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ABOUT THE JOURNAL

„Annals of Nursing" is the official journal of the Medika College for Vocational Studies in Healthcare, Belgrade Serbia. It is a quarterly international open access peer-reviewed journal that covers all aspects of nursing in hospitals, families and the communities. The papers published in "Annals of Nursing" are freely available to all internet users for non-commercial use. The focus of the journal is on the role of nurses in the promotion of health and the quality of life, prevention of illness, care of disabled and ill people and all suffering individuals and rehabilitation after illness.

WELCOME LETTER OF THE EDITOR-IN-CHIEF

Dear readers,

We are proudly launching “Annals of Nursing”, the first international journal in the field of nursing, based in Serbia. As the official journal of the Medika College for Vocational Studies in Healthcare, Belgrade, “Annals of Nursing” will promote good science and practice in nursing. We will publish original scientific articles, reviews, case reports and commentaries on nursing from the whole world. The international editorial board will do its best to keep the highest standards in scientific publishing.

In the first issue of “Annals of Nursing” let us present three papers of high interest for nurses. In his review about hospital cleaning, Goran Belojevic, Editor-in-Chief, gives an up-to-date overview of optimal methods of hospital cleaning and the prevention of healthcare associated infections. Gordana Ristovska, a member of the Editorial Board, has written a valuable review about food allergies, the problem that every nurse and health technician may expect in their practice. Finally, it is our pleasure to publish an original paper of Vojin Vidanovć and Anita Kovačić Popović, the professors of The Medika College about the students’ attitudes regarding the nursing profession.

We will highly appreciate your comments and suggestions for improving the quality of “Annals of Nursing”. The nursing profession has got a powerful scientific booster in favor of health system and patients.

Prof. Dr. Goran Belojević

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Review Article

HOSPITAL CLEANING

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Abstract

The aim of this narrative review is to present up-to-date facts concerning hospital cleaning (HC).

HC is essential in the prevention of healthcare associated infections (HAI). If a proper HC is followed by a proper use of disinfectants even the HAI caused by the most dangerous nosocomial pathogens like methicillin-resistant *Staphylococcus aureus*, vancomycin- resistant *Enterococcus*, carbapenem-resistant *Pseudomonas aeruginosa* and multidrug-resistant *Acinetobacter baumannii* may be stopped without closing the ward or placing the patients in isolation. Critical hospital surfaces that may be highly contaminated with pathogens include toilet seats and bowels, toilet flush handles, doorhandles, furniture, hospital equipment, linen, clothes, buttons, switches, computers, printers, shelves, cellphones, curtains, patient chairs, nurse call-buttons and bed rails. Hand-touch sites at bedside pose the highest risk of HAI for patients and these should be targeted with continuous and detail cleaning. The most used methods for the assessment of hospital cleanliness are visual inspection, aerobic colony counts, adenosine triphosphate (ATP) bioluminescence and fluorescent markers. Together with soaps and detergents the environmental-friendly disinfectants like hydrogen peroxide, high-pressure steam, electrolyzed water, ozone, probiotic cleaners and microfiber cloths have a priority in hospital cleaning. Recent advances in the methods of hospital cleaning together with the continuous education of cleaning staff and nurses significantly contribute to the prevention and control of hospital outbreaks.

Keywords: hospitals, cleaning agents, disinfection, healthcare associated infections

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Introduction

Nosocomial infections (HC) or healthcare associated infections (HAI) are the crucial problems of any health system. It is estimated that in developed and developing countries the prevalence of HAI in acute care hospitals is about 7% and 15%, respectively[1]. HC remains the basic measure in the prevention of HAI[2,3], together with isolation, screening and hand hygiene[4]. After the outbreaks of nosocomial infections, the first control measure is extensive hospital cleaning[5]. When proper hospital cleaning is followed by proper disinfection it may be expected that outbreaks even with most dangerous pathogens like methicillin-resistant *Staphylococcus aureus* (MRSA), vancomycin- resistant *Enterococcus*, *Carbapenem Resistant Pseudomonas aeruginosa* and *Multidrug Resistant Acinetobacter Baumannii* (MDRAB) may be stopped without closing the ward or placing the patients in isolation[6]. On the other hand, if a hospital outbreak is followed by insufficient cleaning re-emergence of cases may be expected[7]. However, modern medicine lacks precise microbial standards how clean hospital is sufficiently clean to fulfill this aim[8]. Dirtiness is not always in a high correlation with microbial contamination and should not be mixed with untidiness. A tidy ward may be dirty, and a clean ward may be cluttered. Both circumstances are unacceptable, Therefore, hospital wards should be both tidy and clean[9].

The aim of this narrative review is to present up-to-date facts about HC:

Nosocomial pathogens

Hospital strains of microorganisms usually exhibit higher resistance to antimicrobial medicines than the strains out of hospitals and a longer survival on surfaces, which may reach several weeks[10]. HAI may be caused by bacteria: *Pseudomonas aeruginosa*, *Clostridium difficile*, *Methicillin Resistant Staphylococcus Aureus* (MRSA), vancomycin- resistant *Enterococcus*, *Serratia*, *Escherichia coli*, Klebsiella, *Multi Drug Resistant Acinetobacter baumannii* etc. [11]. The survival period of bacteria on hospital surfaces may be in the range from several hours to several months[12,13]. The common viral causes of HAI include *norovirus* and *influenza*. Among the fungal causes of HAI, the frequent ones are *Aspergillus* and *Candida albicans*[10]. The purpose of HC is the removal of pathogens from surfaces. Otherwise, these pathogens will contaminate the hands of the patients and hospital staff or will be disseminated by air with the hospital dust[14].

Hospital cleaning and the risk from HAI

The experiences with the outbreaks of HAI caused with *Clostridium difficile*, VRE, MRSA and *Multi Drug Resistant Acinetobacter Bahmani* showed that enhanced hospital cleaning followed by the use of disinfectants substantially contributed to the termination of epidemics[15]. However, even after very detail cleaning following an outbreak, persistent viruses and bacteria may be found at the bedside, around the toilets in the restrooms and on clinical equipment and put the new occupants to the risk of a repeated HAI[16,17]. After the hospital outbreaks caused by *Pseudomonas aeruginosa* it is absolutely necessary to remove the bacterial biofilm by detail cleaning of different plumbing components. Direct application of disinfectant without such a cleaning may not be effective in lowering the risk of HAI with *Pseudomonas aeruginosa*[18]. Proper and systematic cleaning out of epidemics must not be underestimated because the costs of epidemic control are much higher than of a continuous cleaning[19,20].

Contaminated hospital surfaces

Hospital surfaces that may be highly contaminated with pathogens include toilet seats and bowels, doorhandles, toilet flush handles, hospital equipment, furniture, linen, clothes, buttons, switches, computers, printers, shelves, cellphones, curtains, patient chairs, nurse call-buttons, bed rails[21]. The contamination of water containing devices like water baths, hemodialysis equipment, fluid warmers, water traps, neonatal incubators, heater-cooler units, nebulizers, and dental unit waterlines have been linked to hospital infections[22]. Some pathogens are typical for the rooms with a high humidity, like VRE in toilets and *Pseudomonas aeruginosa* in baths[18]. Mops, clothes, wipes and buckets are frequently contaminated with *Klebsiella* and *Serratia*, while MRSA might be found on dusty surfaces like shelves and computer keyboards[2]. Contaminated surfaces on beds or beside them are critical for HAI and they include sheets, lockers and overbed tables[23]. If the surfaces on and beside the patient beds are not properly cleaned between admissions the pathogens from prior patients may be transmitted to the new patients[17]. Touching the contaminated surfaces is a starting point of hand-to-hand spreading contaminants through handshaking, touching door handles, shelves and other surfaces [24,25].

Specific cleaning sites

Hand-touch sites at bedside pose the highest risk of HAI for patients and these should be targeted with continuous and detail cleaning. If these sites are contaminated by a colonized or infected patient the pathogens may be spread by touching of other patients, staff and visitors[26]. Using detergents for frequent cleaning the bedside sites during one year in a surgical ward managed to halve the frequency of MRSA HAI[27]. Recontamination of bedside sites with MRSA is frequent due to touching these surfaces by patients, staff and visitors and detail cleaning each four hours followed by disinfection with hypochlorite may be effective in preventing the recontamination[28, 29.] Some sites are neglected in routine cleaning, for example

underside of the overbed tables and various buttons and switches for electric bed control, nurse call, and equipment controls[30]. It is very important to analyze which sites in a hospital ward are frequently touched and who is responsible for cleaning these sites.

Methods for the assessment of hospital cleanliness

The most used methods for the assessment of hospital cleanliness are visual inspection, aerobic colony counts, adenosine triphosphate (ATP) bioluminescence and fluorescent markers. However, there are no guidelines which of these methods should be used in specific settings.

Visual inspection of hospital cleanliness is not a reliable method of assessing the risk of HAI[32].

Concerning the microbiological methods, the proposed limit of aerobic colony counts on hand-touch hospital surfaces is < 2,5-5 colony forming units (CFU) per cm^2 [33]. Coagulase-positive *Staphylococcus aureus* is usually used bacterial indicator of the contamination of hospital surfaces[34].

