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*Original research paper*

# HYPERSENSITIVITY TO CERTAIN FOOD AND FOOD INGREDIENTS IN THE FUNCTION OF AGE AND EMPLOYMENT OF CUSTOMERS ON A CRUISE SHIP

Nikola D. Vuksanović[1]*, Jovanka V. Popov Raljić[2], Milijanko J. Portić[2], Darko I. Dragičević[3]

[1]Higher Education School for Management and Business Communication, 21205 Sremski Karlovci, Mitropolita Stratimirovića 110, Serbia
[2]University of Novi Sad, Faculty of Sciences, Department of Geography, Tourism and Hotel Management, 21000 Novi Sad, Trg Dositeja Obradovića 3, Serbia
[3]Hospitality and Tourism School, 11000 Belgrade, Jug Bogdana 28, Serbia

*Corresponding author:
Phone: +381631968770
E-mail address: vuksanovicnikola@yahoo.com

**ABSTRACT:** Over the last few decades there has been a tendency to use the word "allergy" to describe all kinds of unexpected reactions to certain foods and food ingredients. The recent literature is plentiful and discusses food allergens and people who are hypersensitive to certain foods. The literature suggests the prevalence of food allergy to specific allergens to be changing with age.
The aim of this empirical research was to examine the hypersensitivity to certain foods in relation to age and employment of the population consisting of customers on cruise ships. The study included 404 tourists on a cruise ship who voluntarily filled food sensitivity questionnaires and submitted them to the ship staff. These questionnaires were used to analyze the allergy trends and their connection to age and employment. The procedures of descriptive statistics and Chi-square test were used to process the obtained data. The results of the research suggested that there was a statistically significant relationship between the persons who were hypersensitive to certain foods relative to employment and age.

**Key words:** *hypersensitivity, tourist, food ingredients, food allergy, prevalence, river cruises*

## INTRODUCTION

The content of food ingredients in food is constantly changing. Some of the changes are desirable, leading to the creation of desirable characteristics, while others are undesirable. The term "food allergy" is used to describe the negative response of the immune system to the intake of certain foods (Johansson et al., 2004); namely food ingredients that have harmful effects on human body. In the last few decades there has been an increase in the prevalence of food allergies in children and adults. Food allergies can include a spectrum of disorders, with symptoms usually being gastrointestinal or respiratory (Yun and Katelaris, 2009).

Meler and Cerović (2003) pointed out that expenditures for food and drinks account for one third of the total tourist spending in global tourism revenues. They add that tourists, regardless of the reason for visiting a particular destination, naturally must satisfy their food needs.

Considering that companies in the tourism industry depend on their costumers, taking good care of them is one of the fundamental principles in the operation of suc-

cessful companies. Consequently, health problems in tourism are getting more and more attention from the tourism industry (MacLaurin, 2001). The World Health Organization (FAO/WHO, 2001) lists key risks to which a tourist may be exposed to while traveling and food safety is one of them. Food safety is defined as an assurance that the food will not cause harm to the costumer – tourist when it is prepared or consumed according to its intended use (Unusan, 2007). Currently, the quality and the safety of food are expressed through the nutrition of patients program (Lazarides, 2009). The allergens in foods, and certain food ingredients, have a harmful effects reaction on human health (Johansson et al., 2001; Stanković, 2008; Boné et al., 2009). Godwin et al. (2005) state that food quality and safety are essential elements in human nutrition, making them a very important factor which affects the customer retentions and safety at tourist destinations (Unusan, 2007).

More specifically, the research indicates a difference in incidence of food allergies depending on age. Studies point out that up to 4% of adults and 8% of children (under the age of three) are intolerant to certain foods (Muñoz-Furlong et al., 2004; Branum and Lukacs, 2008). However, although consistent with this research, self-reported allergies tend to have significantly higher incidence than actual, medically-tested allergies (Woods et al., 2002; Rona et al., 2007).

