

Received: 14 December 2023, Accepted: 12 June 2024,
Published on-line as Recently Accepted Paper: July 2024

DOI: <https://doi.org/10.26529/cepsj.1809>

Food Safety Knowledge Among Tourism Faculty Undergraduates in Slovenia: Can Social Media Leverage Educational Gaps?

MARKO KUKANJA*¹ AND SAŠA PLANINC²

Education on food safety is vital, especially for future tourism managers undergoing training at universities. This study aims to assess the food safety knowledge of student seniors in the two Slovenian public tourism faculties, compare it with previous European and Southeast European studies, and explore the impact of social media use on food safety knowledge among tourism students. The research method utilised a questionnaire-based approach that surveyed three academic years of students until 2023/2024 from the two Slovenian public tourism faculties. Data analysis involved descriptive and bivariate statistics. The research reveals a notable scarcity of studies investigating students' food safety knowledge within the EU. The results indicate that the average food safety knowledge score among Slovenian tourism undergraduates was 52.6%, raising serious concerns as it is lower than such scores reported in similar studies outside the EU, in Serbia and in Turkey. Slovenian tourism undergraduates demonstrated low elementary knowledge about personal hygiene and the spread of foodborne diseases. Curricula analysis showed the absence of mandatory hygiene and food safety courses at Slovenian tourism faculties, and most students (64%) recognised the need for food safety knowledge education. The findings suggest that neither students' work experience in the hospitality industry during their studies (compulsory education at the workplace should be provided for all persons involved in food processing) nor following the food safety information on social media could compensate for the lack of formal education. This study underscores the urgency of introducing a comprehensive food safety curriculum in Slovenian tourism faculties to ensure future managers are equipped with essential food safety knowledge.

Keywords: food safety, knowledge, Slovenia, students, tourism faculty

1 *Corresponding Author. Faculty of Tourism Studies – Turistica, University of Primorska, Portorož, Slovenia; marko.kukanja@fts.upr.si.

2 Faculty of Tourism Studies – Turistica, University of Primorska, Portorož, Slovenia.

Poznavanje varnosti hrane med študenti turizma v Sloveniji: Ali lahko družbeni mediji zapolnijo izobraževalno vrzel?

MARKO KUKANJA IN SAŠA PLANINC

☞ Izobraževanje o varnosti hrane je ključnega pomena, še posebej za prihodnje turistične managerje. Namen te raziskave je oceniti znanje o varnosti hrane med študenti turizma v Sloveniji, ga primerjati s prejšnjimi evropskimi in jugovzhodnoevropskimi študijami ter raziskati vpliv uporabe družbenih medijev na znanje o varnosti hrane. Raziskovalna metoda je temeljila na anketnem vprašalniku, raziskovalni vzorec pa je zajemal tri akademska leta študentov (do leta 2023/24) na dveh slovenskih turističnih fakultetah. Analiza podatkov je vključevala deskriptivno in bivariatno statistiko. Raziskava je razkrila pomanjkanje študij, ki preučujejo poznavanje o varnosti hrane med študenti turizma v EU. Izsledki kažejo, da je povprečna ocena znanja o varnosti hrane med slovenskimi študenti turizma znašala 52,6 %, kar vzbuja skrb, saj je nižja od ocen iz podobnih študij, izvedenih zunaj EU (v Srbiji in Turčiji). Slovenski študentje turizma so pokazali sorazmerno nizko znanje o osebni higieni in širjenju bolezni, povezanih s hrano. Analiza učnih načrtov je pokazala pomanjkanje študijskih vsebin s področij higiene in sanitacije ter varnosti hrane na slovenskih fakultetah, kljub temu pa je večina študentov (64 %) prepoznala potrebo po izobraževanju o varnosti hrane. Ugotovitve nakazujejo, da niti delovne izkušnje študentov v gostinstvu med študijem niti (neformalno) spremljanje informacij o varnosti hrane na družbenih medijih ne more nadomestiti pomanjkanja znanja. Ta študija poudarja smiselnost uvedbe obveznih učnih vsebin s področja varnosti hrane.

Ključne besede: varnost hrane, znanje, Slovenija, študentje, turizem

Introduction

The provision of safe and healthy food is an essential requirement for people, with food safety standing as a paramount concern. However, food safety risks may occur at every link of the supply chain, endangering consumers' lives and health and presenting a serious risk to public health. Within the tourism sector, ensuring the delivery of safe and nutritious food and beverage options is a defining characteristic of the industry.

Despite the highly developed food safety system in the European Union (EU), which is directed by the European Food Safety Agency (EFSA), a substantial number of food-borne illnesses still occur, primarily through poor handling practices. In 2022, there were 5,763 foodborne outbreaks within the EU, which represents a 44% increase compared with 2021 (EFSA, 2023). In 2022, salmonella was identified as one of the most common causes of foodborne outbreaks in the EU (EFSA, 2023).

Similarly, poor hygiene practices are a common problem in small food establishments in the Republic of Slovenia (Šašek et al., 2020), where employees often have neither the appropriate food education nor the appropriate food safety training (Jevšnik et al., 2021; Jevšnik et al., 2023). This is most obvious in the restaurant sector, as in practice, the responsibility for employee food safety education, though compulsory according to EU regulation (EU Parliament, Council of the EU, 2002), is often transferred to food business operators, which often tend to reduce operational costs by abandoning the concern for continuous training of its employees (Ovca et al., 2018). The risk of producing (un)safe food due to the human factor is thus greater for those employees who do not have adequate formal education (deregulation of hospitality professions in Slovenia was implemented in 2005) and participate in on-the-job training, which, due to the unregulated nature of the field is often carried out by incompetent persons without adequate professional and pedagogical knowledge (Jevšnik et al., 2008).

Other problems in practice are high employee turnover and a large proportion of poorly trained seasonal workforce. Food safety cannot be guaranteed only with advanced technology, a sound legal system, and a strict supervision regime. The supply of safe food depends on the responsible behaviour of all stakeholders involved in the food supply chain (Shen et al., 2021).