ATP is a proxy for organic substances and to be more precise, for pathogens in a hospital setting. The swab for ATP is placed in a specific tool with the enzyme luciferase which catalyzes the conversion of ATP to Adenosine-Monophosphate. Bio-luminometer detects the light that is emitted during this enzymatic reaction and the results are expressed in Relative Light Units (RLU). The proposed benchmarks are within the range from 45-1000 RLU, and the most frequent cut off values are 250 and 500 RLU. These cut-offs depend on a country of investigation and on the used brands of a bioluminometer[35]. However, the clear benchmarks for chemical or microbiological contamination of hospital surfaces, especially in an ICU are still missing[36]. The specific problem of ATP method is possible confounding effect of organic matter from food and drink residues, urine, blood, milk, and microfiber[37,38]. Another problem are the residua of detergents and disinfectants which should be removed before taking a swab[39]. The advantages of ATP bioluminescence method are fast results within 20 seconds from sampling and simplicity.

Fluorescent marker method is based on applying a fluorescent gel and the detection of the residual substance after cleaning, under ultraviolet light. A quartering technique is applied in reading the results, using a plastic sheet with a circle. If the gel is visualized in < 1 quarter, from 1-3 quarters and >3 quarters of the circle, the surface is evaluated as totally clean, partially clean and not clean, respectively[40,41].

A very important thing is the frequent inspection of cleaning and the education of the cleaning staff. Positive feedback and the reduction of HAI risk may be expected if the staff is informed that invisible fluorescent markers are placed at critical sites in hospital wards[42,43]. Motivating the staff and recognition of their work are also crucial for keeping high standards of hospital cleanliness because this job may be tiring and boring[44].

Cleaning staff

The cleaning staff may be hired from a private company or may be in-house staff. It is important for the staff to be ready round-the-clock to react on incidental contamination like pouring feces or urine on the floor. In that light in-house staff may have some advantage over a contracted staff[45].

In some hospitals nurses are responsible for the cleaning of the specific sites such as electric devices, clinical equipment, medical notes, intravenous drip stands, overbed tables, lockers and occupied beds[45]. Although the primary focus of nurses is on patients, they must not neglect the cleaning of the sites they are responsible for, however it sometimes happens[33].

Management of the hospital face the problem of missing some sites in routine cleaning schedules due to divided responsibility between the cleaning staff and nurses [46,47]. If the workload of the cleaning staff and nurses is too high it may hinder the efficacy of cleaning and cause the uncleaning of some important hospital sites[48]. Cleaning staff should be well educated about the microbiological principles and trained to maintain and disinfect the cleaning equipment, to frequently change the water in the bucket, to

keep it clean or to change the wipes when moving from cleaning toilets to cleaning near-patient sites[45]. The problems that may hinder the success of cleaning staff's educational process are poor payment, literacy, language and lack of time[3]. Educational intervention among the cleaning staff of an emergency unit had an immediate significant effect in cleanliness of critical sites including dressing cart, women's restroom door handle and women's toilet flush handle[49]. A monthly analyzing the cleaning practices and effectiveness in face-to-face meetings may be very useful in improving the hospital cleanliness[50].

Methods and materials for hospital cleaning

Soaps and detergents are not disinfectants as they do not primarily kill the pathogens but remove them with the dirt. That is why the water, cloths and cleaning equipment may be contaminated if not properly cleaned and changed and spread pathogens on surfaces instead of cleaning them [51,52].

When cleaning is combined with disinfectants killing pathogens is much more effective. Environmental-friendly disinfectants like hydrogen peroxide, high-pressure steam, electrolyzed water and ozone have a priority in hospital cleaning [53,54,55].

When compared to cleaning and chemical disinfection steam technology may have an advantage due to lower cost, shorter application time, reduced water consumption, and time it avoids the use of chemicals, reduced water consumption and the avoidance of chemical contamination[56].

Constant improvements and new methods of hospital cleaning and disinfection are introduced due to scientific advances: ultraviolet devices, air ionizers, microfiber products and microbicidal gases and alcohol based disinfectants[55,57,58]. Bioactive coatings containing heavy metals with microbicidal effect may be applied on any surface: floors, doors, windows, curtains, medical equipment, furniture, linen, pyjamas, toilets, pens, switches, buttons, plastic items etc.[59,60,61,62,63,64]. A coating with nano-silver particles and titanium is highly effective in protecting any surface in a hospital[65]. If there is a great risk of frequent recontamination of hospital surfaces, cleaning may be not effective and biocidal coatings with a prolonged effect could be a solution[66].

These coatings contain biocidal heavy metals such as silver or titanium, copper, zinc or and phages[67]. However, all biocidal coatings that are used in hospitals should be constantly monitored for their possible health effects on patients and adverse environmental effects[68].

Triclosan has been used since nineties for antibacterial protection of toothbrushes, hand-washing gels, dishes and storage boxes[69,70]. However, there are evidence of cross-resistance of triclosan and antibiotics [71].

A new approach in hospital cleaning is forming a stable surface biofilm which excludes pathogens, The most effective cleaning methods in this sense are plain soap and probiotic cleaners containing Bacillus and Lactobacillus spores [72,73,74]. Probiotic cleaners do not exhibit biocidal effect, but are based on biological competition with pathogens for the survival on surfaces[75].

Electrolyzed water is a contemporary cleaning method. If electric current is passed through tap water with added salt the product a powerful disinfectant containing hypochlorous acid and free oxyradicals[76,77]. The advantage of electrolyzed water over chlorinated products is that it is degradable with water, non-toxic and no gloves are needed and it is cheaper, while microbicidal effect is equal or even better[76,77].

Cleaning with microfiber cloths is regarded as environmental-friendly, but caution is needed because some spores, like *Clostridium difficile* for example, may remain on the cloth after cleaning. If a chlorine containing solution is applied it may be effective against the spores, but it may also shorten the usage of the cloth[78].

A very serious nosocomial infection with MDRAB in an ICU was stopped rising the frequency of cleaning critical hospital sites from three to six times daily, use of microfiber products and applying the method “one wipe one room” to avoid cross-contamination[79].

A contemporary method of hospital cleaning is using robots for automated cleaning. Most frequently these robots use hydrogen-peroxide or ultraviolet microbicidal light. It is recommended to use automated cleaning not as an exclusive, but a complementary method to traditional manual cleaning[80].

Hydrogen peroxide vaporization may be used for terminal disinfection taking care that the room is empty, and windows and doors sealed, with the exposure time of several hours. However linen and soft furnishing is not recommendable for this method of disinfection as hydrogen peroxide cannot penetrate sufficiently into these material[81].

A cleaning system of occupied bed space called "look, plan, clean, dry" has been proposed[82]. By visual inspection a cleaner assesses dirtiness, spillages, clutter, patient status, visitors and staff. During planning a cleaner washes her/his hands and puts the gloves on, removes spillage, garbage, rearranges personal belonging and furniture and equipment. Cleaning removes stains, grease, dust and smears and may be followed by disinfection. During dry phase it is necessary to allow sufficient time for drying of used water and disinfectants, followed by replacing all items that had been moved, moving away the equipment, assessing the cleaned area, filling-in the checklist of all actions, and handwashing.

Conclusion

Recent advances in methods of hospital cleaning together with the continuing education of cleaning staff and nurses have significantly raised the efficacy of HAI prevention and control. Nurses should be aware of the cleaning sites they are responsible for as this is equally important as patient care.

Conflict of Interest

The author declares no conflict of interest.

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Review Article

PUBLIC HEALTH ASPECTS OF FOOD ALLERGY AND FOOD INTOLERANCE – LITERATURE REVIEW

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Abstract

Aim of the paper was to make a review of available evidence for food allergies and food intolerance, to make a distinction between allergy and intolerance, and to emphasize the current knowledge about the prevalence and preventive measures. We made a search through PubMed and Google scholar, using the search terms „food“, „allergy“, „intolerance“, „prevalence“, „prevention“ and „measures“ for the period from 2000 to 2020, in order to find appropriate papers and publications. Food intolerance is defined as a non-immunological reaction to certain natural food ingredients or food additives that causes pharmacological, metabolic and gastro-intestinal reactions to food or food compounds. Food allergy is defined as an immune-mediated reaction to food, that is almost always mediated by immunoglobulin E (IgE). The worldwide prevalence of IgE-mediated allergic reactions is not exactly known. It is believed that about 1-2% of adults and between 5-7% of the children suffer from some type of food allergy and this number is growing. The most frequent specific food allergens are eggs, fish, peanuts, nuts, cow’s milk, cereals containing gluten, (such as wheat, rye, barley, oats) seafood, soybeans, sesame, celery and mustard.

Food intolerance can sometimes be controlled by limiting the amount of a certain type of food that is consumed, but when it comes to food allergies, much stricter avoidance of the food is required. Only food allergy, not food intolerance, can lead to a potentially fatal anaphylaxis reaction. In order to avoid food allergy, it is necessary to label the products for the presence of allergens.

Key words: food, allergy, intolerance, prevalence, prevention

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Introduction

According to the Codex Alimentarius, food is any substance, whether processed, semi-processed or raw, intended for human consumption, including chewing gum and any substance used in the preparation or treatment of food, excluding cosmetics, tobacco and substances used only as drugs. Food should satisfy human needs for basic nutrients such as carbohydrates, fats, proteins, and protective substances such as minerals and vitamins[1]. They are ingested and assimilated through the digestion of food, sustain life, generate energy and ensure the growth, maintenance and health of the body. In addition, food also fulfills emotional, social and psychological needs. Unfortunately, food, despite its beneficial roles in the body, can also serve as a medium for disease transmission and a cause of death if it is contaminated with pathogenic microorganisms, microbial toxins, chemical or physical agents from the environment[2].

According to the World Health Organization (WHO), health is a state of complete physical, mental and social well-being, and not merely the absence of disease[3]. Sometimes, certain individuals have an unusual reaction to a particular food or food ingredient, in the form of skin changes or gastrointestinal symptoms to the point of worsening the health condition or even to the point of death if not intervened. Recently, we have come across different terms when it is necessary to describe a pathological condition in people, such as food hypersensitivity, food intolerance, food allergy, which are sometimes used with different purposes and meanings [2].