Allergy is one of the most common diseases of the modern society. More than 25% of population in industrialized countries believes they suffer from allergies in one way or another (Valenta, 2002). Food allergy represents altered, hypersensitive state of the immune system and an adverse reaction to certain foods or food ingredients in some people or populations. The main role of the immune system in the human body is to defend the body from all that is foreign and potentially harmful. However, sometimes the immune system identifies certain food components as foreign and reacts accordingly, causing immune reaction. The ingredients of food and its components which trigger the immune system are called allergens (Kumawat and Jha, 2011).

Many different types of foods have been identified as allergens for people. However, the lack of information about allergic reactions to certain foods and food ingredients can sometimes cause unnecessary avoidance of food or an unexpected adverse reaction to an allergen. The current state of scientific knowledge about some of the most common food ingredients is discussed below.

**The allergens in nutrition**

According to Jackson (2003), substances that cause allergies are called allergens and are divided into several groups in relation to the way in which the human organism comes into contact with them. Accordingly, these are food allergens which impact the nutrition of tourists at every level of preparation, production and distribution of food at a tourist destination.

Johansson et al. (2001) and Stanković (2008) point out that an allergic reaction to food, in a small number of sensitive persons, can be divided into the psychological reactions of intolerance (aversion, etc.) and on the real physiological hypersensitivity reactions to certain foods or food ingredients. Physiological reactions can be particularly difficult if accompanied with anxiety or panic states. Some people attribute their aversion to certain foods to medical problems, as well (Muñoz et al., 2004; Yun and Katelaris 2009; Boné et al., 2009; Sicherer et al., 2010; Kumawat and Jha, 2011; Wigand et al., 2012).

**Foods that most commonly cause allergic reactions**

Foods that most commonly cause allergy are cow's milk, fish, crustaceans and shellfish, wheat, soy, peanuts, walnuts, almonds, hazelnuts and strawberries (Directive 2000/13/EC; Directive 2003/89/EC; Cheftel, 2005; Pálfi and Barna, 2010; Kumawat and Jha, 2011). Yun and Katelaris (2009) reported that about 90% of allergic reactions to food among adults are caused by peanuts, nuts, fish and shellfish; among children they are caused by eggs, milk, soy and flour (Radauer et al., 2008; Sicherer et al., 2010). Food allergies are often caused by food additives, mainly by

preservatives and colours (Directive 2000/13/EC; Directive 2003/89/EC; Cheftel, 2005). Some of these substances are: sodium benzoate, color tartrazine (yellow colored drinks, sweets, etc.) and sweetener aspartame (Sicherer and Sampson, 2010).

In addition to the aforementioned examples, there are other foods containing allergens which cause allergic reactions. There is an increasing number of cases of allergy to meat (beef, veal, lamb, chicken and horsemeat), grains (rice, which is otherwise used as food for hypersensitive persons), gluten-containing cereals (avoidance of gluten from wheat, rye, barley, and related cereals) (Sicherer and Sampson, 2010), vegetables (Swiss chard, celery, carrot and parsley), fruits (apricots, peaches, watermelons, grapes, plums, pears, apples) (Pálfi and Barna, 2010) and wine (Wigand et al., 2012). Additionally, there has been an increase of reactions to freshwater fish, cocoa and coffee (Sicherer and Sampson, 2010). Also, it is often unclear whether it is the food that causes the allergic reaction or the products which were used to treat the plants and the soil where they grew.

