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# NUTRITIONAL HABITS IN PLUNGE DISTRICT ADOLESCENTS

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## Annotation

*Adolescence is a period in which physiological changes in the body occur and the habits of life and eating change. These are manifested for both, boys and girls. In order to better understand what determines the changes in eating habits, the society must educate adolescents and their parents, how physical activity and dietary knowledge are related to eating habits in adolescence. Eating habits among adolescents are particularly worrying because in early age overweight and obesity often results in adult obese and increases the risk of developing various illnesses.*

**Key words:** teenagers, nutrition, habits, inappropriate food.

## Introduction

**The aim** is to analyse the eating habits of teenagers and their attitude to healthy eating.

### Objectives

1. To find out the teenagers' eating habits and the effect of bad food consumption on teenagers health.
2. After the analysis of survey results, to discuss the teenagers' attitude to eating according to the living place of respondents.
3. To find out the dominating eating habits according to the respondents' grade.
4. To estimate the consumption of healthy products according to respondents' gender.

## Methods

The study took place in April 2017 Plungė District Municipality. The survey was carried out with the parents' consent to their children to participate in a one-time questionnaire. The study was based on the principles of general ethics: autonomy, privacy, confidentiality, harmlessness, goodness [11]. The sampling method was chosen for the study. According to the data of Plungė Education Department, the total sample size in Plungė district is 929 teenager. The age of the subjects varies from 13 to 15 years. In proportion to the number of teenagers, it was estimated that 278 teenagers (boys N = 157, girls N = 121) had to be examined in Plunge district. Students from seventh (N=99), eighth (N=95) and ninth (N=84) grades of two cities and three country schools were selected. The tool of research is a close type questionnaire. The questionnaire was the non-standardized, used only for this study, which consisted of 19 questions. Statistical analysis was performed using the software packet of data collection and analysis, SPSS 19.0 (Statistical Package for Social Science 19 for Windows). Categories were described in percentage distributions; relations between categorical signs were searched for and distributed comparing to Chi-square test ( $\chi^2$ ). The charts were prepared using a standard MS Excel and Microsoft Excel programs.

## Background

Rational nutrition for children is the basis for health. It affects the physical and mental development of children, immunity, workability and life durability. As we know, modern adolescents do not adhere to the principles of healthy eating, so we have problems with their eating habits [6]. Consumption of unhealthy food, established habits in adolescents has become a major public health issue [10]. The scientific community has agreed that nutrition is a key factor in maintaining good health. Healthy eating is considered one of the most important means of promoting good health and also contributes to reducing the prevalence of many common chronic diseases. Healthy eating is a balanced and diverse diet, consisting of healthy foods: fresh and natural foods, lots of fruits and vegetables, and foods containing vitamins and minerals. In this regard, modern teenagers have insufficient knowledge about healthy eating, and this is widespread today. Various studies have shown that adolescents are more and more associated with various illnesses, malnutrition, lack of knowledge about healthy foods, and are not able to balance food products [4]. Researchers say that parents influence the nutrition of children not only by allowing them to get one or the other food, but also by their own example, choosing healthier foods as well as their eating behavior [1]. The environment surrounding the teenager, habits can also affect the choice of food and eating behavior. For example, when they

return home from school, teenagers watch consume encouraging commercials [7]. It is noted that food provides energy for the teenager, it is needed for growth, physical activity and vital functions of the body (respiration, blood circulation, digestion, maintenance of the body temperature, thinking). During childbirth, essential changes in its body occur, morphologically and functionally, many organ systems change. At the time of conception, metabolism is intensified and energy demand increases. Irrational nutrition undermines adolescent's health, inhibits development and growth, delays puberty, reduces the protective properties of the body, weakens memory and ability [9]. Emphasis is placed on the role of nutrition in the etiology of chronic diseases and the choice of foods that determine the nutritional habits of children and adolescents around the world [2]. Changing eating habits can improve the health of the population and increase their life duration, therefore exclusive attention should be paid to the young person's health [8].

### Results

Socio-demographic data of the subjects (Table 1).

Table 1

Gender,  $p < 0.001$

| Gender | N   | %    |
|--------|-----|------|
| Male   | 157 | 56,4 |
| Female | 121 | 43,6 |

Distribution of respondents to a gender: male 157 (56,4%), female – 121 (43,6%).

The most of surveyed students live in the countryside (Table 2) – 136 (49.0%), in the city – 65 (23.4%), in small town – 77 (27.6%).

Table 2

Residence

| Living region | N   | %    |
|---------------|-----|------|
| Village       | 136 | 49   |
| Small town    | 65  | 23,4 |
| City          | 77  | 27,6 |

The difference between the rural area and the city was significant,  $p < 0.001$ .

The study involved 99 7th grade students (35.6%), 8th – 95 (34.2%), an 9th – 84 (30.2%) teenagers (Table 3).

Table 3

Classes, ( $\chi^2 = 0.181$ ;  $lfs = 2$ ;  $p > 0.05$ )

| Class   | Male (N) | %    | Female (N) | %    | N  | %    |
|---------|----------|------|------------|------|----|------|
| Class 7 | 57       | 20,5 | 42         | 15,1 | 99 | 35,6 |
| Class 8 | 52       | 18,7 | 43         | 15,5 | 95 | 34,2 |
| Class 9 | 48       | 17,3 | 36         | 12,9 | 84 | 30,2 |

The difference between gender and classes is not significant ( $\chi^2 = 0.181$ ;  $lfs = 2$ ;  $p > 0.05$ ).

Respondents' attitude to healthy diet (Table 4).

Table 4

Respondents' attitude to healthy nutrition by place of residence ( $\chi^2 = 5.554$ ;  $lfs = 6$ ;  $p < 0.05$ )

| Living region | Yes (%) | No (%) | I do not know (%) |
|---------------|---------|--------|-------------------|
| Village       | 16,9    | 10,1   | 10,4              |
| Small town    | 16,2    | 6,5    | 6,1               |
| City          | 15,8    | 6,8    | 11,2              |

In this study, adolescents living in rural areas have a better attitude towards the healthy nutrition – 47 (16.9%). The difference in the attitude to healthy nutrition in comparison with the place of residence was significant ( $\chi^2 = 5.554$ ;  $lfs = 6$ ;  $p < 0.05$ ).

Eating habits of respondents (Table 5). The results of the survey: breakfast, dinner at school every day is mostly eaten by children of grade 7, 22 (7.9%). The highest in daily fruit

intake during breaks is also in class 7 – 11 (4.0%), the difference between fruit eating and gender is very significant ( $\chi^2 = 19.458$ ; IIs = 6;  $p < 0.001$ ). A study was conducted in Klaipėda district in 2014, during which teenage nutrition in schools was analyzed. According to the study, two main criteria for food choice in schools were distinguished: taste characteristics (35.9%) and price (34,7%) [3].

Table 5

The frequency of eating by the respondents' class, warm breakfast / lunch ( $\chi^2 = 2.414$ ; IIs = 6;  $p > 0.05$ ); light snacks ( $\chi^2 = 12,544$ ; IIs = 6;  $p < 0,05$ ); sandwich ( $\chi^2 = 6.302$ ; IIs = 6;  $p < 0.05$ ); sweets, etc. ( $\chi^2 = 8,363$ ; IIs = 6;  $p < 0,05$ ); fruit ( $\chi^2 = 19.458$ ; IIs = 6;  $p < 0.001$ ); fast food ( $\chi^2 = 3.600$ ; IIs = 6;  $p > 0.05$ ).

| <b>A warm breakfast or a lunch in the school canteen</b> | <b>Class 7 (N)</b> | <b>%</b> | <b>Class 8 (N)</b> | <b>%</b> | <b>Class 9 (N)</b> | <b>%</b> |   |
|--|--------------------|----------|--------------------|----------|--------------------|----------|---|
| Every day  | 22                 | 7,9      | 18                 | 6,5      | 19                 | 6,8      | $(\chi^2 = 2,414$ ; IIs = 6; $p > 0,05$ )   |
| 3-4 times a week   | 10                 | 3,6      | 10                 | 3,6      | 11                 | 4,0      |   |
| 1-2 times a week   | 10                 | 3,6      | 6                  | 2,2      | 8                  | 2,9      |   |
| Rarely or never  | 57                 | 20,5     | 61                 | 21,9     | 46                 | 16,5     |   |
| <b>Easy snacks in the school canteen</b>                 |                    |          |                    |          |                    |          |   |
| Every day  | 10                 | 3,6      | 5                  | 1,8      | 3                  | 1,1      | $(\chi^2 = 12,544$ ; IIs = 6; $p < 0,05$ )  |
| 3-4 times a week   | 15                 | 5,4      | 15                 | 5,4      | 8                  | 2,9      |   |
| 1-2 times a week   | 25                 | 9,0      | 34                 | 12,2     | 18                 | 6,5      |   |
| Rarely or never  | 49                 | 17,6     | 41                 | 14,7     | 55                 | 19,8     |   |
| <b>A sandwich brought from school to school</b>          |                    |          |                    |          |                    |          |   |
| Every day  | 1                  | 0,4      | 6                  | 2,2      | 3                  | 1,1      | $(\chi^2 = 6,302$ ; IIs = 6; $p < 0,05$ )   |
| 3-4 times a week   | 4                  | 1,4      | 5                  | 1,8      | 7                  | 2,5      |   |
| 1-2 times a week   | 7                  | 2,5      | 8                  | 2,9      | 8                  | 2,9      |   |
| Rarely or never  | 87                 | 31,3     | 76                 | 27,3     | 66                 | 23,7     |   |
| <b>Sweets, cookies, crisps during breaks</b>             |                    |          |                    |          |                    |          |   |
| Every day  | 2                  | 0,7      | 4                  | 1,4      | 6                  | 2,2      | $(\chi^2 = 8,363$ ; IIs = 6; $p < 0,05$ )   |
| 3-4 times a week   | 16                 | 5,8      | 11                 | 4,0      | 8                  | 2,9      |   |
| 1-2 times a week   | 40                 | 14,4     | 28                 | 10,1     | 26                 | 9,4      |   |
| Rarely or never  | 41                 | 14,7     | 52                 | 18,7     | 44                 | 15,8     |   |
| <b>Apples or other fruits during breaks</b>              |                    |          |                    |          |                    |          |   |
| Every day  | 11                 | 4,0      | 7                  | 2,5      | 10                 | 3,6      | $(\chi^2 = 19,458$ ; IIs = 6; $p < 0,001$ ) |
| 3-4 times a week   | 12                 | 4,3      | 19                 | 6,9      | 17                 | 6,1      |   |
| 1-2 times a week   | 24                 | 8,7      | 25                 | 9,0      | 37                 | 13,4     |   |
| Rarely or never  | 51                 | 18,4     | 44                 | 15,9     | 20                 | 7,2      |   |
| <b>Buy fast food at school (kebabs, burgers, etc.)</b>   |                    |          |                    |          |                    |          |   |
| Every day  | 11                 | 4,0      | 11                 | 4,0      | 13                 | 4,7      | $(\chi^2 = 3,600$ ; IIs = 6; $p > 0,05$ )   |
| 3-4 times a week   | 8                  | 2,9      | 7                  | 2,5      | 10                 | 3,6      |   |
| 1-2 times a week   | 20                 | 7,2      | 14                 | 5,0      | 13                 | 14,7     |   |
| Rarely or never  | 60                 | 21,6     | 63                 | 22,7     | 48                 | 17,3     |   |

59 (20.8%) teenagers never eat breakfast or lunch at school canteen 74 (26.6%) teenagers prefer a high calorie snack. The study found that 22 (7.9%) adolescents in grade 8, eat sweets every day. In 7 th grade, 35 children (12.6%) eat sweets 3-4 times a week. The difference between the use of sweets and classes was significant ( $\chi^2 = 12.210$ ; IIs = 6;  $p < 0.05$ ). Sweet, carbonated beverages are mostly consumed by students on daily basis in grades 7 and 8, with 24 (8.6%) teenagers. Rarely or never – students in class 9, 43 (15.5%). It has also been shown that the majority: 50 boys (31.8%) and 27 girls (22.3%) are consuming dairy products every day. The difference between the consuming dairy and gender was statistically significant ( $\chi^2 = 7.830$ ; IIs = 3;  $p < 0.05$ ). Teenagers drink two liters of water a day, 75 (47.8%) boys and 38 (31.4%) girls. The difference of drinking water per day between the gender is very significant, ( $\chi^2 = 23,805$ ; IIs = 4;  $p < 0,01$ ). The results of the study „Nutrition habits of different sex teenagers in Utena region“ that was accomplished in 2014, showed that teenagers are not consuming enough of water, half of the students druk just 1 l a day [5].

### Conclusions

1. Teenagers are lacking fruits and vegetables in their diet whereof sweets and non alcoholic beverages increased. Breakfast is often out of daily diet.
2. It has been established that adolescents are more interested in healthy diets living in rural areas (18.0%). Adolescents living in the countryside have a higher positive attitude towards healthy eating (16.9%). Teenagers living in the city are not very interested in healthy food (14.0%).
3. The habits of daily consuming fruits during the breaks in the seventh grade – 4.0%. Potato chips are mostly eaten in grade 9 – 8 children (2.9%). Sweets are eaten daily by children in grade 8 – 22 (7.9%). Sweets, carbonated drinks are mostly taken by students in grades 7 and 8 (8.6%) on daily basis, however, 47.8% of adolescents did not eat fish at all.
4. 33.8 % boys and 21.9 % girls have breakfast every day. The majority uses dairy products daily, 31.8% boys and 22.3% girls.

### References

1. Bartkevičiūtė R, Barzda A. Promoting healthy eating of school children. Vilnius: Center for Health Education and Disease Prevention; 2014, p. 1–35.
2. Doustmohammadian A, Omidvar N, Keshavarz-Mohammadi N, Abdollahi M, Amini M, Eini-Zinab H. Developing and validating a scale to measure Food and Nutrition Literacy (FNLIT) in elementary school children in Iran. PLoS One. 2017 Jun 27;12(6).
3. Griškoniš S, Dabašinskienė A, Strukčinskienė B. Teenagers nutrition in health enhancing schools. Health Sciences. 2014;24(5):11–15.
4. Jovičić AĐ. Healthy Eating Habits among the Population of Serbia: Gender and Age Differences J Health Popul Nutr. 2015 Mar;33(1):76-84.
5. Kuprėnaitė Ž, Lubienė J, Ubeikienė R. Comparison of eating habits of different sex teenagers in Utena region. Health Sciences. 2014;24(6):69–74.
6. Montvilienė I, Žuravliova T, Norkienė S, Mažrimas A. Preschool children nutrition parents' point of view. Public Health. 2014;24(5):44–47.
7. Pearson N, Griffiths P, Biddle S, Johnston JP, Haycraft E. Individual, behavioural and home environmental factors associated with eating behaviours in young adolescents. Appetite. 2017 May 1;112:35–43.
8. Rapolienė L, Eigelytė A, Gedrimė L, Norkienė S, Condition J. Citizen's awareness of a healthy lifestyle. Public Health. 2017;27(6):80–84.
9. Strukčinskienė B, Dabašinskienė A, Griškoniš S. Nutrition Peculiarities of Teenagers in Klaipėda Regional Schools. Health Sciences. 2014;24(5):5–10.
10. Vliet JS, Gustafsson PA, Nelson N. Feeling 'too fat' rather than being 'too fat' increases unhealthy eating habits among adolescents – even in boys. Food Nutr Res. 2016 Feb 16;60:29530.
11. Žydžiūnaitė V. Methodology of final thesis preparation. Klaipėda: Klaipėda State University of Applied Sciences; 2011.

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# DEVELOPMENT OF ESTONIAN NURSING PROFESSION AND NURSES' TRAINING: HISTORICAL, POLITICAL AND SOCIAL PERSPECTIVES

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## Annotation

*The purpose of the current article is to describe the development of nursing and nurses' training in the context of social and political changes in Estonia. The historical overview of nursing development in Western Europe, Scandinavia and the Baltic States in general gives the contextual background in which Estonian nursing started and progressed. Focus is on the development of nursing during the period of the restoration of independence, pointing out further development perspectives in nursing and training of nurses. Special attention has been paid on the last decade's emigration of nurses from Estonia - a trend that is continually growing and that can cause problems for health care system.*

*The data used in this paper are based on reviewing and summarising relevant articles, books, and studies, which have been conducted in several European countries, and were inspired by the ideas of nursing education in specific countries which have historically influenced Estonia most. Based on historical research methods, this publication provides Estonian nurses with a documented history of their profession during a critical period of development. Historical research method was used to analyze written nursing history in Estonia. Research materials included documentary sources, old newspapers, books, and journals pertaining to nursing education and practice.*

*Estonian nursing and nursing education have got influences from all over Europe. While the development of European nursing education was interrupted for several decades by the World War II, the first nursing programmes in universities were opened in 1990s. The modern nursing education is mainly influenced by the Bologna process. Thanks to the Bologna process nursing education has been harmonized and Estonian nurses can work all over the Europe with this education. This has resulted in the increase of the professionally educated nurses internationally migrating to work in higher income countries. Nursing education as a whole is becoming more academic - the first Estonian nurses have already acquired PhD.*

*There have been published monographies about nursing and nursing education history in Estonia, but there is a lack of review articles about the history of nursing and nursing education in comparison to historical and modern European nursing education. The present article is trying to fill this gap.*

**Key words:** *Estonia, nursing history, nursing education, professional development, nursing training, professional migration.*

## Introduction

J. E. Asvall, WHO regional Director for Europe, has said: "Who is the most important resource for health that a European country has today? Countries would give different answers to this questions, but all of them would put the work of nurses very high on the list – and rightfully so! The sheer number of the profession is close to 5 million in the 50 countries of the WHO European region. They serve 850 million people, who live in an area bordered by Greenland in the west, the Mediterrean Sea in the South, and the Pacific shores of the Russian Federation in the east. Nurses are not a homogeneous group: large differences are found in the roles they play, the tasks they perform, the training they receive, the status they have in society and the remuneration they get for their work. Taken together, however, they comprise a formidable workforce that provides some of the most essential services to keep people healthy, to take care of the ill and the injured, and to nurse the frail and elderly throughout the Region" (Asvall, 1997, p. xiii).

Development of Estonian nursing has been closely conneted to the changes in society, firstly influenced by European nursing. Virginia M. Dunbar, the administrator the American Red Cross Nursing Services, said in 1937th: „Nursing history in the world is the reflection of the history of different countries. Every country seems to illustrate the past or the future of some other country. Each country enlarges upon and acts out some step in the progress of another. As history help to explain the meaning of a single situation, so one country helps to explain

another. The length of training, the uniform, regulations regarding the wearing of the uniform, hours of duty, the distribution of instruction between doctor and nurse, the spirit of nursing on each of these points and on almost every possible detail the various countries give pictures of different stages, methods, and results. And so the various countries seem to appear not as separate countries, but as different stages and methods in the solution of a single problem that of nursing the people of the country" (Dunbar, 1937). As long as society is changing, and nurses are going to meet and adapt to societies needs, the education of nurses will also have to change continuously (Kyrkjebø et al, 2002).

According to Olga Odiņa: „The origins of (medical) nurse profession formed already in ancient past. Nurses' (medical) work originated alongside the traditional work of patient care and treatment. Since 1295, when one of the surnames of grey nurses (Menborha) was mentioned in Latvia, seven centuries have passed. Nowadays a nurse is a medical practitioner who has acquired an education which conforms to the requirements specified in the Law on Regulated Professions and Recognition of Professional Qualifications" (Odiņa, 2013, p. 5).

The first part of the article gives an overview of the socio-political framework of the development of nursing in Europe and Russia to understand the context of the forming and development of Estonian nursing before the World War II and from there on.

The second part of the article gives an overview of the development of Estonian nursing and nursing education before the Estonian independence, during the Republic of Estonia, the period of Soviet occupation and after gaining independence again, focusing on the trends of health care policy, nursing practice and nursing education.

The third part gives an overview of the migration of nurses and its possible influence on the Estonian healthcare.

### **Some historical lines of the development of nursing and nursing education in Europe**

As Dingwall, Rafferty and Webster (1988) state „Since 1948, most of us have grown up with a pretty clear idea of what a hospital is, what a doctor is, what a nurse is, and so on. In our lifetime there has been a fair degree of consensus about what is and is not valid and reliable medical knowledge. If you looked at health care in 1800, you would find that none of these assumptions hold true. There was no generally accepted body of medical knowledge so that rival theories circulated freely and competitively. There was no legal definition of a doctor and few restrictions on the practice of healing. The Royal Colleges of Physicians and Surgeons and the Society of Apothecaries only served relatively well-off people living in or near major towns. Elsewhere, medical care was given by family members, especially women, using treatments handed down in the local community or taken from books of home remedies, or by anybody from the neighbourhood who could build up some reputation as a healer, a bonesetter, a herbalist, or a midwife" (Dingwall, Rafferty & Webster, 1988, p. 1).

