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CONSUMERS´ AWARENESS OF FOOD SAFETY

Ľudmila Nagyová, Alexandra Andocsová, Andrej Géci, Peter Zajác, Jozef Palkovič, Ingrida Košičiarová, Jozef Golian

ABSTRACT
Eating food is one of the most important needs of every person, so their safety and quality should be crucial for everyone. People expect, that food they eat is hygienically and health safe. Unfortunately, people usually start to focus on food safety only when various food scandals are exposed and it is too late. Mass consumption of food is the cause of a high risk to human health, but only in the case of harmful food. Food-borne diseases are a common and widespread phenomenon in all parts of the world, regardless of the economic development of the country. Protection of human, animal and plant health is one of the main economic priorities of each country. The political objective of the European Union is therefore to ensure that European Union citizens have access to safe and nutritious foods, so it must meet strict safety standards. In ensuring food safety, it is necessary to take into account all aspects of the food production chain as a whole, because each subject can have a potential impact on food safety. This paper deals with the issues of food safety and food quality. The main objective was to find out how consumers perceive higher quality food and whether they read information included on the food packaging. Primary data were obtained from a survey that was conducted on the sample of 478 respondents living in Slovakia. For a deeper analysis, several assumptions, which were verified by Friedman Test, Chi-Square Test of Independence, Wilcoxon Signed-Rank Test, were formulated. The survey has found out that 84% of respondents buy higher quality food and 60% purchase them because of health-related reasons. More than half of respondents search for the information about food safety on the Internet and the same percentage considere government as the most reliable source of information about food safety. Unfortunately, just more than one quarter of them read the information on food label and for 34% is this information unsufficient.

Keywords: Food; Product Packaging; Food Safety; Consumer; National Mark

INTRODUCTION
Food safety is undoubtedly one of the major global concerns that human beings have to confront and are continuously fighting for **(Lv et al., 2018)**. The world will need to feed around 9 billion people by the year 2050 and to do so through safe sustainable food chains **(Godfrai et al., 2010)**. Nowadays billions of people in the world are at risk of unsafe food. Many millions become sick while hundreds of thousands die every year because they consume unsafe food. Therefore, safe food saves lives and it also enhances individual and population health **(Fung et al., 2018)**.

Originally, the term "food safety" was used to describe whether a country had access to enough food to meet dietary energy requirements **(Pinstrup-Andersen, 2009)**. Now food safety is defined as the degree of confidence that food will not cause harm or sickness to the consumer when it is prepared, served and eaten according to its intended use **(WHO, 2003)**. Causes of food contamination, that can cause adverse effects in humans if consumed, could be classified into one of the three following groups – biological hazards (e.g. bacteria, viruses), chemical hazards (e.g. veterinary drug residues, disinfectants), or physical hazards (e.g. plastic, metal, bone) **(FSA, 2009)**. Certain groups of people are susceptible to foodborne disease more than others. Especially vulnerable groups are children or people who suffer chronic illnesses **(Socas-Rodríguez et al., 2017)**. Most of the population will surely get over soon, but these groups can have a long-term effect which can be serious in some cases and lead to a final death of the consumer, especially with certain bacteria infections (**U.S. Department of Health & Human Services, 2018**). The most foodborne disease outbreaks occur at home, restaurants, and/or at social functions, so food safety awareness and education should be emphasized and encouraged among citizens **(Stratev et al., 2017)**. The global food sector operates in an environment where policies, standards, regulations, guidelines, education and advice relating to food, including those related to the safety of food, are continuously being either developed or updated **(King et al., 2017)**. Scientific risk assessment is the basis for legislative development. Based on the Regulation no.178/2002 of the European Parliament and of

the European Council, the European Food Safety Authority (EFSA) was established **(Bírošová and Kačenová, 2010)**. EFSA is an independent agency of the European Union. It´s main role as stated in its founding regulations is to provide independent scientific advice and perform risk assessment and communication on food and feed safety topics to support risk managers at EU level, including EC, European Parliament, and EU Member States **(Regulation (EC) No 178/2002)**. Governments in many countries are fighting for safe food too. They have established new institutions, standards, and methods for regulating food safety and have increased their investments in hazard control systems (e.g. good agricultural practices (GAP), good manufacturing practices (GMP), good hygiene practice (GHP), hazard analysis and critical control point (HACCP) facilities **(Liu et al., 2015; Kecskes-Nagy et al., 2016; Korzenszky et al., 2013)**. Animal welfare is an important condition for obtaining high-quality and safe food in many states too **(Adámková et al., 2017)**.

Food safety is the responsibility of every person involved in the food supply chain from farm to the end users in assuring the safety and quality of the food **(New et al., 2017)**. Detection of food contaminants has been attracting remarkable attention in last decade, which ensures the governments and customers to recognize whether the food is safe **(Cocolin et al., 2011)**. As a result, regulators, producers, and retailers alike are trying to regain consumers' confidence by redesigning legislation and quality-assurance programs. These efforts can only succeed in restoring consumers' confidence if new standards of process and product attributes are successfully communicated. Product labeling is one way to accomplish such communication **(Roosen, 2003).** In Slovak Republic, Značka kvality SK is the guarantee of the highest quality of agricultural and food products. It informs consumers that every product labelled with the logo of the Značka kvality SK, has fulfilled the requirements placed on the granting thereof, complied declared technological process and higher quality parameters. Therefore, these products are clearly different from competing products **(MP SR, 2009)**. When it comes to food, nonfood, specific products or services, they can carry prestigious logo Slovak Gold, which in a simple visual form informs that the quality of the product has been professionally verified and confirmed by independent, non-state authority, thereby it protects consumers from problematic production of all sorts of origins.

Scientific hypothesis

Hypothesis No. 1: We assume that most respondents do not buy high quality food.

Hypothesis No. 2: We expect that most consumers search for the information about the food safety on the Internet.