Since part of this research is intolerance to gluten, seafood, nuts, lactose and diabetes, the following paper will present some of the research. Gluten intolerance is accepted by medicine as a disease known as celiac disease. The term means a permanent disorder caused by reaction to gluten, i.e. proteins present in flour from wheat, rye and barley (Radlović et al., 2005). Several grains and starch sources that are considered acceptable for food without gluten include corn, potatoes, rice and tapioca (derived from cassava) commonly used (Pálfi and Barna, 2010). It was found that some people can react very strongly even in contact with a small amount of allergen. When it comes to lactose intolerance research suggests that 1 mg - 6 g protein of cow's milk can cause a reaction (Jackson, 2003). The fact that the hypersensitive person cannot digest lactose does not mean they should not drink milk. Today, the market can find a substitute for enzymes, such as tablets or drops of lactase, and the milk without the lactase. Approximately 50% of patients who are allergic to cow's milk are also allergic to goat's milk. Bjelaković et al. (2005) pointed out diabetes mellitus or diabetic chronic incurable systemic metabolic disorder, which is characterized by hyperglycemia i.e. sustained elevated levels of glucose in the blood. WHO and FAO (2001) indicate that on average three out of four shrimps are sufficient to cause a reaction in people sensitive to seafood. Studies of Bone et al. (2009) showed that after the nuts, seafood is the next most common cause of severe allergic reactions (anaphylaxis). Some people are allergic to seafood but do not show sensitivity to shellfish and vice versa. Approximately one gram of fish or a few milligrams of fish protein can cause allergic reactions. According to Sicherer and Sampson (2010) 15% of people with allergies to seafood can respond to vapor and odors produced during cooking (especially barbecue).

Sicherer et al. (2010) point out the consumption of only 30 g of nuts a day is enough to reduce the risk of diabetes and heart disease. Many people show sensitivity to peanuts but not peanut oil, i.e. refined peanut oil has a lower threshold of risk for allergies. According to Yun and Katelaris (2009), walnuts, chestnuts, almonds, peanuts, hazelnuts, pistachios and many flavors belong to the group of nuts. These fruits are an inevitable part of the human diet, not just as a snack or additive. They contribute to heart and cardiovascular system functioning properly, and are rich in the important omega-3 fatty acids, vitamins and minerals and with respect to the caloric value they are a source of energy. Major food allergens share a number of common features; they are water-soluble glycoproteins, 10 to 70 kDa in size, relatively stable to heat, acid, and proteases (Sicherer et al., 2010).

Yun and Katelaris (2009) highlighted that the hypersensitivity to certain foods requires special diet regime. Safe nutrition, free of allergens, is very difficult to enforce because the allergens and allergic symptoms are very diverse. Information on products free of allergens is part of food safety. The EU Directive 2000/13/EC (Directive 2003/89/EC – modified) issues

mandatory labeling of the presence of 14 most important nutritional allergens, which include gluten, eggs, fish, peanuts, soybeans, milk, nuts, celery, mustard, sesame seeds, sulphur dioxide, lupin, and molluscs. In Serbia, the presence of allergens is also regulated by the ordinance declarations, labeling and advertising of foods (Pravilnik o deklarisanju, označavanju i reklamiranju hrane, 2013).

In the United States of America a simple replacement of terms, such as "milk" into "lactose" and "lactose free", in order to point consumers on the regulated allergens is applied (Sicherer and Sampson, 2010). Therefore properly written and visible content information gives the consumer all the information about the food and the choice according to their needs. The education of consumers implies avoiding and greater attention when purchasing a product by visible declarations with correctly labeled regulated allergens. Based on previous considerations, it is possible to adapt the tourist offer by creating menus in relation to certain foods and correct labeling.

Clinical experience in the UK, Europe and North America suggests that a relatively small number of foods and food products are responsible for most cases of food allergy. In approximate order of frequency, they are as follows: a) in children - cow's milk, egg, soy, peanut, tree nuts, fish and crustaceans; b) in adults - peanut, tree nuts, crustaceans, fish and egg (Jackson, 2003). Previous studies suggested that the respondents were divided into two groups: children (under 18 years) and adults (over 18 years) (Sicherer and Sampson, 2010; Sicherer et al., 2010).