In the early nineteenth century nursing was not an identifiable and self-conscious occupation. Anybody could freely describe themselves as „a nurse" and call what they did „nursing" (Dingwall, Rafferty & Webster, 1988, p. 4). All the same we can say that nursing as a profession or occupation has existed throughout history, although it has evolved considerably over time. In the current healthcare system, nurses are one of the most trusted healthcare professionals with a significant role to play in patients' treatment and care.

History of nursing stems from religion and military. These two separate fields are directly relevant to nursing and are responsible for its development as a full-fledge profession. Going back to the old times, it was religious practices that encouraged nuns and religious figures to tend to the sick, as it was considered a noble thing to do. The need to help the sick was particularly felt in times of conflict, with wounded soldiers and epidemics outbreaks. During that time, the priests and the nuns took care of them. Gradually, the need for experts in the field was felt and that is how the focus started shifting towards nursing as a proper line of work (Excite Education, 2018).

Throughout history, professionalization has played an important role in the development of the nursing profession. Professions have been defined as 'occupations which are knowledge-based and achieved after following years of higher education and/or vocational training' (Evetts 1999, p. 120). Evetts (1999) proposes a traditional view on professionalization, and argues that professionalization is a diverse process in which professional development takes its own course in different countries. Historically, professionalization in nursing education can be divided into two epochs – the training epoch and the academic epoch (Råholm et al, 2010).

The documented history of nursing education dates back to the early 19th century.

In 1836, the German priest Theodor Fliedner (1800–1864) established the first Deaconess House in Kaiserswerth (Germany) reviving the ancient deaconess activity as it was during the times of Apostles (care of the needy and the sick) and making this job a social one.

During the course of time, deaconess movement gained support not only in Germany but also elsewhere in Europe – in Denmark, Sweden, Norway, Switzerland, Slovakia and the territory of Latvia (Odiņa, 2013, p. 12).

Nursing education attained a formal status in the 1860's and that is where Florence Nightingale (1820-1910) comes in. Florence Nightingale devised a complete curriculum on nursing practices and for the first time nursing education was defined. She exerted the most dominant influence over European nursing history. Her educational and hospital plans were implemented in all European countries. When Nightingale organized nursing education in London from 1861 onwards, students came from all over the world to attend her school, and after completing their studies they returned to their home countries, mostly as managers and educators. Nursing education was, in its early phase, dominated by students working in the clinic to obtain their training, which was organized in accordance with an apprenticeship system (McMillan & Dwyer, 1989; Tallberg, 1994; Sarkio, 2007).

In 1862, international cooperation of different countries in rendering aid to the sick and the wounded was realised for the first time. In 1864, 16 European countries officially joined the Geneva Convention for the Amelioration of the Condition of the Wounded and Sick. In accordance with the provisions of the Convention, medical aid had to be rendered irrespectively of the belligerent party of the army camp. Medical staff, equipment and medical institutions were to be untouchable (Berry, 1997, p. 8). In 1867, Geneva Convention was joined also by the Tsarist Russia. In that year, the Russian Society of Care about Wounded and Sick Soldiers was founded. In 1879, it got a new official name Russian Red Cross Society. The aim of the Russian Red Cross Society was to render aid to the military administration in nursing the wounded and sick soldiers during wartime providing medical and other help (Ringlee, 2016).

In the early 1900s, nursing education changed gradually from hospital-based training to educational programmes containing shorter theoretical periods of study (Råholm, M-B., et al, 2010). Academization of nursing education began in the United States in 1907 with establishment of the first nurse professorship (Adelaide Nutting) in the program for hospital economy at Teachers College, Columbia University, New York, and in 1910 at the University of Michigan when a 5-year program for basic nursing opened. Academic nursing education evolved in Europe quite late, mainly caused by two consequent World Wars that significantly restrained the development of nursing education in Europe (Clift, 1997).

### **Western Europe**

Differences of political, social, and educational views and events in the context of the cultural and geographical settings of Europe and the USA influenced almost the century of delay of academic development in Germany, Austria and Switzerland as compared with the United States. Although the Establishment of nursing work in Germany was fostered at the Deaconess Institute at Kaiserswerth, founded in 1836 by Theodor Fliedner, a university program for nurse teachers was established in East Germany only in 1963 and 3-year basic nursing "trade" schools in West Germany 1965 (Clift, 1997). In Austria, nursing science courses were established in 1986 at the University of Graz as part of the 4-year program in education that leads to masters in philosophy (Mag. Phil.) degree. In Switzerland, the university faculties revised their curriculums not until 1992 to include nursing content based on new guidelines that reflect the nursing needs of the Swiss people (Clift, 1997).

### **Scandinavia**

In Scandinavia, Florence Nightingale exerted the most dominant influence over nursing history. Her educational and hospital plans were implemented in all Scandinavian countries. The first secular nursing education in Sweden, the Red Cross School of Nursing, was founded in 1867. The nursing education started in Uppsala 1881. In 1927, the Red Cross Nursing School was opened in Stockholm. Nursing education was, in its early phase, dominated by students working in the clinic to obtain their training, which was organized in accordance with an apprenticeship system (Råholm et al, 2010).

Professional education of nurses in Finland dates back as far as 1889. In 1966 the Finnish Nursing Research Institute was established. University education in Nursing Science started in 1979 at the University of Kuopio, with a Master's programme in nursing administration (Nursing and Caring Sciences Evaluation Report, 2003, p. 9). The development of research and education in the field was rapid and productive; for 2003 Nursing and Caring Sciences were established themselves among the other disciplines related to health research. Today five Finnish universities have departments of Nursing and Caring Sciences, more than 130 doctoral theses have been published and more than two thousand students have passed their Master's degree education (Nursing and Caring Sciences Evaluation Report, 2003, p. 9).

In 1863 the Danish Deaconess Foundation in Copenhagen was founded after the German Kaiserswerth model and the first systematic training for „the care of the sick“ started. 1899 The Danish Nurses' Organization was founded with the aim to improve the nursing education. In 1938 the School of Advanced Nursing Education at the University of Aarhus was affiliated, but the educational programs were not recognized as university studies and did not qualify for academic degrees (Stallknecht, 2012, p. 6-7).

Reforms in Denmark, Finland, Norway and Sweden in the late 20th century have changed nursing education from an apprenticeship system to a higher education system. This became reality in Denmark in 1990, in Finland in 1990, in Norway in 1983, and in Sweden in 1977. Subsequently, undergraduate nursing education was integrated into university colleges, universities of applied sciences and universities. Nursing research has been linked to other scientific disciplines. Opportunities for doctoral studies gave the nursing profession the chance to develop as an academic discipline and enhance professional autonomy (Råholm et al, 2010).

This shift implied greater economic, administrative and professional independency for the nursing profession. The guiding principles of higher education require that nursing education should be based on scientific and practical knowledge, and thus should provide students with the necessary knowledge for working in the profession and being well-prepared for tomorrow's labour market (Karseth, 2004).

### **Russia**

Nursing in Russia during the Tsarist era had no structure and little formal organisation. The typical nurses of the nineteenth century were 'Sisters of Mercy', working within the communities of the Orthodox Church and semireligious societies, which were formed to provide a military nursing service (Murray, 2004). The Sister of Mercy became a heroic figure during the Crimean War, praised by the authorities and public alike (Curtiss, 1966). Unfortunately the experience of the Crimean War did not stimulate the foundation of an organised nursing service. There was no transfer of this body of nursing knowledge or experience to the wider rural or civilian population. The majority of Russia's population received inadequate medical and little nursing care (Myrray, 2004).

The Red Cross nursing society was established in 1867. The Red Cross opened more hospitals and clinics with the aim of providing free or at least, cheaper medicine to the population. It developed new training courses. The revolution in February of 1917 was the beginning of the end for the Tsarist Sister of Mercy. Many sisters joined the White Army medical units. A few joined Red Army medical units and worked alongside the 'red sisters' (Myrray, 2004).

Because the soviet medical care needed a qualified personnel, new schools were opened initially in medical departments of the Russian Red Cross, which had been transferred to the commissariat; the first one opened in Moscow in 1920. By 1922, there were 31 schools of this type in the territory of the Soviet Union. The teaching programme was initially based on that of the Tsarist nursing communities. Nursing education was continually reviewed throughout the next decade, with further Commissariat legislative changes in 1929, 1936 and 1939. Unfortunately, co-ordinated and standardised course throughout the Soviet Union was not attained. It has been suggested that a standardised curriculum was achieved only in 1982 (Murray, 2004).

To know more, what happened with the Soviet nursing between 1940-1991 please read the section Nursing and training of nurses during the period of Soviet regime.

After the governmental change in 1991, with the end of the Soviet Union and beginning of the Russian Federation, the health care system lost much of its financial support (Goodyear, 2012). As described by Anita Rosebourgh (1997): „Russian nurses are state employees with government-set salaries. A typical nurse works long hours for low wages, under the direct supervision of a physician. A hospital nurse's duties include making daily rounds to check on patients and rooms, passing medications, taking vital signs, ensuring that special treatments are completed. There are 434 traditional nursing schools in Russia providing nursing education. Nursing education can begin any time between the ages of 14 to 18, and graduation from high school is not a prerequisite for entering nursing“.

In 2012, there was 452 nursing schools and 47 medical universities with 37 departments of higher nursing education (Goodyear, 2012).

### **Baltic countries**

From the late 18th century until 1918, Lithuania was part of the Russian Empire. Nurses' training programs in Lithuania had been instituted in Vilnius, Lithuania, in 1895 and in Kaunas, Lithuania, in 1897. However, the true beginning of Lithuanian nurses' education came

with the independence. After World War I, Lithuanians became independent from Tzarist Russia. Lithuanian nurses were also free to develop their profession, including the establishment of nurses' training and standards for practice. The first training courses were 4 months to 1 year long, but by 1923, nurses' training had been increased to two years. Although medical education was established at the university level in 1922, nursing education remained taught in medical schools until 1990 (Karosas & Riklikienė, 2011).

In Latvia, in 1793, in Krāslava's vicinity of the monastery, a girls' school was organised, where nurse training and education was started. Later, in 1866, the first deaconess house in the Baltic was founded in Riga – Mary's Deaconess House. In 1879 by law of the Military Council and basing on the Statute of the Russian Red Cross Society, large attention was paid to nurse education. Studies were held in military hospitals in Riga and in Daugavpils. After the First World War, the USA government structures had a large impact on the introduction of medical reforms in Latvia and in the development of the Latvian Red Cross. In order to extend medical activity, the necessity arose for well-prepared charity nurses. In 1920s and 1930s, many charity nursing school were founded under the wing of the Latvian Red Cross (Odina, 2013, pp. 10-23). In Latvia, the Nurses Association first proposed higher education for nurses in 1989.

European nursing education has been significantly influenced by European cooperation and the Bologna process. The Bologna Process is an intergovernmental cooperation of 48 European countries in the field of higher education. It guides the collective effort of public authorities, universities, teachers, and students, together with stakeholder associations, employers, quality assurance agencies, international organisations, and institutions, including the European Commission, on how to improve the internationalisation of higher education ([http://ec.europa.eu/education/policy/higher-education/bologna-process\\_en](http://ec.europa.eu/education/policy/higher-education/bologna-process_en)). A lot of effort has been made by the member states to open nursing curricula by higher education institutions; and to create harmonised, comparable and high quality curricula. In 2014 there were 47 states in the European higher education area, of which nursing education is provided in 45 states (not in Lichtenstein and Vatikan). 82% of member states offered nursing programmes at BA or equivalent level. Nursing education at the level of Master's or Doctoral degree is available in 60% of member states. In 27% of member states it is still not possible to acquire Master's degree in nursing. Master's degree is the highest possible degree in nursing only in 6 countries of 45. These numbers and procents show that most of the countries offering Master's programmes also provide possibilities for doctoral studies (Lahtinen 2014). On the basis of the Bologna Process, nursing education is now regulated by Higher Education Acts in all countries (Råholm et al, 2010).

### **Nursing in Estonia. Beginning of nursing care in Estonia**

Continuity and knowledge of our roots has always been valued in the Estonian culture. Development of nursing has been influenced by social, historical-cultural, political and ethnic factors.

The history of nursing profession in Estonia goes back to 1700s, when deaconesses took care of weak and sick. Orders of nuns and monks were devoted to taking care of sick at that time. After incorporation of Estonia into Russia the first marine hospital was opened in Tallinn in 1715 (Juske, 2016). The first nurses came to work to Estonia in 1724, following the order of Peter the Great, and started work at the same hospital (Sooväli, 1998). Development of nursing was supported by opening of hospitals in Põltsamaa (1766), Pärnu (1801) and Tartu University Clinic (1804). At that time there was a huge shortage of midwives, nurses and feldshers.

Although the first midwifery school was opened by Tartu University Midwifery Clinic already in 1811, professional nursing training was started only at the second half of 19th century, when doctor Shnelle from Paide started preparation of nurses-wounddressers-putters of cups (Onoper, 2008, pp. 281-282)

In 1867 the Tallinn House of Deaconesses was opened that served as a nursing home and nursing school. The first Estonian sisters of charity came from that school. Some of the graduates found work at the same hospital, some were sent to other counties (Sooväli, 1998).

In 1872 the Estonian Ladies Committee of the Russian Society of Care about Wounded and Sick Soldiers was founded with the aim to make preparations for providing medical care in war conditions and prepare Sisters of Charity. According to the recommendation of the committee the school of nursemaids was opened by Tartu Wound Clinic. (Kõrran, 2008, pp. 13, 46).

In 1880s the first time attention was paid to the work conditions of nurses. In 1893 preparation of feldschers to work with doctors in St. Petersburg was started. A year later, in 1894, a private nursing school was opened by Mellin's clinic in Tartu. Nurses were called deaconesses and teaching was conducted in German language. In 1912 the first Estonian girls were accepted to the course. In 1925 Mellin's clinic gained the status of a state school. Pupils

were called deaconesses and teaching was conducted in German language (Onoper, 2008, 285-315).

During the World War I the profession of a sister of charity became very popular among young women. Women wanted to contribute equally with men and feel themselves needed during the war; and the numbers of applicants to become a sister of charity drastically increased (Halastaja õde, 1914).

#### **Nursing and training of nurses during the period of the Republic of Estonia (1918-1940)**

A lot of attention was paid to public health and application of anti-epidemic measures, with the emphases on nurses's training. Ideas for the development of nursing and training of nurses mainly came from Germany and Scandinavia. Till the beginning of 1920s the state health care system had gained general public approval.

Beside state education a great role in nursing training was played by voluntary professional organisations like Red Cross (1919) and Estonian Association of Sisters of Mercy (1922). The named associations created possibilities for the preparation of nurses and midwives. In 1920 the Estonian Red Cross Nursing School was opened by Tallinn Central Hospital.

The first task of the Estonian Nurses Union (ENU) was the harmonisation of nurses' education. The union operated during the years 1923-1940. In 1925 a nursing school was opened by the Tartu University. Eight years later (1933) the Estonian Nurses Association became the member of the International Council of Nurses (ICN). In 1925, at the request of the Estonian Nurses Association, a nursing school was opened by the Medical Faculty of Tartu University. Later on the school became a Tartu Medical School (Onoper, 2008, pp. 301-316).

During that period professional associations were acting really efficiently in Estonia, Latvia and Lithuania, organising conferences and establishing international contacts. The members of the Estonian Nurses Association took actively part in international conferences both at Baltic and Nordic States, as well as at the international level. During the conferences and congresses (Riga, Helsinki, Paris, Brussels) questions of vocational education, public health, curricula of nursing schools and possibilities of their improvement were discussed (Onoper, 2008, pp. 301-316).

Control over nursing curricula and work conditions characterised nursing speciality in all three Baltic States - Estonia, Latvia and Lithuania. This was the time of the beginning of international cooperation, which enabled Estonian nurses to get international training. For example, through the League of Red Cross Societies nurses had the possibility to study in Belford College in London (Tähelepanemiseks halastajatele õdedele) and through the International Nurses Union could apply to the 2-year health care course by the Columbia University in New York (Stipendium Eesti õdede ühingule, 1925).

Cooperation with close neighbours was also intense. In 1928 the Baltic Committee of Sisters of Mercy was established. The purpose of the Baltic nurses' organization was to discuss professional questions and cooperate in raising the professional standards of nursing. They discussed legislation and promoted registration based on minimum standards of education and experience. The Baltic nurses agreed that nursing theory and practice should be supervised by nurse instructors and not physicians. Students should have two years of training and be allowed to enter only after completing secondary school. They agreed to construct a curriculum with minimum standards for practice and to work toward its enforcement through legislation. Finally, they identified the need to educate themselves about different types of nursing, especially public health (Meeting of the committee of nurses of the Baltic States (ICN 1929;4:69-71.).

In 1928 the Estonian Nurses Association organised a 2-week excursion to Finland for sisters of mercy. Nurses came acquainted with hospitals, health care and care institutions in Helsinki and its surroundings. In addition every nurse had to practice about a week in some suitable institution in Helsinki (Halastaja-õdede ekskursioon Soome, 1928).

The period of the first Republic of Estonia was a period of diverse social services. Social care and health care was built on solid bases. One could work as a nurse only after completing a nursing school (Kõrran, 2008).

Before the World War II nursing profession in all three Baltic countries – Estonia, Latvia and Lithuania- was characterised by high prestige, powerful professional associations, wide international contacts, and strict control over nursing curricula and working conditions (Kalniņš, 2001). As stated by Karosas & Riklikienė, "Between the World War I and World War II, the nursing profession was growing and, with some political maneuvering, was able to run its own affairs. Nurses were striving to improve their training and working conditions both through verbal discussions and professional organisations Baltic nurses were active and able to discuss health

care issues locally, nationally, and internationally. They continued to refine their profession and struggled for increased recognition” (Karosas & Riklikienė, 2011).

### **Nursing and training of nurses during the period of Soviet regime (1940-1991)**

After the involuntary incorporation of all three Baltic States into the Soviet Union, nurses lost their professional standing and were assimilated into the Soviet health care system as mid-level medical workers, who were trained in technical schools after the completion of primary school (Kalniņš, 2001). During the war all activities of medical schools in Tallinn and Tartu got interrupted, although the Tallinn Medical School continued in Tambov till 1943.

After the end of the war tuition in medical schools was provided on the bases of general and secondary education. During the Soviet period the schools operated under different names that were changed according to political decisions. In the course of time schools have emerged and disappeared. Nurses in Estonia were trained just like in the other member states according to the centrally elaborated programmes.

After the World War II no significant changes took place in the health care policy of the Soviet Union. In towns health care was mainly provided by polyclinics and hospitals (Tulva 1995). The key element of ambulatory care services in the rural areas, where one-third of Soviet citizens lived, was a feldsher's office. A feldsher was a mid-level practitioner with responsibility for immunizations, primary care, normal childbirth and minor surgery. More complicated cases were referred to district hospitals. In unevenly populated rural areas of the Soviet Union, the feldsher's services substitute for physician care. The feldsher was similar to the American nurse practitioner but performed many services that were restricted to physicians in the United States (Rowland & Telyukov, 1991).

In 1966 the Estonian Nurses Society (ENS) was established that was the only one in the whole Soviet Union. ENS was active till 1990. Also the Red Cross Society continued its existence during the Soviet period.

By Preker and Feachem (1994), in the immediate post-war years, the soviet countries of central and Eastern Europe (including Latvia, Ukraine, Moldova, Lithuania) greatly expanded their health-care systems. However, their economics began to falter in the late 1970s and long term improvements in health status also slowed and even, in some countries, reversed, in marked contrast to the continuing upward trend in Western Europe. As a result, health care system in Soviet countries entered economic transition with a legacy of low investment in the health sector compared to the neighboring, higher income countries in Western Europe. Primary health care was neglected and, by the 1990s, health services were delivered in dilapidated facilities by low paid staff (Profession of a nurse in the Soviet Union was characterised by a low prestige, absence of autonomy, bad work conditions and insufficient salary. Description of the main role of a nurse in publications was astounding. It was described “as an indisputable executor of doctors’ orders and commands”. The publications never mentioned an independent role of a nurse in the assessment of patient’s condition and planning and application of nursing care (Kalniņš, et al, 2001).

A nurse had to have knowledge about diseases and skills to accomplish different procedures. The quality of nurse’s work was assessed on the bases of its speed and accuracy. A nurse had to be obedient and independence of nurses was suppressed. “A medical nurse follows the orders of a doctor. Some procedures (injections, cups, mustard plasters, enemas etc.) can be accomplished by a nurse independently. In case of more complicated procedures the task of a nurse is to prepare the patient and instruments and to assist the doctor. A ward nurse takes part in the tour of the doctor, helping in the examination of patients, shares the results of personal observation and takes new orders from the doctor. During the tour a nurse gets acquainted with the essence of each patient’s disease and its treatment; and learns which aspects must be observed with special attention” (Gagunova, 1977, p. 8).

In 1980s the health care systems of the Baltic region were lagging far behind the western standards. Health services were concentrated in relatively expensive hospitals which took most of the health budget and encouraged excessive medical specialization, while primary health care services were neglected with polyclinics (in which most people had their first contact with health services) typically staffed by low status doctors offering very poor quality services. There was a shortage of workers, medicine and equipment. The ratio of hospital beds and patients was disproportional. The main shortage was of support staff, including nurses and paramedics (Healy & McKee, 1997).

