Food safety knowledge and practices among elderly in Slovenia

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1. Introduction

According to the epidemiological data of the World Health Organisation, foodborne diseases affect millions of people each year, both in developed and underdeveloped countries (Bahrens et al., 2010). In the European Union (EU), one third (36.4%) of reported food-borne outbreaks are caused by improper handling of food at households, followed by restaurants, cafes, bars, hotels (20.6%), schools and kindergartens (5.5%) (EFSA, 2011).

The majority of verifiable food-borne outbreaks in the EU were associated with foodstuffs of animal origin, where the most common foodstuffs were eggs and egg products, responsible for 17.3% outbreaks, followed by buffet meals and pork products representing 8.1% and 7.8%, respectively, whereas for 22.1% of all outbreaks the food vehicle was unknown (EFSA, 2011). The consumer, as the last link in the food supply chain, plays an important role in the prevention of foodborne diseases and is responsible for proper food handling from purchase to the home food preparation (Redmond & Griffith, 2003; Kennedy et al., 2005; Jevšnik, Hlebec et al., 2008; Jevšnik, Hoyer & Raspor, 2008). Consumers need to know which behaviours are most likely to result in illness in order to make decisions about food handling and consumption behaviours (Hillers, Medeiros, Kendall, Chen,
Redmond and Griffith (2003) critically analysed 88 consumer food safety studies to determine information regarding similarities and disparities between knowledge, attitudes, intentions, self-reported practices, and actual behaviours on domestic food preparation. One of their most notable conclusions extrapolated in their review is that consumer knowledge, attitudes, intentions, and self-reported practices determined by intermediary means such as interviews and questionnaires do not correspond well with actual observed behaviours (Redmond & Griffith, 2003). Worsfold and Griffith's (1997) study of 108 consumers preparing food in their own kitchens determined that safe cooking practices were used by the majority of consumers, although more than half of the participants cooked well in advance of consumption and few used any method to speed the cooling of cooked food. Some consumers used potentially unsafe practices such as transporting and storing food at the wrong temperatures, holding cooked food at ambient temperatures for prolonged periods and inadequate re-heating. Jevnik et al. (2008) investigated the food safety knowledge and practices of 1030 Slovenian consumers during the purchase, transportation and storage of food, as well as food handling practices at home. Their findings identified problems associated with the safe storage of foods, cross-contamination, improper defrosting of frozen food and difficulties associated with the knowledge of correct refrigerator temperatures, but the research relied on self-reported behaviours. However, some food safety violations were recorded among pregnant and non-pregnant women in Slovenia (e.g. kitchen practices that can lead to cross-contamination), mainly in women under 25 years of age (Jevnik, Hlebec et al. 2008).

The most vulnerable to foodborne diseases are the elderly, pregnant women, immune-compromised individuals, and children (McCabe-Sellers & Beattie, 2004). To achieve an adequate level of food safety, a coordinated plan is needed for all involved in the food supply chain (Garayoa, Cordoba, Garcia-Jalon, Sanchez-Villegas, & Vitas, 2005), including a consideration of vulnerable groups in a population. Europe has an increasingly ageing population. The number of Europeans aged over 65 is expected to increase significantly, by 42%, from 87 million in 2010 to 124 million in 2030 (Eurostat, 2010). Due to the ageing population, the demand for public social transfers and services related to age will increase. In Slovenia, 338,944 (16.5% of all) inhabitants are older than 65 years of which 134,176 (39.6%) are male and 204,768 (60.4%) female. The proportion of the population over 65 years did not change from 2009 to 2011 (Statistical office of the Republic of Slovenia, 2011).

