

FOOD ALLERGIES IN SARAJEVO CANTON

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SUMMARY: Introduction: Food allergies have been recognized as significant health issue in last two decades. Prevalence is from 3-38 % of self-reported cases, i.e. 1-7% of those that have been diagnosed as allergies. Numerous projects have been undertaken during last years in order to determine prevalence of food allergies, most frequent allergen types, cause of allergies, link with other health problems, methods of diagnosing, risk control management in food industry, adjustment of legislation in accordance to the needs of allergic persons etc. While some countries have done a lot when it comes to this issue, others even do not have yet data on food allergies in their area, and this is the situation in BiH too. **RESEARCH GOALS:** Establish food allergy prevalence from survey in Sarajevo Canton. Establish frequency of some other allergies in subjects. **Material and methods:** This is a cross-sectional study on allergies and it was conducted during March and April, 2017 amongst Sarajevo Canton population of both genders and all age groups by random sampling method. Specifically designed survey questionnaire consisting of 16 questions was filled in by 480 subjects. The research was conducted retrospectively. **Results:** Results of the survey conducted in Sarajevo Canton are: 51% of persons reporting to have some type of allergy, while 20% of that is reported food allergy cases, i.e. 11.67% of diagnosed food allergy cases, in relation to the total number of 480 subjects (100%) who participated in the survey. The most frequently reported allergens are: milk and dairy products, cereals, eggs, peanut, nuts, fish (including mollusks and crustaceans) and eggs. **Conclusion:** As per obtained results of food allergy prevalence in our research in total surveyed sample of 480 subjects, there are 96 (20%) of subjects, which indicates that the problem of allergies in Sarajevo Canton is significant, with frequency in values characteristic for other regions of Europe and the world. Legislation is harmonized at a regular basis with the EU Acquis communautaire, but there is lack of easily accessible information, that people with allergies could use to facilitate the process of diagnosing, preventing contact with allergens and coping with them in everyday life.

Keywords: Food allergies -prevalence; allergens in food ; Sarajevo Canton

INTRODUCTION

The allergy is a disorder of an individual's immune system, i.e. a negative reaction to external stimuli that are completely harmless to most people. The term allergy is of Greek origin and was formed by joining the word *allos* = altered and *ergeia* = reaction. The spectrum of allergy cause is very broad, ranging from substances in the environment (pollen, dust, sun etc.), animals, medicines, food etc. [1]. A special segment of this problem is reactions to food allergens. The food represents human's primary need, thus it is necessary for maintaining life and health of people. Also, food is a source of satisfaction, especially in richer societies with diversity of food offer. While for majority food is a source of pleasure, for individuals, food may represent a danger leading to unpleasant reactions, and even to death in the

most extreme cases [2]. The allergic reaction to food is defined as a disorder that is a consequence of IgE-specific immune response that re-occurs after the exposure to a particular type of food [3]. Although food allergies have been known for a long time, this problem has attracted more attention in the last twenty years. It is interesting to note that Hippocrates, father of medicine, had already observed and described some allergic reactions to food 2000 years ago [4]. Food allergens are natural proteins that are resistant to effects of heat, proteolytic enzymes and pH change. An individual's immune system may react with a very small amount of allergens present [5]. Generally, allergies are looked upon as a major health problem, but there is also perception that prevalence and severity of symptoms are increasing. According to available data and studies, the prevalence ranges from 1-

3% in adults and even up to 8% in children of up to 3 years of age [6].

Food allergies represent disorder that is more and more talked about worldwide. The prevalence is generally from 1-7% of the total population. The importance of individual allergens depends on age, while prevalence of individual allergens depends on geographical area. The most common allergens in infants and children under 3 years of age are milk and eggs. In the USA, peanuts are very common cause of allergies in younger population, while this allergy is completely unknown in Greece. Fish allergies are common in Spain and Japan, while sesame allergy is common in Israel. In France, mustard is one of major allergens. Each geographical area has its own characteristics when it comes to frequency of allergies and prevalent type of allergen [7]. Generally, the incidence of allergies and types of allergens change over time. The problem of food allergies has evolved from being individual problem to becoming a significant healthcare problem. Although the incidence of allergies is very different (as is the type of allergen) by individual regions worldwide, it is estimated that about 25% of the population is already at risk [8]. Given that the only way to combat allergies is to avoid food allergens, it is clear that knowledge and information are of great importance to allergic persons. In this regard, legislation is of great importance for safety and health of these individuals. That is why the work is still ongoing to improve the laws governing this area. For EU (European Union) Member States, the EC (European Commission) directives and regulations are binding, with the possibility for each country to amend its laws according to its specific needs. One of the ways is to adhere to the list of binding allergens on food product declarations [9].