Health statistics for the Soviet Union's 280 million citizens in the end of 1980s reveal poor life expectancy and high mortality rates, with striking disparities among the individual republics. The nation's health care system is plagued by chronic underfunding, antiquated and deteriorating facilities, inadequate supplies and outmoded equipment, poor morale and few incentives for health care workers, and consumer dissatisfaction. The Soviet Union spent 3.1

percent of its GNP on health in 1987, in contrast with an average of 7.5 percent for the nations belonging to the Organization for Economic Cooperation and Development (OECD) (Rowland & Telyukov, 1991).

Centralised power had strong impact on the Soviet health care system. Limited number of international contacts and close communion could be noticed in all areas, including health care.

#### **Nursing and training of nurses during the period of reindpendence (since 1991)**

In the immediate aftermath of the collapse of communism, each country faced a major economic shock with failing economic output and rising inflation (Healy & McKee, 1997). The break-up of the Soviet Union in 1991 not only changed the political map of Europe but also brought about many other fundamental changes in the countries affected, including economic collapse and, in some places, war. Each country had to build a new national identity, with new constitutions, political systems, the symbols of nationhood and new ways of doing things, including the provision of health services (Rechel, et al, 2014, p. 1).

Together with the reindpendence the Estonia health care education was also changed, following the examples of European education systems (Ernits & Sepp, 2010). The first big change took place at the beginning of 1990s, when nursing curricula based on general education (2 years and 10 months) were closed and programmes based on secondary education were opened (1 year and 10 months) (Ernits & Sepp, 2010; Kannus & Varik, 2011).

This was the period of rapid changes both in the organisation of nursing care and training of nurses.

Already before the restoration of independence in 1991 national nursing unions were re-established in all three Baltic States. They look back at their past history and achievements with pride and investigated international experiences of different models of nursing practice and education. The aim was to launch a reform of nursing education and to train persons promoting professional education abroad, including additional training courses for nurses. The first time importance of teamwork in the whole nursing process was emphasised. In 1993 in Madrid the Estonian Nurses Association became the member of International Nurses Union again. In 2000 an Estonian Council of Nurse-researchers was established. The council aimed at the development of health care policy and evidence-based nursing and improvement of nursing quality (Toode 2005, Toode 2015a). ENU promotes evidence-based nursing together with Tartu University, professional higher institutions and the Ministry of Social Affairs; participates in the preparation of health care regulations and identifying training needs; improvement of nursing terminology and harmonisation of nurses standards of competency. The union also coordinates international relations of the field (Kõrran, 2008).

In 2011 an Advisory Council of Nurses Training was established by ENU. The task of the advisory council is to participate in discussions connected with the quality of nursing education and its development. Today health care colleges offer nursing training on three levels: basing nursing education, professional nursing training (health nursing, mental health nursing, clinical nursing, intensive nursing) and advanced professional training (Pruuden, 2011).

In 1996 a magazine "Eesti Õde" (Estonian Nurse) was founded. "Eesti Õde" is published four times a year and publishes information about evidence-based medicine and articles about the research of students and lecturers of higher education institutions (Kõrran jt 2008). The necessary information can also be acquired from and scientific nursing articles published in the magazine „Eesti Arst“ (Estonian Doctor).

The new era meant big challenges both for the system of social- and health care, as well as education institutions. Social progress was quick and intensive. Development of health care was closely connected with the development of society, including it's social- and health care policy. Activities of the Estonian Nurses Union expanded significantly and international contacts, especially with Finland, Sweden and Denmark, were deepened. (Ende, 2000).

The health care workforce is always the key element in the process of reform. The health care system is labour intensive and reforms must be address the number, type and skill levels of staff, wages and working conditions, and the training and accreditaion of new staff. Nurses are the mainstay of most health care systems but those in former Soviet Union received less training and perform more restricted tasks than in the West. Statistics are hard to interpret as the definition of a trained nurse varies and, until mid 1990s, nurses were classified as „middle level workers“, a category that also included lesser qualified nurses with only high school training (Healy & McKee, 1997).

Reindpendence was the beginning of the change of the whole Estonian health care education system, following the examples of education systems in Europe (Ernits, Sepp 2010).

Like in Western Europe countries the development of nursing in Estonia was based on human rights, ethics and understanding of human approaches. The theoretical bases of Estonian nursing and it's organisatsion became a holistic approach to a human (Rauhala, 1989;

Kalkim et al, 2016), aimed at patient's well-being and recovery. Well-being of a patient is influenced by different factors like health and environment. Cultural sensitivity has also been considered important. These references were considered in development of nursing science. Nursing science plays a certain role Europe, just like in the whole world. Centuries-old-traditions of nursing science have developed its specific knowledge base and academic education based on this knowledge (Tomey & Allgood, 1998).

In 1991 the department of nursing science was opened by Tartu University Faculty of Medicine. Diploma studies in nursing science were opened in the academic year 1991/1992. Studies were conducted according to the 3-year curriculum and the first students graduated in 1994 (Aro, 2006).

The teaching problems connected with the search for new approaches in professional training of nurses after the Soviet period are described by the nursing professor of Saint Louis University of US state of Missouri Irene Kalninš: *„In 1991 the development of new curricula and selection of students was started in all three Baltic states. Responsible for launching the new programmes were the existing higher education institutions. Economic and political considerations demanded as quick implementation of new study programmes as possible, but it was not possible without passing the research and planning phase. Lecturers from Estonia, Latvia and Lithuania got acquainted with BA curricula in Scandinavia and USA and tried to adapt them according to the needs and possibilities of all three countries. That is why it is not surprising that all curricula had strong medical emphasis and only a limited part supported the role of nursing. Programmes in all three higher education institutions were led by doctors; and most of the lecturers were also doctors. Conceptual framework of nursing, philosophy and common core of competencies that must be acquired were missing in the curricula. Development of all curricula was still quite quick, mainly thanks to the foreign lecturers and –councillors and students' reactions“* (Kalninš, 1995).

Together with Danish lecturers preparation of the European curriculum for nurses in medical schools was started. Nursing education was provided on the bases of secondary education (1 year and 10 months), curricula that were based on basic education (2 years and 10 months) were closed. In the academic year 1996/97 medical schools started providing education at the level of professional higher education. Although the beginning was quite chaotic and complicated, the cooperation of Danish Nurses Union, Estonian Nurses Union and Tartu University ended with the preparation of a joint curriculum for nursing specialities (3 years and 6 months) of all schools providing nursing education. Lecturers were offered a special additional training course, mainly led by Danish nursing lecturers (Ernits & Sepp, 2010, Kannus & Varik, 2011; Söderde, 2013.) After opening professional higher education curricula in medical schools in 1996/97 and transfer to 3+2 system, the diploma- and bachelors' (BA) programmes in nursing science were closed in Tartu University as there was no need for such programmes any more.

BA curricula were launched by the university in 1997/1998 and masters' curricula in 1998/1999 (Aro, 2006). In the frames of Tempus Phare project "Master's studies in nursing science in Tartu University to educate nurse-lecturers" a new curriculum was developed. The new curriculum complied with the European standards that concentrated on nursing pedagogy and research work. Studies were organised in cooperation with the lecturers from three different countries. The main subject (nursing science) was coordinated by Kuopio University, nursing didactics by Göteborg University and supporting subjects by Tartu University.

The goal was to prepare nurses with high level academic education - specialists with analytical skills and critical thinking - who are able to affect nursing education and development. Need for nurses with academic higher education arose with the development of health care system. Nurses with academic education were needed to fill in the positions of a head nurse, nursing managers and other managerial positions, as well as for teaching nursing students (Ende, 2000).

The biggest reforms in health care system took place in 1991-1998, when smaller hospitals of curative care were closed or reprofiled into care hospitals (Ruusmann 2001, Eesti haiglavõrgu...2002). The next big reform took place in 1999-2002, after the compilation of the development plan of hospital network Hospital Master Plan together with the consultation company Scandinavian Care. The plan outlined the development of hospital network during the next 15 years. At the beginning of the process there were 115 hospitals with more than 14 000 beds in Estonia. In less than ten years the hospital network changed in a way that in 2001 there were left only 67 hospitals with less than 10 000 beds. Reduction of the numbers of hospitals and beds was a really significant change (Eesti haiglavõrgu...2002).

The aim of the development of hospital network was centralisation of complicated treatments, de-centralisation of easier treatments, decreasing the ratio of outpatient and day care and increasing the ratio of hospital care, implementation of new effective treatment methods

and increase of the importance of nursing care (Eesti haiglavõrgu..., 2002). After the Estonian reindpendence nursing activities developed together with the development of health care and hospital network. Need for health care workers, mainly for nurses, was discussed with educational institutions and professional unions during the preparation of hospital development plans (Eesti haiglavõrgustiku arengukava. 2002).

Changes in the Estonian society have created several possibilities for the elaboration of new health care policy. Earlier achievements have been analysed and history of health care has been studied again and again, with the aim to transfer the results of analyses to current practice. "The content of education and the whole profession is mainly influenced by the health needs of the society, that in turn are influenced by culture and availability of resources. Societal challenges may be observed in the context of political, religious, social and economic factors. Changes in the society have an effect on the work of nurses. Changes in living style, concepts of health and illness influence the development of nursing profession (Krause & Salo 1992, p.67).

The professional standard of a general nurse, approved by the Health and Social Care Qualification Authority, was adopted in June 1999. Professional standard is a set of requirements for skills, knowledge and personal qualities agreed between respective institutions that are necessary for a working in certain level of qualification (Üldõe kutsestandard 1999). Professional requirements are divided between general- and special skills and corresponding knowledge. The professional standard of a nurse includes a list of knowledge and skills about social work, knowledge of law and etc.

As follows from the foregoing description, a nurse in today's Estonia is independent and competent; works with families and cooperates with other spheres; knows legislation and is a contact person between different authorities. Due to the new occupational requirements it is necessary to stress the aspects connected with social nursing in nurses' work. In addition to legal acts (Tervishoiuteenuste..., 2001), nurses' work is regulated by the International Code of Ethics of the Nurses' Union (2006), the aim of which is to support nurses in everyday decision making. At the beginning of the Estonian reindpendence the ratio of the state impact was significantly smaller in comparison with the impact of voluntary sector. At that time the goal was to transfer into a society that can manage independently. The main goal was to develop a wide-ranging social- and health care policy that will cover all areas of life. Such a goal can only be achieved with the existence of meaningful social- and health care policy and educated and competent health care workers (Tulva, 1995).

Legislation has played a significant role in the modernisation of healthcare. Health Services Organisation Act amended in 2001 sets the requirements for the organisation of health care and the order of management, financing and auditing. (RT I 2001, 50, 284). The law has been constantly updated. According to the law a health care worker can be a nurse, doctor, dentist, midwifer, pharmacist or pharmacy pharmacy assistant only in case they are registered in Health Authority. According to the law a patient is a natural person who has applied for or is getting some kind of a health service.

#### **New trends in professional curriculum**

According to the Bologna declaration and 3+2 system a new Master's curriculum was launched in Tartu University (2002). The new curriculum is more concentrated on the specialisation of nursing management and pedagogy. Curriculum development, including the application of international specialists and preparation of lecturers, was supported by the Republic of Estonia and European Union (Aro, 2006). Graduates of Master's curriculum are working as lecturers in professional higher education institutions, nursing managers, and ward nurses at hospitals. Some of the graduates are working in public office like the Ministry of Social Affairs or the Ministry of Education and Science. In 2004 medical schools were preparing to the first international external evaluation (Ernits & Sepp, 2010; Söder, 2013). External evaluation was divided into institutional evaluation and evaluation of curricula group. Both Tallinn and Tartu medical schools passed evaluation successfully and became professional applied higher education institutions in 2005. The names of schools were changed into Tallinn Health Care College and Tartu Health Care College (Ernits, 2015). Curricula of

health care colleges passed national quality assessment in 2009, international institutional accreditation in 2011 and international quality assessment in 2016 (Bauman & Mattisen, 2011).

The development of the hospital network according to the Hospital Master Plan was finished in 2007. There were 63 hospitals, 21 of which were care hospitals (Ruusmann, 2001; Normet 2007). Hospitals are divided into regional-, central-, general and local hospitals. In several regions there is only a general hospital. There are four central hospitals, two regional hospitals and three local hospitals. Problem was considered a shortage of healthcare workers,

as well as weakened infrastructure, low share of outpatient care services, unreasonably long waiting time and lack of availability of nursing care. (Normet, 2007).

Need for nurses with doctoral degree has been pointed out in the Estonian Nursing Development Strategy for the years 2011-2020 «Eight steps for human wellness” that aims at increasing the number of nurses with doctoral degree to support the development of nursing science as an important academic discipline and sustainability in Estonia. In 2015 there were five Estonian nurses acquiring PhD in Finland and two nurses were preparing for the defence of PhD theses in public health in Tartu University (Veski, 2015). Today there are four Doctors of Health Sciences in Estonia with the specialisation of Nursing Science (Hinno, 2012; Toode, 2015; Demidenko, 2018; Ernits 2018), who have studied in Finland and are working as nurse managers and educators. Furthermore, there are two Doctors of Medical Science in Estonia (Freiman, 2017; Vorobjov, 2012) who studied in Estonia. Besides that some practising nurses are also PhD students in some other curriculum in Estonia. Therefore we can state that the future of nursing in Estonia is hopeful.

Current (as on 1st September 2017) basic nursing curricula correspond to the standard of higher education (Kõrgharidusstandard 2008) and directives of the European Union (EU 2005). Curricula (210 ECTS) integrates theory with practice: the proportion of practical training in different health care, social and care institutions is 50 % of the whole volume of the curriculum. Research- and development work form an inseparable part of the curriculum. The main goal of research- and development activities is nursing practice and its development. Practical training can be passed both in Estonia and abroad, as both health care colleges are participating in international cooperation and mobility projects. Graduates of Russian gymnasium have a possibility to study in special students groups with extended study period, during which they also learn Estonian language. A person who has successfully passed basic nursing curriculum can work as a nurse in all spheres in health care in Estonia or other

European countries. Nurses can continue their studies at Master’s level in nursing science in Tartu University and other universities in Europe or pass a nursing specialization course (Õe põhiõppe., 2011 ja 2017). Tallinn Health Care College is developing simulation learning and application of NANDA nursing diagnoses and research. Curricula have been developed in joint cooperation of both health care colleges and are following the same principles and trends.

### **NANDA-I in nursing practice and training**

NANDA International (formerly the North American Nursing Diagnosis Association) is a professional organization of nurses standardized nursing terminology that was officially founded in 1982 and develops, researches, disseminates and refines the nomenclature, criteria, and taxonomy of nursing diagnoses. The purpose of the Association is the implementation of nursing diagnosis which enhances every aspect of nursing practice, from garnering professional respect to assuring consistent documentation representing nurses’ professional clinical judgment, and accurate documentation to enable reimbursement. NANDA International exists to develop, refine and promote terminology that accurately reflects nurses’ clinical judgments. In 2002, NANDA became NANDA International in response to requests from its growing base of membership from outside North America. The correct abbreviation now is NANDA-I (with a hyphen). (NANDA website: [www.nanda.org](http://www.nanda.org).)

The first Estonian contact with NANDA (Nursing Diagnoses: Definitions&Classification) took place in 2000, after the need to teach nursing process and its documentation arised. It was necessary to find a unique language of nursing that is based on nursing terminology. The search for diagnostic systems and comparison of their application experiences (Ingerainen jt, 2008, Puusepp 2017) resulted in a conclusion that it will be wise to translate and apply some of already existing diagnostic systems. NANDA was adopted, as it is an evidence-based classification created in 1982 in US. NANDA and NANDA-I diagnoses continue to be a research subject and additions and updates are made to NANDA in every three years (Herdman 2013; Herdman & Kamitsuru 2016). Estonia is among 16 states in the world where NANDA-I diagnoses are available in national language. Till 2017 almost the third of Estonian nurses had passed NANDA-I basic examination during a basic nursing course or advanced training (Puusepp, 2017).

### **International cooperation of nursing colleges**

International cooperation of healthcare colleges is based on the international trends of Estonian higher education institutions and development needs of colleges and specialities/curricula. An important part of international cooperation is mobility of learners and teachers (Erasmus+ mobility programmes), development projects (NordPlus programme, Innove) and participation in international networks and workgroups. Since 2015, after new

ERASMUS+ credit mobility programme was launched, cooperation with countries like Israel, Ukraine, Georgia, Moldova, Albania and Bosnia and Herzegovina was started. International networks the colleges are participating in can be divided into higher education networks like EURASHE (European Association of Institutions in Higher Education), IUHPE (European Association of Institutions in Higher Education) ja COEHRE (Consortium of Institutes of Higher Education in Health and Rehabilitation in Europe) and professional networks like, for example, ATCN (Advanced Trauma Care for Nurses), ENOTHE (European Network of Occupational Therapy in Higher Education), and EAOO (European Academy of Optometry and Optics).

### **Cooperation between nursing education and health care institutions**

In 1998 an Estonian nursing and midwifery development strategy was compiled with the aim to develop nursing. The team consisted of nursing lecturers, head nurses and representative of the Ministry of Social Affairs. Development Strategy was prepared in the frames of the the WHO project (Tervis 21, 2000). The consultants were Finnish specialists from the ministry of social and health care, research and development centre of social affair STAKES and Kuopio University. The development of nursing as a part of health care, completion of nursing legislation, patient- and family centered nursing care, necessity for higher education in nursing, possibilities for advanced training and research work were seen as the priority of the development strategy (Õdede ja Ämmaemandate ..., 1998).

The need for nurses' specialisation arose after the turn of the century. Estonia established four specialisation fields: clinical nursing, intensive nursing, health nursing and mental health nursing. The priorities of the Nursing Development Plan for the years 2002-2015 were independent work (independent receptions), improvement of specialisation, adequacy of staff and planning (Õendusala arengukava 2002). Since 2011 the development priorities are patient- and family centeredness, patient safety, availability of nursing care, quality of nursing care, nursing-scientific research and evidence-based training and practice (Kaheksa samm..., 2011). Professional nursing colleges are participating in research projects, developing nursing education and practice and organising international and local conferences and seminars. Research and development is done in cooperation with social and health care organisations, training organisations and the third sector (Ernits, 2010; Kannus, 2011).

The ratio of nurses and doctors is strongly out of place. In OECD states there are 3 nurses per one doctor in average. In our neighbouring countries like Finland, Sweden and Norway there are 4 nurses per one doctor. In Estonia the ratio has fallen below 2. It is important to increase the preparation of nurses and doctors. Estonian health care has reached the state, where the lack of nurses has led to the significant increase of workload and development of patient-centered care is being seriously impeded. Nurses with modern preparation are able to take over several doctor's tasks, but there is nobody available doctors could delegate their duties in practice. The deficit is particularly in the area of primary health care and elderly care (Kiiwet 2013).

Both the development of health technologies and aging population increase the need for nursing care, but changes in duties and division of labour can be possible only in a situation, when there is somebody, between whom the duties could be distributed. Nurses have the key role in the functioning of modern medical care. Only the capacity and abundance of nurses have helped the Nordic and European countries to develop a modern patient-centered health care system. Both hospital- and nursing care is leaning on nurses and an increased contribution of nurses is expected in first level health care and development of home care, to be able to manage with the continually growing number of chronic patients. To meet this demand there is no other way than a sharp and sustained increase of the number of prepared nurses. The development of care technologies and aging population also increase the need for nurses (Tulevikuvaade..., 2017).

Curriculas are improved according to the requirements of labour market and the patients' needs of the European Union and Estonia. Huge momentum has been building up over the past few years in nursing education, with accompanying problems like deficit of lecturers with the required qualification. Development in all spheres of nursing practice and nursing education must be done following the directives of the European Union. Nursing care has to be based on scientific knowledge and results of research work, what is a challenge for lecturers. Especially important here is to take into account the results of scientific work and their inclusion into the study programme. The quality of nursing education can be raised by systematic training of the supervisors of practical training and modernisation of training programmes in cooperation with practical training bases. A nurse today is a specialist, who can see, assess and analyse patient's needs, set goals for personal activities and draw up a nursing plan for nursing operations.

Cooperation between higher education institutions and health care institutions is continually developed by advanced training courses.

In addition to the Master in Nursing Science in Tartu University there has been developed a third field in nursing science, focused on clinical nursing. With that aim a Master's programme in Health Science will be opened in Tartu and Tallinn Medical Colleges in the near future (2018/2019). All the necessary prerequisites (existence of competent lecturers, required study environment like simulation centre) for that have been created and there is employers have confirmed their need for Master's students.

### **Need for health care workers and migration of nurses**

Worldwide, there is a dramatic shortage of nurses. An increase in the migration of nurses from their home countries to recipient countries is having a global effect on the healthcare system. This global phenomenon stems from historical, economical, social, and political factors. Migration has a significant impact on both the individual and national level (Hongyan et al, 2014).