Immunoglobulins, such as IgE, are produced by the immune system as a defense against invading microorganisms. Sometimes the body begins to create IgE antibodies against certain agents, such as pollen, dust, household dust and food, and this is exactly the response that stimulates the growth of allergic reactions, such as pollen allergy and food allergy.

There are two stages in the development of IgE-mediated allergies. The first is the sensitization phase, in which the individual upon first exposure to the antigen (usually a protein) undergoes a series of metabolic reactions that result in the production of IgE antibodies[4].

The second stage involves inducing an allergic reaction. IgE binds to specific receptors on the surface of certain blood cells packed with mediators of inflammation, such as histamine. Upon subsequent exposure to the specific antigen, the IgE-bound cells react with the antigen in such a way that they cause the release of inflammatory mediators from the cells, which in turn further cause symptoms of an allergic reaction, such as difficulty breathing, gastrointestinal discomfort, itching on the skin and other symptoms. These symptoms usually occur within a very short time after exposure to the antigen. The largest number of food allergens are proteins in nature. As a result of the large number of similarities between allergens, cross-reactions may occur in some allergic persons, who may be allergic to more than one allergen. Cross-allergic reactions are particularly characteristic between pollen or latex and some types of fruits and vegetables, a syndrome known as pollen-fruit or latex-fruit syndrome [4,5].

According to the European legislation on food safety, food operators are responsible for food safety. That means all legal entities or physical persons participating in the food chain, involved in primary or secondary food production, transportation, distribution, storage and sale have the obligation to place on the market safe food for consumers. The European legislation requires mandatory labeling of allergens in the product declaration in order to protect public health. Within the frame of the Regulation, the list of foods and food ingredients that must be labeled in the declaration as substances that can cause allergy or intolerance in humans is given as follows [6]:

- Cereals containing gluten, (such as wheat, rye, barley, oats, puree or their hybridized species) and products thereof;
- Crustaceans and their products.
- Fish and fish products.
- Peanuts and their products.
- Soybeans and their products.
- Milk and milk products.
- Nuts – almonds, hazelnuts, walnuts, cashews, pecans, Brazil nuts, pistachios, macadamia nuts, Queensland nuts and their products.
- Celery and its products.
- Mustard and its products.
- Sesame seeds and their products.
- Sulfur dioxide and sulphites in concentrations greater than 10 mg/kg or 10 mg/litre, expressed as sulfur dioxide (4).
- Lupin and products thereof;
- Molluscs and products thereof.

Aim of the paper was to make a review of available evidence for food allergies and food intolerance, to make a distinction between allergy and intolerance, and to emphasize the current knowledge about the prevalence and preventive measures against these health disorders.

Material and Methods

We made a search through PubMed and Google scholar, using the search terms: „food“, „allergy“, „intolerance“, „prevalence“, „prevention“, and „measures“, for the period from 2000 to 2020, in order to find appropriate papers and publications.

Results

Food allergy should be distinguished from food intolerance, a condition in which the immune system is not involved and involves reactions to certain food components, such as lactose, amines and histamine. Adverse reactions lacking an immune mechanism are sometimes referred to as non-allergic food hypersensitivity. Food intolerance can sometimes be controlled by limiting the amount of a certain type of food that is consumed, but when it comes to food allergies, much stricter avoidance of the food is required. Only food allergy, not food intolerance, can lead to a potentially fatal anaphylaxis reaction [4].

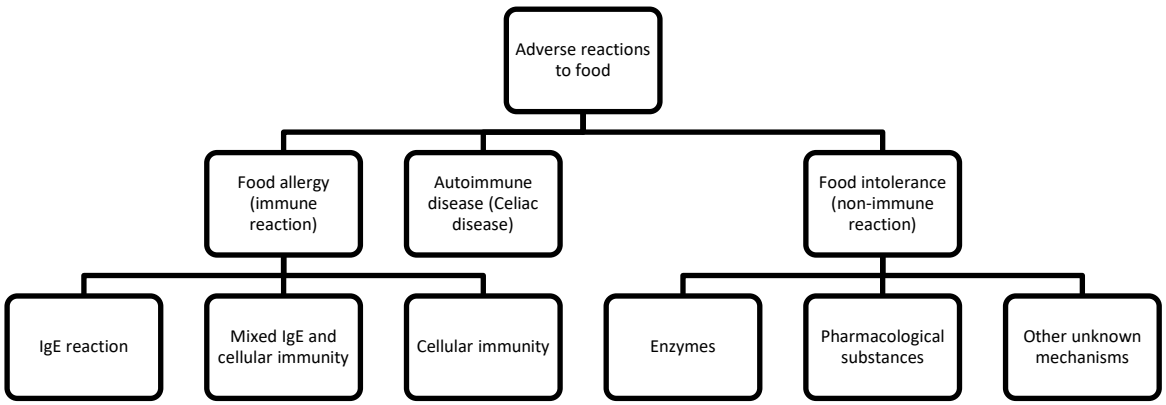

Fig. 1 Classification of adverse reactions to food

Source: EFSA 2014

Food intolerance

Food intolerance is defined as a non-immunological reaction to certain natural food ingredients or food additives that causes pharmacological, metabolic and gastro-intestinal reactions to food or food compounds[2]. Intolerance reactions occur due to congenital or acquired errors in nutrient metabolism, such as lactose intolerance, phenylketonuria, and favism. They also occur as a result of exposure to low molecular weight ingredients that occur as natural ingredients, such as salicylates and amines, or added ingredients - food additives, such as preservatives, colors, emulsifiers and flavor enhancers[4,7].

Food intolerance is chronic, less obvious in its presentation, and often more difficult to diagnose than food allergy. Food intolerance symptoms usually start about half an hour after eating, but sometimes symptoms can be delayed for up to 48 hours. These are symptoms with reactions on the skin, respiratory tract, gastrointestinal tract (GIT) separately or in combination. On the skin, there may be rash, urticaria, angioedema, dermatitis and eczema.

Respiratory tract symptoms may include nasal congestion, sinusitis, pharyngeal irritation, asthma, and nonproductive cough. Symptoms of GIT include mouth ulcers, stomach cramps, nausea, gas, intermittent diarrhea, constipation, irritable bowel syndrome (IBS) [7]

Table 1. Types of food and their ingredients that can cause food intolerance

Ingredient	**Type of food**	**Mechanism of action**
Salicylates	Coffee, green tea, banana, lemon, nectarines, plums, grapes, tomatoes, carrots, cucumber spices	Stimulation of mast cells, which cause pro-inflammatory reactions and muscle contractions
Amines (e.g. histamine)	Wine, beer, cheese, processed meat products, canned fish	Low amine oxidase activity in some individuals limits detoxification of dietary histamine and increased levels of histamine can increase smooth muscle contractions
Glutamates	Tomatoes, cheese, yeast extract	Unknown
Caffeine	Coffee, tea, cola drinks, chocolates	Stimulates central nervous system and increases gastric juice secretion and colonic motor activity possibly via gastrointestinal neuroendocrine hormones
Lactose	Milk and milk products, products containing milk	Lactase enzyme deficiency
Fructose	Fruit, honey fructose syrup	Fructose enzyme deficiency
Polyols	Additives	Laxative effect

Reactions to chemical components of the diet can be much more common than true food allergies. They are caused by a wide range of organic substances present in food of animal and plant origin even more often than food additives, colors and flavors (Table 1). Both natural and artificial ingredients can cause adverse reactions in humans if consumed in large amounts, and the degree of sensitivity varies among individuals. Prevalence of food intolerance depends on data collection methods and definitions, but some authors believe that it covers 15-20% of the population and is most often manifested by gastrointestinal symptoms.

A lack of digestive enzymes can cause food intolerance. Lactose intolerance is the result of the body not producing enough lactase to digest the lactose in milk, and dairy products such as cheese have a lower lactose content and are therefore less likely to cause a reaction. Another carbohydrate intolerance caused by enzyme deficiency is fructose intolerance present in fruit but much more so in fructose syrup[7].

The most common natural chemicals that can cause reactions are salicylate and benzoic acid. Benzoates and salicylates occur naturally in some foods, including fruits, juices, vegetables, spices, herbs, nuts, tea, wines, and coffee. Salicylate sensitivity causes reactions not only to aspirin, but also to foods in which salicylates occur naturally.

Other natural chemicals that commonly cause reactions and cross-reactivity include amines, nitrates, sulfites, and some antioxidants. Exclusion of a type of food does not necessarily identify the substance responsible for intolerance. Because a person can be sensitive to several substances in food, and when they are combined, intolerance is more likely to occur. People with food sensitivities have different tolerance thresholds, so more sensitive people will react to much smaller amounts of the substance [8].

Food allergy

Food allergy is defined as an immune-mediated reaction to food, almost always mediated by immunoglobulin E (IgE)[2,4,5].

The worldwide prevalence of IgE-mediated allergic reactions is not exactly known. It is believed that about 1-2% of adults and between 5-7% of children suffer from some type of food allergy, and this number is growing. The prevalence is higher in children who grew up with allergies, such as an allergy to cow's milk or eggs. The prevalence depends on the country in question, for example, peanut allergy is particularly characteristic of the United States, where the use of peanut butter is quite popular. Mustard allergy is particularly common in France, while celery allergy is characteristic of Switzerland, Germany and France[5].

An allergen is termed "major" if it is recognized by IgE in at least 50% of individuals in cohort studies but is unrelated to allergen strength; in other cases, the allergens are named as "minor".

Common symptoms of food allergies are presented in Table 2.

