19	
	28E	Whole-grain millet flour	ingredient	4.7	
		Potato starch	ingredient		
		Potato, egg, ground caraway, majoram	ingredient		
	28F	Cottage cheese ice cream	20	0.00	0.00
	28A	Bon Matin - sweet rolls	39	0.98	0.38

Daily gliadin intake 3.3 mg

## Conclusion

The results in 14 patients revealed a satisfactory adherence to the gluten-free diet. 1900 food samples were analyzed within the framework of this study (160 bakery products, 23 potato products, 398 dairy products, 319 meat products, 13 fish, 185 cereals products, 427 confectionary, 39 vegetable or fruit products, 23 soy products, 124 drinks, 123 spices and flavour-enhancers, 66 food supplements and medicines. Several raw food materials or final products with high content of gliadin were found during the monitoring, but this fact did not influence the otherwise satisfactory results by the patients followed.



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## References

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