Hypothesis No. 3: We assume that more women than men know the national label for quality agricultural products "Značka kvality SK".

Hypothesis no. 4: We assume that fewer men than women know the product certification system "Slovak gold".

MATERIAL AND METHODOLOGY

The main aim of the present paper is to examine consumers´ awareness of food safety and the relationship between consumers and food quality. In order to meet the stated objective, a questionnaire survey was conducted in the territory of the Slovak Republic in the months of January – March 2018, involving 478 respondents of different age categories. Secondary informations were obtained from the information available to the public as well as from scientific and professional publications of domestic and foreign authors dealing with the given issues. Questions in the questionnaire were divided into two groups - nine classification questions and 16 questions related to the food quality. Potential respondents have received the questionnaire in a paper form. After completing, all correctly filled questionnaires were transformed into the Google Forms internet application.

Statisic analysis

Primarily, the information obtained through the questionnaire survey was processed out by the statistical methods of Friedman´s test, which is a non-parametric alternative to the repeated measures ANOVA where the assumption of normality is not acceptable. Usually it is used in case of ordinal dependent variable. This occurs especially in case of questioner survey, when each respondent assesses more than two products using the same scale. In case of Friedman´s test applications should be met following conditions: One group that is measured on three or more different occasions - group is a random sample from the population, dependent variable should be measured at the ordinal or continuous level and samples do not need to be normally distributed. The non-parametric post-hoc test called Nemenyi test which is based on the Kruskal-Wallis method of ranking in a one-way classification and Chi-Square test of Independence to investigate relationship between categorical variables.

The established hypotheses were verified by appropriate mathematical-statistical methods that enabled the hypothesis to be confirmed or rejected.

The probability level is determined on the base of alpha ($\alpha = 0.05$), which is compared with the significance level (*p*-value). Based on alpha (α), we can evaluate the hypothesis with the *p*-value comparison. If *p*-value is lower than alpha (α), H_0 will be rejected. If *p*-value is higher than alpha (α), H_0 will be accepted.

RESULTS AND DISCUSSION

The majority of totaly 478 respondents was represented by women (58%). Most of the respondents (46%) were aged from 21 to 30 years, followed by the interval from 41 to 50 years (17%) and further from 31 to 40 years (16%).

Group with completed higher education represented 46.8%, secondary education 41.8%, apprenticeship 8.1% and basic education only 3.3% of respondents.In terms of their permanent residence, respondents came from all 8 regions of the Slovak Republic, namely 47.2% from the rural areas and 52.8% from the urban areas. The monthly family income of questioned respondents ranged from the category "up to" 330 € to the category "more than 831 €" (Figure 1). The obtained results were anticipated because

Table 1: Characteristics of Respondents.

Gender	**%**
Female	59
Male	41
Place of Residence	**%**
Village	53
City	47
Age Structure	**%**
Less than 20 years old	6
21 – 30 years old	46
31 – 4 0 years old	16
41 – 50 years old	17
51 – 60 years old	10
61 years old and more	5
Net Family Income	**%**
Up to 330 €	8
331 – 500 €	9
501 – 660 €	21
661 – 830 €	22
831 € and more	40

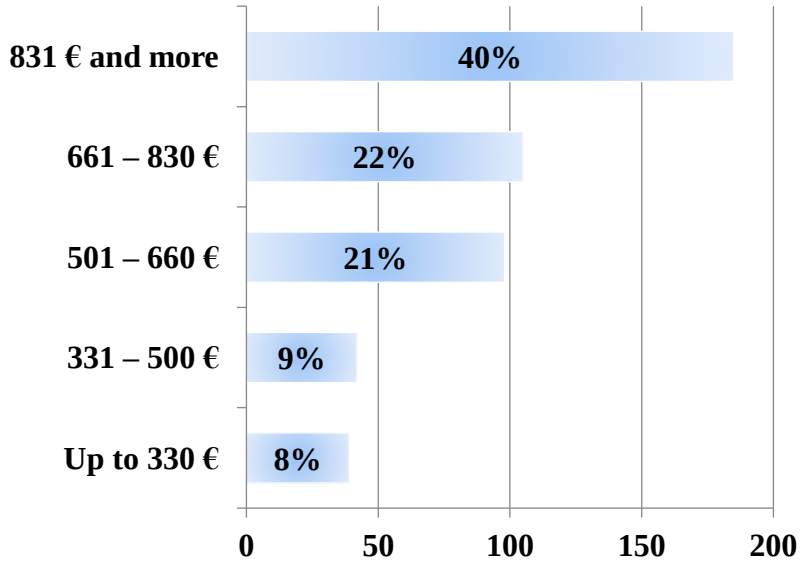

Figure 1 Monthly family income.

the survey was aimed at the general public and all age groups. As it could be seen from the Figure 1, the most respondents reported a monthly family income 831 € and more. Second most-ranked group was represented by an income from 661 € to 830 € (22%). The smallest income ranges (up to 330 €) was marked only by 8% of the respondents.

The first factual question asked in the questionnaire survey was whether the respondent purchases higher quality food. Up to 84% of respondents have claimed that they buy higher quality food on regular basis. This percentage could be so high because of the fact that more than 80% of respondents earn more than 500 € per month. On the other hand, 16% answered this question negatively. Figure 2 reports that 85% of women and 81% of men responded positively. These results were expected, because women are more interested in healthy lifestyle **(Fiala and Brázdová, 2000)** and they are also more likely to have higher quality diet than men **(Hiza et. al, 2013)**.

In relation to this question we formulated the following hypothesis:

H_0: Most consumers do not buy high quality food.

H_1: Most consumers buy high quality food.

To verify the hypothesis, the Wilcoxon signed rank test and significance level were used:

$$p = 0.0742 > \alpha = 0.05$$

Based on the results, we accept the zero hypotheses. Within 5% level of significance, we can claim that consumers do not buy high quality foods.