Table 2. The main symptoms of IgE-mediated food allergies

Gastrointestinal	Nausea, vomiting, abdominal cramps, diarrhea
Respiratory	Difficulty breathing, asthma, rhinitis
Dermatological	Itching, urticaria (wheals), eczema, atopic dermatitis, angioedema, rash
Other	Hypertension, tachycardia, tongue discharge, anaphylactic shock, oral allergy syndrome, laryngeal edema

Specific allergens

Allergy to eggs

Chicken egg allergy is one of the most common immediate food allergies in children in Europe and the United States, but it also occurs not rarely in adults. The reason for its appearance is the proteins found in chicken eggs. Chicken eggs cannot be replaced with other eggs such as those from ducks, turkeys, geese or quails, which can also cause an allergic reaction in sensitized people. The correct name for the chicken is *Gallus gallus domesticus* and therefore labeled allergen names begin with the letters Gal[2].

Eggs are composed of up to 60% white and 35% yolk. The main allergens originating from the egg white are ovomucoid with the designation-label Gal d 1 and ovalbumin with the designation-label Gal d 2. It is thought that egg allergy in children is caused by proteins in the egg white, and in adults by livetin found in the yolk[3].

The two most important protein allergens, ovomucoid and ovalbumin, are resistant to denaturation and enzymatic digestion, however, cooked eggs are considered to have a lower allergenic potential than raw eggs.

Egg allergy is one of the most common allergies encountered in children, with a prevalence of 2%. Most children outgrow the allergy by adulthood, and only less than 1% of the adult population develops an egg allergy. Early sensitization to chicken eggs may predispose some children to the further development of asthma[5]. Prevalence of self-reported eggs allergy in adults in the U.S. is 0.8%, and in EU is 2.5% [8].

Clinical signs and prevention

The following symptoms have been observed: itching in the mouth and pharynx; eczema, pruritus and dermatitis, urticaria, nausea and vomiting, rhinoconjunctivitis, very rarely anaphylaxis. The minimum dose required to cause an allergic reaction is thought to be about 1 mg of liquid egg, but as with other allergens, the lowest dose varies among individuals (3, 6, 10 mg)[8-10].

Avoiding eggs and all products containing eggs is the best way to prevent this allergy. Because the lowest dose varies significantly among individuals, some may not need to avoid products that contain very small amounts of eggs, such as egg yolk lecithin[4].

All repackaged products containing eggs or egg ingredients must be labeled as such, attention should be paid to the content of albumin, ovalbumin, vitelline, globulin and ovomucoid in ingredients made from eggs. Prepared food products commonly containing eggs or egg ingredients include cakes, desserts, pasta, biscuits, mayonnaise, sauces and chocolates. Certain childhood vaccines are prepared from egg yolks, and parents of highly susceptible children should be aware of this fact [11].

Fish allergy

Allergies can occur when ingesting different types of fish because they contain a protein found in the muscle tissue of many different types of fish. The list of fish that cause allergy includes cod, mackerel, herring, sardine, salmon, tuna, anchovy, perch, hake, sheet fish, flatfish, trout, Alaskan pollock, eel, carp and catfish. Although fish and seafood allergies are not related to a common allergen, people can still be allergic to fish and seafood allergens[2].

The main fish allergen is parvalbumin, a protein present in all types of fish. Because parvalbumin is common to all types of fish, people allergic to one type of fish may also be allergic to other types. Parvalbumin is heat stable, so food preparation does not affect the removal of the allergenic potential of the fish. In addition, other proteins in fish, aside from parvalbumin, have been shown to possess allergenic potential[12,13].

The prevalence of fish allergies varies considerably but is generally thought to affect 0.1 to 0.2% of the population. But recent review found that self-reported prevalence in adults in US is 0.9% and in EU 1.3%[8]. Children and adults are equally at risk, and what is significant about fish allergies is that they last throughout an individual's life. Fish allergies are characterized by a higher prevalence in countries and parts of the world where fish is a significant part of the diet[5].

Clinical signs and prevention

The first symptoms include itching and sensitivity in the mouth and throat, and they can be followed by more serious reactions, such as: nausea, vomiting, stomach pain and diarrhea; blisters, itching, oozing and redness of the skin; eczema, asthma, accompanied by wet and reddened eyes and nose, swelling of the airways, anaphylactic shock.

It is noted that doses lower than 5 mg of cod can trigger an allergic reaction. Allergic reactions have been observed due to inhalation of the vapors released during the preparation of fish and after kissing someone who has just consumed fish. Cross-contamination from oil used to fry fish is also a problem. Direct contact with fish in sensitive individuals can also cause eczema or asthma [8-10].

Once diagnosed with fish allergy, the only way an individual can manage the condition is to completely avoid fish in any form and ingredients derived from fish. Because fish is one of the main allergens, it must be indicated in the declared composition of all repackaged products. Some fish or animal oils may also contain trace amounts of fish protein. Gelatin, which is obtained from the skin and bones of fish and is used in food products, is not considered a major problem for consumers allergic to fish. Special attention should be paid by people allergic to fish when consuming food in restaurants, because cross-contamination of food products can easily occur, for example, from the oil in which the food is prepared [4,10, 11,14].

Cow's milk allergy

Hippocrates first noticed and recorded the negative reactions from the use of cow's milk around 370 years B.C. and since then the prevalence, awareness and knowledge of this allergy has risen to a much higher level. Milk allergy is one of the most common types of allergies that occur in infants and is caused by the proteins present in cow's milk[2].

Most milk proteins are potential allergens, and, in that context, milk contains about 30-35 grams of proteins in one liter. The key allergens in milk are casein, beta-lactoglobulin (a protein not found in breast milk), alpha-lactalbumin and alpha-lactoglobulin. Although they can be reduced, the allergenicity

of milk cannot be reduced by simple thermal treatment. Treatments such as pasteurization at 75°C for 15 seconds ensure microbiological safety of milk, but do not provide a significant reduction in its allergenicity. The homogenization process has no effect on the allergenicity of milk proteins. Casein is considered to be the most potent allergen when performing skin tests, while beta-lactoglobulin is considered to be the most potent when performing oral provocation tests[11, 13].

There are no reliable data on the prevalence of milk allergy. However, it is believed that in Western countries it affects about 2-3% of children under the age of 2 years. Children usually lose sensitivity as they grow, with 90% no longer developing an allergic reaction to milk by age 3. In a very small number of cases, milk allergy can be maintained throughout life. It is interesting to note that the trend of sensitivity to milk proteins is not the same now compared to 1990. For example, the prevalence of casein sensitivity has increased dramatically probably due to the increasingly widespread use of casein as a food ingredient[5, 12]. Gargano et al found in their review that prevalence of self-reported cow's milk allergy in adults in US is 1.9% and in EU is 6%.

Clinical signs and prevention

Cow's milk allergy usually develops before the age of three and most patients become tolerant to milk within a few years. Therefore, the distribution of symptoms shows a tendency to be different from other allergies with more cases of atopic dermatitis associated with milk allergy.

The largest number of milk allergic children show two or more types of symptoms in at least two different organs. Up to three quarters develop skin symptoms such as atopic dermatitis, eczema and urticaria. Just over half suffer from gastrointestinal symptoms, such as vomiting, diarrhea, constipation and abdominal pain. About 20-30% develop symptoms related to breathing difficulties, such as hay fever-like symptoms from the nose and eyes and recurrent breathing difficulties[4,7].

Systemic symptoms, such as anaphylactic shock, may occur in 10% of subjects. In infants, who suffer from milk allergy, and were previously exclusively on breast milk, severe atopic eczema occurs as

the main symptom. The lowest dose of milk proteins that is capable of causing an allergic reaction in the performance of provocative research is in the range of 0.6 to 180 mg. The minimum amount of milk that can cause an allergic reaction is about 0.2 ml of cow's milk [2]. Introducing cow's milk into the diet of babies with a family history of atopy can lead to the development of milk allergy. In such cases, proper counseling of the mothers is required[15].

The best way to deal with this type of allergy is to completely avoid cow's milk protein. For infants, a hypoallergenic formula containing highly hydrolyzed proteins is recommended, of course in cases where breastfeeding is not possible. Hydrolysis degrades the large allergenic proteins in milk to smaller peptides that do not have a high allergenic potential. In a small number of cases, a formula based on amino acids can be used (amino acids are the building blocks of proteins and peptides). Partially hydrolyzed formulas are not well tolerated, because the larger protein fragments have not yet lost their allergenic potential. In older children, formulas based on soy milk can be used as an alternative. However, it has been shown that 25% of people allergic to cow's milk also develop an allergy to soy milk. Of great help are the advice of clinical nutritionists who have the goal and task of creating the most appropriate diet that would avoid the intake of food products that contain hidden proteins from cow's milk in their composition[4,10, 15].

Casein and caseinates have quite widespread use as additives in sausages, soups and stews. Casein and whey proteins are included in high protein drinks in powdered form that are reconstituted before use. Other ingredients in which it is possible to find traces of milk proteins from cow's milk are butter, butterfat, butter oil, clarified butter or more commonly known as ghee, cheese, yogurt and ice cream. Food products that may contain "hidden" milk proteins are numerous and it is quite complicated to compile a list that would list them all, for that reason it is important to pay close attention to the labels on the food products, so in that context, it is determined by law that repackaged products containing cow's milk must have a label on the packaging itself [11, 14].