Tourism Education

Tourism education offered by higher educational institutions plays a critical role in training future hospitality professionals. Food safety education

requires training in safe food handling practices, personal hygiene, food preparation, and storage (Turnbull-Fortune & Badrie, 2014). This is important, as today's tourism students will be managers and educators of tomorrow, responsible for ensuring and promoting food safety practices among employees and consumers (Cumhur, 2021).

In this view, using the knowledge, attitude, and practice (KAP) model might aid in understanding the relationships among students' food safety knowledge (FSK), their attitudes, and preventive behaviour. Based on the KAP model, advocating knowledge is regarded as the key to whether an individual adopts preventive behaviours. Therefore, the more knowledge an individual has, the better preventive behaviours they will adopt (Luo et al., 2022). According to Zanin et al. (2021), improvement in FSK through targeted educational actions is also expected to positively influence the food safety culture (also referred to as the food safety climate) within society.

In this view, investigating students' FSK has become an interesting topic within academia. In reviewing the literature, a total of 25 studies investigating university students' FSK were identified over the past decade (since 2012) in major academic databases. Studies at various tertiary study programmes were performed at universities in Bangladesh (Islam et al., 2022); Greece (Lazou et al., 2012); Kuwait (Al-Khamees, 2007); Turkey (Akoğlu & Tuncer, 2017; Cumhur, 2021; Sanlier & Konaklioglu, 2012); Lebanon (Hassan & Dimassi, 2014); Ghana (Adzoyi & Honyenuga, 2014); Canada (Courtney et al., 2016; McIntyre et al., 2013); China (Cai et al., 2023); Pakistan (Abbas et al., 2019); Bulgaria (Stratev et al., 2017); Saudi Arabia (Al-Shabib et al., 2017); Malaysia (Ali et al., 2018); Sweden (Marklinder et al., 2020); Taiwan (Ko, 2018); Ethiopia (Azanaw et al., 2021); Jordan (Osaili et al., 2021); at a major American university (Green & Knechtges, 2015); at the University of Maine (Ferk et al., 2016); at Houston University (Yu et al., 2018); at the military academy in Serbia (Smigic et al., 2021); and at Serbian public universities (Smigic et al., 2020; Vuksanović et al., 2022). Interestingly, only four of the identified 25 studies (Akoğlu & Tuncer, 2017; Cumhur, 2021; Ko, 2018; Yu et al., 2018) included hospitality and tourism students. The analysis of the aforementioned studies has revealed that despite the geographical dispersion and differences in the applied methodological approaches, some generic conclusions can be drawn from reviewing the literature: 1) authors reported shortcomings in students' FSK; 2) students studying natural sciences had significantly higher FSK than their colleagues from social sciences; 3) the lowest FSK scores were related to food microbiology knowledge; and 4) food safety education was a significant predictor of student FSK. Furthermore, it was found that only three studies on tertiary students in the previous decade

(Lazou et al., 2012; Marklinder et al., 2020; Stratev et al., 2017) were performed in the EU member states (Bulgaria, Greece, and Sweden), while three studies were performed in the wider Southeast European (SEE) context (ex-Yugoslav states without Albania), specifically in the Republic of Serbia (Smigic et al., 2020, 2021; Vuksanović et al., 2022). Interestingly, none of the six EU and SEE studies specifically focused on tourism students. However, previous research conducted in Slovenia reported low levels of FSK among secondary school students (Ovca et al., 2014, 2018) and professional food handlers (Jevšnik et al., 2023).

To the best of our knowledge, no data relevant to FSK of EU hospitality and tourism students or Slovenian university undergraduates exists.

(Non)Institutional Sources of FSK

In addition to the importance of formal (institutional) education for FSK, previous studies (Burke et al., 2016; Lange et al., 2018) have also highlighted the importance of different (un)institutional sources of food safety information, such as family and friends, physicians, cooking shows and cookbooks, and the media. A study by Lange et al. (2018) revealed that mothers remain the most important sources of FSK among girls, while boys reported to trust more different heterogeneous sources such as the media and popular cooking shows. In this view, Maughan et al. (2017) highlighted the need to improve FSK communication among celebrity chefs who produce cooking shows. Similarly, Levine et al. (2017) evaluated food safety risk messages in popular cookbooks in the USA and found that most popular cookbook authors are risk amplifiers instead of FSK promoters.

In terms of social media, Giumetti and Kowalski (2022) defined social media as online communication networks that allow users to generate their content and engage in social interaction with large and small audiences. Typical social media platforms include Facebook, Instagram, Twitter, WhatsApp, Snapchat, TikTok, WeChat, and others. In terms of FSK, social media represent a set of internet-based learning platforms on which most young people socialise and informally learn on the internet (Mou & Lin, 2014). With the rapid introduction of social media in the previous two decades, distinctions among learning, entertainment, work, and leisure are becoming increasingly apparent. Accordingly, social media has also become a vital element of the (formal) teaching and learning process (Abbas et al., 2019). Several studies (Cai et al., 2023; Rasheed et al., 2020; Habes et al., 2020) confirmed that social media use positively influences students' knowledge sharing, innovation, and learning performance.

Social media has proved extremely efficient in sharing up-to-date health preventive information during the Covid-19 pandemic (Al-Dmour et al., 2020).

Specifically, scarce scientific evidence has been provided regarding the importance of social media in raising hygiene and FSK awareness among the tertiary student population. For example, a study by Yu et al. (2018) revealed that hospitality students have little interest in food safety courses. Nevertheless, researchers (Yu et al., 2018) have reported that students' motivation to learn food safety can be significantly increased by using electronic media devices and personal computers. Interestingly, a recent study (Cai et al., 2023) has shown that the Chinese platform WeChat has limited effects on improving FSK among Chinese university students.