Most respondents (62%) claimed that they purchase higher-quality food because of health reasons – they believe that these foods can prevent illnesses or in some cases even cure them. The second reason was that these foods are controlled better, so they must fulfil higher requirements (18%), the third was that some people see quality food as pleasure or possibility of trying something unusual and 14% of the sample do so, since they earn enough money to afford them. Healthy foods have many advantages and a lot of customers buy them for various reasons, therefore retailers should focus on creating healthy corners where quality, fresh and especially health beneficial foods are sold. Priority should be to suppress sales of unhealthy products like tobacco, alcohol and various frozen semi-finished products. Based on the **Minkler et al. (2018)** research, in such stores customers buy up to 35% less unhealthy and harmful food.

The following question was dedicated to the factors which could lead to higher frequency of purchasing high quality food even when they are more expensive. Most respondents (60%) said they would be willing to buy more of these food if they had higher living standard. Similar survey was done by **Asif et al. (2018)** who found out that 55% of respondents would be more likely to buy higher quality foods if their economic situation changed to better. This fact can be caused by todays consumption time when people want to earn more money to buy more products. Over 20% of our respondents would purchase them only in the case of their illness and 24% of them would do so if they had more information about them. Consumers´ awareness about food quality and food safety is the key, because if customers do not know about these products, they simply can not search for them in stores and the probability of purchasing them is low. 4% of our respondents would welcome more propagation in electronic media.

On the other hand, 59.2% of respondents do not buy food of higher quality because they believe that more expensive does not always mean better. Another reason was according to 41% their price and 3.6% thought that they simply do not need quality food.

The main objective of the next question was to find out whether and how often respondents perceive information on the food packaging (Figure 3).

The above mentioned figure shows that 164 respondents (34.5%) usually seek for the information on the product packaging when purchasing food. Other 29.8% of respondents do so sometimes and 27.1% read product labels every time they shop. For 41 respondents, these informations are totally irrelevant and not important. According to several studies, packaging plays a very important role in the process of selling food **(Ahmed et al., 2005)**. Nowadays, packaging has become an integrated marketing tool and acts as the most important promotional tool **(Jerzyk, 2016)**. Another study has confirmed that consumers emphasize the freshness of the food, which is mostly stated on the wrapper **(Heide and Olsen, 2017).** There is a strong link between food packaging and consumer behavior, as shopping becomes a habit in which consumers choose individual foods based on their packaging **(Srey et al., 2013)**.

For two-thirds of respondents (66%) the information on food packaging is usually sufficient. Surprisingly, 23% of respondents reported mostly insufficient information and 2.9% always insufficient. Therefore, food producers should be more responsible and maybe consider adding more information than it is required by legislation.

Information on the packaging of products corresponds to the reality according to experience of 82.5% our respondents. Negative experience with discrepancy had only 17.5% of them. Because of many food scandals some customers are sceptic and do not trust companies even if the producers are periodically controled. Legislation states that packaging of packaged foods must include the mandatory data which can also be supplemented by voluntary data. Regulations of the European Parliament and the Council of the EU states that mandatory information must be easily accessible, indelible and big enough to be read. The only exception is represented only by the cathegory of non-packaged food. Mandatory data can not be masked, overlaid, or interrupted by other text or images. Pictograms or symbols can only supplement these data **(Regulation (EU) No 1169/2011)**.

In relation to the previous question we were interested also in the fact, whether information on the packaging of products is understandable. For 294 respondents (61.5%) these informations are clear. However, 21.5% of respondents staited that informations are incomprehensible mostly and for 4.2% always (Figure 4). These results may be caused mostly by the fact, that the above mentioned legislation is in many cases by companies not fulfilled.

Product labels also include information about the country of origin (where every single food comes from, or where it was produced). The following question was therefore addressed to the given issue. In particular, we focused on whether consumers consider it necessary or unnecessary to indicate the country of origin and the manufacturer of the food item. Most respondents, namely 333 (69.8%), consider placing the name of producer and the country of origin directly on the food packaging to be decisive and for one quarter it isimportant. The rest of the respondents (7.5%) consider this information to be unimportant. Even nowadays some consumers do not care where the food they are purchasing and subsequently eating was produced and factors like price, brand or taste and aroma are more important **(Golian et al., 2018)**.

Another pair of questions was focused on knowing how quality food are labeled in Slovakia. The first one was dedicated to the lable "Slovak Gold". Out of 478, 273 respondents said that they are familiar with the mentioned label. Other 42% answered this question negatively. The main reason for the lack of recognition can be the nowadays absence of promotion of this label in television, printed media and on the Internet.

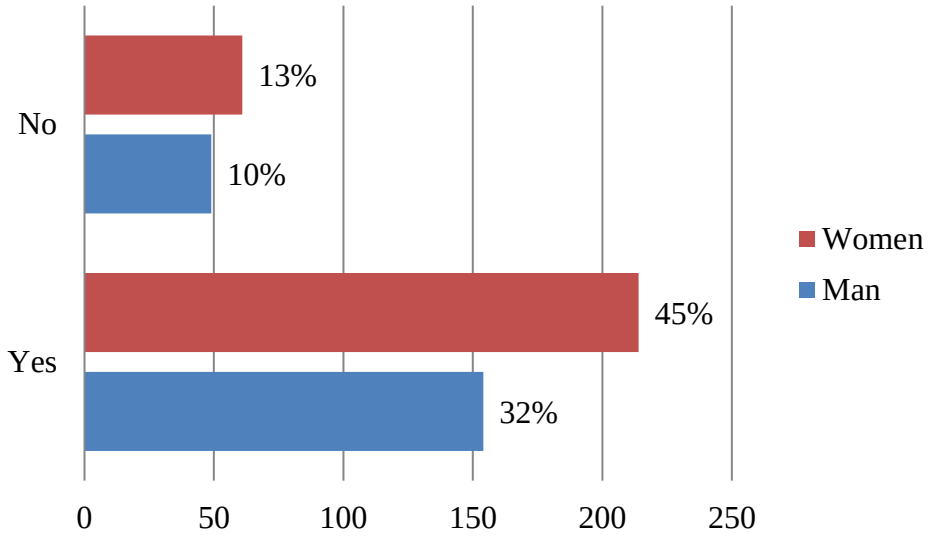

Figure 2 Dependence of buying higher quality food on respondent's gender.