Throughout human history people have migrated to find better living conditions or have been affected by displacement caused by natural disaster, wars or human trafficking. Report of the International Organisation for Migration 2010 says that estimatedly 214 millions of people are living outside their home country and nurses form a part of ever-increasing migration flows (Kingma, 2007).

Nursing can increasingly be characterised like a mobile profession, one can manage with all over the world. Health care workers and their knowledge is universal, as it can be applied in the same way in every country, what makes migration between countries easier (Võrk jt, 2004,8-10). Thousands of nurses migrate every year in a search for better salary and work environment, possibilities for career, professional development, personal security or novelty and adventures (Kingma 2007, Freeman jt 2012). Availability of jobs, opportunities for professional or career advancement, personal development, recognition of sensitive employment policies, stable socio-political environments, quality of life improvement, attractive salaries, and social and retirement benefits represent several of the pull factors that attract nurses to the recipient countries. The following push factors in the source country contribute to nurse migration: low wage compensation, limited career opportunities, limited educational opportunities, lack of resources to work effectively, unstable and/or dangerous working conditions, lack of social and/or retirement benefits etc. International Centre on Nurse Migration reported that the primary causes of migration ('push' factors) stem from a desire for more professional development opportunities, a need for greater wage compensation (Haour-Knipe, & Alero, 2008).

International migration of health care workers is under the special attention of states for the reason that there is a lack of health care workers in several countries. These states include both Estonian neighbouring states in Scandinavia and the other EU member states like, for example, Great Britain. To cover the deficit of labour forces the states are trying to recruit workers from abroad and workforce with lower labour earnings is easily willing to accept jobs offered (Võrk jt, 2004, p. 8). Typically, the nurse migration stream moves predominantly from developing countries to industrialized countries (Hongyan et al, 2014).

Migration of nurses abroad has become a significant problem in Estonian health care. The main reason for moving abroad was connected with remuneration. Important were also considered possibilities for additional training and professional practice, as well as disappointment in the Estonian life and the concrete health care institution (Adamson, 2014, 7).

Critical lack of nurses in industrial states has created a huge demand for nurses that can be evidenced during international recruitment campaigns. The World Health Report (2006) has pointed out that international recruitments and migration of health care workers is influencing state labour supplies and has become an important aspect in politics. The analyses of the Organisation for Economic Co-operation and Development's (2012) also confirms that the ratio of nurses in Estonia is lower than the average and is preventing the increase in the efficiency in health care sector. The number of nurses was increasing till 2008 and then started to decrease – in 2008 there were 6,4 nurses per 1000 inhabitants and in 2010 the ratio was 6,1. Whilst the average ratio in Europe is 8, in Finland even 15 per 1000 inhabitants, the Estonian nurses feel the trend for growing workload. In the conditions of constantly growing workload nurses can pay only minimal attention to patients (OECD: Health at glance Europe 2012, p. 72). Continual and regular recruitment campaigns of Finnish and Swedish hospitals and foreign language courses organised by the Estonian Unemployment Insurance Fund do not contribute in any way to improve the situation.

European Union legislation in force support the mobility and migration of health care workers, that in the context of Estonia means one-way movement from Estonia. This can also be proved by the certificates issued by the Estonian Health Authority for the recognition of

professiona competency abroad. Heavy ship traffic between Tallinn and Helsinki enable to work simultaneously in Estonia and Finland (Kiivet et al, 2013). That is often the case.

Migration of health care workers abroad raises legitimate questions about the sustainability of health care system. During the recent years international migration of doctors and nurses has become increasingly visible. Estonia has set the aim that there should be 9 nurses per 1000 inhabitants, but during the past decade the ratio has stayed between 6-7 (Kiivet et al, 2013). In OECD member states the average is three nures per one doktor. In Estonia the ratio of doctors and nurses is out of place: to achieve the average ratio of Europe and OECD 3:1 there should be 4000 nurses more working in Estonia than now (Tulevikuvaade..., 2017). During the years 2007–2008 a “Nationa Health Plan 2009-2020” (1) was prepared under the responsibility of the Ministry of Social Affairs. s koostati Sotsiaalministeeriumi juhtimisel „Rahvastiku tervise arengukava 2009–2020“ (1), that has become a main document for planning. In this development plan is the number of nursing specialists per 1000 inhabitants one of the five indicators of development. The number of nurses should increase 50% during the years 2011-2020 (from 6,4 to 9 nurses per 1000 inhabitant).

To achieve a balanced health care system it is necessary to know how to foresee the education needs of health care workers both in quantitative and qualitative aspects (content). Mobility and migration of health care workers has been constantly growing in the states of European Union. In case of Estonia it means mobility in only one direction – out from Estonia. It is absolutely clear that doctors and nurses leaving abroad increase the need for their training. Planning the need for training shpuld also consider age composition of health care workers. European Union legislation in force support the mobility and migration of health care workers. The age distribution of working-age nurses is quite even, the biggest is the 35-44 generation. The biggest number of nurses leave to Finland, Sweden, Denmark, Norway, Grait Britain and other countries (Kiivet et al, 2013).

### Summary

*Although in 1800 there was no generally accepted body of medical knowledge as well as no legal definition of a doctor, a hospital or a nurse, we have to admit that nursing as a profession has existed throughout history. In the beginning the nursing was given by family members or servants, especially women. In the early nineteenth century nursing was not an identifiable and self-conscious occupation. second half of 19th century.*

*We must agree with the statement that „The main resource of every health care system is the personnel who work in it. Staff pay is a major budget item and staff control most of the other expenditure, but money is not the whole story. The quality of the contribution of each person, is central to success or failure. In the long run, the achievements of any health care system are primarily influenced not by the choice of structure or funding mechanism, important as these are, but by how well the system develops, motivates and deploys its staff. The well-trained nurses are an important part“ (Salvage, 1997, p. 4).*

*Although the Estonian nursing and nursing education developed in parallel with Europe and reached quite a high level before the beginning of the World War II, the further development was restrained by the prolonged war and the following Soviet occupation. After the end of the World War II the rapid repair of the health care system was started – free medicine was available for everyone. Nurses lost their professional standing and autonomy. They were assimilated into the Soviet health care system as mid-level medical workers with low prestige who's quality of work was assessed on the bases of its speed and accuracy. Till the end of 1970s – beginning of 1980s all resources were exhausted and economic misery reached the health care system. Primary healthcare was totally left for policlinics with elderly personnel with low status, without the necessary training and able to offer only extremely low-quality service. Top-medicine was concentrated into hospitals. The collapse of the Soviet Union caused the collapse of the health care system of the time and everything had to start form scratch to be built up.*

*Nursing profession in the Soviet Union was characterised by low prestige, lack of autonomy, poor work conditions and insufficient salary. It has been really had to get rid of such image after the Estonian reindpendence. We may say that we have not really succeeded to do that till now. Doctoral studies and academic nursing that were started in Scandinavian states already in 1980s, only start to develop in Estonia now.*

*Since the Bologna process (3+2) Estonian nursing education has been significantly influenced by European cooperation. The purpose of the Bologna process has been to create harmonised, comparable and high quality curriculum. Still not all member countries are able to provide nursing education at the level of Master´ s or Doctoral degree. It shows that there is still*

a long way to go not only in Estonia but also in Europe as a whole to achieve the purpose of the Bologna process.

Bologna process, cooperation between higher education institutions and harmonised curriculums brought without any doubt a high quality education but also another problem - an increasing number in the migration of nurses from Estonia to the neighboring countries, mostly to Finland and Sweden. Availability of jobs, personal development, better work conditions, significantly higher salary, quality of life improvement, and social and retirement benefits represent some factors that attract nurses to the recipient countries. Doctors and nurses leaving abroad increase the need for their training. But we have to ask a serious question – why we train and educate our doctors and nurses for other countries instead to increase their salaries and develop the working conditions?

Scientific-based approach in nursing education still needs developing in Estonia. Prerequisite for the provision of effective and high quality nursing care are nursing research papers and their application into practice. We are already making progress in nursing education that will help us move in this direction. Today, 100 master degree students have graduated from the University of Tartu and health care colleges have just begun master curriculums for a total of 120 students. All this has become possible thanks to the overcoming of the so-called critical mass, with whom science can already be integrated and put into practice. And it is not less important that every student's research and graduation thesis contributes the new knowledge of our own cultural space and information about nursing.

Still, the biggest challenge in increasing the effectiveness of health care services and development of patient-centered health care is the lack of nurses. Although the international migration of nurses has been slowing down, there are many health care institutions in Estonia constantly looking for new nurses and nurse assistants as well. The number of state-commissioned student places for nurses has grown a bit during the recent years – during the years 2005–2011 the number of student places for nurses and midwives grew 20% in total, about 10 student places in average per year and the number of nursing graduates that has been falling for year turn to a little raise, still, the growth rate remained several times lower than necessary and the number of graduates, who stay in Estonia and start working as a nurse has not grown. (Kiivet et al, 2013).

Lack of personnel does not allow to bring nursing care to the level which would be helpful for aging population and would increase the workload both in hospitals and family care. It is important to create conditions that motivate nurses to work in Estonia. This can be achieved through the proficient and capable management and changes in health care policy that would value nursing as a profession and improve the nurse's professional image. International cooperation and participation in networks should be strengthened. The support of Nordic States, especially the support of Finnish colleagues, is of considerable importance. The continuing cooperation with Baltic Nurses Association is also the basis of continuous development. A good base for internationalisation is formed by the opportunities of digital culture.

## References

1. Adamson K. Eesti õdede kogemused migreerumisest. Magistritöö. Tartu Ülikool: Arstiteaduskond, Õendusteaduse osakond; 2014.
2. Aro I. Õendusteaduse osakond 1991-2006. 15 aastat akadeemilist õendusharidust Eestis. Tartu Ülikooli arstiteaduskonna õendusteaduse osakonna juubelikonverents. 10. Oktoober 2006. Tartu; 2006.
3. Asvall JE. Foreword. In: Nursing in Europe: a resource for better health. Edited by Salvage J, Heijnen S. Copenhagen: WHO Regional Office for Europe; 1997.
4. Berry NO. War and the Red Cross: The Unspoken Mission. London: MacMillan press; 1997.
5. Clift JM. Nursing Education in Austria, Germany, and Switzerland. Journal of Nursing Scholarship. 1997;29(1):89–93.
6. Curtiss JS. Russian sisters of mercy in the Crimea 1854 –55. Slavic Review. 1966;1:84–100.
7. Derkatch C. Method as Argument: Boundary Work in Evidence-Based Medicine. Social Epistemology. 2008;22(4):371–388.
8. Dingwall R, Rafferty AM, Webster C. An Introduction to the Social History of Nursing. London: Routledge; 1988. Available from: <https://www.taylorfrancis.com/books/9781134978717>.
9. Donohue MP. Nursing: the finest art. St. Louis: Mosby Co.; 1985.
10. Donohue MP. Why nursing history? Journal of Professional Nursing. 1991;7(2):77.
11. Dunbar V. Nursing in northern Europe. American Journal of Nursing. 1937;37:123–130.

12. Eesti haiglavõrgu arengukava; 2002. Available from: [http://sm.ee/sites/default/files/content-editors/eesmargid\\_ja\\_tegevused/Tervis/Tervishoiususteed/hva2002\\_1\\_.pdf](http://sm.ee/sites/default/files/content-editors/eesmargid_ja_tegevused/Tervis/Tervishoiususteed/hva2002_1_.pdf)
13. Eesti Punane Rist. Koost. Kalev Vilgats. Tallinn: Eesti Punane Rist; 2009.
14. Ende E. Leedid lambikesega. Terviseleht. 2000;16.
15. Ernits Ü, Sepp A. Tallinna Tervishoiu Kõrgkool 1940-2010: artiklite kogumik. Tallinn: Tallinna Tervishoiu Kõrgkool; 2010.
16. Ernits Ü, Kõrgemaa U, Puusepp K, Ehasalu A., Mets-Oja S, Siimer Õ, Kärema A, Bartels I, Kaasik-Aaslav U, Merits M, Leberecht AM, Vanatoa M, Sildver K, Kirm H, Lilienberg K, Viigimäe M, Lipand A, Javed P, Mägi S, Ummus H, Sepp A. Tallinna Tervishoiu Kõrgkool 75. Tallinn: Active Print OÜ; 2015.
17. Euroopa parlamendi ja nõukogu direktiiv 2005/36/EÜ. Euroopa Liidu Teataja; 2005. Available from: <http://eurlex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2005:255:0022:0142:et:PDF>
18. Evetts J. Professionalisation and professionalism: issues for interprofessional care. 1999;13(2):119–28.
19. Excite Education. History of Nursing Education; 2018. Available from: <http://www.excite.com/education/education/history-of-nursing-education>
20. Freeman M, Baumann A., Blythe, J, Fisher A, Akhtar-Danesh N. Migration: a concept analysis from a nursing perspective. Journal of Advanced Nursing. 2012;15(5):1175–1186.
21. Freimann T. Musculoskeletal pain among nurses: prevalence, risk factors, and intervention. PhD dissertation. Institute of Family Medicine and Public Health, Faculty of Medicine, Tartu: University of Tartu; 2017.
22. Gagunova J. Haigete põetamine. Tallinn; 1977.
23. Goodyear R. Nursing in Russia: Steps Forward for the Profession. The Journal for Nurse Practitioners. 2012;8(2):162–163.
24. Grip G, Gustafson S., Göthlin K, Lantz G. Õe eetika. Tallinn HUMA; 1995.
25. Halastaja õde: [ettekujutus halastajaõdest: iseloom, välimus, tööst sõja ajal]. Tallinna Teataja. 1914 September 30;222:1.
26. Halastaja-õdede ekskursioon Soome. Postimees. 1928 October 16;282:6
27. Haour-Knipe M, Davies A. Return migration of nurses. International Centre on nurse migration; 2008. Available from: <http://www.intlnursemigration.org/wp-content/uploads/2014/10/ReturnmigrationA4.pdf>
28. Harra K. Muusikoiden epäsuotuisat stressikokemukset ja niiden hallinta. Tampereen Yliopisto. Akateeminen väitöskirja; 2004.
29. Haugan G, Rannestad T, Hanssen B, Espnes GA. Self-transcendence and nurse–patient interaction in cognitively intact nursing home patients. Journal of Clinical Nursing. 2012;21:3429–3441, doi: 10.1111/j.1365-2702.2012.04217.x.
30. Healy J, McKee M. Health sector reform in central and eastern Europe: the professional dimension. Health policy and planning. 1997;12(4):286–295.
31. Herdman HT. Õendusdiagnoosid. Definitsioonid ja klassifikatsioon 2012-2014. Tartu: Elmatar; 2013.
32. Herdman HT, Kamitsuru S. Õendusdiagnoosid. Definitsioonid ja klassifikatsioon 2015-2017. Greif OÜ; 2016.
33. Hino S. The Professional Practice Environment: Hospital Nurses Perspectives in Three European Countries. Publications on the University of Eastern Finland Dissertation in Health Sciences Kuopio: University of Eastern Finland, Department of Nursing Science; 2012.
34. Ingerainen D, Sammul S, Kuldmäe I, Kosula K, Tohus I, Leppik A, Tähepõld H. Pereõe tegevusjuhend. Tallinna Pereaarstide Selts. Tallinn; 2008.
35. Juske J. Härjapea jõe saladus. Tallinn: Hea Lugu; 2016.
36. Kaheksa sammu inimese tervise heaks. Eesti õenduse ja ämmaemanduse arengustrateegia 2011-2020. Tallinn: Eesti Õdede Liit. Eesti Ämmaemandate Ühing; 2011. Available from: [http://www.ammaemand.org/ee/m\\_files/3bdf1588619cdb9793b5f22620fc4b4e.pdf](http://www.ammaemand.org/ee/m_files/3bdf1588619cdb9793b5f22620fc4b4e.pdf)
37. Kalkim A, Midilli T, Baysal E. An Investigation of the Perceptions and Practices of Nursing Students Regarding Spirituality and Spiritual Care. Religions. 2016;7(8):101.
38. Kalnins I. Pioneers in academia: higher education for nurses in Estonia, Latvia and Lithuania. Nursing Outlook. 1995;43:84–87.
39. Kalnins I, Barkauskas VH, Šeškevičius A. Baccalaureate nursing education development in 2 Baltic countries: Outcomes 10 years after initiation. Nursing Outlook. 2001;49(3):142–7.

40. Kannus A, Varik M. Tartu Tervishoiu Kõrgkool – de facto 200 ja de jure 6 aastat tegevuse algusest. *Eesti Arst*. 2011. 90(11):538–539.
41. Karosas L, Riklikienė O. Development of the Nursing Profession in Pre-War Independent Lithuania (1918-1939): A Comparison Between Past and Present. *The Journal Nursing Education, Research & Practice*. 2011;1, 4-11.
42. Karseth B. Curriculum changes and moral issues in nursing education. *Nurse Education Today*. 2004;24 (8):638–643.
43. Kiivet RA, Visk H, Raag M. Õdede arvu prognoos aastaks 2032. *Eesti Arst*. 2013;92(11):616–626.
44. Kiivet, RA, Visk H, Asser T. Eestis töötavate arstide arvu prognoos aastaks 2030. *Eesti Arst*. 2012;91(8):403–412. Available from: <http://ojs.utlib.ee/index.php/EA/article/viewFile/11220/6405>
45. Kingma M. Nurses on the move: a global overview. *Health Services Research*. 2007;42(3):1281–1298.
46. Kyrkjebø JM, Mekki TE, Hanestad BR. Short Report: Nursing education in Norway. *Journal of Advanced Nursing*. 2002;38(3):296–302.
47. Kõrgharidusstandard. RT I 2008, 57, 322; RT I, 23.08.2016, 6.
48. Kõrran T, Onoper A, Pruuden E, Roots E, Ruul-Kasemaa K, Saluvere T, Sarv H, Õunapuu M. Sammud käänulisel teel: Eesti õenduse arengutest 21. sajandini. Tartu: Eesti Õdede Liit; 2008.
49. Krause K, Salo S. Teoreettinen hoitotyö. Hoitotyön tietoperustasta, tutkimuksesta ja käytännöstä. Kirjayhtymä. Helsinki; 1992.
50. Kutsestandard. Üldõde III. Tervishoiu ja sotsiaaltöö kutsenõukogu; 1999.
51. Lahtinen P, Leino-Kilpi H, Salminen L. Nursing education in the European higher education area — Variations in implementation. *Nurse Education Today*. 2014;34(6):1040–1047.
52. Maailma Tervishoiuorganisatsiooni Euroopa regiooni õenduse ja ämmaemanduse haridusstrateegia. Tervis 21–"Tervis kõigile" 21.sajandi sihid. Tallinn: WHO; 2000.
53. McMillan M. & Dwyer J. Changing times, changing paradigms (1): From hospital training and college education in Australia. *Nurse Education Today*. 1989;9:13–18.
54. Meeting of the committee of nurses of the Baltic States. International Council of Nurses. 1929;(4):69–71.
55. Murray E. Russian nurses: from the Tsarist Sister of Mercy to the Soviet comrade nurse: a case study of absence of migration of nursing knowledge and skills. *Nursing Inquiry*. 2004;11(3):130–137.
56. NANDA website. Retrieved from [www.nanda.org](http://www.nanda.org).
57. Normet I. Kas Eesti haiglad on efektiivsed ja pakuvad efektiivset ravi". 15 aastat ravikindlustuse süsteemi; 26.04.2007 Available from: [https://www.haigekassa.ee/files/est\\_haigekassa\\_uudised\\_uudis2007/Normet.pdf](https://www.haigekassa.ee/files/est_haigekassa_uudised_uudis2007/Normet.pdf)
58. Nursing and Caring Sciences Evaluation Report. Publications of the Academy of Finland. 2003;12/03. Painopörssi Oy, Helsinki.
59. Odiņa. O. Development of the nurse profession in Latvia (18th-20th centuries). Summary of the Doctoral Thesis. Rīga Stradiņš University, Academic School of Nursing; 2013.
60. Onoper AM. Ülevaade õdede, ämmaemandate ja velskrite ajaloo ja tegevusest: bibliograafia. Tartu: Eesti Õdede Liit; 2008. Available from: [http://www.kirmus.ee/resources/pdf/bibl\\_final.pdf](http://www.kirmus.ee/resources/pdf/bibl_final.pdf)
61. Organisation for Economic Co-operation and Development. Health at a Glance: Europe 2012. OECD Publishing; 2012. Available from: [https://www.oecd-ilibrary.org/social-issues-migration-health/health-at-a-glance-europe-2012\\_9789264183896-en](https://www.oecd-ilibrary.org/social-issues-migration-health/health-at-a-glance-europe-2012_9789264183896-en)
62. Pruuden E. Eesti õenduskoostöö strateegiline juhtimine- NÖKK. *Eesti õde*. 2011;3, 9–10.
63. Puusepp K. Kümme aastat NANDA-I jälgedes. *Eesti Õde*. 2017;1:28–30.
64. Pärnu Haigla 1835-2005. Koost. Liina Pärnamäe jt. Pärnu: Pärnu Haigla; 2005.
65. Råholm MB, Birte Larsen Hedegaard BL, Löfmark A, Slettebø A. Nursing education in Denmark, Finland, Norway and Sweden – from Bachelor's Degree to PhD. *Journal of Advanced Nursing*. 2010;66(9):2126–2137.
66. Rahvusvahelise Õdede Nõukogu. Eetikakoodeks õdedele. Genf: Rahvusvaheline Õdede Nõukogu; 2006.
67. Rauhala L. Ihmisen ykseys ja moninaisuus. Helsinki: Sairaanhoidajien koulutussäätiö; 1989.
68. Kiivet RA, Visk H, Raag M. (Õdede arvu prognoos aastaks 2032. *Eesti Arst*. 2013;92(11):616–626.