Allergy to mustard

There are many varieties of mustard, belonging to the *Brassicaceae* family. Mustard seeds are ground to form a powder that is used as a spice and flavor enhancer in a number of dishes. The whole seed

is often used in solutions to improve flavor, and mustard oil is used but not as often in food preparation. Due to its wide use as a flavor enhancer, mustard can often act as a kind of masked allergen that can cause severe allergic reactions. France is one of the largest European producers of mustard and also the largest consumer, ahead of Germany and Great Britain. This may explain the high prevalence of mustard allergy in France. Whereas mustard varieties *Brassica nigra* and *Brassica juncea* are extensively cultivated in India[2,4].

The main allergen of white mustard is designated Sin a 1, from the oriental mustard Bra j 1. These allergens are heat stable and resistant to digestion by proteolytic enzymes, such as trypsin and proteases. Therefore, roasting mustard seeds has little effect on their allergenicity. Also, their resistance to proteolytic enzymes means that they have a high resistance to digestion in the stomach and will pass through the gastrointestinal tract unchanged[2,9].

The prevalence of allergic reactions to mustard has been increasing recently. In eastern France, 0.8% to 1% of food allergies are attributed to mustard; in central France 3% and in southern France 8.9%. In Spain, 1.5% of food allergies are due to mustard. India is a country where the production and consumption of mustard is high. The prevalence of mustard allergy is also quite high in India. Because mustard is introduced into the diet at an early age, the prevalence of mustard allergy is quite high even in infants and children[2,4].

Clinical signs and prevention

Initial clinical features are atopic dermatitis, urticaria and/or angioedema. Other typical symptoms are asthma and breathing difficulties; abdominal pain and diarrhea; dizziness, low blood pressure and anaphylactic shock[4, 10].

As with all other types of food allergies, the best way to deal with this allergy is to avoid all products containing mustard. Because its use is quite wide as a spice, it is not always easy to avoid its consumption. Foods to avoid include sauces, curry sauces, mayonnaise, salad dressings, crackers, flours, instant soups and some baby foods. Whole seeds are used to produce pickle brine, so products such as

gherkins and pickled onions can be contaminated with mustard. Care should be taken when eating in restaurants and fast-food stands. Sandwiches are more likely to be contaminated because the food preparer and server in restaurants probably comes into contact with mustard or its products at some point from procurement to production and serving of the food [11,14].

Peanut allergy

Peanuts are one of the most common food allergy triggers and can cause serious reactions, including anaphylaxis. Very small amounts of peanuts can cause a reaction in sensitive individuals. An adverse reaction to peanut consumption is a true food allergy response that involves over-activation of the immune system and the production of IgE antibodies[2,4, 10].

Proteins in peanuts represent 25% of the product and are responsible for the allergenicity of peanuts. Peanut proteins are thought to contain a number of allergenic fractions, many of which are still unidentified and uncharacterized. Neither roasting nor other heat treatments of peanuts appear to reduce the allergic response. In fact, roasting peanuts can increase their allergenic potential. This is quite unusual because most allergenic proteins can become less allergenic or lose their allergenic potential completely upon heat treatment. On the other hand, when peanuts are boiled in water, their allergenicity decreases. The reason for this is that when boiling in water, the allergenic proteins pass into the water[10,13].

Peanuts are a common cause of food allergy in the United States where peanut consumption is very high. Allergy to peanuts has recently become more and more common in Great Britain, in parallel with the growing popularity of products containing peanuts. Although exact figures are not known, some research suggests that 1 in 200 people may be at risk to some degree, although recent research in children, carried out in 2002, suggested that 1 in 70 children in the UK were allergic to peanuts. At one time it was thought that peanut allergy was lifelong in all cases, but recently it has been shown that 20% of the young population outgrow their peanut allergy[16].

The increased incidence of peanut allergy is thought to be a result of increased dietary intake at an earlier age compared to before. Sensitive infants can be sensitized through breast-feeding, certain ointments applied to broken skin, or through respiratory exposure to peanut allergen. Sensitization can happen in utero. Atopic individuals with asthma are at greater risk of developing food allergies[10].

Clinical signs and prevention

Peanut allergy symptoms vary widely, from mild to severe. The most common mild symptoms include tingling in the mouth and lips and swelling of the face; nausea and colicky pain, accompanied by tightness in the throat; urticaria and flushing. Severe reactions, which occur in those who are more sensitive to peanuts, include: swelling of the airways and obstruction in breathing; immediate drop in blood pressure; collapse and unconsciousness. More serious reactions are classified as anaphylaxis and require prompt medical intervention. The onset of anaphylactic reactions is usually quite rapid and can lead to unconsciousness in a short time [4, 10].

The amount of peanuts needed to cause an allergic reaction has not been sufficiently studied, although sensitive individuals may react to insignificant amounts (from 100 μg to 50 mg). In some cases, reactions to extremely low doses of peanuts are observed. For example, children exhibit symptoms only after touching a table that has previously been cleaned of visible peanut butter residue; other cases have been documented when kissing someone who has consumed peanuts or drinking from the same cup. Allergy symptoms have been observed in patients who were present in a room in which a jar of peanut butter was opened. Even being in close proximity to someone eating peanuts can be enough to trigger a reaction in certain individuals [10,16].

The best way to manage a peanut allergy is to completely avoid peanuts and products containing them, although this is not always the case. The presence of "hidden" peanut products in processed foods is always a risk for sensitive individuals. Food labels must always be read carefully because peanuts and their products can go by different names, such as groundnuts, monkey nuts, earth nuts, mixed nuts, peanut

butter, peanut oil, tree nut oil, and peanut oil. Products such as cakes, biscuits, desserts, ice cream, cereal sweets, marinades, cereals, ready meals (especially Thai, Indonesian, Chinese and Indian food), curry sauces, salad dressings, marzipan and pralines and vegetarian products such as vegetarian sandwich, etc., all of which may contain traces of peanuts. There is an exposure to risk when eating in restaurants and buying unpackaged food, because there are no laws to declare the contents of these products. Care is required when preparing and storing food to ensure protection against cross-contamination. In children suffering from peanut allergy, it is best to avoid consumption of other nuts, sesame seeds, mixed nuts and other legumes in order to prevent further sensitization [4, 11, 14, 16].

Seafood allergy

Seafood is biologically very different from the fish, they are aquatic invertebrates that can be divided into 4 main groups: crustaceans, mollusks, gastropods, cephalopods. A shellfish allergy is relatively common and is thought to be caused by a protein known as tropomyosin, which occurs in most crustaceans. For those reasons, a person allergic to one type of crustacean marine animal is likely to be allergic to the others as well[4,10].

Shellfish allergy is the third most common allergy after peanuts and tree nuts. It is thought that it is possible that 1% of the population is at risk of this type of allergy, although the frequency of occurrence varies greatly around the world. For example, Scandinavian countries have a higher incidence of shellfish allergy compared to other northern European countries. It is estimated that approximately three-quarters of people allergic to one type of shellfish are allergic to the others[4, 5, 12].

Clinical signs and prevention

Common symptoms include itching of the lips, mouth and throat; swelling of the lips, tongue, throat and palate; urticaria, itching of the skin and swelling under the skin; nausea, vomiting and diarrhea;

asthma, difficulty breathing, wheezing and runny nose and eyes; anaphylaxis. Symptoms can occur after ingestion of seafood when handling seafood or even inhalation of steam during seafood preparation[7].

Once diagnosed with a shellfish allergy, the only way to successfully manage the allergy is to completely avoid shellfish in any form or ingredients derived from them. As one of the most recognized major allergens, shellfish must always be labeled on repackaged products in the EU and US, although this is not yet the case for mollusks such as mussels[4,11,14].

Due to the fact that crustaceans are a relatively expensive ingredient, it is relatively rare that they are not declared in the product content or appear as an unexpected ingredient. Stews and soups may contain seafood extract to enhance flavor and surimi may contain seafood extract. Dishes to avoid are paella and many Southeast Asian specialties. People suffering from a shellfish allergy are also advised to avoid dietary supplements such as glucosamine, as it is produced by the shells and skeletons of seafood.

People who suffer from this type of allergy must be especially careful when eating in restaurants because there have been cases where sensitive people have suffered anaphylactic shock when inhaling vapors during the preparation of crustacean seafood. For the same reasons, sensitive people should avoid open fish markets [14].

Soy allergy

Soybeans (*glycine max*.) are one of the most common causes of allergic reactions to food. It is the protein fraction of soy that causes allergic reactions, and unfortunately, this protein fraction is also found in much soy products. Soy allergy occurs in children and adults but is considered to be less serious and less frequent compared to peanut allergy. As with other food allergies, soy allergy does not occur during the first exposure to the allergen, the symptoms appear only after repeated exposure to soy. The first contact allows only sensitization of the individual. It is still not entirely clear which components of the composition of soy are responsible for its allergenicity, so far at least fifteen protein allergens have been

detected in the composition of soy. People allergic to soy are usually also allergic to tree pollen, such as birch pollen[2,5, 8].

Research indicates that the prevalence of this allergy ranges between 0.3 and 1.0%, with only a slightly higher prevalence in children compared to adults. The higher prevalence in children likely occurs because of infant exposure to soy products intended for that age and available in infant formula or as a result of sensitization in utero[9,10].

Clinical signs and prevention

Soy allergy symptoms range from mild and moderate to severe, where medical intervention is already necessary. This type of allergy is considered one of the most important and causes excessive activation of the immune system and the creation of IgE antibodies [4].

There are significant differences in the symptoms that occur as a result of stimulation of the immune system in different people in different parts of the world. These differences are thought to be due to the different allergens involved in the process, for example, the allergens responsible for triggering an allergic reaction in Japan are thought to be different compared to those in North America and Europe, although the basis for these differences remains unclear.