According to Smith (1998) and Buzby, in 2002 the elderly the in USA have the highest incidence of foodborne illness of any age group. EUFIC (2003) emphasised that susceptibility to foodborne illness increases with age and indicates the problems that the elderly encounter as being in a high-risk group for foodborne diseases. These include an age-associated decrease in humoral and cellular immunity, age-related changes in the gastrointestinal tract (decreased production of gastric acid and decreased intestinal motility), malnutrition, lack of exercise, entry into nursing homes, and excessive use of antibiotics. Data from foodborne outbreaks associated with nursing homes indicate that the elderly are more likely to die from foodborne Campylobacter, Clostridium perfringens, Escherichia coli O157:H7, Salmonella, and Staphylococcus aureus infections than the general population (Smith, 1998). Also Listeria and particularly Listeria monocytogenes should be considered as an important foodborne pathogen that can cause listeriosis with flu-like symptoms in healthy people, and severe complications in immunocompromised subjects, children, pregnant women and the elderly (Pesavento,ucci, Nieri, Comodo, & Lo Nostro, 2010). One reason for more frequent foodborne infections among elderly is that many of the body’s functions become impaired with age (e.g. problems with vision; the sense of smell becomes less acute with age; many elderly people cannot walk without assistance and find it hard to bend or to remain standing for long periods; some elderly people are malnourished, which increases their susceptibility to infections, including those caused by pathogens in food). Perceived financial constraints may cause other food safety related problems for elderly. They may be reluctant to throw away food, even when it is in poor condition. They may be unable or unwilling to replace damaged cookware or appliances that do not work properly. Running a kitchen is such a routine task that it is easy to forget the hazards associated with it, especially with increasing age (EUFIC, 2003). The results of the Hudson and Hartwell (2002) pilot study show that most participants (a focus group of nine older people living at home) had not measured their refrigerator temperature and did not know what it should be. The majority had not adjusted the temperature control/dial and gauged the correct temperature by the feel of goods inside. Johnson et al. (1998) assumed that food storage practices among the majority of elderly people interviewed in their study do not meet recommended safety standards to minimise the risk of food poisoning.

Therefore, it was important that this current study investigate both reported and actual food safety status in the domestic environment on a specific vulnerable group of elderly people. The aim of this study was to investigate food safety knowledge and practices among elderly population.

2. Methodology

2.1. Research design

The survey examining food safety knowledge and practices of the Slovenian elderly was conducted from May to June, 2009. The survey was performed within a group of residents of Ljubljana and its surroundings, who voluntary attended training for maintaining their balance (Rugelj, 2010) at the Faculty of Health Sciences at the University of Ljubljana, in Ljubljana, Slovenia.

Elderly were voluntarily enrolled in training for maintaining their balance at the Faculty of Health Sciences. They were recruited by advertising in the publications of Pensioners’ Association of Slovenia, at the noticeboards in pensioners’ clubs and day centres. All the participants were living in community and had no known neurological or musculoskeletal diseases.

2.2. Questionnaire design

The sample consists of 100 randomly selected elderly people (above 65 years old) in the capital of Slovenia and its surrounding.

Using the knowledge of food safety issues derived from previous studies, a semi-structured questionnaire was developed. For clarity and validity, the questionnaire was pilot tested using 10 randomly selected people older than 65 years. Adjustments were made where necessary. The revised questionnaire was divided into three sections, with a demographic section at the end. Areas of inquiry included (1) food safety knowledge, and (2) good hygiene practice at home. Some questions included multi-item scales. Answers were given on a 5-point scale, where ‘1’ indicated the weakest and ‘5’ the strongest agreement. Each questionnaire required on average 20 min to complete. The SPSS 13.0 statistical package was used for statistical analysis. Scores for each test category (i.e. food safety knowledge and practices and opinion of food safety) were calculated by assigning correct responses. Considering question type, Chi-square or t-test with 5% significance level were used to
2.4. Hygiene evaluation of kitchen surfaces and vegetables and their preparation. The sequences of individual main attention was focused on the handling of the raw chicken and a mixed salad (green lettuce, cabbage and tomatoes). The less than half an hour. Dishes were selected regarding the level of at an appropriately low temperature during transport which took store just before meal preparation. The food had been maintained E. coli (i.e. E. coli’ participants

Vegetables, knives for cutting meat, knives for cutting vegetables, kitchen counters, cutting boards for meat, cutting boards for volunteers (each test plate. Plates for total aerobic count, coliforms and with vortex for 2 min and then 1 ml of solution was added on to the laboratory within 1 h. In the laboratory, they were shaken swabs on plastic sticks 5 ml of sterile 0.9% NaCl solution were added. After swabbing, the swabs were transported in a cool box transport. After the incubation period, we counted the colonies that grew on plates.

3. Results and discussion

3.1. Questionnaire results

The main findings on food safety knowledge and good hygiene practice at home are presented and discussed. A relatively homogenous population regarding age (above 65), gender (82.8% of women) and education (primary school: 42.7%; vocational school 26.8% and secondary school: 29.4%) participated in this study.