Based on the presented theoretical background, this study aims to assess tourism undergraduates' FSK in the two Slovenian public tourism faculties and to explore the impact of social media use on FSK among tourism students. Specifically, the goals of this study are 1) to investigate FSK among final-year tourism undergraduates in Slovenia, 2) to compare Slovenian tourism senior undergraduates' FSK to that of tertiary students reported in previous EU and SEE research, and 3) to analyse tertiary tourism students' social media use and determine the importance of hygiene and food safety information provided on social media for students' FSK using a correlation analysis (see Table 3).

Building upon the established research objectives, our study endeavours to explore the following research questions (RQs):

RQ1: *What is the level of Slovenian tourism undergraduates' FSK in comparison to EU and SEE tertiary students' FSK?*

RQ2: *What is the importance of hygiene and food safety information provided on social media for tourism students' FSK?*

Hopefully, this research will reveal (potential) gaps in the FSK of senior tourism undergraduates in Slovenia, determine the importance of social media use for student FSK, and help to improve the formal (curriculum) and informal (social media use) food safety learning process.

Method

Participants

The number of analysed units (n) was 153, predominantly (76%) completed by female students. The average age of students was 20.3 years. Most students graduated from the secondary school of hospitality and tourism (41%), and 35% of them graduated from general secondary schools (in Slovene

gimnazija). Almost half of the students (47.1%) reported that they often or regularly work in the tourism industry while studying at the faculty. The average self-reported study grade was 7.8 on a ten-point scale.

While specific data on tertiary tourism students in Slovenia, classified according to the Klasius national system, is publicly unavailable, official statistics from the 2022/23 academic year indicate a total of 79,987 students enrolled in tertiary education across the country. Notably, 63.3% of these students were pursuing university education at the first-level study programs (Pečan, 2023). Our research findings align with the demographic profile of the broader student population in Slovenia. According to reports by Gril et al. (2022), the majority of students in Slovenia are under the age of 22, with women constituting the largest portion of the university student population (62.9%). Additionally, employment emerges as a crucial income source for students, with 44% relying on their earnings. Many students engage in substantial work commitments, with a majority working more than 20 hours per week alongside their studies.

Instrument

First, literature related to the field of the study was retrieved from major academic databases, including PubMed, Scopus, Web of Science, JSTOR, MEDLINE, ScienceDirect, and Emerald Insight. The search utilised keywords such as 'food safety knowledge', 'students', 'hygiene', 'tourism', 'hospitality', 'social media', 'knowledge', and 'food knowledge'. Initially, 86 articles were identified.

After narrowing the focus to scientific papers written in English from 2012 onwards, specifically examining the FSK of tertiary students (University or Faculty), 25 relevant articles were identified through the screening process. It's noteworthy that no articles written in Slovenian were found.

Among these 25 articles, only four were found to specifically investigate the FSK of hospitality students and six studies were conducted in the EU and SEE, as outlined in Table 2.

Next, the questionnaire was developed in three parts. To evaluate FSK and facilitate the comparison of results, 14 items from a validated instrument by Vuksanović et al. (Vuksanović et al., 2022) were introduced. FSK questions were multiple choice, and respondents were asked to indicate the right answer. In the second part, social media use was assessed using a nine-point scale (Jiang et al., 2021) ranging from 1 (never) to 9 (>90 min. per day). The list of social media meaningfully was adopted from the work of Giumetti and Kowalski (2022). The different hygiene and food safety information in media was measured with an open-ended question. The last part included demographic variables (five indicators).

Finally, to obtain a deeper insight into the food safety educational process, the undergraduate study programmes at the two Slovenian public tourism faculties, which are publicly available (Faculty of Tourism, 2021; Turistica.si, n.d.), were analysed.

Research Design

The study was focused on undergraduate students attending the last year of undergraduate (bachelor's degree) study programmes at two (out of two) academic institutions in Slovenia, specifically focused on providing tourism study programmes.

Primary data were gathered from students in their final years of study spanning three academic years. Employing a census approach due to unavailable public data on the exact number of third-year students enrolled at each faculty, an online questionnaire was disseminated to all participants attending lectures or compulsory exercises. This distribution was conducted following the explicit consent and supervision of the lecturers. Two researchers were involved in the data collection process.

Students were instructed to have either a mobile phone or laptop ready to access the survey. The survey link, created using 1KA software (an open-source application that enables services for online surveys), was then shared with students through a QR code. Participants were briefed on the study's objectives, and complete confidentiality was guaranteed. Engagement with the questionnaire was voluntary, and no additional credits or incentives were offered. The questionnaire's completion duration averaged around 12 minutes and underwent pilot testing by ten students. Out of the 178 questionnaires completed, 153 met the criteria for inclusion in the analysis. As all data was gathered in a centralised online database with a guarantee of complete anonymity, differences between students from both faculties were not specifically explored in this study.

Data analysis was performed using IBM SPSS Statistics 29. Descriptive statistics and bivariate analyses (Spearman's rank correlation coefficient (r_s), Chi-square test (χ^2), and t-test (t)) were used. FSK scores presented dependent variables. Each multiple-choice answer had one correct answer that was assigned a score of one (1) point, while zero (0) points were assigned to wrong answers. The overall FSK score was the sum of correct responses for each student. The average time spent on social media was calculated as the average number of responses related to following different social media. For all statistical analyses, a significance level of 0.05 was used.

Results

Results reveal that the mean value (score) related to FSK was 52.6%. Detailed results for each FSK question are presented in Table 1. The results indicate the lowest FSK score for the question ‘Which of these individuals should not prepare food for others?’ (9.8%) and the highest for the question, ‘Which of these individuals are least likely to get food poisoning?’ (84.3 %). Interestingly, the majority of students (64%) participating in the study self-reported the need for additional hygiene and food safety education.