A case study, conducted in the USA, pointed out that up to 4% of adults and 8% of children (under the age of three) are intolerant to certain foods (Muñoz-Furlong et al., 2004; Branum and Lukacs, 2008). Sicherer and Sampson (2010) pointed out that the incidence of food allergy is 3-4% of adult population and 5% of children population in western countries, while Boné et al. (2009) suggested the tendency to suffer from allergies was hereditary and around 30% of population was prone to these disorders, while it manifested in about 20% of them.

Woods et al. (2002) and Rona et al. (2007) pointed out that 25% of adults believe that they or their children are intolerant to food, however, the actual prevalence is much lower – about 5-8% of children and 1-2% of adults are fairly intolerant to some foods.

A study conducted by Muñoz - Furlong et al. (2004) showed the results where respondents were adults. In particular, the research groups of respondents participated were 41 - 60 years and 61 years and over. Namely, in the first group of 3604 respondents, 19 were allergic to fish and 110 were allergic to seafood while in the second group of 1876 respondents 5 were allergic to fish and 49 were allergic to seafood. In a similar survey related to nut allergy (Sicherer et al., 2010), in the first group of 3548 respondents, 48 were allergic to nuts, while in the second group of 3091 respondents, 29 were allergic to nuts.

Although the incidence of allergies remains constant throughout the body of literature, for both children and adults, a significant difference is noted when allergies are self-reported, as the number of allergy-sufferers increases by 4% at its highest estimate to 25% of the general population. The literature pointed out that depending on the methods used to identify allergies, the results can vary greatly (Woods et al., 2002; Rona et al., 2007). While many individuals believe and claim they suffer from allergies, when tested medically, a large majority of them is proven not have any allergic reactions.

The aim of this research was to empirically test the hypothesis that age and employment status are factors in frequency of presence of allergies. While the literature on the relationship of the employment status and allergies is scarce, the authors extrapolated hypotheses from the existing data. Given the older generations' allergy incidence is lower, the authors constructed a hypothesis stating retired persons will have the lowest incidence of allergies. Additionally, the authors were curious to see the effect of employment versus un-

employment had on allergies, as the existing literature made any extrapolations impossible.

Bearing in mind the previous theoretical considerations, the aim of this empirical research was to examine the relationship of age and employment status in relation to incidence of allergies in the population consisting of customers of cruise ships. There are two affirmative hypothesis set up in this paper on the basis of which following is stated:

$H_1$ – There is a statistically significant relationship between the age of a person and their hypersensitivity to certain foods,

$H_2$ – There is a statistically significant relationship between the employment status of a person and their hypersensitivity to certain foods.

## MATERIALS AND METHODS

The population for this research included 404 customers from 3 different cruise ships during the expedition called "The Great Rivers of Europe" going from Amsterdam to Vienna which was organized by the "Grand Circle Corporation" (Boston, USA) during 2012. Descriptive analysis of the population is provided below in the Results section of this article. The "Grand Circle Corporation" targets customers who are domestic, Americans in this case, over the age of 50 (Grand Circle Cruise Line, 2012). Due to the population in this research consisted mainly of the elderly, it did not represent the general population and the results of this research cannot be applied to the general population. However, the population in question was representative of the target customers for tourist cruises and other tourist arrangements in general.

When making the reservation for the cruise, the customers were asked to submit their answers to a questionnaire listing their nutritional requirements. The participation was purely voluntary. The questionnaire included the following questions: gender, age, employment status (employed, unemployed or retired) and hypersensitivity to certain foods (intolerance to: lactose, gluten, nuts, seafood, being a diabetic, or not having any dietary preferences). These questionnaires were used for the catering purposes during the cruise. The principal researcher was given a permission to access the anonymised questionnaires by the cruise organizer "Grand Circle Corporation" for the purpose of conducting an academic research. The subjects in the research – the cruise ship customers – were not informed their data was being used in an academic research, as the data was obtained *post hoc* and it was anonymised. As there was no direct interaction with human subjects during the research, no special ethics permissions were needed.