Symptoms range from mild and moderate, including oral allergy syndrome (stiffness in the mouth, etc.), nausea, vomiting, diarrhea, urticaria, and itchy skin, to severe, requiring medical treatment, such as sudden falls of blood pressure, choking and anaphylaxis[7, 10].

The best way to manage a soy allergy is to adopt a diet that excludes the intake of soy products or products containing soy derivatives. Because soy is considered one of the main allergens, labeling of repackaged products containing soy is required. For those reasons, careful observation of food product labels is recommended[4,6].

Products that may contain soy include pastries, cereals, ice cream, margarine, chocolate, pasta, processed meats, ready meals, vegetarian foods, tofu, tempeh, miso, soy protein concentrates and isolates.

Food additives that may contain soy include hydrolyzed vegetable proteins, certain flavor enhancers and lecithin (E322).

Research shows that most people allergic to soy protein can safely consume refined soy oil because almost all traces of the protein have been removed during the refining process[11, 14].

Eating in restaurants and buying unpackaged food also poses a risk, special attention should be paid to the preparation and storage of food products in order to avoid cross-contamination.

Sesame allergy

The production and consumption of sesame seeds has increased dramatically in recent years in parallel with the increasing prevalence of sesame allergy. Sesame seeds can be used whole, or they can be crushed to form a paste that is used as an ingredient in many food products[11].

The main allergens in sesame belong to the proteins stored in the seeds and are quite resistant to processing and proteolysis. At least 4 proteins in sesame are thought to be responsible for its allergenicity and these are: 7S vicilin-globulin type, the two proteins stored in the seed (Ses i 3, Ses i 2) and 2S albumin[2]. In Australia the observed prevalence in children is about 0.42%, and in Great Britain it is predicted to be 0.04% in the adult population, although it is probably much higher. In fact, the first survey by the Allergy Vigilance Network, started in 2000, shows that 4% of life-threatening food allergies are caused by sesame seeds[8, 13].

Sesame allergy is much more characteristic of Japan and China, the main producers of sesame where the use of sesame seeds is a significant part of the diet. Prevalence is increasing significantly in countries such as Australia and France, and especially Israel, where sesame seed pastes in the form of tahini, hummus and halva are common snack items. Sesame is considered the leading cause of IgE-mediated food allergies in Israel and is the second cause of anaphylactic reactions after cow's milk. Sesame allergy is also a cause of workplace allergy in people involved in the production of bread and pasta containing sesame. Many people allergic to sesame are also allergic to tree nuts[10, 13].

Clinical signs and prevention

The main clinical features of sesame allergy in children are asthma and atopic dermatitis. About half of adults at risk experience anaphylactic shock, with loss of consciousness in some cases. Mainly, the basic symptoms include redness of the skin, urticaria, itching, angioedema, swelling of the skin; hay fever, asthma, coughing, difficulty breathing and chest tightness; oral allergy syndrome, nausea, vomiting, diarrhea, stomach cramps; dizziness, drowsiness, low blood pressure, collapse, anaphylaxis. Symptoms occur from a few minutes to 2 hours after ingestion of products containing sesame. The incidence of gastrointestinal symptoms in sesame allergy is low compared to other symptoms that occur [2,4,7]

Total avoidance of sesame seeds, flour or oil is recommended for people suffering from sesame allergy. Because the allergy is particularly prevalent in people who already suffer from another type of allergy, such as eczema or other types of food allergies, it is recommended that sesame be excluded from the diet of infants with a history of atopic dermatitis or atopic family history. disease. Sesame seeds can also be present as a hidden ingredient, especially in margarines and salad dressings where the label often says "vegetable oil". However, the requirements of recent labeling legislation in the EU require mandatory labeling of sesame in the declaration of repackaged products containing it as an ingredient[11, 14].

Celery allergy

Celery is one of the most common food products causing oral allergy syndrome in elderly people in Switzerland, Germany and France. Allergy to celery root is more common than allergy to celery stalks. The main allergen in celery is labeled Api g1 and is heat resistant, so its ability to cause an allergic reaction remains preserved even after extensive heat treatment. For those reasons, food preparation does not reduce the allergenicity of celery or its products. Celery in spice form or raw has equal potency for causing an allergic reaction[2,4, 9].

Celery allergy is very often associated with tree or grass pollen allergy. Individuals who have developed an allergic reaction to birch pollen tend to be allergic to the birch pollen allergen designated

Bet v 1. When people suffering from Bet v 1 type of allergy, eat certain types of fruits and vegetables, such as celery, they quite often experience an allergic reaction that occurs in the mouth itself, known as oral allergy syndrome. Because celery allergy is often associated with birch pollinosis and/or wild wormwood, the term birch-wild wormwood-celery syndrome has been coined[4].

It is the most common type of pollen-related food allergy in Switzerland where up to 40% of patients are allergic to celery root and severe anaphylactic reactions have been reported. In France, about 30% of serious allergic reactions to food are thought to be caused by celery.

There is evidence that birch pollen and celery allergy are highly related in Central Europe, while in Southern Europe celery allergy is more often associated with wild wormwood pollen[4,13,15].

Clinical signs and prevention

In provocation testing with celery 50% of patients developed local reactions in the mouth and 50% developed systemic reactions. Other symptoms include itching and redness of the skin and oozing of the skin; stomach cramps and nausea; difficulty breathing, asthma and chest tightness; anaphylactic shock [4, 10].

Nut allergy

In this category as potential allergens are included: almonds, Brazil nuts, cashews, hazelnuts, macadamia nuts, walnuts and Queensland hazelnuts. Nut allergies are common, potentially life-threatening food allergies. Allergies usually last a lifetime. Nuts can belong to different families that are not related to each other, and tree nuts are also not related to peanuts. People allergic to peanuts can eat tree nuts, and those allergic to tree nuts can eat peanuts. However, some allergic people can be allergic to both peanuts and tree nuts, some people can be

allergic to only one of the nuts and not all nuts. Of all the common nuts, almonds cause the fewest adverse reactions[2,4, 10].

An adverse reaction to nuts is a true food allergy, which involves an overreaction of the immune system and the production of IgE antibodies. The main allergens in nuts are: 2S albumin, 7S stored globulins, 11S globulins, which are stored in the seeds, non-specific lipotransfer proteins and Bet v 1 homologue[2,7].

Food research indicates that nut allergy affects 1% of the population. It is thought to be much more common in the United States than in certain parts of Europe, such as Spain, although it is not clear why there would be such a split. Genetic and environmental factors can play a significant role. Nut allergy is not as common as peanut allergy, although in Germany hazelnut allergy is more common than peanut allergy[12].

Clinical signs and prevention

Nut allergy symptoms can vary greatly from mild to severe. The most common moderate symptoms are numbness of the mouth and lips and facial flushing; nausea and colicky pain, accompanied by a feeling of constriction in the throat; urticaria or flushing. Severe reactions occur in those who are more sensitive, such as: suffocation, sudden drop in blood pressure, collapse and unconsciousness[4,10, 16].

These symptoms occur as a result of the rapid release of preformed histamine and other mediators of inflammation from mast cells and basophils. More serious reactions are classified as anaphylaxis and require immediate medical attention. The onset of an anaphylactic reaction is usually very rapid and can result in unconsciousness in a short time [9,16].

Avoiding nuts and their products completely is probably the best way to manage this allergy. Despite the fact that it says that an allergy to one type of nut does not mean a predisposition to an allergy to other nuts, however, it does not always have to be the case. For people allergic to tree nuts have to avoid all tree nuts, unless tolerance to a specific type of tree nut has been confirmed by reliable tests[6, 16, 17].

Products most likely to contain nuts include chocolate, sweets, cakes, desserts, candies, marzipan, doughnuts, ice cream, cereals, ready meals, granola, energy mixes, pesto sauce, muesli, vegetarian ready meals and products, so in that context, special attention should be paid when checking the marks. Special

care should be taken during the preparation and storage of food products in order to avoid cross-contamination[11,14,17].

Wheat allergy

Wheat and products containing wheat are quite often associated with allergies in children and adults. As with other allergies, the protein fraction is responsible for causing an allergic reaction. The proteins found in wheat are similar to those found in rye, barley and spelt. For those reasons, people who suffer from a wheat allergy are likely to be allergic to some other grains as well. Rice and maize are not thought to cause similar problems[4].

A wheat allergy is an adverse reaction followed by the production of immunoglobulin E antibodies in response to one or more protein fractions found in the wheat grain. That protein fraction includes gliadin, gluten, albumin and globulin. The largest number of allergic reactions occur in response to the globulin and albumin fraction present, although in a small number of cases gliadin and gluten are responsible. Allergic reactions to wheat occur when food products containing wheat are ingested or when wheat flour is inhaled[4, 8, 9, 18].

People who suffer from wheat allergy are often also allergic to related grains, such as barley, rye, and in certain cases, oats. Some of the allergens present in wheat are similar to the allergens present in grass pollen. Heat does not affect the reduction of the allergenic potential of wheat. On the contrary, the roasting process itself has been shown to increase resistance to proteolytic enzymes, thereby allowing allergens to pass through the digestive tract intact, where they can trigger an immune response. For these reasons, baked bread is considered to have a higher allergenic potential compared to raw flour[2,14].

A wheat allergy should not be confused with celiac disease, although the symptoms are similar. Celiac disease, also known as gluten enteropathy, was until recently identified as gluten intolerance. Wheat allergy can occur in any individual, whereas celiac disease is a hereditary disease[4].

Wheat allergy occurs in both younger and older population, although it is thought that it may decrease over the course of life in the younger population. People who develop wheat allergy later in life usually have it throughout their lives. Prevalence of self-reported wheat allergy in adults in the US is 0.8%, but in EU 3.6%, according to recent surveys [8]. Research conducted in Australia indicates that the prevalence among the young population is 0.25%[12].