OBJECTIVES OF THE PAPER

Establish whether there is a problem with food allergies in Sarajevo Canton.

Establish the frequency of some other allergies in subjects.

MATERIAL AND METHODS

This cross-sectional study of food allergies was conducted during March and April, 2017 among residents of Sarajevo Canton of all age groups and by random sampling method. Special survey questionnaire was designed, and it was filled in by 480 subjects. This research was conducted retrospectively. As previously mentioned, the research was conducted based on the survey questionnaire. The research was performed of the available data on studies conducted in BiH and the region, concerning the food allergy prevalence. "Food Allergy" survey questionnaire was prepared and it consisted of 16 questions answered by the subjects. So, the questionnaire had been created specifically for this research in Sarajevo Canton, i.e. all population categories were included. The survey of the subjects is conducted in the following ways: (1) Direct interview with a subject; (2) Contact with subjects via e-mail; (3) Via social network (Google Disc). Direct interviewing of subjects was conducted in order that research would comprise all age-related and social groups of Sarajevo Canton population, as well as to obtain data for certain number of families with all their members. The research was conducted in the period March – April, 2017.

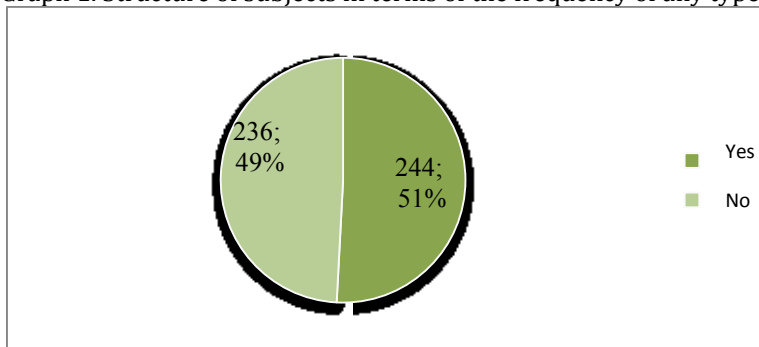
Statistical data processing : The research results are presented in accordance with the filled in questionnaire, in the form of absolute numbers (N) and percentage values (%). Statistical data processing was done using the statistical calculator "Social Science Statistic". For the nominal variables, Chi-Square Test and ANOVA test were used. P value <0,05 was considered statistically significant.

RESULTS

The total number of subjects surveyed in Sarajevo Canton is 480. Of the total number of surveyed, 168 (35%) are male persons, and 312 (65%) are female persons. The number of female subjects is significantly higher than number of male subjects (Chi-Square Test, $\chi^2 = 22,0972$, $p = 0,00003$; for $p < 0,05$)

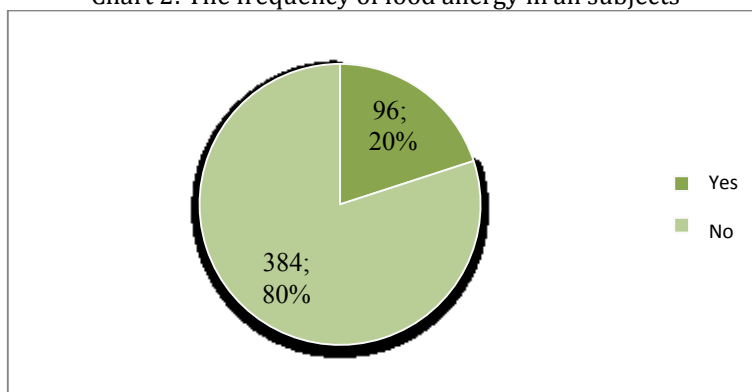
The number of subjects under 18 years of age was 37 (8%) and was significantly lower than the number of adults: 443 (92%) (Chi-Square Test $\chi^2 = 209,1042$, $p < 0,05$)

Chart 1: Graph 1. Structure of subjects in terms of the frequency of any type of allergy