69. Rautava-Nurmi H. Hoitotyön taidot ja toiminnot. Helsinki: Sanoma Pro OY; 2016.
70. Rautava-Nurmi H, Westergård A, Henttonen T. jt. Hoitotyön taidot ja toiminnot. Sanoma Pro OY, Helsinki; 2015.
71. Rechel B, Richardson E, McKee M. (2014). Introduction. In: Trends in health systems in the former Soviet countries. Edited by Bernd Rechel, Erica Richardson, Martin McKee. Observatory Studies Series 35. Copenhagen, Denmark: WHO Regional Office for Europe; 2014. p. 1–7.
72. Ringlee A. The Russian Red Cross in War and Revolution, 1904-1907: A National Aid Society Confronts the Public; 2016. Available from: <https://cseees.unc.edu/files/2016/01/Russian-Red-Cross-in-War-and-Revolution1.pdf>
73. Ruohotie P. Oppiminen ja ammatillinen kasvu. Helsinki: Werner Söderström Osakeyhtiö; 2005.
74. Ruohotie P, Honka J. Osaamisen kehittäminen organisaatiossa. Consulting Team, Seinäjoki; 1997.
75. Rowland D, Telyukov AV. Soviet Health Care from Two Perspectives. Health Affairs. 1991;10(3):71–86.
76. Ruusmann A. Eesti Tervishoiuprojekt 2015. Eesti Õde; 2001;26(2), 5–7.
77. Salvage J. Introduction. In: Nursing in Europe : a resource for better health. Edited by Jane Salvage and Serge Heijnen. Copenhagen: WHO Regional Office for Europe; 1997. p 1–11
78. Sariko M. Sairaanhoitajaksi Kasvattaminen.Sairaahoitajakoulutus ja Siina kaytetyt oppikirjat suomessa vuoteen 1967 asti (The historical development of Finnish nursing textbooks from the late 1880s to 1967 – the training of nurses in the Foucauldian perspective). Doctoral dissertation. Research Report 208, Department of Education. Helsinki: University of Helsinki; 2007.
79. Sooväli EM. Õenduse ajalooline ülevaade maailmas ja Eestis. Eesti Õde. 1998;1:18–19.
80. Stallknecht K. Nursing and Politics in Denmark: The Impact of Conflicts in a Historical perspective. Copenhagen: Danish Nurse's Organization; 2012.
81. Stipendium Eesti õdede ühingule. Vaba Maa. 1925 July 28;171, 4.
82. Sõerde K. Ülevaade Tallinna Tervishoiu Kõrgkooli ajaloost. Eesti Arst. 2013;92(3):163.
83. Tallberg M. (1994) Nursing and Medical care in Finland from the Eighteenth to the late Nineteenth Century. The Background for the Introduction of Nurses' Training in Finland in 1889 with some Comparisons with developments in Sweden. Nursing History Review. 1994;2, 169–190.
84. Tervishoiuteenuste korraldamise seadus. RT I 2001, 50, 284; RT I 03.03.2017, 1.
85. Toode K. Õdede töömotivatsiooni mõjutegurid. Master thesis. Tartu: Tartu Ülikool, 2005.
86. Toode K, Helminen M, Routasalo P, Suominen T. Hospital nurses' working conditions in relation to motivation and patient safety. Nursing Management. 2015;21(10):31–41. Available from: 10.7748/nm.21.10.31.e1293.
87. Toode K. Nurses' Work Motivation. Essence and associations. Academic Dissertation. Tampere: University of Tampere; 2015. Available from: <http://www.rahvatervis.ut.ee/bitstream/1/6124/1/Toode2015.pdf>
88. Tulevikuvaade tööjõu- ja oskuste vajadusele: tervishoid. Tallinn, Kutsekoda; 2017. Available from: [http://oska.kutsekoda.ee/wp-content/uploads/2016/04/tervishoiu\\_uuringu\\_terviktekst.pdf](http://oska.kutsekoda.ee/wp-content/uploads/2016/04/tervishoiu_uuringu_terviktekst.pdf)
89. Tulva T. Viron sosiaalityön muutoutuminen murroskaudella. Akateeminen väitöskirja Rovaniemi: Lapin Yliopisto; 1995.
90. Tähelepanemiseks halastajatele õdedele. Tallinna Teataja. 1921 September 16;214, 1.
91. Veski R. Esimene Eesti õde sai doktorikraadi. Postimees: Tervis; 10.04.2015. Available from: <https://tervis.postimees.ee/3152597/esimene-eesti-ode-sai-doktorikraadi>.
92. Vorobjov S. Drug use, related risk behaviour and harm reduction interventions utilization among injecting drug users in Estonia: implications for drug policy. Department of Public Health, University of Tartu, Estonia, National Institute for Health Development. Tartu; 2012.
93. Võrk A, Priinits M, Kallaste E. Tervishoiutöötajate väljaranne Eestist: väljarände suurus, mõju tervishoiutöötajate vajadusele ja võimalikud poliitikavalikud. Tallinn: Poliitikauuringute Keskus PRAXIS; 2004.
94. The World Health Report 2006 - working together for health. Geneva: World Health Organization; 2006. Retrieved from [http://www.who.int/whr/2006/media\\_centre/WHR06\\_slides\\_en.pdf?ua=1](http://www.who.int/whr/2006/media_centre/WHR06_slides_en.pdf?ua=1)

96. Õe põhiõppe õppekava 1467. Tallinn: Tallinna Tervishoiu Kõrgkool; 2011. Available from: [http://www.ttk.ee/public/OE\\_Oppekava\\_2011\\_EHIS.pdf](http://www.ttk.ee/public/OE_Oppekava_2011_EHIS.pdf)
97. Õe põhiõppe õppekava 2296. Tartu: Tartu Tervishoiu Kõrgkool; 2017. Available from: <https://enda.ehis.ee/avalik/avalik/oppekava/OppekavaOtsi.faces>
98. Õendusala arengukava 2002-2015. Available from: [http://www.ena.ee/images/ELANIKONNALE/Oendusala\\_arengukava\\_2002-2015.pdf](http://www.ena.ee/images/ELANIKONNALE/Oendusala_arengukava_2002-2015.pdf)
99. Õenduse ja Æmmaemanduse Riiklik Arengustrateegia. Tallinn: Sotsiaalministeerium; 1998.

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# RESIDENTS' SATISFACTION WITH FOOD AND FOOD SERVICE IN LONG TERM CARE NURSING HOME (PILOT SURVEY)

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## Annotation

*Residents of a long-term care nursing homes, can lose an ability to exercise their choice of food and it can lead to undernutrition and lower quality of life. There is a lack of studies in Lithuania, investigating a satisfaction with food and food service in long term care nursing homes and there was none using a FoodEx-LTC questionnaire.*

**Key words:** food, food service, satisfaction, long term care, nursing home.

**Presentation of a problem:** statistical data in Lithuania showed that there were 6484 residents in long term care facilities for adults with disabilities and 5809 residents in long term care homes for elderly in 2017 (latest available data)[1]. Though satisfaction with food is an important determinant of a life quality [2], there is a lack of scientific research on this topic. Many hospitals in Lithuania include patient's satisfaction surveys in their annual reports, but these surveys analyse satisfaction with medical procedures and staff services, but not food satisfaction. There was a report in 2018 presenting evaluation of food service in 10 health care institutions (only one of them was long term care institution) in Lithuania. This report showed, that satisfaction with food and reported food quality was better in institutions with their own kitchen, compared to those ordering food elsewhere (it was not a scientific research, so statistical significance of these differences is unknown) [3].

**Research goals** were to estimate residents' satisfaction with food and food services in long term care nursing home and to estimate the internal consistency reliability of a FoodEx-LTC questionnaire.

## Objectives:

1. To measure how important is for residents to exercise food choice.
2. To find out the residents' perceptions toward nursing home kitchen staff.
3. To compare satisfaction with food and food service between male and female residents of the nursing home.

**Methodology.** This pilot survey was conducted in long term care nursing home in Klaipėda district, Lithuania in 2018 October. There are 186 residents in this nursing home, but only 75 of them (60 % of them women, n=45) participated in this survey, because 75 is a recommended pilot sample size for standardised effect sizes that are extra small ( $\leq 0.1$ ) [4]. To be included in the study, residents had to have lived at nursing home for at least 1 year, be able to make themselves understood, and have adequate cognitive skills for daily decision-making (this information was provided by social worker, who participated in questioning, ensuring that ethical principles (voluntary participation, information for subjects, privacy and data protection) were applied during the survey). The mean of age of participants was 53.65 (9.549) years. A researcher met with each resident, observed by a social worker, obtained informed consent, and administered the FoodEx-LTC questionnaire, a 44-item, 5-subscale questionnaire that measures resident food and food service satisfaction (5 subscales are: 1. Enjoying Food and Food Service, 2. Exercising Choice (subsubscale estimates an importance of choice), 3. Cooking Good Food, 4. Providing Good Food Service (the Negative View) and 5. Providing Good Food Service (the Positive View)). Questionnaire Items 1–16. 20–26 scored 1 - true. 2 - somewhat true. 3 – somewhat false. 4 - false; items 17–19 scored 1 - important. 2 - somewhat important. 3 - somewhat not important. 4 - not important. The FoodEx-LTC may be self-administered or interviewer administered and can be used across long-term care settings. Literal translation (not tested) of the questionnaire was used in this study. [5] The researcher read each item to the resident and scored it based on the resident's response. IBM SPSS version 20.0 was used to generate descriptive statistics, estimate the internal consistency reliability of a questionnaire (Cronbach's alpha) and compare means (Student's t test), p values  $< 0.05$  were estimated as statistically significant.

**Background.** Adults living in long term care nursing homes are nutritionally vulnerable, often consuming insufficient energy, macro - and micronutrients to sustain their health and function. Multiple factors are proposed to influence food intake, yet our understanding of these diverse factors and their interactions are limited [6]. Research has demonstrated the importance of physical environments at mealtimes for residents in long term care [7]. It is also very important for a long term care nursing home residents to be able to have a choice. Nutritional interventions that encourages resident decision making facilitates overall satisfaction with care and improved health [8]. Long-term care institutions have gone through revolutionary culture change from hospital-like facilities based on a medical model of care, toward more home-like facilities, with a focus on the quality of life of residents, and providing real choices and individualized care [9]. There are many factors that can influence the satisfaction with food and food services [10]. Study conducted in long term care homes in Australia between October 2015 and March 2016 showed that participant preferences were influenced by food taste, choice in relation to serving size, timing of meal selection, visual appeal, and additional cost. The study found that respondents were willing to pay a premium to receive food that met their expectations of taste, and for a high level of control over serving sizes [11]. Food not only provides the physical nutritional requirements of the body, but can also be a part of social occasions, emotions, and provide a source of enjoyment, socialisation [12]. Studies have shown differences in what staff consider to be important to create a quality dining experience for residents, and the factors that residents themselves consider important [13]. Staff may rank some aspects which were highly important to residents (such as: feeling at home, having a varied menu) of lower importance than residents rank these aspects themselves. That is the reason why it is important to not only rely on staff, but also include the residents of a long term care nursing homes when it comes to a decision making about changes in food service.

#### Analysis of the results

The Lithuanian version of FoodEx-LTC questionnaire showed high reliability scores, except for a subscale 5: Providing Good Food Service (the Positive View) (Table 1).

Table 1

Internal consistency reliability of the FoodEx-LTC questionnaire Lithuanian version

| Scale/subscale  | Cronbach's alpha |
|---|------------------|
| All questionnaire   | 0.826            |
| 1 subscale: Enjoying Food and Food Service                  | 0.928            |
| 2 subscale: Exercising Choice                               | 0.812            |
| 3 subscale: Cooking Good Food                               | 0.718            |
| 4 subscale: Providing Good Food Service (the Negative View) | 0.907            |
| 5 subscale: Providing Good Food Service (the Positive View) | 0.688            |

Research showed that there was no significant difference in importance of choice between male (2.1667) and female (2.4111) residents ( $p>0.05$ ), they both reported average scores of an importance of choice (Table 2). Women showed bigger satisfaction with exercising choice (2.4000) than men (2.6333),  $p<0.01$ , but men reported bigger satisfaction with food and food service (3.7000) compared to women (3.4889),  $p<0.05$  (Table 2). This can be explained, because 24.3 percent of women in Lithuania reported food benefits to their health as food choice criteria, compared to 15.3 percent of men ( $p<0.05$ ) and men preferred taste as one of the main choice criteria (38.8 %), compared to women (24.9 %),  $p<0.05$  [14]. It can be a reason for men to be less satisfied with a healthy diet provided in long term care nursing home. Further research is needed to find out their food preferences. Qualitative research methods could be applied for this goal.

Table 2

Residents' satisfaction with food and food services by subscales according to a gender. Lower scores represent better satisfaction, except subscales marked \*

| Scale/subscale   | Gender                 |                          | p            |
|--|------------------------|--------------------------|--------------|
|  | Male<br>N=30<br>M (SD) | Female<br>N=45<br>M (SD) |              |
| 1 subscale: Enjoying Food and Food Service*                        | 3.7000 (0.000)         | 3.4889 (0.43548)         | <b>0.01</b>  |
| 2 subscale: Exercising Choice<br>Subsubscale: Importance of choise | 2.6333 (0.29750)       | 2.4000 (0.25226)         | <b>0.000</b> |
|  | 2.1667 (1.3668)        | 2.4111 (1.14559)         | 0.405        |
| 3 subscale: Cooking Good Food                                      | 1.5333 (0.23973)       | 1.5111 (0.26304)         | 0.712        |
| 4 subscale: Providing Good Food Service * (the Negative View)      | 3.9000 (0.22743)       | 3.7111 (0.75745)         | 0.190        |
| 5 subscale: Providing Good Food Service (the Positive View)        | 1.2500 (0.11371)       | 1.3000 (0.14302)         | 0.113        |

\* - bigger scores represent better satisfaction.

Table 3 lists individual item means of both genders. Most responses indicated that residents generally enjoyed the food served in the nursing home. 100% reported to have never been served food that looked or smelled bad. However, 5 residents (6.7 %) reported to have lost their appetite since they began to live in this nursing home. This loss of an appetite can lead to an undernutrition and loss of body mass. There was a research in Lithuanian long term nursing homes in 2010 that showed a significant loss of body mass (10 % in 180 days) in 7.4 percent of men and 5.1 percent of women [15]. Also 5 residents (6.5 %) reported they had to wait to go back to their rooms, presenting a quality of life issue. None of them reported to have received a food they hated. Comparing this data with an initial questionnaire testing study [5] data we can see some differences: 44% had to wait to go back to their rooms in the initial study, compared to only 6.5 % in this study. Fifty-two percent received food they hated in the initial study and nobody complained about that in this study.

Many residents (40%) reported that they felt comfortable refusing food that they did not like (female more than male,  $p < 0.01$ ) (Table 3). Most (73.3%) residents wanted to choose what to eat, but only 40% believed that choosing when to eat was important. In contrary to a first subscale, subscale 2 data is similar to an initial study data: Most residents (75%) felt comfortable refusing food they did not like, but 65% did not complain. Most (79%) wanted to choose what to eat, but only 54% believed that choosing when to eat was important [5].

Most residents described kitchen staff positively. For example, 100% reported that it was true or somewhat true that staff knew how to prepare a meal, made food look presentable, came up with clever ideas and had experience in food service. 100% reported that it was true or somewhat true that foods looked appetizing (female more than male,  $p < 0.05$ ) (Table 3).

93.3% of residents agreed that staff ordered or fixed sufficient food for meals. 86.7% agreed that staff did not have trouble cooking for large groups. Only 6.7% of residents reported that staff sometimes had trouble getting the meal ready on time (women more than men,  $p < 0,05$ ) (Table 3), and that food was poorly prepared or served because of equipment problems.

Most residents believed in receiving freshly cooked foods, fresh fruits and vegetables, and the right amount of food, all served at the right time. 86.7% reported that nursing home staff kept a close eye on what they ate (male more than female,  $p < 0.05$ ). Residents reported that kitchen staff worked hard to serve food everyone liked, cared about the food they served, and were friendly and courteous (female more than male,  $p < 0.05$ ) (Table 3). Overall, 93.3% of residents were satisfied or somewhat satisfied with the food service in this study, compared to 89 % of satisfied or somewhat satisfied residents in the initial questionnaire testing study [5].

Table 3

Residents' satisfaction with food and food services according to a gender. Note: Items 1–16. 20–26 scored 1 - true. 2 - somewhat true. 3 – somewhat false. 4 - false; items 17–19 scored 1 - important. 2 - somewhat important. 3 - somewhat not important. 4 - not important.

| <b>Subscale One:<br/>Enjoying Food and Food Service</b>                                 | <b>Gender</b> | <b>Mean</b> | <b>SD</b> | <b>p</b>     |
|---|---------------|-------------|-----------|--------------|
| <i>Since I came to the nursing home:</i>  |               |             |           |              |
| 1. I have lost my appetite.   | Male          | 4.00        | 0         | <b>0.014</b> |
|   | Female        | 3.56        | 0.967     |              |
| 2. I am forced to eat with other people.  | Male          | 1.00        | 0         | -            |
|   | Female        | 1.00        | 0         |              |
| 3. I have to eat things I just hate.  | Male          | 4.00        | 0         | 0.06         |
|   | Female        | 3.89        | 0.318     |              |
| 4. I am taken to the dining room too soon.  | Male          | 4.00        | 0         | <b>0.005</b> |
|   | Female        | 3.78        | 0.420     |              |
| 5. I have to wait to go back to my room.  | Male          | 4.00        | 0         | <b>0.014</b> |
|   | Female        | 3.56        | 0.967     |              |
| 6. I have food in front of me that I cannot get at.                                     | Male          | 4.00        | 0         | <b>0.009</b> |
|   | Female        | 3.67        | 0.674     |              |
| <i>Over the past week, during mealtime, I have received:</i>                            |               |             |           |              |
| 7. Food I dislike.  | Male          | 4.00        | 0         | <b>0.005</b> |
|   | Female        | 3.78        | 0.420     |              |
| 8. Food that looks or smells bad.   | Male          | 4.00        | 0         | -            |
|   | Female        | 4.00        | 0         |              |
| 9. Foods cooked wrong.  | Male          | 4.00        | 0         | 0.06         |
|   | Female        | 3.78        | 0.636     |              |
| 10. Foods always cooked the same way.   | Male          | 4.00        | 0         | 0.06         |
|   | Female        | 3.78        | 0.636     |              |
| 11. The same food too often.  | Male          | 4.00        | 0         | 0.06         |
|   | Female        | 3.78        | 0.636     |              |
| <b>Subscale Two: Exercising Choice</b>  |               |             |           |              |
| <i>Since I came to the nursing home:</i>  |               |             |           |              |
| 12. I worry that I will not get the food I ask for.                                     | Male          | 4.00        | 0         | <b>0.000</b> |
|   | Female        | 3.22        | 0.927     |              |
| 13. I feel powerless to change the food or food service.                                | Male          | 4.00        | 0         | <b>0.000</b> |
|   | Female        | 3.44        | 0.693     |              |
| <i>I enhance my satisfaction with the food and food service at the nursing home by:</i> |               |             |           |              |
| 14. Complaining about the food.   | Male          | 3.67        | 0.758     | 0.495        |
|   | Female        | 3.78        | 0.636     |              |
| <i>Here at the nursing home:</i>  |               |             |           |              |
| 15. I have refused food I don't like.   | Male          | 3.50        | 0.777     | <b>0.000</b> |
|   | Female        | 2.33        | 1.348     |              |
| 16. I eat because I am hungry.  | Male          | 4.00        | 0         | <b>0.000</b> |
|   | Female        | 2.56        | 1.358     |              |
| <i>How important to you is:</i>   |               |             |           |              |
| 17. Choosing what to eat.   | Male          | 2.17        | 1.367     | 0.574        |
|   | Female        | 2.00        | 1.168     |              |
| 18. Choosing when to eat.   | Male          | 2.33        | 1.398     | 0.169        |
|   | Female        | 2.78        | 1.330     |              |
| 19. Sending outside the nursing home for food.  | Male          | 2.00        | 1.438     | 0.179        |
|   | Female        | 2.44        | 1.358     |              |
| <b>Subscale Three: Cooking Good Food</b>  |               |             |           |              |
| <i>The staff here at the nursing home:</i>  |               |             |           |              |
| 20. Know how to prepare a meal.   | Male          | 1.00        | 0         | 0.06         |
|   | Female        | 1.11        | 0.318     |              |
| 21. Make food look presentable.   | Male          | 1.00        | 0         | -            |
|   | Female        | 1.00        | 0         |              |
| 22. Come up with clever ideas.  | Male          | 1.17        | 0.379     | <b>0.000</b> |
|   | Female        | 1.00        | 0         |              |