Demographic information of participants is specific regarding the study’s objective. The questionnaires were completed by 100 elderly of age above 65, living in towns (50%) or villages (50%). Similar to results acquired among Slovenian consumers in the general population (Jevšnik, Hlbec et al., 2008), the elderly also believe that they are not responsible for food safety to the same degree as other links in food supply chain or as food safety inspectors and governmental agencies (Table 1). Regarding small differences between both groups, statistical significance (p > 0.05) was not detected.

This is confirmed also by their opinion regarding the most frequent spots of food poisoning and infections (street vendors: 49.3%; restaurants and catering facilities: 30.8%), although surveillance data from the EFSA report for countries of the European Union (EFSA, 2011) clearly shows that the domestic environment is still most frequently (36.4% of all confirmed outbreaks) reported as a place of foodborne outbreak. Further group-specific problems were identified. For the majority of elderly (60.2%), labelling on food items is not always possible to read (small print, foreign language), comparable to Hudson and Hartwell’s (2002) study among the elderly in which they have no difficulty understanding instructions, but have difficulties reading them, because they are in small print. The elderly were asked if they know the most appropriate storage temperature for perishable food items. Their answers were compared to the results of air temperature measurements in their domestic refrigerators (Fig. 1). The majority (48.2%) of participants agree that the temperature in domestic refrigerators should be from +1 °C to +4 °C although only in one case (6.3%) was the air temperature measured in that range. Furthermore, measurements of food items’ internal temperature show a comparable situation (data not shown). A further 73.3% confessed that they did not know what the actual temperature in their domestic refrigerator was; it is much higher than among general Slovenian population (43.7%) as revealed by Jevšnik, Hlbec et al. (2008). A further 80.2% participants in the study confessed that they had never measured their refrigerator’s temperature. These results are comparable to the Worsfold and Griffith’s (1997)
study in which they determined that 88% of participants had not measured their refrigerator’s temperature and did not know what it should be.

A significant part of participants reported an unsafe food handling practice regarding re-heating leftovers. They do not re-heat leftovers (10.8%) or they re-heat them only so far that the food becomes lukewarm (23.0%). The situation is comparable to the general population (Jevnik, Hlebec et al., 2008; Jevnik, Hoyer et al., 2008), where 9.1% report that they do not re-heat leftovers at all. This study also revealed that the majority of participants (42.9%) behaved inappropriately when thawing fresh meat, i.e. on the kitchen counter, which is better than in general population (50.4%) as revealed by Jevnik, Hlebec et al. (2008) but comparable to the proportion of participants of other studies who thawed foods at room temperature: 41.6% in Badrie, Gobin, Dookeran, and Duncan (2006), 45.2% in Surujlal and Badrie (2004), and 40.1% in Jay, Comar, and Govenlock (1999).

Otherwise, the elderly are aware of some basic food safety principles. For example, 98.1% agree that critical food items like chicken meat have to be cooked sufficiently and a further 71.3% are aware that this is to avoid food poisoning; 75.1% are aware that someone can die because of food poisoning and further agree that food poisoning can be a consequence of different hazards like microorganisms (33.7%) and chemicals (43.3%). When asked “Do you ever ignore actions for preventing food poisoning and why?” 38.7% confirmed their ignorance of preventive measures with arguments: “I forget” and “I do not think I’m doing anything wrong, because have never been poisoned before”. Also elsewhere (Clayton & Griffith, 2004) consumers neglect preventive measures due to lack of time (28%) or due to their laziness (14%).

The statistical significance between the place of residence (village/town) and answers were analysed, while other demographic parameters did not show statistically significant differences. Only in two cases, i.e. in understanding the concept of food safety (\( p = 0.023 \)) and understanding of the fact that the food past its expiration date should not be eaten (\( p = 0.000 \)) showed statistically significant differences between the place of residence (village/town). The elderly living in towns understand the concept of food safety better and are also more aware of the health risks when the shelf life of a certain food item is expired. In other responses, both groups were not statistically different.

3.2. Observation

It has been observed that the participants living in towns or villages do not always act in accordance with good hygiene practice during food preparation at home. In Table 2, findings of the observation in selected categories and sub-categories of GHP are presented and discussed.