Table 1

Food safety knowledge (FSK) of Slovenian tourism senior undergraduates

FSK questions	Right answers (bolded)	FSK score in %
Which of the following scenarios for cleaning kitchen counters is the best?	Soap, water, sanitiser /sanitiser, water/brush, sanitiser/water, drying	52.3
While washing your hands, is it enough to rub them for (in sec.)?	10 / 20 / 30 / 40	32.7
Freezing kills harmful germs in food?	True / False	75.8
Which food is the least likely to cause food poisoning?	Baked potato left on the kitchen counter overnight / Leftover chicken eaten cold / Chocolate cake left on the kitchen counter overnight / Slices of pizza left on the counter overnight.	25.5
What is the recommended temperature for freezers (in °C)?	-18 / 18 / 8 / 0 / -4	79.7
What is the recommended temp for fridges (in °C)?	-4 / 4 / 12 / 16	82.4
Which food does not need to be refrigerated?	Fruit salad / Open can of peas / Raisins / Chocolate pudding	68.0
How can a food be made safe if it has salmonella in it?	Cook it well / Freeze it for 3 days / not safe to eat / Don't know	43.1
For a burger to be safe to eat, does it need to be cooked until its internal temp. reaches (in °C)?	52 / 71 / 121 / 130	60.8
The micro-organism that causes most food-borne illnesses is...?	Bacteria / Viruses / Parasites / Fungi	62.7
Which of these individuals should not prepare food for others? A person with:	Diarrhoea / severe acne / HIV / a cold	9.8
Which foods do pregnant women, infants, and children need not avoid?	Soft cheeses / Raw or undercooked eggs / Undercooked hot dogs / Canned vegetables	35.3
Which of these individuals are least likely to get food poisoning?	Seniors / Pregnant women / Teenagers / Cancer patients	84.3
Most disease-causing bacteria can grow within a temp. The range between (in °C)?	5-60 / 20-40 / 40-60 / 30-70	24.2
OVERALL SCORE		52.6

Following the study's second goal, the identified FSK score (52.6%) was compared to studies investigating tertiary students' FSK in the EU and SEE states. As can be seen from Table 2, none of the five identified EU and regional (SEE) studies specifically focused on tourism and hospitality students.

Table 2

The EU and SEE studies analysing tertiary students FSK (2012 onwards)

Authors	Country	Study population	<i>n</i>	FSK score in %
Lazou et al. (2012)	Greece (EU)	University students (general)	837	37.0
Stratev et al. (2017)	Bulgaria (EU)	Veterinary students	100	85.0
Marklinder et al. (2020)	Sweden (EU)	University students (general)	606	63.4
Smigic et al. (2020)	Serbia	University students (general)	240	56.0
Smigic et al. (2021)	Serbia	Military academy cadets	120	50.5
Vuksanović et al. (2022)	Serbia	University students (general)	930	57.7

The comparison of FSK scores provided the answer to RQ1. As can be seen from Tables 1 and 2, Slovenian tourism senior undergraduates have higher FSK than Greek and lower FSK than Serbian and Swedish university students. Interestingly, Slovenian tourism students' FSK is slightly higher than that of military academy cadets in Serbia. Unfortunately, previous studies presented in Table 2 applied similar, albeit slightly different, research questions. This hindered a more detailed comparison of research findings, apart from the comparison of the overall FSK scores across different studies (indicating the percentage of correct answers out of all possible correct answers), with the exception of the study by Vuksanović et al. (see also the Discussion section). Furthermore, an analysis of the study curriculum at Slovenian faculties (Faculty of Tourism, 2021; Turistica.si, n.d.) revealed the absence of a compulsory hygiene and food safety course. To obtain a deeper understanding of the importance of demographic characteristics for FSK, a statistical relationship between students' demographics (age, gender, study grade, and work experience) and FSK was calculated. The results indicate that the only positive correlation exists between gender and FSK ($\chi^2 = 7.696$; $df = 2$; $p = 0.021$), as male students scored better than females. All other demographics (including work experience in the tourism industry) proved to be insignificant for FSK. Therefore, it may be hypothesised that the observed gender gap in FSK is attributable to a lack of formal education (see also Discussion section).

In the last step, following the third goal of the study (RQ2), social media use was analysed based on a student self-report. Students indicated their usage of the different social media either on a nine-point Likert-type ordinal scale, representing time intervals ranging from less than 5 minutes to more than 1 hour per day, with an option indicating non-usage. Alternatively, they reported their weekly usage by selecting the frequency of usage, ranging from once, few, or several times per week, with a non-usage option. On average ($M = 7.4$), students follow different social media for 54 minutes per day (calculated to min. based on a nine-scale Likert-type ordinal scale). Most of them use Instagram and Video platforms (YouTube) (on average, app. 30 min. per day), interactive web pages (app. 10 min), Facebook (app. 10 min), and other media (e.g., Tik-Tok). They use LinkedIn and Twitter the least (a few times per week).

To answer RQ2, statistical correlations (r_s) between the use of different social media and FSK were calculated (see Table 3). Interestingly, no statistically significant correlations ($p > 0.05$) were found.

Table 3

Correlations (r_s) between social media use and FSK

Social media use	FSK (No. of right answers)	
	r_s	Sig. (p)
Instagram	-0.142	0.082
YouTube	0.057	0.482
Interactive web pages	-0.030	0.713
Facebook	0.004	0.956
Twitter	-0.060	0.467
LinkedIn	-0.097	0.234

Nevertheless, almost half of the students (47.7%) self-reported following the different information about hygiene and food safety on social media in their free time. Based on an open-ended question, students reported the following information, with most answers relating to the practices of foodborne illness prevention, hygiene practices, allergen awareness, and expiration date awareness. Therefore, we additionally verified whether differences in FSK exist between both groups of students (users and followers vs. users and non-followers) using the t-test. Again, no significant differences were found ($t = 0.142$; $df = 151$; $p = 0.887$) between both groups of respondents.

Discussion

In the previous ten years, a range of research (see the Introductory chapter) has been conducted to assess university students' FSK. To the best of our knowledge, the present study is the first to offer insights into EU hospitality and tourism students' FSK and the Slovenian tertiary students' FSK. Generally, the results reveal (RQ1) a relatively low (52.6%) FSK of tourism senior undergraduates in Slovenia (see Table 2). Even though the identified results from our study were higher than those reported in Greece (see Table 2), Slovenian tourism undergraduates performed just slightly better than Serbian military cadets (Smigic et al., 2021) and significantly lower than Serbian (57.7%) (Vuksanović et al., 2022) and Swedish university students (63.4%) (Marklinder et al., 2020). Specifically, in comparison to tourism and hospitality undergraduates in Turkey, a recent study by Cumhuri (2021) reported the average FSK score of Turkish tourism undergraduates ranging between 85.8 and 95.4%, which further worsens the result identified in our study.