| <b>Subscale One:<br/>Enjoying Food and Food Service</b>                 | <b>Gender</b> | <b>Mean</b> | <b>SD</b> | <b>p</b>     |
|---|---------------|-------------|-----------|--------------|
| 23. Have experience in food service.                                    | Male          | 1.00        | 0         | -            |
|   | Female        | 1.00        | 0         |              |
| <i>Here at the nursing home. I get:</i>                                 |               |             |           |              |
| 24. A variety of foods.   | Male          | 1.50        | 0.777     | 0.049        |
|   | Female        | 1.22        | 0.420     |              |
| 25. Foods that are appetizing.  | Male          | 1.33        | 0.479     | <b>0.018</b> |
|   | Female        | 1.11        | 0.318     |              |
| <i>(Over the past week) The kitchen staff here at the nursing home:</i> |               |             |           |              |
| 26. Do not order or fix enough food.                                    | Male          | 4.00        | 0         | 0.06         |
|   | Female        | 3.78        | 0.636     |              |
| <b>Subscale Four: Providing Good Food Service—Negative View</b>         |               |             |           |              |
| <i>The kitchen staff here at the nursing home:</i>                      |               |             |           |              |
| 27. Do not order or fix enough food.                                    | Male          | 4.00        | 0         | 0.06         |
|   | Female        | 3.89        | 0.318     |              |
| 28. Have trouble cooking for large groups.                              | Male          | 3.50        | 1.137     | 0.495        |
|   | Female        | 3.67        | 0.953     |              |
| 29. Sometimes have trouble getting the meal ready.                      | Male          | 4.00        | 0         | <b>0.014</b> |
|   | Female        | 3.56        | 0.967     |              |
| 30. Serve food so late that it affects the next meal.                   | Male          | 4.00        | 0         | 0.06         |
|   | Female        | 3.78        | 0.636     |              |
| <i>Since I came to the nursing home:</i>                                |               |             |           |              |
| 31. Food is poorly prepared or served because of equipment problems.    | Male          | 4.00        | 0         | 0.06         |
|   | Female        | 3.67        | 0.953     |              |
| <b>Subscale Five: Providing Good Food Service—Positive View</b>         |               |             |           |              |
| <i>Over the past week, during mealtime. I have received:</i>            |               |             |           |              |
| 32. Foods served at the proper temperature.                             | Male          | 1.00        | 0         | 0.06         |
|   | Female        | 1.11        | 0.318     |              |
| 33. Food freshly cooked and served on time.                             | Male          | 1.00        | 0         | 0.06         |
|   | Female        | 1.22        | 0.636     |              |
| 34. Plenty of fresh fruits and vegetables.                              | Male          | 1.00        | 0         | 0.06         |
|   | Female        | 1.11        | 0.318     |              |
| <i>Here at the nursing home. I get:</i>                                 |               |             |           |              |
| 35. Food that is healthy for me.  | Male          | 1.00        | 0         | -            |
|   | Female        | 1.00        | 0         |              |
| 36. The right amount of food.   | Male          | 1.00        | 0         | 0.06         |
|   | Female        | 1.11        | 0.318     |              |
| <i>The staff here at the nursing home:</i>                              |               |             |           |              |
| 37. Keep a close eye on what I eat.                                     | Male          | 1.00        | 0         | <b>0.014</b> |
|   | Female        | 1.44        | 0.967     |              |
| <i>The kitchen staff here at the nursing home:</i>                      |               |             |           |              |
| 38. Work hard to serve food everyone likes.                             | Male          | 1.17        | 0.379     | 0.495        |
|   | Female        | 1.11        | 0.318     |              |
| 39. Care about the food they serve.                                     | Male          | 1.00        | 0         | -            |
|   | Female        | 1.00        | 0         |              |
| 40. Are concerned about my health.                                      | Male          | 1.00        | 0         | -            |
|   | Female        | 1.00        | 0         |              |
| 41. Are friendly and courteous.   | Male          | 1.17        | 0.379     | <b>0.004</b> |
|   | Female        | 1.00        | 0         |              |
| <i>The nursing home staff here at the nursing home:</i>                 |               |             |           |              |
| 42. Get take-out food for me, if I want it.                             | Male          | 4.00        | 0         | 0.06         |
|   | Female        | 3.67        | 0.953     |              |
| 43. Provide help in cutting-up my food.                                 | Male          | 1.00        | 0         | 0.06         |
|   | Female        | 1.11        | 0.318     |              |
| <i>Since I came to the nursing home:</i>                                |               |             |           |              |
| 44. I have been satisfied with the food service.                        | Male          | 1.17        | 0.379     | 0.36         |
|   | Female        | 1.33        | 0.953     |              |

## Conclusions

1. FoodEx-LTC Lithuanian version showed high internal consistency reliability (Cronbach's alpha - 0.826), so it can be used as an instrument researching satisfaction with food and food services in long term care nursing homes in Lithuania.
2. Men and women reported the same level of importance of food choice (between somewhat important and somewhat not important,  $p>0.05$ ), but women were more satisfied with exercising choice than men ( $p<0.01$ ) and had less trouble than men to refuse the meals they didn't like ( $p<0.05$ ).
3. None of the residents complained about kitchen staff. All reported that it was true or somewhat true that staff knew how to prepare a meal, made food look presentable and appetizing (women more than men,  $p<0.05$ ), came up with clever ideas and had experience in food service.

## References

1. Statistics Lithuania, Survey of social services. Available from: <https://osp.stat.gov.lt/statistiniu-rodikliu-analize?hash=5cefc529-8c4e-4dfb-ab43-128cc49470b0#/>
2. Jihye J, Sunhee S. Importance of satisfaction with food for older adults' quality of life. *British Food Journal*. 2014;116(8):1276-1290. Available from: <https://doi.org/10.1108/BFJ-01-2013-0019>
3. The State Food and Veterinary Service report on food service evaluation in health care institutions. 2018. Available from: <https://sam.lrv.lt/uploads/sam/documents/files/Naujienos/.../Bendroji%20ataskaita.doc>
4. Whitehead A, Julious S, Cooper C, Campbell M. Estimating the sample size for a pilot randomised trial to minimise the overall trial sample size for the external pilot and main trial for a continuous outcome variable. *Stat Methods Med Res*. 2016 Jun; 25(3): 1057–1073.
5. Crogan N, Evans B, Velasques D. Measuring nursing home resident satisfaction with food and food service: initial testing of the FoodEx-LTC. *J Gerontol Biol Sci Med Sci*. 2004;59A:370–377.
6. Keller HH, Carrier N, Slaughter SE, Lengyel C, Steele CM, Duizer L, Morrison J, Villalon L. Prevalence and Determinants of Poor Food Intake of Residents Living in Long-Term Care. *Journal of the American Medical Directors Association*. 2017;18 (11):941–947.
7. Luglio S, Keller H, Chaudhury H, Slaughter SE, Lengyel C, Morrison J, Boscart V, Carrier N. Construct validity of the Dining Environment Audit Protocol: a secondary data analysis of the Making Most of Mealtimes (M3) study. *BMC Geriatr*. 2018. Jan 22;18(1):20.
8. Crogan N, Dupler A, ShortR, Heaton G. Food Choice Can Improve Nursing Home Resident Meal Service Satisfaction and Nutritional Status. *J Gerontol Nurs*. 2013 May;39(5):38-45. doi: 10.3928/00989134-20130313-02.
9. Dorner B. Practice paper of the American Dietetic Association: Individualized nutrition approaches for older adults in Health Care Communities. *Journal of the American Dietetic Association*. 2010;110:1554–1563.
10. Wright ORL, Connelly LB, Hendrikz J. Determinants of foodservice satisfaction for patients in geriatrics/rehabilitation and residents in residential aged care. *Health Expect*. 2013 Sep; 16(3):251–265.
11. Milte R, Ratcliffe J, Chen G, Miller M, Crotty M. Taste, choice and timing: Investigating resident and carer preferences for meals in aged care homes. *Nurs Health Sci*. 2018 Mar;20(1):116–124. doi: 10.1111/nhs.12394.
12. Hall S, Dodd RH, Higginson IJ. Maintaining dignity for residents of care homes: A qualitative study of the views of care home staff community nurses, residents and their families. *Geriatr Nurs*. 2014 Jan-Feb;35(1):55–60. doi: 10.1016/j.gerinurse.2013.10.012.
13. West GE, Ouellet D, Ouellette S. Resident and staff ratings of foodservices in long-term care: Implications for autonomy and quality of life. *Journal of Applied Gerontology*. 2003;22:57–75.
14. Dobrovolskij V, Stukas R. Eating habits and blood cholesterol concentration among Lithuanian residents. *Visuomenės sveikata*. 2014;priedas Nr. 1.
15. Spirgienė L. Health disorders of elderly residents of long term care facilities. PhD thesis. Lithuanian University of Health Sciences; 2010.

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# TREATMENT OF HEART AND CIRCULATION DISORDERS USING AUTOCHTHONOUS MEDICINAL PLANTS OF LITHUANIA

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## Annotation

*In phytotherapical literature medicinal plants are divided to groups by their remedial features, effects and suitability for treatment of disorders and diseases. In literature sources (various publications of Lithuanian authors) 107 species of medicinal plants are recommended for treatment of these disorders. In separate publications the number of species for treatment of heart and circulation disorders is varied quite strong (4-54 species). 12 most frequent species of autochthonous medicinal plants of Lithuania (each of them was mentioned not less than in 7 publications) are recommended for treatment: Leonurus cardiaca, Convallaria majalis, Crataegus monogyna, Valeriana officinalis, Gnaphalium uliginosum, Fragaria vesca, Capsella bursa-pastoris, Hypericum perforatum, Viscum album, Polygonum aviculare, Berberis vulgaris, Viburnum opulus.*

**Key words:** autochthonous plants, medicinal plants, phytotherapy, heart disorders, circulation disorders.

## Introduction

In phytotherapeutic literature medicinal plants are divided to groups by their remedial features, effects and suitability for treatment of disorders and diseases. Medical plant group for treatment of heart and circulation disorders was analysed. In 14 literature sources 107 plant species were recommended for treatment of these disorders.

**Problem:** In these days heart and circulation disorders are one of most spread and many people suffer from these. Not only synthetic drugs, but drugs produced from plant raw are using for treatment too. On purpose to use most effective drugs, it is necessary to know medicinal plants most suitable for treatment of heart and circulation disorders.

**Object:** Autochthonous medicinal plant species of Lithuania.

**Goal:** On the basis of Lithuanian authors publications to draw up the list of autochthonous medicinal plant species of Lithuania using for treatment of heart and circulation disorders.

**Objectives:** To explore medicinal plant species using for treatment of heart and circulation disorders in such aspects: 1) active compounds; 2) remedial effects; 3) applying in official medicine and phytotherapy.

**Methods:** Analysis of scientific information sources, comparative analysis of Lithuanian authors phytotherapeutic data. The frequency of species recommended for treatment of disorders in scientific information sources is measured using *recommendation points* (the number of publications, where species are recommended for treatment of disorders of the same phytotherapeutic group). Phytotherapeutic group is the group of plant species, which by their remedial (therapeutic) features, effects or suitability are recommended for treatment of disorders of appropriate organ system. All Latin names of vascular plant species are cited by *Lietuvos induočių augalų sąvadas* (Gudžinskas, 1999) indexed regarding to requirements of International Botanic Nomenclature.

## 1. Phytotherapeutic classification of medicinal plants

The authors of 14 publications<sup>1</sup> on Lithuanian medicinal plants (Budnikas, Obelevičius, 2015; Dudėnas, Grinevičius et al., 1976; Grybauskas, 1927, 1946; Gudanavičius, 1960; Gudžinskas, Balvočiūtė, 2008; Jaskonis, 1996; Kalasauskienė, 2009; Kaunienė, Kaunas, 1991; Pipinys (ed.), 1973; Ragažinskienė, Rimkienė et al., 2005; Sasnauskas, 2002a, 2002b;

<sup>1</sup> On purpose to unify the data the publications of the same author published in several years were equated to one information source (e.g. Grybauskas, 1927, 1946; Sasnauskas, 2002a, 2002b; Vasiliauskas, 1991, 2015) and medicinal plants described thereat are presented in the single column (Table 1).

Stirbys, 2006; Šimkūnaitė, 1971; Vasiliauskas, 1991, 2015) were grouped medicinal plants according to their remedial (therapeutic) features, effects or suitability for treatment of appropriate organ systems. The number of separated groups in every publication differs and varies from 13 to 26. One of these is group of medicinal plants using for treatment of heart and circulating disorders. Medicinal plants for treatment of atherosclerosis and hypertension are included into this group too.

Systematised information about medicinal plants recommended for treatment of disorders of respiratory tracts is presented in other paper of authors (Motiekaitytė, Venckus, 2018).

## 2. Medicinal plants for treatment of heart and circulation disorders

In 14 publications 107 species of autochthonous medicinal plant species of Lithuania were recommended for treatment of mentioned disorders (Table 1). In separate publications the number of species varies strongly – from 4 (Budnikas, Obelevičius, 2015) to 54 (Kalasauskienė, 2009).

Table 1

Autochthonous medicinal plant species of Lithuania using for treatment of heart and circulation disorders

| Serial Number | Species                        | References     |                |                       |                      |                        |                    |                         |                |                     |                       |                            |                    |                          |               |                  |                          | The number of recommendation points |
|---------------|--------------------------------|----------------|----------------|-----------------------|----------------------|------------------------|--------------------|-------------------------|----------------|---------------------|-----------------------|----------------------------|--------------------|--------------------------|---------------|------------------|--------------------------|-------------------------------------|
|               |                                | Ph. Eur., 2016 | Ph.Russ., 1990 | Budnikas et al., 2015 | Dudėnas et al., 1976 | Grybauskas, 1927, 1946 | Gudanavičius, 1960 | Gudžinskas et al., 2008 | Jaskonis, 1996 | Kalasauskienė, 2009 | Kaunienė et al., 1991 | Ragažinskienė et al., 2005 | Pipyns (ed.), 1973 | Sasnauskas, 2002a, 2002b | Stirbys, 2006 | Šimkūnaitė, 1971 | Vasiliauskas, 1991, 2015 |                                     |
| 1             | 2                              | 3              | 4              | 5                     | 6                    | 7                      | 8                  | 9                       | 10             | 11                  | 12                    | 13                         | 14                 | 15                       | 16            | 17               | 18                       | 19                                  |
| 1.            | <i>Leonurus cardiaca</i>       | +              | +              | +                     | +                    | +                      | +                  | +                       | +              | +                   | +                     | +                          | +                  | +                        | +             | +                | +                        | 13                                  |
| 2.            | <i>Convallaria majalis</i>     | +              | +              | +                     | +                    | +                      | +                  | +                       | +              | +                   | +                     | +                          | +                  | +                        | +             | +                | +                        | 12                                  |
| 3.            | <i>Crataegus monogyna</i>      | +              | +              | +                     | +                    | +                      | +                  | +                       | +              | +                   | +                     | +                          | +                  | +                        | +             | +                | +                        | 12                                  |
| 4.            | <i>Valeriana officinalis</i>   | +              | +              | +                     | +                    | +                      | +                  | +                       | +              | +                   | +                     | +                          | +                  | +                        | +             | +                | +                        | 11                                  |
| 5.            | <i>Gnaphalium uliginosum</i>   | +              | +              | +                     | +                    | +                      | +                  | +                       | +              | +                   | +                     | +                          | +                  | +                        | +             | +                | +                        | 10                                  |
| 6.            | <i>Fragaria vesca</i>          | +              | +              | +                     | +                    | +                      | +                  | +                       | +              | +                   | +                     | +                          | +                  | +                        | +             | +                | +                        | 9                                   |
| 7.            | <i>Capsella bursa-pastoris</i> | +              | +              | +                     | +                    | +                      | +                  | +                       | +              | +                   | +                     | +                          | +                  | +                        | +             | +                | +                        | 8                                   |
| 8.            | <i>Hypericum perforatum</i>    | +              | +              | +                     | +                    | +                      | +                  | +                       | +              | +                   | +                     | +                          | +                  | +                        | +             | +                | +                        | 8                                   |
| 9.            | <i>Viscum album</i>            | +              | +              | +                     | +                    | +                      | +                  | +                       | +              | +                   | +                     | +                          | +                  | +                        | +             | +                | +                        | 8                                   |
| 10.           | <i>Polygonum aviculare</i>     | +              | +              | +                     | +                    | +                      | +                  | +                       | +              | +                   | +                     | +                          | +                  | +                        | +             | +                | +                        | 8                                   |
| 11.           | <i>Berberis vulgaris</i>       | +              | +              | +                     | +                    | +                      | +                  | +                       | +              | +                   | +                     | +                          | +                  | +                        | +             | +                | +                        | 7                                   |
| 12.           | <i>Viburnum opulus</i>         | +              | +              | +                     | +                    | +                      | +                  | +                       | +              | +                   | +                     | +                          | +                  | +                        | +             | +                | +                        | 7                                   |
| 13.           | <i>Cichorium intybus</i>       | +              | +              | +                     | +                    | +                      | +                  | +                       | +              | +                   | +                     | +                          | +                  | +                        | +             | +                | +                        | 6                                   |
| 14.           | <i>Mellilotus officinalis</i>  | +              | +              | +                     | +                    | +                      | +                  | +                       | +              | +                   | +                     | +                          | +                  | +                        | +             | +                | +                        | 6                                   |
| 15.           | <i>Oxyccoccus palustris</i>    | +              | +              | +                     | +                    | +                      | +                  | +                       | +              | +                   | +                     | +                          | +                  | +                        | +             | +                | +                        | 6                                   |
| 16.           | <i>Ribes nigrum</i>            | +              | +              | +                     | +                    | +                      | +                  | +                       | +              | +                   | +                     | +                          | +                  | +                        | +             | +                | +                        | 6                                   |
| 17.           | <i>Tanacetum vulgare</i>       | +              | +              | +                     | +                    | +                      | +                  | +                       | +              | +                   | +                     | +                          | +                  | +                        | +             | +                | +                        | 6                                   |
| 18.           | <i>Vaccinium vitis-idaea</i>   | +              | +              | +                     | +                    | +                      | +                  | +                       | +              | +                   | +                     | +                          | +                  | +                        | +             | +                | +                        | 6                                   |
| 19.           | <i>Taraxacum officinale</i>    | +              | +              | +                     | +                    | +                      | +                  | +                       | +              | +                   | +                     | +                          | +                  | +                        | +             | +                | +                        | 6                                   |
| 20.           | <i>Equisetum arvense</i>       | +              | +              | +                     | +                    | +                      | +                  | +                       | +              | +                   | +                     | +                          | +                  | +                        | +             | +                | +                        | 5                                   |
| 21.           | <i>Digitalis grandiflora</i>   | +              | +              | +                     | +                    | +                      | +                  | +                       | +              | +                   | +                     | +                          | +                  | +                        | +             | +                | +                        | 5                                   |
| 22.           | <i>Lamium album</i>            | +              | +              | +                     | +                    | +                      | +                  | +                       | +              | +                   | +                     | +                          | +                  | +                        | +             | +                | +                        | 5                                   |
| 23.           | <i>Urtica dioica</i>           | +              | +              | +                     | +                    | +                      | +                  | +                       | +              | +                   | +                     | +                          | +                  | +                        | +             | +                | +                        | 5                                   |
| 24.           | <i>Achillea millefolium</i>    | +              | +              | +                     | +                    | +                      | +                  | +                       | +              | +                   | +                     | +                          | +                  | +                        | +             | +                | +                        | 4                                   |
| 25.           | <i>Artemisia absintium</i>     | +              | +              | +                     | +                    | +                      | +                  | +                       | +              | +                   | +                     | +                          | +                  | +                        | +             | +                | +                        | 4                                   |
| 26.           | <i>Astragalus glycyphyllos</i> | +              | +              | +                     | +                    | +                      | +                  | +                       | +              | +                   | +                     | +                          | +                  | +                        | +             | +                | +                        | 4                                   |
| 27.           | <i>Bidens tripartita</i>       | +              | +              | +                     | +                    | +                      | +                  | +                       | +              | +                   | +                     | +                          | +                  | +                        | +             | +                | +                        | 4                                   |
| 28.           | <i>Calluna vulgaris</i>        | +              | +              | +                     | +                    | +                      | +                  | +                       | +              | +                   | +                     | +                          | +                  | +                        | +             | +                | +                        | 4                                   |
| 29.           | <i>Centaurium erythraea</i>    | +              | +              | +                     | +                    | +                      | +                  | +                       | +              | +                   | +                     | +                          | +                  | +                        | +             | +                | +                        | 4                                   |
| 30.           | <i>Corylus avellana</i>        | +              | +              | +                     | +                    | +                      | +                  | +                       | +              | +                   | +                     | +                          | +                  | +                        | +             | +                | +                        | 4                                   |
| 31.           | <i>Crataegus rhipidophylla</i> | +              | +              | +                     | +                    | +                      | +                  | +                       | +              | +                   | +                     | +                          | +                  | +                        | +             | +                | +                        | 4                                   |
| 32.           | <i>Erysimum cheiranthoides</i> | +              | +              | +                     | +                    | +                      | +                  | +                       | +              | +                   | +                     | +                          | +                  | +                        | +             | +                | +                        | 4                                   |
| 33.           | <i>Filipendula ulmaria</i>     | +              | +              | +                     | +                    | +                      | +                  | +                       | +              | +                   | +                     | +                          | +                  | +                        | +             | +                | +                        | 4                                   |
| 34.           | <i>Ledum palustre</i>          | +              | +              | +                     | +                    | +                      | +                  | +                       | +              | +                   | +                     | +                          | +                  | +                        | +             | +                | +                        | 4                                   |
| 35.           | <i>Plantago major</i>          | +              | +              | +                     | +                    | +                      | +                  | +                       | +              | +                   | +                     | +                          | +                  | +                        | +             | +                | +                        | 4                                   |
| 36.           | <i>Rubus idaeus</i>            | +              | +              | +                     | +                    | +                      | +                  | +                       | +              | +                   | +                     | +                          | +                  | +                        | +             | +                | +                        | 4                                   |
| 37.           | <i>Sorbus aucuparia</i>        | +              | +              | +                     | +                    | +                      | +                  | +                       | +              | +                   | +                     | +                          | +                  | +                        | +             | +                | +                        | 4                                   |
| 38.           | <i>Betula pubescens</i>        | +              | +              | +                     | +                    | +                      | +                  | +                       | +              | +                   | +                     | +                          | +                  | +                        | +             | +                | +                        | 3                                   |
| 39.           | <i>Elytrigia repens</i>        | +              | +              | +                     | +                    | +                      | +                  | +                       | +              | +                   | +                     | +                          | +                  | +                        | +             | +                | +                        | 3                                   |
| 40.           | <i>Galium verum</i>            | +              | +              | +                     | +                    | +                      | +                  | +                       | +              | +                   | +                     | +                          | +                  | +                        | +             | +                | +                        | 3                                   |
| 41.           | <i>Humulus lupulus</i>         | +              | +              | +                     | +                    | +                      | +                  | +                       | +              | +                   | +                     | +                          | +                  | +                        | +             | +                | +                        | 3                                   |
| 42.           | <i>Malus sylvestris</i>        | +              | +              | +                     | +                    | +                      | +                  | +                       | +              | +                   | +                     | +                          | +                  | +                        | +             | +                | +                        | 3                                   |
| 43.           | <i>Parnassia palustris</i>     | +              | +              | +                     | +                    | +                      | +                  | +                       | +              | +                   | +                     | +                          | +                  | +                        | +             | +                | +                        | 3                                   |
| 44.           | <i>Rosa canina</i>             | +              | +              | +                     | +                    | +                      | +                  | +                       | +              | +                   | +                     | +                          | +                  | +                        | +             | +                | +                        | 3                                   |
| 45.           | <i>Rosa majalis</i>            | +              | +              | +                     | +                    | +                      | +                  | +                       | +              | +                   | +                     | +                          | +                  | +                        | +             | +                | +                        | 3                                   |
| 46.           | <i>Tilia cordata</i>           | +              | +              | +                     | +                    | +                      | +                  | +                       | +              | +                   | +                     | +                          | +                  | +                        | +             | +                | +                        | 3                                   |
| 47.           | <i>Trifolium pratense</i>      | +              | +              | +                     | +                    | +                      | +                  | +                       | +              | +                   | +                     | +                          | +                  | +                        | +             | +                | +                        | 3                                   |
| 48.           | <i>Viola tricolor</i>          | +              | +              | +                     | +                    | +                      | +                  | +                       | +              | +                   | +                     | +                          | +                  | +                        | +             | +                | +                        | 3                                   |
| 49.           | <i>Alchemilla vulgaris</i>     | +              | +              | +                     | +                    | +                      | +                  | +                       | +              | +                   | +                     | +                          | +                  | +                        | +             | +                | +                        | 2                                   |
| 50.           | <i>Angelica archangelica</i>   | +              | +              | +                     | +                    | +                      | +                  | +                       | +              | +                   | +                     | +                          | +                  | +                        | +             | +                | +                        | 2                                   |
| 51.           | <i>Arctostaphylos uva-ursi</i> | +              | +              | +                     | +                    | +                      | +                  | +                       | +              | +                   | +                     | +                          | +                  | +                        | +             | +                | +                        | 2                                   |
| 52.           | <i>Centaurea cyanus</i>        | +              | +              | +                     | +                    | +                      | +                  | +                       | +              | +                   | +                     | +                          | +                  | +                        | +             | +                | +                        | 2                                   |
| 53.           | <i>Chelidonium majus</i>       | +              | +              | +                     | +                    | +                      | +                  | +                       | +              | +                   | +                     | +                          | +                  | +                        | +             | +                | +                        | 2                                   |
| 54.           | <i>Cicuta virosa</i>           | +              | +              | +                     | +                    | +                      | +                  | +                       | +              | +                   | +                     | +                          | +                  | +                        | +             | +                | +                        | 2                                   |