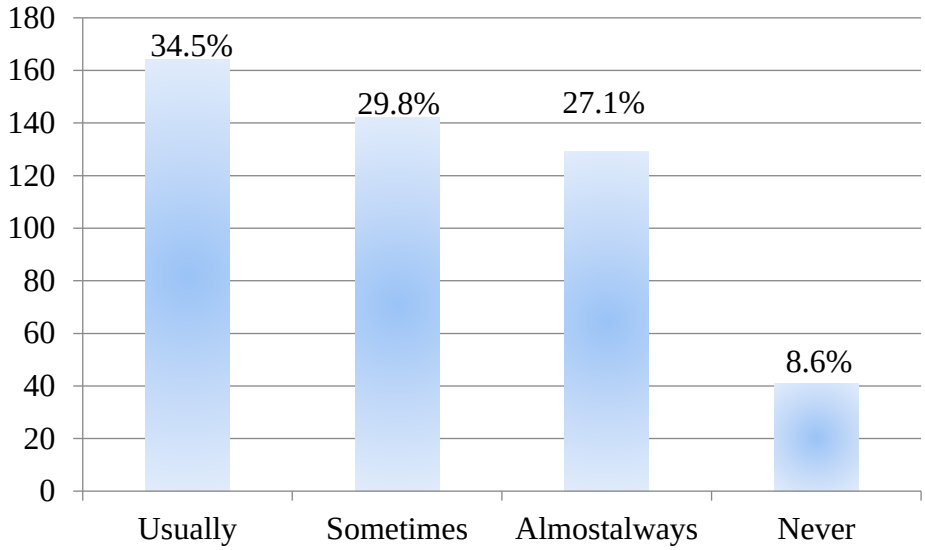

Figure 3 Frequency of reading information on food packaging.

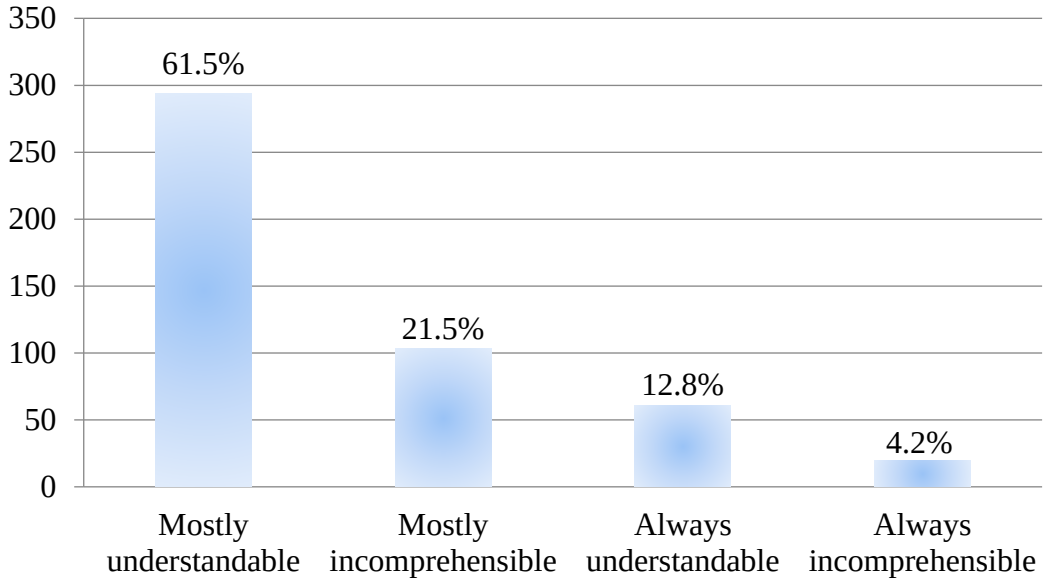

Figure 4 Clarity of information on food packaging.

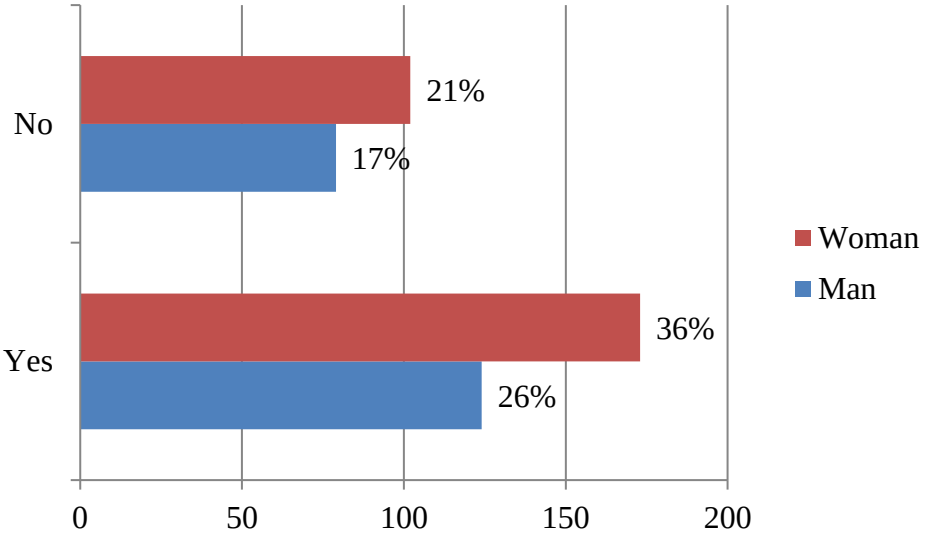

Figure 5 Dependence of knowing "Značkakvality SK" on respondent's gender.