### Statistical data processing

The statistical analysis was carried out using the Statistical Package for Social Science (SPSS) version 19.0. The methods of descriptive statistics used were relative numbers and percentages. Before selecting the statistical procedure for testing the significance of the differences, Kolmogorov-Smirnov, normality test of results distribution, was applied. It was shown that the test results were not distributed according to the normal distribution. Therefore, non-parametric statistical procedures were applied.

Chi-square test examines the relationship between two categorical variables (two or more categories) and it is used to test deviations of obtained (empirical) frequencies from some of the expected (theoretical) values. The test examined whether the subjects that were hypersensitive to certain foods were equally represented in various age groups. Furthermore, the same test was used to compare the distribution of subjects hypersensitive to certain foods in relation to employment status.

## RESULTS

The gender structure of the respondents showed there were more males than females. The largest number of respondents was retired. Age-wise, the largest number of customers was in the group of 70 and over, while there was the smallest number of respondents in the age group of up to 19 years.

It was examined whether and to what extent were the scores on the age and allergy scale associated. The Chi-square test was conducted. Based on the value of Chi-square, authors concluded the deviations of obtained data from the expected theoretical data was significant at $p = 0.01$, $df = 30$, $X^2 = 176.049$ (Table 2). This implies that the same results could be obtained from a similar sample regardless of its overall size. Based on the obtained results, the first hypothesis which stated that there was a statistically significant relationship between subjects that were hypersensitive to certain foods and age, was confirmed.

Based on crosstabulation, it was concluded that the largest number of subjects in the age group of 70 and over did not have any allergies, which showed that there were some empirical deviations from the expected values. Also, in this age group, there were empirical deviations from the expected values in all the hypersensitivity groups except in the group of lactose intolerance (Table 3). Slightly higher number of empirical deviations from theoretical could be observed in diabetic patients (in the age group to 19 years), followed by subjects aged 20 to 29 (nuts and seafood) and diabetic patients in the age group from 30 to 39 years. Minimum number of empirical deviations from the expected values was in the age groups from 40 to 49 and from 50 to 59 years. The reasons for these deviations will be presented in the discussion below. Based on the size of Chi-square, the deviations of obtained data from the expected values were significant at $p = 0.01$; $df = 30$; $X^2 = 127.040$ (Table 4), it was concluded that the same allocation of results could be obtained on a similar sample regardless of its overall size. Based on the obtained results, the second hypothesis which stated that there was a statistically significant relationship between persons' employment status and their hypersensitivity to certain foods, was confirmed. The empirical deviations from the expected value in the group of retirees who did not suffer allergies are evident in Table 5. In the retired group there was a distinct deviation in diabetic patients. Minimum number of empirical deviations from the expected value was among the unemployed (nuts and seafood). In the employed group, the highest empirical deviation from the expected was in diabetic patients.

**Table 1.**
Descriptive analysis of the population

| Variables | Category | Number of respondents | Percent of respondents |
|---|---|---|---|
| **Gender** | Male | 203 | 50.2 |
| | Female | 201 | 49.8 |
| Total | | 404 | 100 |
| **Age** | To 19 | 8 | 2.0 |
| | 20 – 29 | 19 | 4.7 |
| | 30 – 39 | 19 | 4.7 |
| | 40 – 49 | 24 | 5.9 |
| | 50 – 59 | 24 | 5.9 |
| | 60 – 69 | 33 | 8.2 |
| | 70 and over | 277 | 68.6 |
| Total | | 404 | 100 |
| **Employment status** | Employed | 73 | 18.1 |
| | Unemployed | 33 | 8.2 |
| | Retired | 298 | 73.8 |
| Total | | 404 | 100 |
| **Hypersensitivity to certain foods** | Lactose intolerant | 25 | 6.2 |
| | Gluten intolerant | 16 | 4.0 |
| | Nuts | 14 | 3.5 |
| | Seafood | 14 | 3.5 |
| | Diabetic | 22 | 5.4 |
| | No allergies | 313 | 77.5 |
| Total | | 404 | 100 |