Furthermore, in our study, the highest percentage of correct answers (84.3%) was related to 'the risk groups for food poisoning', while the lowest (9.8%) was associated with 'preparing food when being sick'. A comparison with Serbian students (Vuksanović et al., 2022) reveals that they scored highest (82.7%) in 'the best way of cleaning the kitchen counter'. Similarly, only 10.1% of students from the University of Novi Sad, like in Slovenia, were aware that a person with diarrhoea should not prepare food for others. The latter is of particular concern as Slovenian hospitality students, like their colleagues from Serbian universities, do not know the basics about preventing the spread of foodborne infections, such as the strict prohibition for people with diarrhoea from preparing food for others. Low knowledge was also identified for 'safe hand washing practices' (32.7 %) and knowledge related to preventing food poisoning with salmonella. To eliminate salmonella, proper heat treatment must be provided, and only 43.1% of Slovenian tourism senior undergraduates knew that, while 65.8% of students in Serbia provided the right answer (Vuksanović et al., 2022).

In addition to the identified lack of formal education provided at Slovenian tourism faculties, the identified gender differences in our study are also worrying. That is, similar to our findings, studies from underdeveloped countries (from the EU perspective), such as Ghana (Adzoyi & Honyenuga, 2014) and Lebanon (Hassan & Dimassi, 2014), which also reported low student FSK, provided evidence of differences in FSK scores between both genders. In contrast, in countries with significantly better results, such as Sweden (Marklinder

et al., 2020) and Serbia (Vuksanović et al., 2022), no gender differences were identified. A possible explanation for this could be that with proper educational interventions, the gender gap disappears.

Another alarming research finding relates to work experience in the tourism industry, which proved unimportant for student FSK. Specifically, in practice, the responsibility for employee food safety education is most often transferred to food providers (Ovca et al., 2014; EU Parliament, Council of the EU, 2002), and most students (47.1%) reported working during their studies. Nevertheless, no statistical correlations were identified between student work experience and their FSK, which seriously questions the quality of FSK information provided at the workplace. Unfortunately, this result corroborates previous findings of (Jevšnik et al., 2023), who reported major gaps in knowledge transfer among professional food handlers in Slovenia, which seriously questions the professionalism and didactical competences of food safety educators at the workplace, which proved to be of significant importance for health-related education (Hřivnová, 2021).

Regarding the (informal) food safety education through following the different social media (RQ2), no statistical correlations were found between actual FSK and social media use. Even though previous research provided evidence about the importance of social media for sharing hygiene and food safety information (Al-Dmour et al., 2020), we can conclude that, according to our research findings, informal following of food safety information in students' free time does not influence their FSK. Despite numerous instructions related to personal hygiene provided during the COVID-19 pandemic, we can assume that they did not significantly improve students' FSK on this matter. Nevertheless, students seem aware of their poor FSK, as 64% reported needing FSK education.

Finally, the results have shown that neither work experience in the tourism industry nor social media use can compensate for the lack of formal education provided by the faculty, which has been identified as a prerequisite for FSK in previous research findings (Cumhur, 2021; Marklinder et al., 2020). Accordingly, university students' education should prioritise increasing awareness, enhancing knowledge, and promoting proper practices to prevent foodborne diseases. Targeted food safety education programmes focusing on food safety management systems, such as Hazard Analysis Critical Control Point (HACCP) practices and procedures, should be incorporated into curricula. Given that undergraduates in tourism faculties lack practical food handling (cooking) lessons, compulsory practical training in food and beverage departments should be considered, as students might choose among several options (e.g.,

project work, selection of tourism sectors) for their practical training (Turistica.si, n.d.). Moreover, the targeted use of Information and Communication Technologies (ICT) can play a crucial role in delivering food safety educational content to students. Various formats, such as pictures, text, videos, and voice, can enhance the effectiveness of educational materials on FSK (Luo et al., 2020; Seow et al., 2022).

Conclusion

This research was performed at two Slovenian national and public tourism faculties. Three undergraduate academic years of tourism student seniors were investigated. The results indicate 1) a low level of tourism student FSK, 2) the absence of food safety education, and 3) that informal education through following food safety information on social media and work experience has no impact on student FSK. The identified low FSK score is the most worrying factor as students move into professional and managerial roles. Therefore, they will also need to educate employees on the importance of food safety behaviour, and they will be responsible for public food and beverage offerings. This research has also pointed out gender differences in FSK, which was the case of studies performed in (under)developed non-EU countries with low food safety awareness (Adzoyi & Honyenuga, 2014; Azanaw et al., 2021). The major contribution of this study reflects the urgency of introducing food safety education for tourism graduates. The university environment is an ideal place for education on food safety aimed at preventing diseases caused by incorrect food handling and low hygiene. While this research deals with the absence of elementary food safety ignorance, such as personal hygiene knowledge, prevention of the spread of foodborne illnesses, and knowledge about handling foods with salmonella among tourism undergraduates in an EU member state, the global society has to deal with much bigger concerns related to food safety, such as water scarcity, climate change, and the prevention of global disease outbreaks.