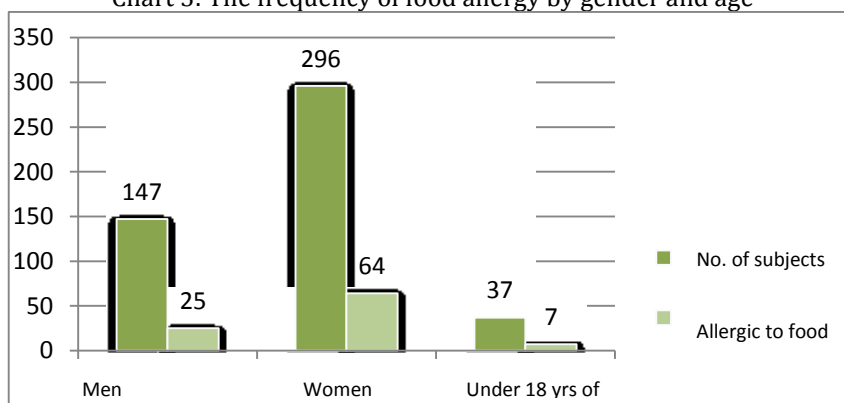
Of 480 subjects, 244 subjects (51%) gave a positive answer, while 236 (49%) subjects gave a negative answer, i.e. there is no significant difference between the group with allergy and the group without allergy (Chi-Square Test: $\chi^2 = 0,0667$; $p = 0,796246$, for $p < 0,05$)

Chart 2: The frequency of food allergy in all subjects



Of 480 subjects, 96 (20%) answered that they had a food allergy, i.e. 384 (80%) answered they did not have a food allergy, which represents significant difference between these two groups of subjects (Chi-Square Test: $\chi^2 = 94,9451$, $p < 0,05$).

Chart 3: The frequency of food allergy by gender and age



Of the total number of men (147), 122 (83%) of them are not allergic to food, while 25 (17%) of them are. Among women, the number of those allergic to food is 64 (22%), while among younger ones - under 18 years of age, the number of those allergic to food is 7 (19%). Percentage of men, women and children is not

significantly different (Chi-Square Test: $\chi^2 = 1,3366$; $p = 0,512568$; $p < 0,05$). Of 480 subjects, 244 confirmed some form of allergy, and of those 244, 96 (39%) also have a food allergy, while 148 (61%) have some other form of allergy. Subjects allergic to food (96 of them), in 49% of cases are allergic to other allergens, too.

There is no significant statistical difference between these two subject groups (food allergies only and food allergies in combination with

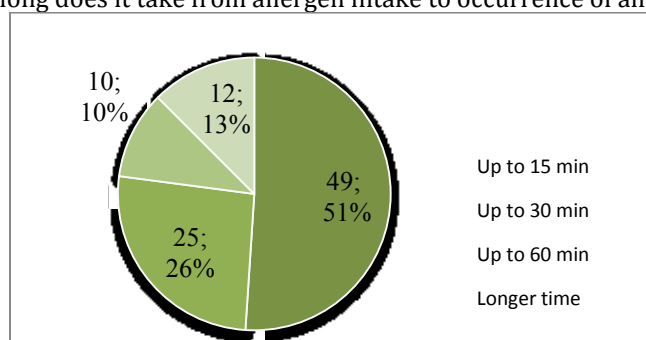
another form of allergy). (Results of Chi-Square test are: $\chi^2 = 0,0208$; $p = 0,885228$; $p > 0,05$)

Table 1. Presentation of foodstuff subjects are allergic to

Ordinal no.	Allergen	Number of subjects	% of number of subjects(480)	% of all food allergy subjects (96)
1	Dairy products	19	3,96	19,80
2	Eggs	6	1,25	6,25
3	Peanut	15	3,13	15,65
4	Cereals	16	3,33	16,65
5	Nuts	16	3,33	16,65
6	Fish, mollusks, crustaceans	13	2,71	13,55
7	Soy	4	0,83	4,15
8	Celery	1	0,21	1,05
9	Mustard	3	0,63	3,15
10	Sesame	1	0,21	1,05
11	Sulfur dioxide and sulfides	3	0,63	3,15
13	Fruit	6	1,25	6,25
14	Honey	1	0,21	1,05
15	Yeast	1	0,21	1,05
16	Food colors	1	0,21	1,05
17	Vinegar	1	0,21	1,05

Presentation of structure of frequency of allergens in food: most commonly allergies are reported to be to dairy products (3,96%), then to cereals and nuts (3,33% each).

Chart 4.: How long does it take from allergen intake to occurrence of allergy symptoms?