**Table 2.**
Chi-square tests (age and allergies)

| | Value | df | Asymp. sig. (2-sided) |
|---|---|---|---|
| **Pearson Chi-square** | 176.049[a] | 30 | .000 |
| **Likelihood Ratio** | 155.438 | 30 | .000 |
| **Linear-by-Linear Association** | 62.939 | 1 | .000 |
| **N of Valid Cases** | 404 | | |

[a] *30 cells (71.4%) have expected count less than 5. The minimum expected count is 0.28*

**Table 3.**
Crosstabulation – age and allergies

| | | | **Hypersensitivity to certain foods and food ingredients** | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | **Not allergic** | **Lactose intolerant** | **Gluten intolerant** | **Nuts** | **Seafood** | **Diabetic** | **Total** |
| **Age** | **To 19** | * | 5 | 0 | 1 | 0 | 0 | **2** | 8 |
| | | ** | 6.2 | 0.5 | 0.3 | 0.3 | 0.3 | **0.4** | 8.0 |
| | **20 – 29** | * | 10 | 2 | 2 | **2** | **2** | 1 | 19 |
| | | ** | 14.7 | 1.2 | 0.8 | **0.7** | **0.7** | 1.0 | 19.0 |
| | **30 – 39** | * | 8 | 3 | 2 | 2 | 1 | **3** | 19 |
| | | ** | 14.7 | 1.2 | 0.8 | 0.7 | 0.7 | **1.0** | 19.0 |
| | **40 – 49** | * | 4 | 7 | 4 | 3 | 1 | 5 | 24 |
| | | ** | 18.6 | 1.5 | 1.0 | 0.8 | 0.8 | 1.3 | 24.0 |
| | **50 – 59** | * | 10 | 5 | 1 | 3 | 2 | 3 | 24 |
| | | ** | 18.6 | 1.5 | 1.0 | 0.8 | 0.8 | 1.3 | 24.0 |
| | **60 – 69** | * | 16 | 4 | 4 | 1 | 4 | 4 | 33 |
| | | ** | 25.6 | 2.0 | 1.3 | 1.1 | 1.1 | 1.8 | 33.0 |
| | **70+** | * | **260** | 4 | **2** | **3** | **4** | **4** | 277 |
| | | ** | **214.6** | 17.1 | **11.0** | **9.6** | **9.6** | **15.1** | 277.0 |
| **Total** | | * | 313 | 25 | 16 | 14 | 14 | 22 | 404 |
| | | ** | 313.0 | 25.0 | 16.0 | 14.0 | 14.0 | 22.0 | 404.0 |

** count; ** expected count*

**Table 4.**
Chi-square tests (employment and allergies)

| | **Value** | **Df** | **Asymp. sig. (2-sided)** |
|---|---|---|---|
| **Pearson Chi-square** | 127.040[a] | 10 | 0.000 |
| **Likelihood Ratio** | 114.776 | 10 | 0.000 |
| **Linear-by-Linear Association** | 75.408 | 1 | 0.000 |
| **N of Valid Cases** | 404 | | |

[a] *10 cells (55.6%) have expected count less than 5. The minimum expected count is 1.14*

**Table 5.**
Cross-tabulation (employment and allergies)

| | | | **Hypersensitivity to certain foods and food ingredients** | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | **Not allergic** | **Lactose intolerant** | **Glutem intolerant** | **Nuts** | **Seafood** | **Diabetic** | **Total** |
| **Employment** | **Employed** | * | 25 | 16 | 7 | 8 | 6 | **11** | 73 |
| | | ** | 56.6 | 4.5 | 2.9 | 2.5 | 2.5 | **4.0** | 73.0 |
| | **Unemployed** | * | 17 | 5 | 3 | **2** | **2** | 4 | 33 |
| | | ** | 25.6 | 2.0 | 1.3 | **1.1** | **1.1** | 1.8 | 33.0 |
| | **Retired** | * | **271** | 4 | 6 | 4 | 6 | **7** | 298 |
| | | ** | **230.9** | 18.4 | 11.8 | 10.3 | 10.3 | **16.2** | 298.0 |
| **Total** | | * | 313 | 25 | 16 | 14 | 14 | 22 | 404 |
| | | ** | 313.0 | 25. | 16.0 | 14.0 | 14.0 | 22.0 | 404.0 |