3.2.1. Hand washing

Before and during food preparation, between different tasks (e.g. transition from unclean to clean working phase, after handling eggs or packaging), hands in both observed groups were not washed or were not washed sufficiently (without use of soap and poor washing technique). Observations are comparable with research done by Worsfold and Griffith (1997) where 66% of British consumers neglect the washing of their hands before preparing food and 76% do not wash hands after handling of eggs. Furthermore, Jevnik, Hlebec et al. (2008) indicated that only 57.1% of Slovenian consumers in the general population wash their hands properly with warm water and soap, and that only half (52%) of them take more than 10 s to do it.

3.2.2. Knives and boards

Only one knife and chopping board were used during food preparation, although with cleaning (warm water, cleaning agent, drying with dish cloth) between different work operations. These observations are comparable to Worsfold and Griffith (1997) who also noticed that the use of only one chopping board during food preparation is seen among 60% of consumers; however, De Boer and Hahne (1990) further report that 25% of consumers use chopping boards that are not cleaned during different operations of food preparation, representing greater chances for cross contamination as well as a greater likelihood of food poisoning. In both groups observed in this study, wooden chopping boards are more frequently used, in contrast to British consumers who use plastic ones more often (Hudson & Hartwell, 2002).

3.2.3. Cleaning of working areas

Sink area was not always cleaned before preparation of food. Working areas were cleaned simultaneously during food preparation in both groups with cleaning sponge and cleaning agent although, based on observation, not effectively enough. A similar situation was also observed by others; 13% consumers of age above 60 do not wash working areas after processing of raw chicken (USDA, 2008). In 75% of domestic kitchens, a single kitchen sink is used for all stages of food preparation (Worsfold & Griffith, 1997), with greater risk of cross contamination.

3.2.4. Paper towels and dish cloths

The same dish cloth was used for various operations, i.e. drying of hands, wiping of working areas, wiping of kitchenware and wiping of vegetables in the majority of observed elderly people in both groups. A higher proportion of them use paper towels for different tasks, such as hand drying, wiping of spattered oil from frying, and wiping of working areas; however paper towels and dish cloths were mainly used simultaneously. Results presented by others show that more than half of consumers (55%) use one dish cloth to clean work areas and kitchenware; some dish cloths (14%) are already dirty and wet before food preparation, leading to faster growth and reproduction of microorganisms (USDA, 2008). In 71% of kitchens, paper towels are present although rarely used during the food preparation (Worsfold & Griffith, 1997). Enriquez, Enriquez-Gordillo, Kennedy, and Gerba (1997) reported the presence of Salmonella spp. and Staphylococcus on dishtowels, representing a vector for the bacterial contamination of other kitchen surfaces.
### 3.2.5. Food preparation

Most malpractices were observed by preparing the cabbage, where half of village group just chopped it without previous cleaning. The majority in both groups only wiped it with a dish cloth previously used for hand drying and wiping of working areas. Among all types of meat (e.g. pork, beef, poultry, etc.), the greatest attention should be paid to the handling of chicken, because of its potential contamination with pathogenic microorganisms. During observation of the handling of chicken, except washing meat before preparation less malpractice was noticed. Especially noticeable were observed malpractices in preparing cabbage. De Boer and Hahne (1990) also reported that a significance of cross contamination. Hudson and Hartwell (2002) reported that the knowledge about operation of domestic refrigerators was observed in both groups, suggesting lower awareness of this issue among the observed participants. Ovca and Jevnik (2009) also reported that a significant portion of consumers (41%) does not clean food before preparing it.

### 3.2.6. Cooking and roasting control

Participants tasted the food to be sure that it is cooked. Consumers in both groups also cooking according to the time of cooking or roasting or they perform visual control to be sure that food is properly cooked or roasted. It is extremely important that food is sufficiently cooked or roasted, since most potentially harmful microorganisms present in foods are destroyed at 75 °C. Therefore, it is important that consumers are aware and are checking (e.g. with thermometer) the efficacy of cooking or roasting. Nevertheless Phang and Bruhn (2011) found that only 4% of respondents (N = 199) used the thermometer for checking the meat done.

### 3.2.7. Cold storage

Air temperature measurements show deviations from recommended storage temperatures in refrigerator (1–4 °C), which should be followed considering the variety of different food stored in it. In half of the air measurements in the refrigerators, the measured temperature was above recommended temperature, with a range of 67% never check the temperature of it. When arranging food items in the refrigerator, consumers follow the principle stated as “I put it in the upper part where free space is available” and do not take into account the risk of cross contamination. Hudson and Hartwell (2002) reported similar result for elderly English consumers in which 25% followed...
the same principle and in which 81% of refrigerator air temperatures exceed the recommended values.