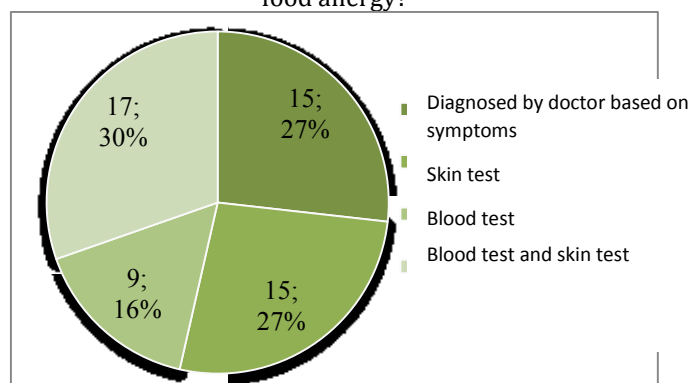


According to presented chart, most commonly reactions occur immediately (within 15 minutes) in 51% of subjects, then after half an hour (25%). Of 96 subjects with food allergy, 29 of them (30%) were hospitalized due to allergy, while 67 (70%) were not. There is a significant statistical difference between these two groups

of subjects (Chi-Square Test: $\chi^2 = 7,8274$, $p = 0,005146$, for $p < 0,05$).

Of the total number of subjects with food allergy, 56 (58%) of them were diagnosed, while 40 (42%) of them were not, which represents a significant statistical difference between these two groups (Chi-Square Test: $\chi^2 = 1,3427$, $p = 0,236566$, for $p < 0,05$).

Chart 5. Structure of subjects according to the answer to the question: In which way were you diagnosed a food allergy?



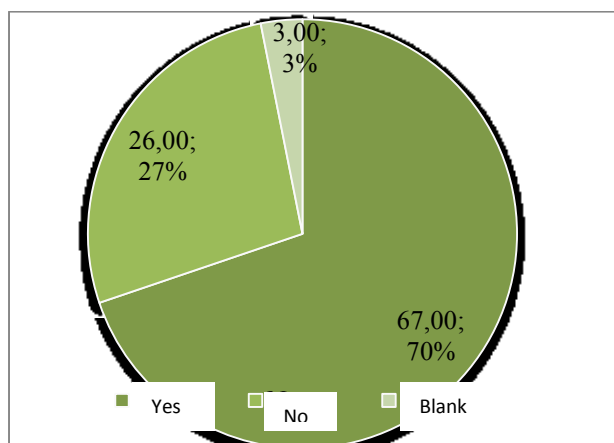
Out of the total of 56 subjects with accurate diagnosis, 15 (27%) of them did a skin test, 15 (27%) of them did a blood test, and 9 (16%) of them did both skin and blood test, while 17 (30%) of them were diagnosed based on symptoms without any additional tests. Types of test, i.e. way of diagnosing does not show any statistically significant difference (Chi-Square Test: $\chi^2 = 1,7629$, $p = 0,623037$; for $p < 0,05$).

In 55 cases (57%) the subjects allergic to food have family members with some allergy, which does not represent statistically significant

difference in relation to the group of subjects whose family members do not have allergies (Chi-Square Test: $\chi^2 = 1,0263$, $p = 0,311032$, for $p < 0,05$).

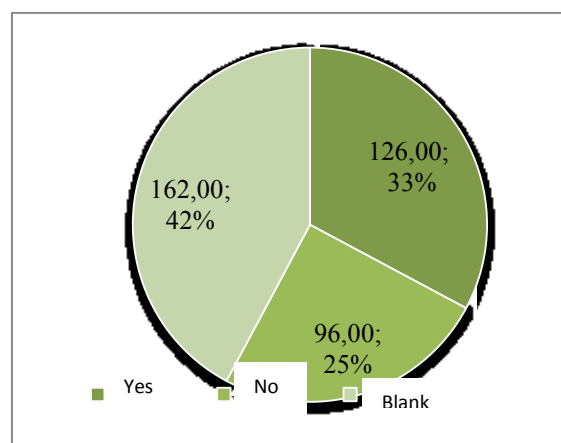
The subjects gave the following answers to the question related to whether they check the contents on food articles:

Chart 6. Structure of subjects according to the answer to the question: if you are allergic to food, do you check contents on declaration?



Declarations, i.e. ingredients in food items are checked by 70% of persons with food allergies, while that percentage is only 33% in subjects without food allergies. From the above-mentioned, we conclude that there is statistically significant difference in habits of reading declarations in allergic persons and those who

Chart 7. Structure of subjects according to the answer to the question: if you are not allergic to food, do you check contents on declaration?



are not allergic (Chi-Square Test: $\chi^2 = 60,3412$, $p < 0,00001$, for $p < 0,05$). The subjects with food allergies are not generally satisfied with allergen labelling (70% of cases), while 21% of subjects are satisfied with current situation, and 9% of them did not answer this question.