** count; ** expected count*

## DISCUSSION

The results of the research suggested that the largest empirical deviations from the expected values existed in the group of retirees who did not suffer from allergies. Additionally, the largest number of persons who were not allergic could be found in the age group of 70 and over, which was congruent with the findings on employment. The smallest number of hypersensitive persons was in the age groups 40 to 49 and 50 to 59, i.e. the empirical deviations from the expected values were lowest in these groups. Based on the results and confirmed hypothesis, it can be concluded that the same allocation of results could be obtained from a similar sample regardless of its overall size.

This kind of research should be conducted periodically as it can provide an insight into the needs of customers. This information can be used as a basis for making decisions aimed at improving the culinary practice on ships.

Future research should take into account other individual characteristics of customers, such as education, marital status or religion in order to determine whether they correlate with incidence of allergies. In addition, the future research could involve repeated studies in different setting in order to compare the results. Caution should be exercised when choosing the experiment setting, as certain environments, like the cruise boat in the case of this research, did not represent the general population. As such, the results produced under such conditions cannot be applied generally.

## CONCLUSION

The research indicated that there was a statistically significant relationship between subjects that were hypersensitive to certain food in relation to employment status and age. Older, and therefore retired, clientele in general suffered fewer allergies than younger population. Consequently, in absence of nutritional information for a particular set of customers, the caterers may use the age of their customers as a predictor of their likelihood to suffer from allergies. However, the priority must remain to obtain allergy-related information for each particular set of clientele.

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# ПРЕОСЕТЉИВОСТ НА ОДРЕЂЕНУ ХРАНУ И НАМИРНИЦЕ У ЗАВИСНОСТИ ОД СТАРОСТИ И ЗАПОСЛЕЊА ГОСТИЈУ НА ТУРИСТИЧКИМ БРОДОВИМА

Никола Д. Вуксановић*[1], Јованка В. Попов Раљић[2], Милијанко Ј. Портић[2], Дарко И. Драгичевић[3]

[1]Висока школа струковних студија за менаџмент и пословне комуникације, 21205 Сремски Карловци, Митрополита Стратимировића 110, Србија
[2]Универзитет у Новом Саду, Природно-математички факултет, Департман за географију, туризам и хотелијерство, 21000 Нови Сад, Трг Доситеја Обрадовића 3, Србија
[3]Угоститељско - туристичка школа, 11000 Београд, Југ Богдана 28, Србија

**Сажетак:** Током последњих неколико деценија постоји тенденција да се користи реч "алергија" која описује све врсте неочекиваних реакција на одређене намирнице и прехрамбене састојке. Новијих литературних података у којима се разматрају алергени и људи који су преосетљиви на одређене намирнице има у изобиљу. У литератури се указује да се преваленција алергије на специфичне алергене у храни мења са годинама старости.
Циљ овог истраживања био је да се емпиријски испита преосетљивост посматране популације на одређене намирнице у односу на старост и статус запослености. Студија је обухватила 404 туриста на крстарењу који су добровољно испунили упитнике о осетљивости на одређену храну и доставили их особљу брода. Ови упитници су коришћени за анализу трендова алергије и њихову везу са узрастом и статусом запослености. Поступци дескриптивне статистике и хи-квадрат теста су коришћени за обраду добијених података. Резултати истраживања су указали да постоји статистички значајна веза између особа које су преосетљиве на одређене намирнице у односу на запошљавање и старост.

**Кључне речи:** преосетљивост, туристи, састојци хране, алергија на храну, преваленција, туристички бродови

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