In certain subgroups, wheat allergy may be more characteristic. For example, in the bakery industry there is data, which says that wheat allergy is the cause of allergy in workplaces, and that in 30% of people[10]. A specific type of allergy known as exercise-induced wheat anaphylactic reaction has been associated with physical activity after wheat consumption. This type of allergy is more often seen in adults who have no previous history of wheat allergy[4].

Clinical signs and prevention

An allergic reaction to wheat begins within minutes to hours of wheat consumption (or inhalation). The most common symptoms are skin itching, redness, urticaria, eczema, angioedema, abdominal cramps, nausea, vomiting, diarrhea, asthma, breathing difficulties, allergic rhinitis. In more serious cases: drop in blood pressure, collapse and anaphylactic shock.

It is not yet entirely clear how much is needed to cause a reaction in sensitive individuals; however, a recent study in Germany using doses of 4 mg to 3.5 g of wheat flour concluded that only small amounts of wheat are needed to cause an allergic reaction [2,4, 8, 18].

The best way to deal with this condition is to avoid products containing wheat. Since wheat is a widely used ingredient in common food products, avoiding its consumption is a challenge. However, to comply with recent allergen legislation, all prepackaged food products containing wheat are required to be so labelled. Individuals who are allergic to wheat should also avoid grains that contain gluten, such as rye, barley, and oats, although rice- and corn-based foods may be suitable substitutes [4, 11, 14].

Discussion

All food operators in secondary food production, in retail, in restaurants and other catering establishments have the obligation to indicate the presence of allergens according to the Regulation on information related to food. By doing so, they give the opportunity to every person who knows that they have an allergy to food to make a choice that will not have a negative effect on their health. All the allergens listed above are part of the list of allergens that must be indicated in the product declaration or on the menu in catering establishments. They should also label the gluten content in the products with the following labels: "does not contain gluten" if it contains gluten less than 20mg/kg or with "very low gluten content" if it contains gluten in the range of 20mg/kg to 100mg/kg[6,11,14].

Considering the global trend for increased sensitization of the population to allergens and the possibility of an increased immune reaction in people, a broad action is needed to overcome or reduce this problem [4,10]. Education of the population, especially young parents, for early recognition of the signs of intolerance, celiac disease and food allergy in children is very important. This should be especially aimed at parents with a family history of food allergy or celiac disease, who need to plan their infant's diet very carefully. Education can take place through electronic media, through health facilities where parents come for regular control of the child's development, or through kindergartens and schools with the application of appropriate educational material.

Education of the people to deal with allergies to certain foods, about the first measures they should take and seek medical help is the next step. To deal with the allergy, it is necessary to understand the meaning of strict exclusion of certain food products, for example milk, eggs, peanuts that can cause a serious clinical outcome that can lead to a fatal outcome if timely intervention is not done. This means recognizing products that may contain ingredients from food products to which they are allergic, and this can be achieved through mandatory reading of the product declaration[19].

Conclusions

Intolerance to a certain type of food is a condition in which the immune system is not involved, it involves reactions to certain food components, such as lactose, amines and histamine, due to an innate lack of enzymes or a pharmacological reaction. Prevalence of food intolerance depends on data collection methods and definitions; some authors believe that it covers 15-20% of the population and is most often manifested by gastrointestinal symptoms.

Food allergy is an unwanted immune reaction to food that always involves immunoglobulin E (IgE). The largest number of food allergies are caused by proteins that cause sensitization and then trigger an allergic reaction in sensitized individuals. Food intolerance can sometimes be controlled by limiting the amount of a certain type of food that is consumed, but when it comes to food allergies, much stricter avoidance of the food is required. Only food allergy, not food intolerance, can lead to a potentially fatal anaphylaxis reaction.

The measures for the prevention of these pathological conditions consist in timely diagnosing and avoiding the food that causes allergy or intolerance. When it comes to food allergy, strict avoidance is necessary because even the smallest amount can sometimes cause fatal reactions.

To avoid allergens, it is necessary to label the products for the presence of allergens. Food operators have an obligation to consistently label products and take all measures in the production process to control allergens.

It is necessary to improve the system for reporting diseases, especially for food allergies, intolerance and celiac disease in order to reach an objective prevalence of these pathological conditions in the population. In this direction, research work should proceed on this problem, which has an increasing tendency at the global level, and therefore at the national level.

Conflict of Interest: The authors declare no conflict of interest.

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Original Article

ATTITUDES OF STUDENTS OF THE COLLEGE FOR VOCATIONAL STUDIES IN HEALTHCARE „MEDIKA“ REGARDING THE NURSING PROFESSION

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Abstract

Background: Nursing is a recognizable profession, but due to numerous prejudices, there is a need to strengthen awareness of the values of the nursing profession, both on an individual and a social level.

Aim*:* This research aims to determine the attitudes of students at a college for vocational studies in healthcare toward the nursing profession, i.e. towards the roles and tasks of nurses/technicians, values in nursing, social stereotypes in nursing, professionalism, and characteristics of nurses/technicians.

Materials and Methods*:* The research sample included 50 students at the colleges for vocational studies in healthcare "Medika" from Belgrade, Loznica, and Kruševac. A questionnaire on sociodemographic characteristics and the Nursing Image Questionnaire (NIQ-7) were applied. Mann-Whitney U test and Kruskal-Wallis H test were used to test the differences between the median values in two and three independent groups, respectively.

Results*:* We found a significantly more positive attitude towards nursing among the respondents aged 40 to 49 compared to younger categories of respondents (subscale „Social stereotypes towards nursing"; p=0.022;), those who were married compared to single or divorced („Social stereotypes towards nursing; p=0.019), and those who owned the apartment compared to those who lived with parents or rented the apartment ("Social stereotypes towards nursing"; p= 0.002; ; and **"**Characteristics of nurses / technicians"; p=0.015;)..

Conclusion*:* We show that there is a positive correlation between older age, marriage and socio-economic status and the students' attitudes towards nursing profession. Further studies on this topic may contribute to the improvement of the quality and efficacy of nursing studies.

Keywords: attitudes, education, higher education, health care

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Introduction

The World Health Organization[1] defines the health care system as a health infrastructure that provides a range in a modern health care system, encompasses different areas of professional activity at different levels of health care, all intending to ensure the efficient functioning of the health care system. During their professional engagement, nurses have several roles requiring certain knowledge and skills, so it is important to provide continuous education to progress in the nursing profession.

In recent years, increasing attention has been focused on the education of nurses, through which students are prepared for responsible and professional work within their profession [2]. Study programs are aimed at providing quality knowledge and skills in the field of nursing care, as well as training for independent practical work. Nurses are expected to acquire the necessary knowledge and skills during their education and learn to value their profession. Takase et al., [3] state that nurses who feel that society has a negative perception of nursing are more likely to develop a lower self-image, which can lead to job

dissatisfaction. The results of several studies concerning social stereotypes towards nursing and perceptions of nursing are heterogenous. Some of them emphasize the positive qualities of nurses, such as communication, professionalism, knowledge, and reliability [4], while others focus on the negative perception of nursing, which includes: lower education, lower salary and poor

working conditions [5]. For the development of nursing profession, it is extremely important how nurses perceive nursing and how their behaviour and attitudes influence the creation of an image of nursing.

As a profession, nursing is recognizable today, but there is still a need to strengthen nursing awareness of the values of one's profession, due to the numerous prejudices it carries with it.

This research aims to determine the attitudes of students at a college for vocational studies in healthcare about the nursing profession.

Materials and Methods

Sample

The study was conducted from October to November 2020 among students at the colleges for vocational studies in healthcare "Medika" from Belgrade, Loznica, and Kruševac. The sample consisted of 50 students, gender distributed as 5 males and 45 females, aged 19 to 49 years. The participation was anonymous.

Questionnaires

Data were collected by electronic questionnaires sent to the students' e-mail addresses.

A sociodemographic questionnaire was specially designed for this research. The questions were related to gender, age, status of studies, the field of study, year of study, place of study, the reason for enrolling the study, reactions to the study environment, employment status, marital status, children and living conditions.

The Nursing Image Questionnaire, the seventh version (NIQ-7), created by Toth et al. [6], and translated and validated by Čukljek et al. [7]was used for assessing the attitudes of nurses and technicians towards the nursing profession. NIQ-7 consists of 30 items, which refer to the role of nurses/technicians (10 items), values (7 items), social stereotypes towards nursing (6 items), professionalism (4 items), and characteristics of nurses/technicians (3 items). The responses are given on a Likert-type scale from 1-5, where 1 indicates the least agreement with the particular statement. The items 4, 9, 15, 17, 19, 23, and 27 are reversely scored. By scoring the questionnaire, a minimum of 30 and a maximum of 150 points may be obtained, whereby a higher score on the questionnaire indicates a more positive attitude towards nursing. Cronbach's alpha coefficient was used to test the reliability of NIQ-7 concerning the attitudes towards nursing. All domains of the questionnaire have satisfactory reliability ranging from 0.711 to 0.731 (Table 1).