Table 2: Impact of allergies on life quality

Impact on life quality	Number of answers	Percentage
Insignificant	23	23,96
Existing but I manage to cope with it	34	35,42
Existing	14	14,58
I often have problems	13	13,54
I am always worried	10	10,42
Blank	2	2,08
	96	100,00

Regarding the question of impact of allergies on life quality, significant difference exists between individual categories of answers. Majority of subjects have problems, but they manage to cope with it (34 subjects, or 35,4%), while smallest number of answers (10 subjects or 10,4%) is related to category "I am always worried" ($\chi^2 = 40,915$, $p < 0,0001$, for $p \leq 0,05$).

DISCUSSION

The food allergy survey conducted in Sarajevo Canton comprised 480 subjects. Of the total number of subjects, 443 were adults or 92%, while those under the age of 18 were 37 or 8% (Chart 2). In the group of subjects, male persons were represented with 35% (168), and female persons with 65% (312) (Chart 1). Although there is significant difference in the number of females and males, this did not affect the survey results. There is no difference in the frequency of food allergies in terms of gender, and there is no significant allergic difference in gender in any of the studies available to us.

Out of 480 subjects, 244 (51%) of them reported having some form of allergy (pollen, house dust, hair, medicines, food, sun etc.), while 96 (20%) of them reported food allergies. Of the total number of allergy cases, the food appears as allergen to a significant extent in 39% of cases (Chart 6). Of the subjects allergic to food (total of 96), 49 (51%) of them have only food allergy, while the remaining 47 (49%) have also some other forms of allergies (Chart 7). In adults, the largest number of allergies is related to inhalation allergies and they develop as a consequence of IgE sensitivity to aeroallergens, with cross-reaction to food. Persons with allergy to pollen, latex, house dust and so on, have also cross-allergies to food of plant origin: fresh fruit, nuts and vegetable. Even 40% of adults allergic

to pollen also have allergy to food of plant origin [6]. Some other studies state that prevalence of allergies to food samples is conditioned by geographical position, socio-economic conditions and eating habits. It has been known for a long time that food allergy affects children more than adults. Based on these researches, prevalence of allergic reaction to food is about 5% in adults and 8% in children, and these numbers are still increasing. As possible risk factor, they mention gender, vitamin D insufficiency, malnutrition and obesity, increased hygiene, genetics, atopic diseases, increased use of antacids, exposure time to allergen and so on. The most common allergens in child population are cow milk (2,2%), peanut (1,8%) and nuts (1,7%), while in adult population, these are mollusks (1,9%), fruit (1,6%) and vegetables (1,3%) [7].

The allergic reaction may be result of consumption of food with allergen, inhalation of vapors or contact with such food. Reactions vary from mild symptoms, such as rash and burning sensation to very difficult conditions such as anaphylactic shock [8].

Patients allergic to pollen often have cross allergy so they feel oral and pharyngeal allergic symptoms while eating fresh fruit and vegetables [10].

In 2007, research of food allergies was conducted in children younger than 6 years of age in the area of city of Osijek, Republic of Croatia. The questionnaire was filled in by 810 parents, and the result obtained is that 5,4% of children are allergic to food. The most common causes of allergies are food additives, eggs, peanut and milk, and then honey, pesticides, fish and gluten. Conclusion of this research is that allergies develop in children in pre-school age (with high percentage of food additives as

allergy cause of nearly 41%), and that correct food labelling is of great importance due to a need to exclude dangerous foodstuff from nutrition [11]. Another research conducted in 2014 also in Republic of Croatia, Vukovar-Srijem Parish (General Parish Hospital) comprised infants 0-1 year and young children of 1-4 years. The research included 59 subjects suspected to have allergy to cow milk. After conducted testing, (determining specific IgE antibodies by standard immunofluorescent test), allergy was confirmed in 35,6% cases. Conclusion of the research is that allergy to cow milk is common in observed population, and that diagnosis is established relatively late. Higher percentage of allergy is established in boys of this age, as well as in children who live in villages [12].

In the Alergology Department of Clinic for Skin Diseases at University Clinical Center Tuzla, in 2009 and 2012, the patients (224 and 316 patients respectively) underwent intradermal testing. In the interval of just two years, significant increase of patients was observed and they were sensitized to specific allergens in food. As possible causes of increased number of cases of sensitivity, authors of the study mention changes of food allergenicity, lower standard of inhabitants and poor food quality, changes in eating habits and so on. In order to make more solid conclusions, it is necessary to conduct researches in longer period of time. According to data of this study, in the area of Tuzla Canton, in 2012, the most common positive food allergens were: vegetable (beans, peas and potatoes), mushrooms, flour, drinks (cocoa, coffee, green tea) and fruit [13].