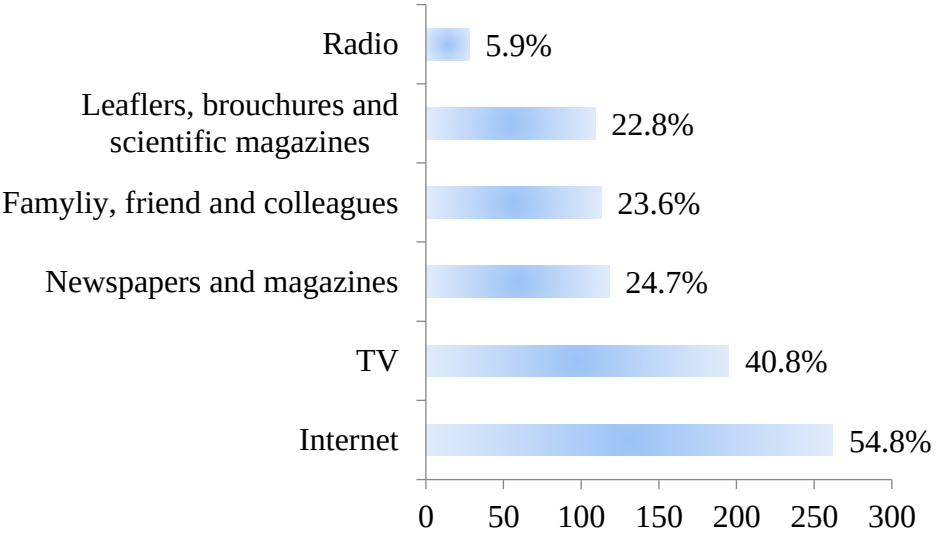

Figure 6 Source of information about food safety.

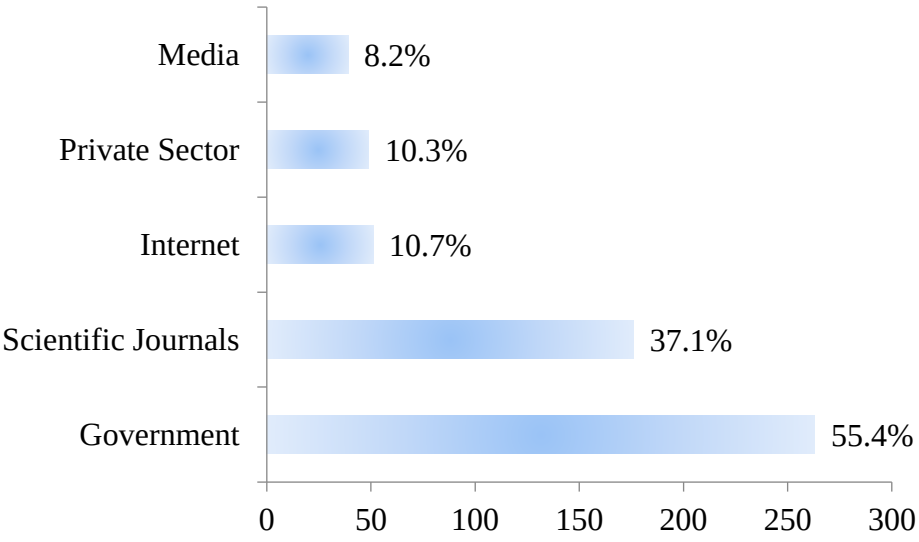

Figure 7 The most reliable sources of information about food safety.

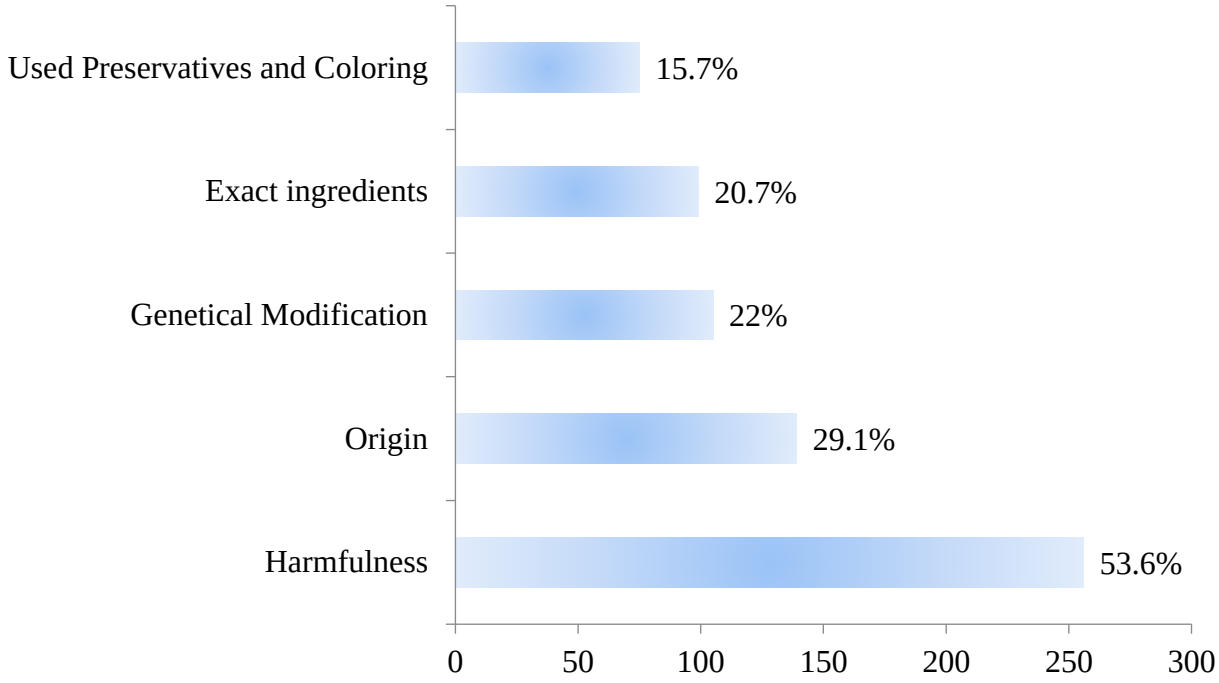

Figure 8 Types of information that are missed by consumers.