Table 1. The scale of reliability for the Nursing Image Questionnaire

Parameter	Cronbach's Alpha
Roles of nurses	0,714
Values	0,739
Social stereotypes toward nursing	0,711
Professionalism in nursing	0,731
Characteristics of nurses/technicians	0,728

In descriptive statistics the frequencies, percentages, and sample mean value (Median) with range were used in inferential statistics the probability level was established at $p<0.05$. As the distribution of numerical variables assessed with the Kolmogorov Smirnov test was not normal, non-parametric statistical methods were used. Mann-Whitney U test and Kruskal Wallis H were used to test the differences between the means of two and three or more independent groups, respectively. Statistical processing and analysis were done in the statistical package SPSS ver. 24 (Statistical Package for the Social Sciences) for Windows. 5

Results

There were 3/4 of respondents who were aged from 19-39 years. All respondents were self-financing programme course students. The majority of respondents (88%) were at nursing studies, while 12% of respondents were at physiotherapist studies. About half of the respondents were in the first year of study, while 46% of the respondents were in the second year of study. Concerning the employment status 76% of respondents were employed in healthcare system. With respect to civil status 60% of respondents were married and 62% of respondents had children. Regarding the living conditions 56% of respondents lived in their own apartments, while the rest either lived with their parents or in a rented apartment. The vast majority of respondents reported the desire to improve their education as a reason for enrolment (74%), and 92% of them received positive reactions from their families (Table 2).

Table 2. General information about the respondents **(N=50)**

Parameter		**N**	**%**
Gender	male	5	10
	female	45	90
Age	19-29	18	36
	30-39	19	38
	40-49	13	26
Study status	Self-financed	50	100
	On budget	0	0
Study program	Vocational nursing	44	88
	Physiotherapist	6	12
Year of studies	First	27	54
	Second	23	46
Place of study	Beograd	23	46
	Loznica	13	2
	Kruševac	14	28
Workplace	Employed in health care	38	76
	Employed elsewhere	7	14
	Unemployed	5	10
Marital status	Married	30	60
	Single / divorced	20	40

Continuation of Table 2

Children	Yes	31	62
	No	19	38
Place of residence	Own apartment	28	56
	With parents	22	44
Reason for enrolment	The desire to improve	37	74
	Financial incentives	6	12
	Desire to help	3	6
	Family advice	1	2
	Better workplace	1	2
	Career and finances	2	4
Reason for enrolment (categorized)	Self-improvement	37	74
	Other	13	26
Reaction of family	Positive	46	92
	Neutral	4	8

We investigated whether there was a difference between the scores on certain subscales between certain sociodemographic groups. The obtained data show that a significantly more positive attitude towards nursing was reported among the respondents aged 40 to 49 compared to younger categories of respondents (subscale „Social stereotypes towards nursing"; p=0.022;), those who were married compared to single or divorced (subscale „Social stereotypes towards nursing; p=0.019;), and those who owned the apartment compared to those lived with parents or rented the apartment (subscale "Social stereotypes towards nursing"; p= 0.002; ; and subscale **"**Characteristics of nurses / technicians"; p=0.015. (Table 3).

Table 3. Attitudes about nursing in different sociodemographic groups

	Roles of nurses	**p**	**Values**	**p**	**Social stereotyp uursing**	**p**	**Profession. in nursing**	**p**	**Charact. of nurses / technicians**	**p**
Gender		0,53[a]		0,82[a]		0,05[a]		0,19[a]		0.48[a]
Male	8(5-11)		15(14-19)		27(26-30)		25(21-26)		35(27-36)	
Female	10(3-11)		15(11-20)		25(17-29)		26(14-32)		35(25-40)	
Age		0,21[b]		0,33[b]		**0,02[b]**		0,19[b]		0,57[b]
19-29	10 (7-11)		15(11-20)		23(17-29)		26(20-32)		33,5(25-40)	
30-39	10 (4-11)		16(12-19)		26(21-30)		26(18-31)		35(27-40)	
40-49	10 (3-11)		15(11-19)		27(21-29)		24(14-29)		36(25-40)	
Study program		0,11[a]		0,21[a]		0,31[a]		0,50[a]		0,20[a]
Vocational nursing	10 (3-11)		15 (11-20)		25,5(18-30)		26 (14-31)		35,5 (25-40)	
Physiother.	9 (5-10)		17(11-19)		22(17-28)		26 (23-32)		34 (25-37)	
Year of studies		0,56[a]		0,56[a]		0,78[a]		0,50[a]		0,21[a]
First	10(3-11)		16(11-19)		26(21-30)		25(17-31)		36(25-40)	
Second	10(4-11)		15(11-20)		25(17-29)		27(14-32)		34(25-40)	
Place of study		0,44[b]		0,86[b]		0,41[b]		0,50[b]		0,42[b]
Belgrade	10(4-11)		15(11-20)		25(17-29)		26(14-32)		34(25-40)	
Loznica	10(8-11)		15(13-17)		27(19-30)		27(19-31)		35(26-40)	
Krusevac	10(3-11)		16(11-19)		23,5(21-28)		25,5(22-30)		36(25-40)	

Continuation of Table 3

Workplace		0,90[b]		0,91[b]		0,11[b]		0,22[b]		0,48[b]
Employed in health care	10(3-11)		15(12-19)		26(19-30)		25(14-31)		36(25-40)	
Employed elsewhere	9(8-11)		15(11-18)		22(18-29)		27(26-29)		34(32-40)	
Unemployed	10(10-11)		16(11-20)		21(17-28)		25(23-32)		34(25-40)	
Marital status		0,35[a]		0,65[a]		**0,02[a]**		0,71[a]		0,09[a]
Married	10(3-11)		15(11-19)		26,5(19-30)		25(14-31)		36(25-40)	
Single / divorced	10(8-11)		16(11-20)		23,5(17-29)		26(20-32)		34(25-40)	
Children		0,27[a]		0,32[a]		0,11[a]		0,99[a]		0,16[a]
Yes	10(3-11)		16(11-19)		26(19-30)		26(14-31)		36(25-40)	
No	10(7-11)		15(11-20)		25(17-29)		26(20-32)		34(25-40)	
Place of residence		0,20[a]		0,46[a]		**0,002[a]**		0,56[a]		**0,015[a]**
Own apartment	10,5(4-11)		15(11-19)		26,5(21-30)		25(14-31)		36(25-40)	
With parents	10(3-11)		16(11-20)		22,5(17-28)		26(20-32)		34(25-40)	
Reason for enrolment		0,15[a]		0,49[a]		0,97[a]		0,17[a]		0,35[a]
The desire to improve	10(3-11)		15(11-19)		25(17-30)		26(17-32)		36(25-40)	
Other	10(4-11)		15(11-20)		26(18-29)		24(14-29)		33(25-40)	
Reaction of family		0,15[a]		0,94[a]		0,59[a]		0,16[a]		0,21[a]
Positive	10 (3-11)		15(11-20)		25,5(17-30)		26(14-32)		35,5(25-40)	
Neutral	8,5 (5-10)		16,5(16-19)		21(18-28)		26,5(24-29)		32,5(26-34)	

[a]Mann-Whitney U test, [b]Kruskal Wallis H test; Median (Minimum-Maximum) values are presented

Discussion

With respect to gender distribution 90% of our sample were females and that is in accordance with the findings that nursing profession is mainly a female one [8]. Students who enroll nursing schools, do it primarily with a desire to help others, and then because of job security [9]. However, in our research, the reason for enrolling nursing studies was self-improvement (74%), and that coincides with the fact that the majority of students were already employed in healthcare (76%) and want to improve their knowledge and skills. Radcliffe[10] states that nursing has been developed as a female profession based on a stereotype that women are better in nursing than men because of their innate sense of nurturing [11]. The reason for the underrepresentation of men in nursing may be that the choice for the nursing profession among men is significantly influenced by the media, public opinion, patient attitudes, organizational culture in nursing, etc. [12].

There are stereotypes that nurses are doctors' assistants, which nurses would not agree with [13], that nurses want to be doctors but are not intelligent enough [14] and that there is a greater possibility of marrying a doctor [15]. Kosier et al., [2] point out that nurses have enough knowledge and skills for independent work, as well as that the education of nurses is adequately organized and ensures the necessary knowledge and skills. The nursing profession is a responsible job [8], which implies the need for nurses to be capable and responsible in their work because in this way they contribute to the success of providing health services at all levels of the health system. Previous studies indicate that nurses are not adequately paid [8,13,16,17], but express satisfaction with their work [13,17,18,19].

Looking at the role, tasks and characteristics of nurses, we can say that nurses are advocates of patients' rights [20]. Further research in nursing profession indicates a tendency to agree that patient advocacy by the nurses is also highly important because patients are more vulnerable while being in the clinical settings. Increased fear for their health condition or lack of information about procedures and interventions that need to be performed are most present. Advocacy of patients' rights enables nurses to

care for, as well as promote the rights and interests of patients in such situations [21]. Furthermore, interventions provided by nurses are just as important as interventions by physicians. This is confirmed by the research of Laurent et al. [22] that points out that interventions delivered by nurses instead of doctors is a strategy used to improve access, efficiency and quality of care. Compassion and compassionate care stand out as two essential elements of nursing, which affect the overall quality of the patient's life. The view that nurses are kind and compassionate beings who provide support to patients is supported by other studies [23,24,25].

Within the framework of professionalism, the importance of conducting nursing research is emphasized for the development of nursing [18,19] and maintaining high standards of health care [26]. In recent years there is a need for continuous education [2,26], which is carried out to preserve acquired competencies and improve existing abilities, knowledge, and skills.

We found higher scores on certain subscales, namely: social stereotypes towards nursing for respondents aged 40 to 49, married students and those who owned the apartment (additional subscale characteristics of nurses/technicians) Čukljek [27] also showed that the attitude towards nursing was in a positive correlation with the year of study.

Conclusion

Our study shows that the main factors that significantly and positively influence the attitudes of students towards nursing profession are older age, marriage and better socio-economic status. Further studies are needed in this research field to improve the quality and efficacy of nursing studies.

Conflict of interest

The authors declare no conflict of interest.

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