3.3. Hygiene evaluation results

According to the bacteriological test of kitchen surfaces and participants’ hands, the following hygiene and sanitary indicators: TAC, coliforms, E. coli, moulds and yeasts were found.

The results of the microorganism counts were compared due to average number per selected kitchen surfaces. TAC was most abundant on hands, kitchen counters and plastic dishes. The results of hygiene evaluation presented in Fig. 2 show that participants hands (surface no. 10) are the most contaminated by microorganisms among all selected surfaces, followed by kitchen counters (surface no. 1) and chopping boards (surfaces no. 2 and 3). In the case of coliforms, colonisation was also found on kitchen counters and chopping boards for vegetables. The presence of E. coli was determined on kitchen counters, chopping boards for vegetables and plastic dishes. Meanwhile, the greatest amount of moulds and yeasts were found on knives for chopping meat (surface no. 4).

The results show that most work surfaces and kitchen tools are contaminated with potentially pathogenic and non-pathogenic microorganisms. Hygiene and sanitary microbiological indicators are established by state standards. According to the Slovenian Law on specific measures in food poisoning and their prevention (Slovenian Official Gazette No. 24/1981), the maximum number for TAC is 200 per 20 cm². In this study, all cases of average TAC exceed the maximum level on at least one of the kitchen surfaces. Only for the fork were none of the analysed pathogenic microorganisms found (Fig. 2), although the results show a large deviation in TAC, which is the first indicator of the hygiene status. Coliform bacteria are important microbiological sanitary indicators, which cause the need for hygiene in processing and handling of food (Filimon, Borozan, Bordean, Radu, & Popescu, 2010). The presence of coliforms and E. coli may indicate faecal contamination (Likar, 2000) and indicates a lack of hygiene after using the toilet. Contaminated hands play a key role in transferring faecal particles from one host to another (Curtis & Cairncross, 2003). A person who practices inadequate hand hygiene after defecation can transfer pathogens to other persons through direct interpersonal contact, contact with inanimate objects and surfaces, and

Fig. 2. Average log CFU/20 cm² per selected kitchen surfaces in observed domestic environment. Legend: Selected kitchen surfaces in observed domestic environment include: (1) kitchen counters (where food is prepared at home); (2) cutting board for meat (from preparation of raw meat); (3) cutting board for vegetables (vegetables before preparation); (4) knife for cutting meat (chicken meat before cutting); (5) knife for cutting vegetables (cabbage salad before cutting); (6) bowl (dish in which coleslaw was prepared); (7) serving platter; (8) fork; (9) wall of the refrigerator; (10) participants’ hands.

4. Conclusions

The need for more information regarding good hygiene practice through adequate education material has been well evidenced by this study. Both the qualitative and quantitative results have been shown some practices that are not in accordance with the knowledge and principles of good hygiene practices. During food preparation, the elderly do not always follow all hygiene and food safety requirements. Their sometimes improper food handling practice (e.g. cross contamination, raw food preparation, improper refrigerator temperature, hand washing) can become a risk factor for foodborne disease at home.

The results of the microbiological analysis of the swabs showed a low level of hygiene status. In most cases, there was increased total number of microorganisms. In four cases, the presence of the
E. coli was found. Results have shown the need for greater consumer awareness regarding food safety issues. The Slovenian Institute of Public Health and the Slovene Consumers’ Association have made some efforts to address this, but they do not reach the target group of elderly, because they inform consumers predominantly by giving information via web sites. When a consumer is outside the food safety circle, we are not treating food safety “from farm to fork”. 

Rasper (2008) emphasised that Good Nutritional Practice (GNP) must become a link in the global vision of food safety control, which begins and ends with concern for the consumer. A food safety platform with the consumer as an active partner in GNP will function when GHP will actually enter our daily lives (Rasper, 2008).

To raise the food safety knowledge and awareness of the elderly, we suggest target media information (e.g. cooking shows) and good hygiene practice information material in the form brochures, leaflets (describing clearly safe food handling practices from the point of purchase to the home, as well as within the home), that elderly would receive after short education/training programme during their union meetings or directly to their home. When designing food safety training programme and/or materials, personal testimonies of people how experienced food poisoning should be applied instead of foodborne diseases statistics. Especially to persuade doubters who think they are doing nothing wrong, because they have never been poisoned yet.

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