H_0: Fewer men than women do not know the lable "Slovak Gold".
H_1: Fewer men than women know the lable "Slovak Gold".
To verify hypothesis no. 4, the Chi-square test of independence and the level of significance were used:

$$p = 0.0001 < \alpha = 0.05$$

To test the hypotheses, calculated *p*-value was compared to the estimation risk alpha. The null hypothesis was rejected and therefore the alternative hypothesis H_1 was accepted. So, with 95% of probability, it is possible to claim that fewer men than women do not know the lable "Slovak Gold".

The second question (Figure 5) was focused on the national brand of high-quality agricultural products „Značka kvality SK“. The brand itself was created in the year 2004 and its main objective was to inform Slovak consumers about the quality of domestic food, which should support the consumption of domestic food products **(MP SR, 2009)**.

The graph shows that more than 50% of respondents know the logo of Značka kvality SK. Very similar results were achieved by **Nadányiová (2015)**, resp. **Košičiarová et al. (2016)**. More women (36%) than men. The larger unknown national brand of high-quality raw materials is visible in women's eyes, and up to 21%. For men it is 17%. This result, the greater lack of recognition of national brands of quality raw materials for women, surprised us. Research is supposed to confirm that women go shopping more often. This fact was also confirmed in the survey above **(Bhaskar et al., 2018)**. Of course, they often go shopping for the unborn, even to observe the information given on the clouds, and therefore do not have to label individual brands.

H_0: More women than men do not know the national label for quality of agricultural products “Značka kvality SK”.
H_1: More women than men know the national label for quality of agricultural products “Značka kvality SK”.

Statistical testing was performed by using the Wilcoxon signed rank test and significance levels:

$$p = 0.0125 < \alpha = 0.05$$

After comparing the *p*-value and the alpha value, we reject the null hypothesis. After accepting the alternative hypothesis, we can conclude that more women than men know the national label for quality of agricultural products “Značka kvality SK”.

The last five questions were devoted to consumers´ awareness of food safety. The largest number of respondents (40.5%) has rather enough information and 14% of them has definitely enough information about the food safety. But it is striking that 45.5% of our respondents were lacking this type of information. Based on the mentioned results, government and producers should teach consumers how to choose safe food in stores, store them at home and prepare them so they can eat nutritious health beneficial food. Even **Zan´s (2017)** survey has found out that food safety education has a positive impact on customers, because up to 37.4% of respondents have showed improved behavior when it comes to food.

In the next question, respondents were asked to identify 3 of the 6 sources they obtain information about the food safety (Figure 6).

Most respondents search for these information on the Internet (54.8%), second mostly used source was TV (40.8%) and third were newspapers and magazines (24.7%).

H_0: Most consumers search for least information about the food safety on the Internet.
H_1: Most consumers search for the most information about the food safety on the Internet.

To test the hypothesis No. 2, the Friedman´s test and the level of significance were used:

$$p = 0.0021 < \alpha = 0.05$$

The last null hypothesis was rejected because the level of significance alpha had a lower value than *p*-value. Qualitative statistics confirmed that most consumers search for the most information about the food safety on the Internet.

Furthermore, the questionnaire survey examined which source of information about the food safety is according to consumers the most trustworthy (Figure 7). When answering this question, respondents could choose more than one answer. The most trustworthy source is according to the survey the government (55.4%). Almost 40% of respondents thought that reliable information can be found in scientific journals dedicated to this issue. Nearly the same percentage marked options the Internet (10.7%) and the private sector (10.3%). Just 8.2% of respondents absolutely rely on information obtained from media. People should choose source they draw information from more carefully, because information coming from media or the Internet can be sometimes distorted. The most reliable are official documents of Ministry of Agriculture and Rural Development of the Slovak Republic (it is the highest organ responsible for safety of food in Slovak Republic) and European Union (its main function is to ensure safe and nutritious food and feed, high level of animal health, animal welfare, plant protection and clear and understandable information about the origin, content and use of food) **(EU, 2014)**.

The last question looked closer to the issue of type of the information which is missed by respondents. Respondents were asked to fill in up to 3 answers (Figure 8). Figure 8 shows that 53.6% of respondents were lacking the information about potential harmfulness of food. Second biggest group (29,1%) want to know the country of origin of the bought food. They are not satisfied with the lable „made in EU "they want the exact country to be identified. 22% of respondents had filled in the option „genetical modifications "and 20,7% the option „exact ingredients ". Customers are interested in ingredients, but moreover they want to know whether they are natural or artificially created in the laboratory.

CONCLUSION

Based on the results of this research we can conclude that 39% of respondents had insufficient information about the safety of purchased foods. One reason for being uninformed may be that they simply do not care about food quality. When it comes to source of information about the food safety, consumers usually search for them on the Internet (54.8%), in TV (40.8%) or in newspapers and magazines (24,7%). Paradoxically, for the most trustworthy source providing food safety information respondents (55.4%) marked the government and just 10,7% trust information found online.

The survey also found out that up to 84% of respondents buy higher quality food on daily basis. Most of them (62%) claimed that they do so for health reasons and to maintain healthy lifestyle. 48% of questioned said they do not recognize the lable "Slovak Gold". This may be due to the consumer's failure to read basic information on the food packaging or to insufficient advertising. Therefore, the Ministry of Agriculture and Rural Development should create informational campaign to support selling domestic food.

For 66% of respondents the information on the food packaging is sufficient. Interestingly, 23% of respondents reported a lack of information, especially about potential harmfullness of food, the state where the food was produced and the origin of used ingredients.