| Serial Number | Species                          | References     |                 |                       |                      |                        |                     |                         |                |                     |                       |                            |                    |                          |               |                  |                         | The number of recommendation points |
|---------------|----------------------------------|----------------|-----------------|-----------------------|----------------------|------------------------|---------------------|-------------------------|----------------|---------------------|-----------------------|----------------------------|--------------------|--------------------------|---------------|------------------|-------------------------|-------------------------------------|
|               |                                  | Ph. Eur., 2016 | Ph. Russ., 1990 | Budnikas et al., 2015 | Dudėnas et al., 1976 | Grybauskas, 1927, 1946 | Gudanaivičius, 1960 | Gudžinskas et al., 2008 | Jaskonis, 1996 | Kalasauskienė, 2009 | Kaunienė et al., 1991 | Ragažinskienė et al., 2005 | Pipiny (ed.), 1973 | Saanauskas, 2002a, 2002b | Štrėbys, 2006 | Šimkūnaitė, 1971 | Vasilėuskas, 1991, 2015 |                                     |
| 55.           | <i>Drosera rotundifolia</i>      |                |                 |                       |                      |                        |                     |                         |                |                     |                       | +                          | +                  |                          |               |                  |                         | 2                                   |
| 56.           | <i>Fumaria officinalis</i>       |                |                 |                       |                      |                        |                     |                         |                |                     |                       |                            | +                  |                          |               |                  |                         | 2                                   |
| 57.           | <i>Helichrysum arenarium</i>     |                |                 |                       |                      |                        |                     |                         |                |                     |                       |                            |                    |                          | +             | +                |                         | 2                                   |
| 58.           | <i>Juniperus communis</i>        |                |                 |                       |                      | +                      |                     |                         |                |                     |                       |                            |                    | +                        |               |                  |                         | 2                                   |
| 59.           | <i>Matricaria recutita</i>       |                |                 |                       |                      |                        |                     | +                       |                |                     |                       | +                          |                    |                          |               |                  |                         | 2                                   |
| 60.           | <i>Menyanthes trifoliata</i>     |                |                 |                       |                      |                        |                     |                         |                |                     |                       |                            |                    |                          | +             | +                |                         | 2                                   |
| 61.           | <i>Ononis arvensis</i>           |                |                 |                       |                      |                        |                     |                         |                |                     |                       |                            |                    |                          |               |                  |                         | 2                                   |
| 62.           | <i>Persicaria maculosa</i>       |                |                 |                       |                      |                        |                     |                         |                |                     |                       | +                          |                    |                          |               |                  |                         | 2                                   |
| 63.           | <i>Pinus sylvestris</i>          |                |                 |                       |                      |                        |                     |                         |                |                     |                       |                            |                    |                          |               |                  | +                       | 2                                   |
| 64.           | <i>Polygonatum odoratum</i>      |                |                 |                       |                      |                        |                     |                         | +              |                     |                       | +                          |                    |                          |               |                  |                         | 2                                   |
| 65.           | <i>Rubus caesius</i>             |                |                 |                       |                      |                        |                     |                         |                |                     |                       |                            |                    |                          | +             |                  |                         | 2                                   |
| 66.           | <i>Salix caprea</i>              |                |                 |                       | +                    |                        |                     |                         |                |                     |                       |                            |                    |                          |               |                  |                         | 2                                   |
| 67.           | <i>Saponaria officinalis</i>     |                |                 |                       |                      |                        |                     |                         |                |                     |                       |                            |                    |                          | +             |                  |                         | 2                                   |
| 68.           | <i>Sedum acre</i>                |                |                 |                       | +                    |                        |                     |                         | +              |                     |                       |                            |                    |                          |               |                  | +                       | 2                                   |
| 69.           | <i>Solanum nigrum</i>            |                |                 |                       | +                    |                        |                     |                         | +              |                     |                       |                            |                    |                          |               |                  |                         | 2                                   |
| 70.           | <i>Symphytum officinale</i>      |                |                 |                       |                      |                        |                     |                         | +              |                     |                       |                            |                    |                          |               |                  | +                       | 2                                   |
| 71.           | <i>Thalictrum aquilegifolium</i> |                |                 |                       | +                    |                        |                     |                         |                |                     |                       |                            | +                  |                          |               |                  |                         | 2                                   |
| 72.           | <i>Thymus serpyllum</i>          |                |                 |                       |                      |                        |                     |                         |                |                     |                       |                            |                    |                          | +             |                  |                         | 2                                   |
| 73.           | <i>Vaccinium uliginosum</i>      |                |                 |                       |                      |                        |                     |                         |                |                     |                       |                            |                    |                          |               |                  | +                       | 2                                   |
| 74.           | <i>Acorus calamus</i>            |                |                 |                       |                      |                        |                     |                         |                |                     |                       |                            | +                  |                          |               |                  |                         | 1                                   |
| 75.           | <i>Aegopodium podagraria</i>     |                |                 |                       |                      |                        |                     |                         | +              |                     |                       |                            |                    |                          |               |                  |                         | 1                                   |
| 76.           | <i>Arctium lappa</i>             |                |                 |                       |                      |                        |                     |                         |                |                     |                       |                            |                    |                          | +             |                  |                         | 1                                   |
| 77.           | <i>Chamaedaphne calyculata</i>   |                |                 |                       |                      |                        |                     |                         |                |                     |                       |                            |                    |                          | +             |                  |                         | 1                                   |
| 78.           | <i>Empetrum nigrum</i>           |                |                 |                       | +                    |                        |                     |                         |                |                     |                       |                            |                    |                          |               |                  |                         | 1                                   |
| 79.           | <i>Euonymus verrucosus</i>       |                |                 |                       | +                    |                        |                     |                         |                |                     |                       |                            |                    |                          |               |                  |                         | 1                                   |
| 80.           | <i>Euphrasia officinalis</i>     |                |                 |                       |                      |                        |                     |                         |                |                     |                       |                            | +                  |                          |               |                  |                         | 1                                   |
| 81.           | <i>Euphrasia rostkoviana</i>     |                |                 |                       |                      |                        |                     | +                       |                |                     |                       |                            |                    |                          |               |                  |                         | 1                                   |
| 82.           | <i>Filipendula ulmaria</i>       |                |                 |                       |                      |                        |                     |                         |                |                     |                       |                            |                    |                          |               |                  | +                       | 1                                   |
| 83.           | <i>Geranium pratense</i>         |                |                 |                       |                      |                        |                     |                         | +              |                     |                       |                            |                    |                          |               |                  |                         | 1                                   |
| 84.           | <i>Geranium sylvaticum</i>       |                |                 |                       | +                    |                        |                     |                         |                |                     |                       |                            |                    |                          |               |                  |                         | 1                                   |
| 85.           | <i>Herniaria glabra</i>          |                |                 |                       |                      |                        |                     |                         |                |                     |                       |                            |                    |                          |               |                  | +                       | 1                                   |
| 86.           | <i>Inula britannica</i>          |                |                 |                       |                      |                        |                     |                         |                |                     |                       |                            |                    |                          | +             |                  |                         | 1                                   |
| 87.           | <i>Linaria vulgaris</i>          |                |                 |                       | +                    |                        |                     |                         |                |                     |                       |                            |                    |                          |               |                  |                         | 1                                   |
| 88.           | <i>Lycopus europaeus</i>         |                |                 |                       | +                    |                        |                     |                         |                |                     |                       |                            |                    |                          |               |                  |                         | 1                                   |
| 89.           | <i>Melampyrum nemorosum</i>      |                |                 |                       | +                    |                        |                     |                         |                |                     |                       |                            |                    |                          |               |                  |                         | 1                                   |
| 90.           | <i>Mentha aquatica</i>           |                |                 |                       |                      |                        |                     |                         | +              |                     |                       |                            |                    |                          |               |                  |                         | 1                                   |
| 91.           | <i>Origanum vulgare</i>          |                |                 |                       |                      |                        |                     |                         |                |                     |                       |                            |                    |                          | +             |                  |                         | 1                                   |
| 92.           | <i>Petasites hybridus</i>        |                |                 |                       |                      |                        |                     |                         | +              |                     |                       |                            |                    |                          |               |                  |                         | 1                                   |
| 93.           | <i>Peucedanum palustre</i>       |                |                 |                       |                      |                        |                     |                         |                | +                   |                       |                            |                    |                          |               |                  |                         | 1                                   |
| 94.           | <i>Plantago lanceolata</i>       |                |                 |                       |                      |                        |                     |                         |                |                     |                       |                            | +                  |                          |               |                  |                         | 1                                   |
| 95.           | <i>Primula veris</i>             |                |                 |                       |                      |                        |                     |                         |                |                     |                       |                            | +                  |                          |               |                  |                         | 1                                   |
| 96.           | <i>Pulmonaria obscura</i>        |                |                 |                       |                      |                        |                     |                         |                |                     |                       |                            | +                  |                          |               |                  |                         | 1                                   |
| 97.           | <i>Prunella vulgaris</i>         |                |                 |                       |                      |                        |                     |                         |                |                     |                       |                            |                    |                          | +             |                  |                         | 1                                   |
| 98.           | <i>Pulsatilla pratensis</i>      |                |                 |                       |                      |                        |                     |                         |                |                     |                       |                            |                    |                          | +             |                  |                         | 1                                   |
| 99.           | <i>Rubus chamaemorus</i>         |                |                 |                       |                      |                        |                     |                         |                | +                   |                       |                            |                    |                          |               |                  |                         | 1                                   |
| 100.          | <i>Rubus saxatilis</i>           |                |                 |                       |                      |                        |                     |                         |                | +                   |                       |                            |                    |                          |               |                  |                         | 1                                   |
| 101.          | <i>Sanguisorba officinalis</i>   |                |                 |                       |                      |                        |                     |                         |                |                     |                       |                            |                    |                          |               |                  |                         | 1                                   |
| 102.          | <i>Securigera varia</i>          |                |                 |                       | +                    |                        |                     |                         |                |                     |                       |                            | +                  |                          |               |                  |                         | 1                                   |
| 103.          | <i>Solanum dulcamara</i>         |                |                 |                       |                      |                        |                     |                         |                |                     |                       |                            |                    |                          | +             |                  |                         | 1                                   |
| 104.          | <i>Stachys officinalis</i>       |                |                 |                       |                      |                        |                     |                         |                |                     |                       |                            |                    |                          |               | +                |                         | 1                                   |
| 105.          | <i>Stachys silvatica</i>         |                |                 |                       | +                    |                        |                     |                         |                |                     |                       |                            |                    |                          |               |                  |                         | 1                                   |
| 106.          | <i>Thlaspi arvense</i>           |                |                 |                       |                      |                        |                     |                         |                |                     |                       |                            |                    |                          |               |                  |                         | 1                                   |
| 107.          | <i>Vaccinium myrtillus</i>       |                |                 |                       |                      |                        |                     |                         | +              |                     |                       |                            |                    |                          |               |                  |                         | 1                                   |
|               | The number of species            | 3              | 9               | 4                     | 27                   | 9                      | 7                   | 22                      | 21             | 54                  | 13                    | 31                         | 32                 | 49                       | 33            | 8                | 38                      |                                     |

There were no medicinal plant species, which authors of all 14 publications indicated as suitable for treatment of heart and circulation disorders solidly. Authors mostly recommended for treatment medicinal plants belonging to 12 species (Table 1, serial number 1-12): *Leonurus cardiaca*, *Convallaria majalis*, *Crataegus monogyna*, *Valeriana officinalis*, *Gnaphalium uliginosum*, *Fragaria vesca*, *Capsella bursa-pastoris*, *Hypericum perforatum*, *Viscum album*, *Polygonum aviculare*, *Berberis vulgaris*, *Viburnum opulus* (species are enumerated in the direction of decrease of their number of recommendation points (from 12 to 7).

### 3. Medicinal plants for treatment of hypertension

In 13 publications 45 species of autochthonous medicinal plant of Lithuania were recommended for treatment of this disease (Table 2). In separate publications the number of such species varied strongly from 1 (Grybauskas, 1927, 1946) to 22 (Kalasauskienė, 2009).