Study Limitations and Recommendations for Future Research

One limitation is that students acted as respondents, which may have affected the likability of responses. Despite this potential disadvantage, several studies thus far (e.g. Ferk et al., 2016; Smigic et al., 2021; Yu et al., 2018) have also investigated students of specific educational institutions (see the Introduction section). As there are several higher vocational colleges for catering and tourism in Slovenia, future studies should also include students from higher vocational institutions. In this view, it is also recommended that the sample size be

increased in future research by including students from neighbouring countries as students and workforce migrations (especially from the Balkan (ex-Yugoslav) states) are common in Slovenian tourism and higher education. To facilitate the benchmarking process for measuring students' FSK, it is recommended that a standardised methodology that adheres closely to international professional guidelines, such as those proposed by EFSA, be adopted. Despite our study's use of the same FSK research instrument as the study by Vuksanović et al. (2022), which was published in the official Journal of the Slovenian National Institute of Public Health (NIJZ), it is important to exercise additional caution. Specifically, in their guidelines, NIJZ, along with the World Health Organization (WHO), advises consumers to refrigerate foods at $\leq 5^{\circ}\text{C}$ (World Health Organization, 2006; NIJZ, 2022; Ovca et al., 2021), as opposed to just (strictly) 4°C as proposed by Vuksanović et al. (2022). Greater care must also be taken with the internal temperatures of burgers. Vuksanović et al. (2022) generalised the types and temperatures of burgers, overlooking the fact that different types (e.g., beef and poultry) require distinct core temperatures for safe consumption. By doing so, regional competitions focusing on measuring students' FSK according to international professional guidelines (e.g., EFSA, WHO) could enhance student knowledge and food safety culture, thereby promoting international comparability of results. Furthermore, a comparison of FSK between tourism managers and graduates would also provide a deeper understanding of the problem, as today's students will act as future tourism managers, which might create a longitudinal 'spiral of not knowing'. The importance of targeted (formal) educational interventions that include state-of-the-art information technologies and artificial intelligence to improve FSK should also be investigated, preferably by using a standardised set of indicators.

Disclosure Statement

The authors have no conflict of interest to declare.

References

- Abbas, J., Aman, J., Nurunnabi, M., & Bano, S. (2019). The impact of social media on learning behavior for sustainable education: Evidence of students from selected universities in Pakistan. *Sustainability*, 11(6), 1–23. <https://doi.org/10.3390/su11061683>
- Adzoyi, P. N., & Honyenuga, B. Q. (2014). Exploring Knowledge, attitudes and practices towards food hygiene by hospitality students in Ghana. *Food Science and Quality Management*, 26, 1–12.
- Akoğlu, A., & Tuncer, T. (2017). The level of food safety knowledge of gastronomy and culinary arts students in Turkey. *International Journal of Agriculture, Environment and Bioresearch*, 2(6), 80–92.
- Al-Dmour, H., Masadeh, R., Salman, A., Abuhashesh, M., & Al-Dmour, R. (2020). Influence of social media platforms on public health protection against the COVID-19 Pandemic via the mediating effects of public health awareness and behavioral changes: Integrated model. *Journal of Medical Internet Research*, 22(8), Article e19996. <https://doi.org/10.2196/19996>
- Ali, A., William, A., Prajapati, S., & Ahmed, N. (2018). A KAP study on food safety and hygiene among private university students in Kedah State, Malaysia. *Journal of Natural Remedies*, 18(3), 113–121. <https://doi.org/10.18311/jnr/2018/22289>
- Al-Khamees, N. A. (2007). Food safety knowledge and reported behaviour of university students in Kuwait. *International Journal of Health Promotion and Education*, 45(3), 93–99. <https://doi.org/10.1080/14635240.2007.10708110>
- Al-Shabib, N. A., Husain, F. M., & Khan, J. M. (2017). Study on food safety concerns, knowledge and practices among university students in Saudi Arabia. *Food Control*, 73, 202–208. <https://doi.org/10.1016/j.foodcont.2016.08.005>
- Azanaw, J., Dagne, H., Andualem, Z., & Adane, T. (2021). food safety knowledge, attitude, and practice of college students, Ethiopia, 2019: A cross-sectional study. *BioMed Research International*, Article e6686392. <https://doi.org/10.1155/2021/6686392>
- Burke, T., Young, I., & Papadopoulos, A. (2016). Assessing food safety knowledge and preferred information sources among 19–29-year olds. *Food Control*, 69, 83–89. <https://doi.org/10.1016/j.foodcont.2016.04.019>
- Cai, Z., Luo, X., Xu, X., Shi, Z., Reis, C., Sharma, M., Hou, X., & Zhao, Y. (2023). Effect of WeChat-based intervention on food safety knowledge, attitudes and practices among university students in Chongqing, China: A quasi-experimental study. *Journal of Health, Population and Nutrition*, 42(1), Article 28. <https://doi.org/10.1186/s41043-023-00360-y>
- Cumhur, Ö. (2021). The effect of food safety and hygiene education on the knowledge levels of tourism students in Turkey. *Gastroia: Journal of Gastronomy and Travel Research*, 5(3), Article 3. <https://doi.org/10.32958/gastoria.906837>
- EFSA. (2023, December 12). *Monitoring of Foodborne Diseases*. European Food Safety Authority – EFSA. <https://www.efsa.europa.eu/en/topics/topic/monitoring-foodborne-diseases>
- European Parliament, Council of the European Union. (2002). 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. *Official Journal of the European Communities*, 45(L31), 01/02/2002, 1–24. <http://data.europa.eu/eli/reg/2002/178/oj/eng>
- Faculty of Tourism. (2021, July 11). *Undergraduate Study Programmes*. University of Maribor, Faculty of Tourism. <https://www.ft.um.si/en/study/study-programmes/>
- Ferk, C. C., Calder, B. L., & Camire, M. E. (2016). Assessing the food safety knowledge of University of Maine students. *Journal of Food Science Education*, 15(1), 14–22. <https://doi.org/10.1111/1541-4329.12076>
- Giumetti, G. W., & Kowalski, R. M. (2022). Cyberbullying via social media and well-being. *Current Opinion in Psychology*, 45, Article 101314. <https://doi.org/10.1016/j.copsyc.2022.101314>
- Green, E. J., & Knechtges, P. L. (2015). Food safety knowledge and practices of young adults. *Journal of Environmental Health*, 77(10), 18–25.
- Gril, A., Bijuklić, I., Autor, S., & Prem, I. (2022). Evropska raziskava o socialni dimenziji visokega šolstva [European survey on the social dimension of higher education] (EVROSTUDENT VII). Pedagoški inštitut. <https://www.pei.si/wp-content/uploads/2022/02/evrostudentVII.pdf>
- Habes, M., Salloum, S., Alghizzawi, M., & Mhamdi, C. (2020). The relation between social media and students' academic performance in Jordan: YouTube perspective. In A. E. Hassanien, K. Shaalan, & M. F. Tolba (Eds.), *Proceedings of the International Conference on Advanced Intelligent Systems and Informatics 2019* (pp. 382–392). Springer International Publishing. https://doi.org/10.1007/978-3-030-31129-2_35
- Hassan, H. F., & Dimassi, H. (2014). Food safety and handling knowledge and practices of Lebanese university students. *Food Control*, 40, 127–133. <https://doi.org/10.1016/j.foodcont.2013.11.040>
- Hřivnová, M. (2021). Evaluation of the implemented and adopted curriculum in health education in the Czech Republic with an emphasis on the drinking regimen. *Center for Educational Policy Studies Journal*, 11(4), 81–108. <https://doi.org/10.26529/cepsj.1192>
- Islam, Md. N., Hassan, H. F., Amin, Md. B., Madilo, F. K., Rahman, Md. A., Haque, Md. R., Aktarujjaman, Md., Farjana, N., & Roy, N. (2022). Food safety and handling knowledge and practices among university students of Bangladesh: A cross-sectional study. *Heliyon*, 8(12), Article e11987. <https://doi.org/10.1016/j.heliyon.2022.e11987>
- Jevšnik, M., Bobnar, S., Šadl, M. S., & Raspor, P. (2021). Food safety culture among food handlers in Slovenia. *Acta Microbiologica Bulgarica*, 37(1), 10–21.
- Jevšnik, M., Hlebec, V., & Raspor, P. (2008). Food safety knowledge and practices among food handlers in Slovenia. *Food Control*, 19(12), 1107–1118. <https://doi.org/10.1016/j.foodcont.2007.11.010>
- Jevšnik, M., Kirbiš, A., Vadnjal, S., Jamnikar-Ciglenečki, U., Ovca, A., & Kavčič, M. (2023). Food safety knowledge among professional food handlers in Slovenia: The results of a nation-wide survey. *Foods*, 12(14), Article 14. <https://doi.org/10.3390/foods12142735>
- Jiang, P., Xu, T., Zhang, C., Chen, J., & Wang, T. (2021). Unforgettable restaurant: Helping older people who are living with disability and dementia return to society. *General Psychiatry*, 34(6), Article 6. <https://doi.org/10.1136/gpsych-2021-100657>