Obtained results of food allergy prevalence in our research in the total number of subjects (20%) suggests that the problem of allergies in the Sarajevo Canton area is significant, and that the frequency is in the values which are characteristic also for other regions in Europe and the world. For example, in Great Britain, the percentage of persons (all ages) allergic to food is 20% (Young, 1994), in Germany, it is 34,9% (Zuberbier, 2004), in France, it is 3,24% (Kanny, 2001), in USA, it is 28% (Bock, 1987), in Holland, it is 12 % (Jansen, 1994), in Spain, it is 4,6 % (Woods, 2001), in Australia, it is 19,1% (Woods 2001), in Denmark, it is 13% (Osterballe 2005) etc. All presented data relate to self-reported cases, regardless of whether the subjects were diagnosed or not [7]. Research (Lee, 2017.) in Korea established that food allergy prevalence is

very individual; it is a result of impact of culture, age, ethnicity and eating habits [14]. Generally accepted opinion is that food allergy prevalence has been on the increase in the last decades, in particular in western countries, but high quality evidence based on a diagnosis confirmed by testing regarding food allergy which would support this presumption is lacking, due to high cost and potential risks related to conducting a food test in broader population [15].

With regard to the issue of allergens in our research, the largest number of subjects, as in most researches available to us, was allergic to milk and dairy products (19 cases), cereals and nuts (16 cases each), followed by eggs, mollusks, fish, crustaceans, fruits and other. Of 14 allergens defined by statutory regulation as allergens that have to be labeled, the subjects reported allergies to everything on this list, except for lupine, while some others were added (Table 1).

Of the allergens that are not on the list - fruits, vinegar, honey, yeast and food coloring were reported. Nearly 3% of subjects answered they were allergic to other foods (which are not on the priority allergens list), without mentioning exactly the foods they were allergic to. Given that about 3% of subjects mentioned the foods not listed on the list prescribed by law, there is a need to conduct research in the area of BiH which will provide more data on these allergens. The tests conducted in Europe show that the most commonly reported allergens (not listed) are as follows: vegetables and mostly peas, tomato, spinach, eggplants and carrots, followed by chocolate, garlic, honey, pork, black pepper, pickled cucumbers, cocoa, potato, sugar, chicken and beef. So, Zuberbier (Germany, 2004) reports on prevalence of 1,8% for vegetables, while other studies (Gelincik 2008, Turkey; Mustafayev 2012, Turkey; Osterballe 2005, Denmark; Venter 2008, Great Britain) show prevalence of less than 0,5% when it comes to other allergens [16].

The percentage of allergens reported by subjects in our survey is in the range which is defined as the average by individual studies. The European Academy of Allergy and Clinical Immunology (EAACI) Project: in 2014, the results of the study on the prevalence of food allergies in Europe by the EAACI expert group for food allergies, were published, and based on reviews of available studies conducted in the period from 2000-2012. Although the researchers dealt with very

heterogeneous studies, an overview of frequency of basic allergens was made. The most common allergy is to cow's milk, wheat, eggs, followed by nut products, according to subjects' statements, and confirmed by oral food test [17].

Studies conducted in Great Britain relate to different age groups of children younger than 15 years of age. Prevalence for self-reported cases is from 11-33%, while percentage of allergies confirmed by the test is significantly lower (1-5 %). The most common allergens are eggs, milk, wheat and peanut [18], [19]. There is a lot of data suggesting that food allergies are common (comprising up to 10% of population), and prevalence has increased during the last three decades, but it seems that it disproportionately comprises persons in industrialized/western regions. They are more common in children in comparison to adults [20].

Our survey showed that of 96 food allergy cases, 56 (58%) were diagnosed, while 40 (42%) were not diagnosed, which did not represent significant statistical difference.

According to the answers of subjects, allergic reactions occur most commonly within 15 minutes after consumption (or contact, i.e. inhalation of the smell) of food, and this happens in as many as 51% of cases; within 30 minutes it happens in 26% of cases. Of 96 subjects, who report food allergy, 29 (30%) stayed in hospital due to the allergy. Of 56 subjects who were diagnosed with allergy, 15 did skin test, 9 did blood test, 17 did both tests (skin and blood test), and 15 were diagnosed by a doctor based on the symptoms.

Based on the answers by subjects, it was concluded that all mentioned diagnostic methods were used, and statistically, there was no significant difference in listed tests regarding their use. Percentage of diagnosed allergies is 11,67% in relation to the total number of subjects (480).