REFERENCES

Adámková, A., Adámek, M., Mlček, J., Borkovcová, M., Bednářová, M., Kouřimská, L., Skácel, J., Vítová, E. 2017. Welfare of the mealworm (*Tenebrio molitor*) breeding with regard to nutrition value and food safety. *Potravinarstvo Slovak Journal of Food Sciences*, vol. 11, no. 1, p. 460-465. https://doi.org/10.5219/779

Ahmed. A., Ahmed, N., Salman, A. 2005. Critical issues in packaged food business. *British Food Journal*, vol. 107, no. 10, p. 760-780. https://doi.org/10.1108/00070700510623531

Asif, M., Xuhui, W., Nasiri, A., Ayyub, S. 2018. Determinant factors influencing organic food purchase intention and the moderating role of awareness: A comparative analysis. *Food Quality and Preference*. vol. 63, p. 144-150. https://doi.org/10.1016/j.foodqual.2017.08.006

Bhaskar, S., Stavwell, P., Cordato, D., Attia, J., Levi, Ch. 2018. Reperfusion therapy in acute ischemic stroke: dawn of a new era? *BMC Neurology*. vol. 18, no. 8, p. 1-26. https://doi.org/10.1186/s12883-017-1007-y

Bírošová, Z., Kačenová, D. 2010. *Food safety in the Slovak Republic and cooperation with the European Food Safety Authority (Bezpečnosť potravín v Slovenskej republike a spolupráca s európskym úradom pre bezpečnosť potravín). Food Safety and Control (Bezpečnosť a kontrola potravín).* Nitra, Slovakia : Slovak University of Agriculture in Nitra. 342 p. ISBN 978-80-552-0350-8.

Cocolin, L., Rajkovic, A., Rantsiou, K., Uyttendaele, M. 2011. The challenge of merging food safety diagnostic needs with quantitative PCR platforms. *Trends in Food Science & Technology*, vol. 22, no. 1, p. 30-38. https://doi.org/10.1016/j.tifs.2011.02.009

Fiala, J., Brázdová, Z. 2000. A comparison between the lifestyles of men and women parents of school age children. *Central European Journal of Public Health*, vol. 8, no. 2, p. 94-100.

EU. 2014. Food safety in the EU [online] s.a. [cit.2018-11-06]. Available at: https://europa.eu/european-union/topics/food-safety_en

FSA. 2009. The food safety act 1990 - A guide for food businesses [online] s.a. [cit.2018-11-06]. Available at: https://www.food.gov.uk/sites/default/files/media/document/fsactguide.pdf

Fung, F., Wang, H. S., Menon, S. 2018. Food safety in the 21st century. *Biomedical Journal*, vol. 41, no. 2, p. 88-95. https://doi.org/10.1016/j.bj.2018.03.003

Godfrai, H. C. J., Beddington R. J., Crute, R. I., Haddad, L., Lawrence, D., Muir, F. J., Pretty, J., Robinson, S., Thomas, M. S., Toulmin, C. 2010. Food Security: The Challenge of Feeding 9 Billion People. *Science*, vol. 327, no. 5967, p. 812-818. https://doi.org/10.1126/science.1185383

Golian, J., Nagyová, Ľ., Andocsová, A., Zajác, P., Palkovič, J. 2018. Food safety from consumer perspective: Health safety. *Potravinarstvo Slovak Journal of Food Sciences*, vol. 12, no. 1, p. 313-322. https://doi.org/10.5219/917

Heide, M., Olsen, S. O. 2017. Influence of packaging attributes on consumer evaluation of fresh cod. *Food Quality and Preference*, vol. 60, p. 9-18. https://doi.org/10.1016/j.foodqual.2017.02.015

Hiza, H. A., Casavale, K. O., Guenther, P. M., Davis, C. A. 2013. Diet Quality of Americans Differs by Age, Sex, Race/Ethnicity, Income and Education Level. *Journal of Academy of Nutrition & Diet*, vol. 113, no. 2, p. 297-306. https://doi.org/10.1016/j.jand.2012.08.011

Jerzyk, E. 2016. Design and Communication of Ecological Content on Sustainable Packaging in Young Consumers' Opinions. *Journal of Food Products Marketing.* vol. 22, no. 6, p. 707-716. https://doi.org/10.1080/10454446.2015.1121435

Kecskes-Nagy, E., Korzenszky, P., Sembery, P. 2016. The role of color sorting machine in reducing food safety risks. *Potravinarstvo*, vol. 10, no. 1, p. 354-358. https://doi.org/10.5219/511

King, T., Cole, M., Farber, J. M., Eisenbrand, G., Zabaras, D., Fox, E. M., Hill, J. P. 2017. Food safety for food security: Relationship between global megatrends and developments in food safety. *Trends in Food Science & Technology*, vol. 68, p. 160-175. https://doi.org/10.1016/j.tifs.2017.08.014

Korzenszky, P., Sembery, P., Géczi, G. 2013. Microwave milk pasteurization without food safety risk. *Potravinarstvo*, vol. 7, p. 45-48. https://doi.org/10.5219/260

Košičiarová, I., Nagyová, Ľ., Holienčinová, M., Rybanská, J. 2016. Quality Label as the Guarantee of Higher Quality of Food - A Case Study of Slovak Food Market. *Procedia - Social and Behavioral Sciences*, vol. 220, p. 200-209. https://doi.org/10.1016/j.sbspro.2016.05.485

Liu, Y., Liu, F., Zhang, J. F., Gao, J. 2015. Insights into the nature of food safety issues in Beijing through content analysis of an Internet database of food safety incidents in China. *Food Control*, vol. 51, p. 206-211. https://doi.org/10.1016/j.foodcont.2014.11.017