- Ko, W.-H. (2018). The development of a competence scale of food safety and hygiene for hospitality students. *Journal of Food Safety*, 38(5), Article e12498. <https://doi.org/10.1111/jfs.12498>
- Lange, M., Göransson, H., Fleig, L., & Marklinder, I. (2018). Adolescents' sources for food safety knowledge and trust. *British Food Journal*, 120(3), 549–562. <https://doi.org/10.1108/BFJ-03-2017-0159>
- Lazou, T., Georgiadis, M., Pentieva, K., McKevitt, A., & Iossifidou, E. (2012). Food safety knowledge and food-handling practices of Greek university students: A questionnaire-based survey. *Food Control*, 28(2), 400–411. <https://doi.org/10.1016/j.foodcont.2012.05.027>
- Levine, K., Chaifetz, A., & Chapman, B. (2017). Evaluating food safety risk messages in popular cookbooks. *British Food Journal*, 119(5), 1116–1129. <https://doi.org/10.1108/BFJ-02-2017-0066>
- Luo, X., Luo, L., Liu, H., Xiao, Y., Yu, X., Hou, X., Zeng, H., Zhang, F., Zhang, Y., Sharm, M., & Zhao, Y. (2020). Needs assessment survey for a food safety education through We-Media: A cross-sectional survey among junior students of an education and a medical university in Chongqing, China. *Journal of Nutritional Science and Vitaminology*, 66(Supplement), S267–S274. <https://doi.org/10.3177/jns.66.S267>
- Luo, Y.-F., Chen, L.-C., Yang, S.-C., & Hong, S. (2022). Knowledge, attitude, and practice (KAP) toward COVID-19 pandemic among the public in Taiwan: A cross-sectional study. *International Journal of Environmental Research and Public Health*, 19(5), Article 2784. <https://doi.org/10.3390/ijerph19052784>
- Marklinder, I., Ahlgren, R., Blücher, A., Ehn Börjesson, S.-M., Hellkvist, F., Moazzami, M., Schelin, J., Zetterström, E., Eskhult, G., & Danielsson-Tham, M.-L. (2020). Food safety knowledge, sources thereof and self-reported behaviour among university students in Sweden. *Food Control*, 113, Article 107130. <https://doi.org/10.1016/j.foodcont.2020.107130>
- Maughan, C., Chambers, E., IV, & Godwin, S. (2017). Food safety behaviors observed in celebrity chefs across a variety of programs. *Journal of Public Health*, 39(1), 105–112. <https://doi.org/10.1093/pubmed/fdw026>
- McIntyre, L., Vallaster, L., Wilcott, L., Henderson, S. B., & Kosatsky, T. (2013). Evaluation of food safety knowledge, attitudes and self-reported hand washing practices in FOODSAFE trained and untrained food handlers in British Columbia, Canada. *Food Control*, 30(1), 150–156. <https://doi.org/10.1016/j.foodcont.2012.06.034>
- Mou, Y., & Lin, C. A. (2014). Communicating food safety via the social media: The role of knowledge and emotions on risk perception and prevention. *Science Communication*, 36(5), 593–616. <https://doi.org/10.1177/1075547014549480>
- NIJZ. (2022, September 27). *Ohlajevanje živil, shranjevanje ohlajenih živil [Refrigeration of foodstuffs, storage of refrigerated foodstuffs]*. Nacionalni inštitut za javno zdravje - NIJZ. <https://nijz.si/moje-okolje/varnost-zivil/ohlajevanje-zivil-shranjevanje-ohlajenih-zivil/>
- Osaili, T. M., Al-Nabulsi, A. A., & Taybeh, A. O. (2021). Food safety knowledge, attitudes, and practices among Jordan universities students during the COVID-19 pandemic. *Frontiers in Public Health*, 9, 1–13. <https://doi.org/10.3389/fpubh.2021.729816>
- Ovca, A., Jevšnik, M., Kavčič, M., & Raspor, P. (2018). Food safety knowledge and attitudes among

future professional food handlers. *Food Control*, 84, 345–353.