Taking into consideration that allergy cases often occur in several family members, this survey shows the datum that in 55 cases persons with food allergy also have some other family members with some allergy, which does not represent significant statistical difference.

Persons with food allergy apply elimination diets, i.e. they avoid taking food items they are allergic to. That is why clear and easily legible labelings are much more important to them. The survey showed that. When asked whether they

read labeling on products, nearly 70% of subjects answered YES, while 33% of subjects without allergy gave that answer. Only 3 persons with allergy did not give answer to this question, nor 162 persons without allergy. When asked whether they are satisfied with allergen labeling on food products, of 96 persons with allergies, only 20 (21%) were satisfied, while 67 (70%) were not satisfied. Reasons of customers' dissatisfaction were not examined in this survey. Also an online survey conducted in Great Britain (Anaphylaxis Campaign, 2005 and 2006) with a similar question (the question was: How good or bad do you assess the current system of labeling for allergic persons?) showed the following similar results: very good 0,8%, pretty good 32,5%, fairly bad 39,1%, very bad 26,3% and I do not know 1,3%. The answers fairly bad and very bad together make up 65,4%, while in our survey this percentage is 70%. One of the conclusions of this research is that it would be much easier for consumers to make a decision if preventive warning was defined, as well as the way of preventive warning that all the manufacturers would use in the same way.

One of the most important projects implemented in order to collect the data on food allergies in Europe is the EuroPrevall (The Prevalence, Cost and Basis of Food Allergy across Europe) project. It was financed by EU, project implementation started in 2005, and it lasted nearly 5 years. 63 partners from 23 countries were involved in the project, as well as collaborators from North America, Australia, New Zealand and Africa. The researches were carried out in accordance with legally adopted list of allergens in that period, as well as with some new foods that proved to be important allergens in some European regions. Priority no. 1 was: eggs, milk, nuts (hazelnut), fish, mollusks, peanut, apple, peach and celery, while priority no. 2 was: kiwi, mustard, sesame, soy, walnut and wheat.

The results of the studies are highly dependent on the geographical area in which the research is conducted. Common allergens across Europe are: apples and hazelnuts, then peanut, peach, celery, fish and shrimps. The listed foods are the priority no. 1 in Europe. Milk and egg allergies occur exclusively in children. Priority no. 2 is: kiwi and nuts, with kiwi as a significant allergen in entire Europe. The food of 3rd priority includes: carrot (important allergen in Lithuania), tomato, water-melon and banana. There are also some new allergens on the list

that have not been considered a priority until now [21].

Prevalence of food allergies in Europe - European Food Safety Authority (EFSA) 2011, this project was conducted with similar goal in Europe; the goal was "Gathering references and overview of frequency of food allergy in Europe". The project done by EFSA in 2011 directed its activities to the following: 1. Overview of available scientific data on frequency of food allergies; 2. Determination of concentration threshold for each allergen (where possible); 3. Overview of available analytical methods for determination of food allergens.

A total of 7333 articles were gathered, and 92 of them were taken into consideration. Of that number, 52 are related to European countries: Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Sweden, Italy, Holland, Norway, Portugal, Spain, Turkey and Great Britain. The studies comprised different age groups in the population, different allergens, as well as various data gathering and diagnosing methods. Some allergens were examined in detail (for example: milk, peanut and fish), while for others very little information exist (lupine and celery). When it comes to research of individual allergens, many studies exist, but as far as frequency of allergies is concerned, very small number of studies is selected in which control diagnosing is conducted. By examination of gathered studies, 27 studies were observed which gathered data on other food allergens (which are not usual). Other reported allergens in Europe are mainly: vegetables such as peas, tomatoes, spinach, eggplants and carrots, then chocolate, garlic, honey, pork, black pepper, pickles, cocoa, potato, sugar, chicken and beef. There has also been reported certain number of allergens as a general term: colors, additives and juices. In other regions in the world, the following are reported as allergens: cassava, buckwheat, duck, monosodium glutamate etc. [22]. In the research by Corinne A. et al. 2018, authors recommend to avoid food containing allergens, although clinical practice changed in this view [23].

Since food allergies have a significant impact on the quality of life of an individual, as well as of his/her family, the last question of this survey was for the subjects to evaluate the impact of allergy on the quality of their lives. The subjects could evaluate the impact by means of 5 proposed answers, where the impact is graded

from "insignificant", then "it exists, but I manage to cope with it", "it exists", "I have problems often", to the worst scenario "I am always worried". The largest number of subjects evaluated that "the problem exists, but they manage to cope with it" (34 answers, i.e. 35,4%), and the smallest number of subjects answered "I am always worried" (10, i.e. 10,4%) (Table 2).