Lv, M., Liu, Y., Geng, J., Kou, X., Xin, Z., Yang, D. 2018. Engineering nanomaterials-based biosensors for food safety detection. *Biosensors and Bioelectronics*, vol. 106, p. 122-128. https://doi.org/10.1016/j.bios.2018.01.049

MP SR. 2009. Food quality mark SK, the future of Slovak food (Značka kvality SK, budúcnosť slovenských potravín) [online] s.a. [cit. 2018-10-28]. Available at: http://www.znackakvality.sk/?pl=17

Minkler, M., Estrada, J., Thayer, R., Juachon, L., Wakimoto, P., Falbe, J. 2018. Bringing Healthy Retail to Urban "Food Swamps": a Case Study of CBPR-Informed Policy and Neighborhood Change in San Francisco. *Journal of Urban Health*, vol 21, no. 6, p. 850-858. https://doi.org/10.1007/s11524-018-0234-x

Nadányiová, M. 2015. The Quality Mark SK and its Impact on the Shopping Behavior of Slovak Consumers. *Procedia Economics and Finance*, vol. 23, p. 1509-1514. https://doi.org/10.1016/S2212-5671(15)00467-0

New, C. Y., Thung, T. Y., Premarathne, J. M. K. J. K., Russly, A. R., Abdulkarim, S. M., Son, R. 2017. Microwave oven safety: A food safety consumer survey in Malaysia. *Food Control*, vol. 80, p. 420-427. https://doi.org/10.1016/j.foodcont.2017.05.024

Regulation (EU) No 1169/2011 of the European Parliament and of the Council of 25 October 2011 on the provision of food information to consumers as amended. OJ L 304, 22.11.2011, p. 1-18.

Pinstrup-Andersen, P. 2009. Food security: definition and measurement. Food security, vol. 1, no. 1, p. 5-7. https://doi.org/10.1007/s12571-008-0002-y

Roosen, J. 2003. Marketing of sale food through labelling. *Journal of Food Distribution Research*, vol. 34, no. 3 p. 77-82.

Socas-Rodríguez, B., González-Sálamo, J., Hernández-Borges, J., Rodríguez-Delgado, M. Á. 2017. Recent applications of nanomaterials in food safety. *TrAC Trends in Analytical Chemistry*, vol. 96, p. 172-200. https://doi.org/10.1016/j.trac.2017.07.002

Srey, S., Jahid, K. I., Ha, S. 2013. Biofilm formation in food industries: A food safety concern. *Food Control*, vol. 31, no. 2, p. 572-585. https://doi.org/10.1016/j.foodcont.2012.12.001

Stratev, D., Odeyemi, O. A., Pavlov, A., Kyuchukova, R., Fatehi, F., Bamidele, F. A. 2017. Food safety knowledge and hygiene practices among veterinary medicine students at Trakia University. *Bulgaria Journal of Infection and Public Health*, vol. 10, no. 6, p. 778-782. https://doi.org/10.1016/j.jiph.2016.12.001

Regulation (EC) No 178/2002 of the European Parliament and of the Council of 28 January 2002 laying down the general principles and requirements of food law, establishing the European Food Safety Authority and laying down procedures in matters of food safety. OJ L 31, 1.2.2002, 3 1-44.

U.S. Department of Health & Human Services. 2018. Causes of Food Poisoning [online] s.a. [cit. 2018-10-28]. Available at: https://www.foodsafety.gov/poisoning/causes/

WHO. 2003. Gems/food regional diets. Geneva : WHO Document Production Services. p. 1-27. ISBN 92-41-59108-0.

Zan, H., Lambea, M., McDowell, J., Scharff, R. L. 2017. An Economic Evaluation of Food Safety Education Interventions: Estimates and Critical Data Gaps. *Journal of Food Protection*, vol. 80, no. 8, p. 1355-1363. https://doi.org/10.4315/0362-028X.JFP-16-510

Contact address:

*prof. Ing. Ľudmila Nagyová, PhD., Slovak University of Agriculture in Nitra, Faculty of Economics and Management, Department of Marketing and Trade, Tr. A. Hlinku 2, 949 76 Nitra, Slovakia, Tel.: +421376414102, E-mail: nagyoval26@gmail.com

Ing. Alexandra Andocsová, Slovak University of Agriculture in Nitra, Faculty of Economics and Management, Department of Marketing and Trade, Tr. A. Hlinku 2, 949 76 Nitra, Slovakia, Tel.: +421376414700, E-mail: sasena.andocsova@gmail.com

Ing. Andrej Géci, Slovak University of Agriculture in Nitra, Faculty of Economics and Management, Department of Marketing and Trade, Tr. A. Hlinku 2, 949 76 Nitra, Slovakia, Tel.: +421376414835, E-mail: geci.andrej@gmail.com

Ing. Peter Zajác, PhD., Slovak University of Agriculture in Nitra, Faculty of Biotechnology and Food Sciences, Department of Food Hygiene and Safety, Tr. A. Hlinku 2, 949 76 Nitra, Slovakia, Tel.: +421376414371, E-mail: peter.zajac@uniag.sk

Ing. Jozef Palkovič, PhD., Slovak University of Agriculture in Nitra, Faculty of Economics and Management, Department of Statistics and Operations Research, Tr. A. Hlinku 2, 949 76 Nitra, Slovakia, Tel.: +421376414162, E-mail: jozef.palkovic@uniag.sk

Ing. Ingrida Košičiarová, PhD., Slovak University of Agriculture in Nitra, Faculty of Economics and Management, Department of Marketing and Trade, Tr. A.

Hlinku 2, 949 76 Nitra, Slovakia, Tel.: +421376414171E-mail: ingrida.kosiciarova@mail.com
prof. Ing. Jozef Golian, Dr., Slovak University of Agriculture in Nitra, Faculty of Biotechnology and Food sciences, Department of Food Hygiene and Safety, Tr. A. Hlinku 2, 949 76 Nitra, Slovakia, Tel.: +421376414325, E-mail: jozef.golian2311@gmail.com

Corresponding author: *

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