<https://doi.org/10.1016/j.foodcont.2017.08.011>

Ovca, A., Jevšnik, M., & Raspor, P. (2014). Food safety awareness, knowledge and practices among students in Slovenia. *Food Control*, 42, 144–151. <https://doi.org/10.1016/j.foodcont.2014.01.036>

Ovca, A., Škufca, T., & Jevšnik, M. (2021). Temperatures and storage conditions in domestic refrigerators—Slovenian scenario. *Food Control*, 123, Article 107715.

<https://doi.org/10.1016/j.foodcont.2020.107715>

Pečan, P. (2023, May 23). *Vpis študentov v višješolsko in visokošolsko izobraževanje, študijsko leto 2022/2023*. [Enrolment of students in post-secondary and higher education, academic year 2022/2023]. Statistični urad Republike Slovenije - SURS.

<https://www.stat.si/StatWeb/News/Index/11121>

Rasheed, M. I., Malik, M. J., Pitafi, A. H., Iqbal, J., Anser, M. K., & Abbas, M. (2020). Usage of social media, student engagement, and creativity: The role of knowledge sharing behavior and cyberbullying. *Computers & Education*, 159, Article 104002. <https://doi.org/10.1016/j.compedu.2020.104002>

Sanlier, N., & Konaklioglu, E. (2012). Food safety knowledge, attitude and food handling practices of students. *British Food Journal*, 114(4), 469–480. <https://doi.org/10.1108/00070701211219504>

Seow, W.-L., Md Ariffin, U. K., Lim, S. Y., Mohamed, N. A., Lee, K. W., Devaraj, N. K., & Amin-Nordin, S. (2022). A systematic review on the usability of web-based applications in advocating consumers on food safety. *Foods*, 11(1), Article 115. <https://doi.org/10.3390/foods11010115>

Shen, C., Wei, M., & Sheng, Y. (2021). A bibliometric analysis of food safety governance research from 1999 to 2019. *Food Science & Nutrition*, 9(4), 2316–2334. <https://doi.org/10.1002/fsn3.2220>

Smigic, N., Jovanovic, S., Djekic, I., & Nikolic, S. (2021). Food safety knowledge among cadets of Military Academy in Republic of Serbia. *Acta Periodica Technologica*, 52, 159–171.

<https://doi.org/10.2298/APT2152159S>

Smigic, N., Lazarov, T., & Djekic, I. (2020). Does the university curriculum impact the level of students' food safety knowledge? *British Food Journal*, 123(2), 563–576.

<https://doi.org/10.1108/BFJ-06-2020-0485>

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*, 10(6), 778–782.

<https://doi.org/10.1016/j.jiph.2016.12.001>

Šašek, N., Fazlič, D., Levpušček, D., & Volmut, T. (2020, September 10). *Razkrivamo lokacije: Inšpektorji začasno zaprli 31 gostinskih obratov* [Locations revealed: 31 catering establishments temporarily closed by inspectors]. 24ur.com.

<https://www.24ur.com/novice/slovenija/inspekcijski-nadzor-gostiln-zacasno-zapri-31-obratov.html>

Turistica.si. (n.d.). *Undergraduate Study Programmes*. University of Primorska, Faculty of Tourism Studies - Turistica (UP FTŠ Turistica). Retrieved March 15, 2024, from

<http://www.turistica.si/en/study/undergraduate-studies/dodiplomski-studij>

Turnbull-Fortune, S., & Badrie, N. (2014). Practice, behavior, knowledge and awareness of food safety among secondary & tertiary level students in Trinidad, West Indies. *Food and Nutrition Sciences*, 05(15), 1463–1481. <https://doi.org/10.4236/fns.2014.515160>

Vuksanović, N., Bajrami, D. D., Petrović, M. D., Raletić, S. J., & Radivojević, G. (2022). Knowledge about food safety and handling practices – Lessons from the Serbian public universities. *Slovenian Journal of Public Health*, 61(3), 145–154. <https://doi.org/10.2478/sjph-2022-0020>

World Health Organization. (2006, May 15). *Five keys to safer food manual*.

<https://www.who.int/publications-detail-redirect/9789241594639>

Yu, H., Sirsat, S. A., & Madera, J. M. (2018). Enhancing hospitality students' motivation to learn food safety knowledge using tablet personal computer (TPC)-based simulation game class activity. *Journal of Hospitality, Leisure, Sport & Tourism Education*, 23, 82–94.

<https://doi.org/10.1016/j.jhlste.2018.08.002>

Zanin, L. M., Stedefeldt, E., da Silva, S. M., da Cunha, D. T., & Luning, P. A. (2021). Influence of educational actions on transitioning of food safety culture in a food service context: Part 2 - Effectiveness of educational actions in a longitudinal study. *Food Control*, 120, Article 107542.

<https://doi.org/10.1016/j.foodcont.2020.107542>

Biographical note

MARKO KUKANJA, PhD, is an associate professor in the field of Business Organizational Sciences in Tourism at the Faculty of Tourism Studies – Turistica, University of Primorska, Slovenia. His main areas of research interest are Food and Beverage Management, Quality Management in Tourism, and Tourism Entrepreneurship.

SAŠA PLANINC is a senior lecturer in the field of Business Organizational Sciences in Tourism at the Faculty of Tourism Studies – Turistica, University of Primorska, Slovenia. His main areas of research interest are Food and Beverage Management, Information and Communication Technologies in Tourism, and Methodology and Statistics in Tourism Research.