The concept of the quality of life may have different meanings and generally it encompasses many factors: freedom, security, financial opportunities, spiritual pleasure, health, quality of environment etc. The quality of life related to health (QLRH) was defined by the WHO in 1993 in the following way: QLRH is the individual perception of our life in the context of culture and value system in which we live, and in relation to our goals". QLRH may be defined in a variety of ways, and basically implies personal perception of health, including physical shape, psychological status, social and professional possibilities etc. [24].

The existing Food Allergen Labeling Guide is also being further worked on within European Commission, and it relates to allergen list in Annex II of Regulation on Provision of Food Information to Consumers [25].

Considering that BiH imports food, most frequently from EU countries or regional countries, it is important for consumers that Republic of Croatia and Republic of Slovenia, as EU Members, had to harmonize their legislation with EU regulations and directives. We are also interested in the legislation of Republic of Serbia, which, even though it is not in EU, like BiH, is trying to harmonize its legislation with EU regulations and directives on a regular basis. In Serbia is in force the Rulebook on "Declaration, Labeling and Marketing of Food" ("Official Gazette" RS No. 85/2013) which has introduced, since 2014, mandatory labeling of 14 allergens, so they are clearly distinguished from other ingredients [26].

CONCLUSION

Results obtained on food allergy prevalence in our research in total number of subjects, i.e. of 480 subjects, 96 (20%) of them indicate that problem of allergy in the area of Sarajevo Canton is significant, and frequency is within the values which are characteristic for other regions in Europe and worldwide.

List of reported allergens mainly corresponds to the list of obligatory allergens defined by law.

The most common allergens are dairy products (3,96%), cereals (3,33%), peanut (3,13%), nuts (3,33%), fish with mollusks and crustaceans (2,71%), then eggs (1,25%), soy (0,83%), mustard (0,63%), sulfur dioxide and sulfides (0,63%), celery (0,21%) and sesame (0,21%). The only allergen not mentioned by the subjects is lupine, the use of which is not traditional in BiH, but may be expected in imported products. 70% of persons allergic to food showed dissatisfaction by food labeling. This high percentage of dissatisfied consumers (who also have significant health problems) indicates the need to examine reasons for dissatisfaction, and to start initiatives for positive changes in accordance with consumer needs.

Considering that food allergies significantly impact life quality of individual as well as his entire family, and adequate treatment is non-existent, generally, this problem has to be solved in a way to provide, for the population, the best possible conditions in which they will be able to control themselves the type of food they consume.

EU and BiH food regulations have been analyzed, and in relation to food allergens. It is concluded that food regulations in BiH are harmonized with EU regulations on a regular basis, which is of great importance for persons allergic to food.

For food allergy related disorders there is no adequate therapy yet, so the only way is prevention, i.e. avoidance of allergens we are sensitive to.

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Enclosure 1: QUESTIONNAIRE – FOOD ALLERGENS

Remark: Please put X next to selected answers.

Please feel free to write at the end of questionnaire all that you consider to be important for your allergy.

The goal of survey is to determine frequency of food allergy in Sarajevo Canton. The data from survey are anonymous and will not be used for any other purposes.

1	Name and surname:		
2	Gender:	M	F
3	Year of birth:		
4	Do you have any allergy?	Yes No	
5	You are allergic to:	Food Medicines Pollen Sun Other _____	
6	Are you allergic to food?	Yes No	
7	Which foodstuff are you allergic to?	Cereals containing gluten Dairy products Eggs Peanut Nuts Fish Mollusks Crustaceans	Soy Sesame seed Mustard Celery Lupine Sulfur dioxide and sulphites Other, mention _____
8	How long does it take from allergen intake to occurrence of allergy symptoms?	Up to 15 min Up to 30 min Up to 60 min Longer _____	
9	Have you been in hospital due to food allergy?	Yes No	
10	Have you been diagnosed allergy to some food by any method?	Yes No	
11	In which way were you diagnosed food allergy?	Skin test Blood test Diagnosis by doctor based on your symptoms	
12	Do other members of your family have any type of allergy?	Yes No	
13	If you are allergic to food, do you check contents on food articles?	Yes No	
14	If you are not allergic, do you check contents on food articles?	Yes No	
15	Are you satisfied with allergen labeling on declaration?	Yes No	
16	Using scale 1-5, please describe to which extent allergy impacts quality of your life	Insignificant; Existing but I manage to cope with it; Existing; Often I have problems; I am always worried because of it	
Other remarks:			