## Autochthonous medicinal plant species of Lithuania using for treatment of hypertension

| Serial Number | Species                          | References           |                        |                |                    |                         |                     |                       |                             |                     |                          |               |                  |                          | The number of recommendation points |
|---------------|----------------------------------|----------------------|------------------------|----------------|--------------------|-------------------------|---------------------|-----------------------|-----------------------------|---------------------|--------------------------|---------------|------------------|--------------------------|-------------------------------------|
|               |                                  | Dudėnas et al., 1976 | Grybauskas, 1927, 1946 | Jaskonis, 1996 | Gudanavičius, 1960 | Gudžinskas et al., 2008 | Kalasauskienė, 2009 | Kaunienė et al., 1991 | Ragaziūnskienė et al., 2005 | Pipinys (ed.), 1973 | Sasnauskas, 2002a, 2002b | Stirbys, 2006 | Šimkūnaitė, 1971 | Vasiliauskas, 1991, 2015 |                                     |
| 1.            | <i>Leonurus cardiaca</i>         | +                    |                        | +              | +                  | +                       | +                   | +                     | +                           | +                   | +                        | +             | +                | 11                       |                                     |
| 2.            | <i>Crataegus monogyna</i>        | +                    |                        | +              |                    | +                       | +                   | +                     | +                           | +                   | +                        | +             | +                | 10                       |                                     |
| 3.            | <i>Gnaphalium uliginosum</i>     | +                    |                        |                | +                  |                         | +                   | +                     | +                           | +                   | +                        | +             | +                | 10                       |                                     |
| 4.            | <i>Viscum album</i>              | +                    | +                      | +              |                    |                         | +                   | +                     | +                           | +                   | +                        | +             | +                | 8                        |                                     |
| 5.            | <i>Capsella bursa-pastoris</i>   |                      |                        | +              |                    | +                       | +                   | +                     | +                           | +                   | +                        | +             | +                | 7                        |                                     |
| 6.            | <i>Berberis vulgaris</i>         |                      |                        |                | +                  |                         | +                   | +                     | +                           | +                   | +                        | +             | +                | 6                        |                                     |
| 7.            | <i>Oxycoccus palustris</i>       |                      |                        | +              |                    |                         | +                   | +                     | +                           | +                   | +                        | +             | +                | 6                        |                                     |
| 8.            | <i>Fragaria vesca</i>            |                      |                        |                |                    |                         | +                   | +                     | +                           | +                   | +                        | +             | +                | 5                        |                                     |
| 9.            | <i>Viburnum opulus</i>           |                      |                        |                |                    |                         | +                   | +                     | +                           | +                   | +                        | +             | +                | 5                        |                                     |
| 10.           | <i>Polygonum aviculare</i>       | +                    |                        | +              |                    |                         |                     |                       |                             |                     | +                        |               | +                | 4                        |                                     |
| 11.           | <i>Astragalus glycyphyllos</i>   | +                    |                        |                |                    |                         | +                   |                       | +                           |                     |                          |               |                  | 3                        |                                     |
| 12.           | <i>Crataegus rhipidophylla</i>   | +                    |                        |                | +                  |                         |                     |                       |                             | +                   |                          |               |                  | 3                        |                                     |
| 13.           | <i>Ledum palustre</i>            |                      |                        | +              |                    |                         | +                   |                       |                             |                     | +                        |               |                  | 3                        |                                     |
| 14.           | <i>Ribes nigrum</i>              |                      |                        |                |                    |                         | +                   |                       |                             |                     | +                        |               | +                | 3                        |                                     |
| 15.           | <i>Sorbus aucuparia</i>          |                      |                        |                |                    |                         | +                   |                       |                             |                     |                          |               | +                | 3                        |                                     |
| 16.           | <i>Vaccinium vitis-idaea</i>     |                      |                        |                |                    |                         |                     |                       |                             | +                   | +                        |               | +                | 3                        |                                     |
| 17.           | <i>Valeriana officinalis</i>     |                      |                        |                |                    | +                       | +                   |                       |                             |                     | +                        |               |                  | 3                        |                                     |
| 18.           | <i>Filipendula ulmaria</i>       |                      |                        |                |                    |                         | +                   |                       | +                           |                     |                          |               |                  | 2                        |                                     |
| 19.           | <i>Humulus lupulus</i>           |                      |                        |                |                    |                         |                     |                       |                             |                     | +                        |               | +                | 2                        |                                     |
| 20.           | <i>Melilotus officinalis</i>     |                      |                        |                |                    |                         | +                   |                       |                             |                     | +                        |               |                  | 2                        |                                     |
| 21.           | <i>Rosa majalis</i>              |                      |                        |                |                    |                         |                     |                       |                             |                     | +                        | +             |                  | 2                        |                                     |
| 22.           | <i>Thalictrum aquilegifolium</i> | +                    |                        |                |                    |                         |                     |                       |                             | +                   |                          |               |                  | 2                        |                                     |
| 23.           | <i>Tilia cordata</i>             |                      |                        |                |                    | +                       | +                   |                       |                             |                     |                          |               |                  | 2                        |                                     |
| 24.           | <i>Acorus calamus</i>            |                      |                        |                |                    |                         | +                   |                       |                             |                     |                          |               |                  | 1                        |                                     |
| 25.           | <i>Aegopodium podagraria</i>     |                      |                        |                |                    | +                       |                     |                       |                             |                     |                          |               |                  | 1                        |                                     |
| 26.           | <i>Chamaedaphne calyculata</i>   |                      |                        |                |                    |                         |                     |                       |                             |                     |                          | +             |                  | 1                        |                                     |
| 27.           | <i>Centaurea cyanus</i>          |                      |                        |                |                    |                         | +                   |                       |                             |                     |                          |               |                  | 1                        |                                     |
| 28.           | <i>Cicuta virosa</i>             |                      |                        | +              |                    |                         |                     |                       |                             |                     |                          |               |                  | 1                        |                                     |
| 29.           | <i>Corylus avellana</i>          |                      |                        |                |                    |                         | +                   |                       |                             |                     |                          |               |                  | 1                        |                                     |
| 30.           | <i>Empetrum nigrum</i>           | +                    |                        |                |                    |                         |                     |                       |                             |                     |                          |               |                  | 1                        |                                     |
| 31.           | <i>Euonymus verrucosus</i>       | +                    |                        |                |                    |                         |                     |                       |                             |                     |                          |               |                  | 1                        |                                     |
| 32.           | <i>Fumaria officinalis</i>       |                      |                        |                |                    |                         | +                   |                       |                             |                     |                          |               |                  | 1                        |                                     |
| 33.           | <i>Geranium pratense</i>         |                      |                        |                |                    | +                       |                     |                       |                             |                     |                          |               |                  | 1                        |                                     |
| 34.           | <i>Helichrysum arenarium</i>     |                      |                        |                |                    |                         |                     |                       |                             |                     |                          |               | +                | 1                        |                                     |
| 35.           | <i>Hypericum perforatum</i>      |                      |                        |                |                    |                         |                     |                       |                             |                     |                          |               | +                | 1                        |                                     |
| 36.           | <i>Inonotus obliquus</i>         |                      |                        |                |                    |                         |                     |                       |                             |                     |                          |               | +                | 1                        |                                     |
| 37.           | <i>Menyanthes trifoliata</i>     |                      |                        |                |                    |                         |                     |                       |                             |                     |                          |               | +                | 1                        |                                     |
| 38.           | <i>Ononis arvensis</i>           |                      |                        |                |                    |                         | +                   |                       |                             |                     |                          |               |                  | 1                        |                                     |
| 39.           | <i>Parnasia palustris</i>        | +                    |                        |                |                    |                         |                     |                       |                             |                     |                          |               |                  | 1                        |                                     |
| 40.           | <i>Pinus sylvestris</i>          |                      |                        |                |                    |                         |                     |                       |                             |                     |                          |               | +                | 1                        |                                     |
| 41.           | <i>Prunella vulgaris</i>         |                      |                        |                |                    |                         |                     |                       | +                           |                     |                          |               |                  | 1                        |                                     |
| 42.           | <i>Rubus caesius</i>             |                      |                        |                |                    |                         |                     |                       |                             |                     | +                        |               |                  | 1                        |                                     |
| 43.           | <i>Rubus idaeus</i>              |                      |                        |                |                    |                         |                     |                       |                             |                     |                          |               | +                | 1                        |                                     |
| 44.           | <i>Solanum nigrum</i>            | +                    |                        |                |                    |                         |                     |                       |                             |                     |                          |               |                  | 1                        |                                     |
| 45.           | <i>Stachys silvatica</i>         | +                    |                        |                |                    |                         |                     |                       |                             |                     |                          |               |                  | 1                        |                                     |
| 46.           | <i>Taraxacum officinale</i>      |                      |                        |                |                    | +                       |                     |                       |                             |                     |                          |               |                  | 1                        |                                     |
|               | Number of species                | 13                   | 1                      | 8              | 4                  | 8                       | 22                  | 5                     | 12                          | 9                   | 17                       | 8             | 4                | 17                       |                                     |

The authors of 13 publications most often were recommended for treatment of hypertension medicinal plants belonging to 9 species (Table 2, serial number 1-9): *Leonurus cardiaca*, *Crataegus monogyna*, *Gnaphalium uliginosum*, *Viscum album*, *Capsella bursa-pastoris*, *Berberis vulgaris*, *Oxycoccus palustris*, *Fragaria vesca*, *Viburnum opulus* (species are enumerated in the direction of decrease of their number of recommendation points (from 11 to 5)).

#### 4. Medicinal plants for treatment and prophylaxis of atherosclerosis

In 11 publications 49 autochthonous medicinal plant species of Lithuania were recommended for treatment of this disorder (Table 3). In separate publications the number of such species varied strong from 1 species (Gudžinskas, Balvočiūtė, 2008; Gudanavičius, 1960; Kaunienė, Kaunas, 1991) to 29 (Stirbys, 2006).

Autochthonous medicinal plant species of Lithuania using for treatment and prophylaxis of atherosclerosis

| Serial Number | References                     |                        |                |                        |                    |                     |                       |                     |                            |                          |              |                          | The number of recommendation points |
|---------------|--------------------------------|------------------------|----------------|------------------------|--------------------|---------------------|-----------------------|---------------------|----------------------------|--------------------------|--------------|--------------------------|-------------------------------------|
|               | Species                        | Grybauskas, 1927, 1946 | Jaskonis, 1996 | Gudžinskis et al, 2008 | Gudanavičius, 1960 | Kalasauskienė, 2009 | Kaunienė et al., 1991 | Pipynys (ed.), 1973 | Ragažinskienė et al., 2005 | Sasnauskas, 2002a, 2002b | Stirbys 2006 | Vasiliauskas, 1991, 2015 |                                     |
| 1             | 2                              | 3                      | 4              | 5                      | 6                  | 7                   | 8                     | 9                   | 10                         | 11                       | 12           | 13                       | 14                                  |
| 1.            | <i>Viscum album</i>            | +                      |                |                        | +                  | +                   |                       | +                   | +                          | +                        |              | +                        | 7                                   |
| 2.            | <i>Crataegus monogyna</i>      |                        |                | +                      |                    | +                   |                       |                     | +                          | +                        | +            | +                        | 6                                   |
| 3.            | <i>Fragaria vesca</i>          |                        | +              |                        |                    | +                   |                       |                     | +                          | +                        | +            | +                        | 6                                   |
| 4.            | <i>Leonurus cardiaca</i>       |                        |                |                        |                    | +                   |                       | +                   | +                          | +                        | +            | +                        | 6                                   |
| 5.            | <i>Taraxacum officinale</i>    |                        |                |                        |                    | +                   |                       |                     | +                          | +                        | +            | +                        | 5                                   |
| 6.            | <i>Convallaria majalis</i>     |                        |                |                        |                    | +                   |                       | +                   |                            | +                        | +            |                          | 4                                   |
| 7.            | <i>Berberis vulgaris</i>       |                        | +              |                        |                    |                     |                       |                     |                            | +                        | +            | +                        | 4                                   |
| 8.            | <i>Plantago major</i>          |                        |                |                        |                    | +                   |                       |                     |                            | +                        | +            | +                        | 4                                   |
| 9.            | <i>Sorbus aucuparia</i>        |                        |                |                        |                    | +                   |                       |                     |                            | +                        | +            | +                        | 4                                   |
| 10.           | <i>Urtica dioica</i>           |                        |                |                        |                    | +                   |                       |                     | +                          |                          | +            | +                        | 4                                   |
| 11.           | <i>Alchemilla vulgaris</i>     |                        |                |                        |                    | +                   |                       | +                   |                            |                          | +            |                          | 3                                   |
| 12.           | <i>Drosera rotundifolia</i>    |                        | +              |                        |                    |                     |                       | +                   |                            | +                        |              |                          | 3                                   |
| 13.           | <i>Equisetum arvense</i>       |                        |                |                        |                    | +                   |                       |                     |                            |                          | +            | +                        | 3                                   |
| 14.           | <i>Malus sylvestris</i>        |                        |                |                        |                    |                     | +                     |                     |                            | +                        |              |                          | 3                                   |
| 15.           | <i>Melilotus officinalis</i>   |                        |                |                        |                    | +                   |                       |                     |                            |                          | +            | +                        | 3                                   |
| 16.           | <i>Ribes nigrum</i>            |                        |                |                        |                    | +                   |                       |                     | +                          |                          |              | +                        | 3                                   |
| 17.           | <i>Rubus idaeus</i>            |                        |                |                        |                    |                     |                       |                     | +                          |                          | +            | +                        | 3                                   |
| 18.           | <i>Trifolium pratense</i>      |                        |                |                        |                    | +                   |                       |                     | +                          | +                        |              |                          | 3                                   |
| 19.           | <i>Viburnum opulus</i>         |                        |                |                        |                    | +                   |                       |                     |                            | +                        |              | +                        | 3                                   |
| 20.           | <i>Calluna vulgaris</i>        |                        |                |                        |                    | +                   |                       |                     |                            |                          | +            |                          | 2                                   |
| 21.           | <i>Betula pubescens</i>        |                        |                |                        |                    |                     |                       |                     |                            | +                        | +            |                          | 2                                   |
| 22.           | <i>Elytrigia repens</i>        |                        |                |                        |                    |                     |                       |                     |                            | +                        | +            |                          | 2                                   |
| 23.           | <i>Erysimum cheiranthoides</i> |                        |                |                        |                    |                     |                       |                     | +                          | +                        |              |                          | 2                                   |
| 24.           | <i>Oxycoccus palustris</i>     |                        |                |                        |                    |                     |                       |                     | +                          |                          |              | +                        | 2                                   |
| 25.           | <i>Rosa canina</i>             |                        |                |                        |                    |                     |                       |                     | +                          | +                        |              |                          | 2                                   |
| 26.           | <i>Saponaria officinalis</i>   |                        |                |                        |                    |                     |                       |                     |                            | +                        |              | +                        | 2                                   |
| 27.           | <i>Viola tricolor</i>          |                        |                |                        |                    |                     |                       |                     | +                          |                          | +            |                          | 2                                   |
| 28.           | <i>Achillea millefolium</i>    |                        |                |                        |                    |                     |                       |                     |                            |                          | +            |                          | 1                                   |
| 29.           | <i>Bidens tripartita</i>       |                        |                |                        |                    |                     |                       |                     |                            |                          | +            |                          | 1                                   |
| 30.           | <i>Chelidonium majus</i>       |                        |                |                        |                    |                     |                       |                     |                            |                          | +            |                          | 1                                   |
| 31.           | <i>Conium maculatum</i>        |                        |                |                        |                    | +                   |                       |                     |                            |                          |              |                          | 1                                   |
| 32.           | <i>Corylus avellana</i>        |                        |                |                        |                    | +                   |                       |                     |                            |                          |              |                          | 1                                   |
| 33.           | <i>Euphrasia officinalis</i>   |                        |                |                        |                    |                     |                       | +                   |                            |                          |              |                          | 1                                   |
| 34.           | <i>Gnaphalium uliginosum</i>   |                        |                |                        |                    | +                   |                       |                     |                            |                          |              |                          | 1                                   |
| 35.           | <i>Helichrysum arenarium</i>   |                        |                |                        |                    |                     |                       |                     |                            |                          | +            |                          | 1                                   |
| 36.           | <i>Herniaria glabra</i>        |                        |                |                        |                    |                     |                       |                     |                            |                          |              | +                        | 1                                   |
| 37.           | <i>Hypericum perforatum</i>    |                        |                |                        |                    |                     |                       |                     |                            |                          | +            |                          | 1                                   |
| 38.           | <i>Inula britannica</i>        |                        |                |                        |                    |                     |                       |                     |                            |                          | +            |                          | 1                                   |
| 39.           | <i>Juniperus communis</i>      | +                      |                |                        |                    |                     |                       |                     |                            |                          |              |                          | 1                                   |
| 40.           | <i>Menyanthes trifoliata</i>   |                        |                |                        |                    |                     |                       |                     |                            |                          | +            |                          | 1                                   |
| 41.           | <i>Ononis arvensis</i>         |                        |                |                        |                    |                     |                       |                     |                            | +                        |              |                          | 1                                   |
| 42.           | <i>Origanum vulgare</i>        |                        |                |                        |                    |                     |                       |                     |                            |                          | +            |                          | 1                                   |
| 43.           | <i>Plantago lanceolata</i>     |                        |                |                        |                    |                     |                       | +                   |                            |                          |              |                          | 1                                   |
| 44.           | <i>Rosa majalis</i>            |                        |                |                        |                    | +                   |                       |                     |                            |                          |              |                          | 1                                   |
| 45.           | <i>Stachys officinalis</i>     |                        |                |                        |                    |                     |                       |                     |                            |                          | +            |                          | 1                                   |
| 46.           | <i>Thlaspi arvense</i>         |                        |                |                        |                    | +                   |                       |                     |                            |                          |              |                          | 1                                   |
| 47.           | <i>Thymus serpyllum</i>        |                        |                |                        |                    |                     |                       |                     |                            |                          | +            |                          | 1                                   |
| 48.           | <i>Vaccinium vitis-idaea</i>   |                        |                |                        |                    |                     |                       |                     |                            |                          | +            |                          | 1                                   |
| 49.           | <i>Valeriana officinalis</i>   |                        |                |                        |                    |                     |                       |                     |                            |                          | +            |                          | 1                                   |
|               | Number of species              | 2                      | 3              | 1                      | 1                  | 21                  | 1                     | 7                   | 14                         | 19                       | 29           | 17                       |                                     |

The authors of 11 publications most often were recommended for treatment and prophylaxis of atherosclerosis medicinal plants belonging to 10 species (Table 3, serial number 1-10): *Viscum album*, *Crataegus monogyna*, *Fragaria vesca*, *Leonurus cardiaca*, *Taraxacum officinale* *Convallaria majalis*, *Berberis vulgaris*, *Plantago major*, *Sorbus aucuparia*, *Urtica dioica* (species are enumerated in the direction of decrease of their number of recommendation points (from 7 to 4).

### 5. Phytotherapy of heart and circulation disorders

The phytotherapeutic preparations possibly could be used as additional remedies alongside modern pharmaceutical treatment. Extracts of hawthorn fruits, flowers and leaves could be used additionally or could replace temporarily preparations for treatment of ischemic heart disease. Therapeutically effect of hawthorn is determining by flavonoids, which this plant accumulate abundantly (Urbonavičiūtė, Jakštas et al., 2006). Flavonoids obtaining from hawthorn not only dilate coronary arteries but have insubstantial hypotensive and sedative effects too. The same hypotensive effect is characteristic to *Geranium sanguineum*, *Gnaphalium uliginosum*, *Viscum album*.

To date treatment of ischemic heart disease involves medications, containing cardiac glycosides. If ischemic heart disease is not complicated, doctor can prescribe herbal preparations containing cardiotonic glycosides, which are produced using flowers and leaves of *Convallaria majalis*. Insubstantial cardiotonic effect is characteristic to glucorhamnosides obtained from *Leonurus cardiaca*. *L. cardiaca* plants not so decreases blood pressure, as far as have sedative features that are important for many of cardiology patients. Curing ischemic heart disease, for which various oedemas are typical, herbal preparations stimulating diuresis (diuretics) are frequently prescribing.

Foreign phytotherapeutists for treatment of heart and circulation disorders recommend quite a few species, which are not autochthonous in Lithuania or are growing as cultivated plant. We will review only these species mentioned by foreign authors, which are autochthonous in Lithuania.

In official medicine for treatment of ischemic heart disease *Convallaria majalis*, which accumulates cardiotonic glycosides, is using (Petkov (ed.), 1988). Among plants, which contrary not accumulates cardiotonic glycosides, various species of *Crataegus* and *Leonurus cardiaca* are recommended. Complementary medicine is using these species: *Achillea millefolium*, *Hypericum perforatum*, *Valeriana officinalis*, *Viscum album* (Van Wyck, Wink, 2010).

Global phytotherapy (Petkov (red.), 1988) for treatment of hypertension is using *Gnaphalium uliginosum*, *Geranium robertianum*, *G. sanguineum* (Lithuanian authors these species of *Geranium* recommend rarely – they were classing by 2 recommendation points), *Sedum acre*, *Viscum album*, whereas official medicine is using *Convallaria majalis*. Complementary medicine is using these species: *Betula pendula*, *B. pubescens*, *Equisetum arvense*, *Humulus lupulus*, *Solidago virgaurea*, *Valeriana officinalis*, *Viscum album* (Van Wyck, Wink, 2010).

Phytotherapy for treatment and prophylaxis of atherosclerosis mostly is using cultivated species – onion (*Allium cepa*) and garlic (*Allium sativum*) (Petkov (red.), 1988; Van Wyck, Wink 2010).

## 6. Plant active compounds for treatment of heart and circulation disorders using in phytotherapy

Phytotherapy for treatment of ischemic heart disease and heart neuroses is using glycosides. Cardiotonic glycosides are strongly working compounds, therefore they are mostly using in official medicine, whereas in phytotherapy – very carefully, as is prescribed by doctor in herbal preparation recipe. Medicinal plants accumulating glycosides belongs to following autochthonous plant genera in Lithuania - *Digitalis*, *Convallaria*, *Crataegus*. Medicinal plants accumulating essential oils: *Humulus lupulus*, *Achillea millefolium*, *Valeriana officinalis*, *Matricaria recutita* are using for treatment too. Mentioned plants and their active compounds are recommended for treatment of atherosclerosis and hypertension (Petkov (red.), 1988).

## 7. Comparative analysis of autochthonous medicinal plants of Lithuania using for treatment of heart and circulating disorders

Lithuanian authors mostly recommended for treatment of these disorders 12 species (Table 1, Serial numbers 1-12). These species are included or not included in:

- 1) European Pharmacopoeia (2016) (Table 1, column 3);
- 2) Russian Pharmacopoeia (The State Pharmacopoeia of the USSR, 1990) (Table 1, column 4).

In these Pharmacopoeias are described medicinal plant species and plant raw, which are permitted to use in pharmacy and official medicine, coincide only partly. From 85 species of plants described in Russian Pharmacopoeia (RPh) even 35 species are not included in European Pharmacopoeia (EPH) (Shikov et al., 2014).

After to having a view of species mostly recommended by Lithuanian authors for treatment of heart and circulating disorders, there were stated, that plant raw (PR) of only 3 species are using in pharmacy for producing of cardiovascular preparations, which are permitting for treatment in official medicine.

There are 5 species incorporated into EPH and RPh at the same time:

*Leonurus cardiaca*. PR: *Leonuri Herba*; Active compounds (AC): iridoid glycosides, alkaloids, diterpenes;

*Crataegus monogyna*. PR agreeably to EPH - *Crataegi folium cum flore*, *Crataegi fructus*; PR agreeably to RPh - *Fructus Crataegi* only, AC: oligomeric procyanidins, flavonoids, organic acids;

*Valeriana officinalis*. PR agreeably to EPH - *Valerianae radix*; PR agreeably to EPH - *Rhizomata cum Radicibus Valerianae*; AC: valepotriates (valtrate, acevaltrate), sesquiterpenoids.

*Leonurus cardiaca* and *Valeriana officinalis* have sedative effect, *Crataegus monogyna* – cardiovascular effect. All 3 recited species are involved into composition of over-the-counter drug *Heart drops* producing by Lithuanian pharmacy industry. This drug is one of mostly taking by Lithuanian population.

*Hypericum perforatum*. PR - *Hyperici herba*. Plant has antidepressant, styptic and antiseptic effects. Herbal infusion *St John's wort Herb* is dealing at pharmacies of Lithuania as preparation against depression. However high degree of undesirable interacting between plant and synthetic drugs is stated and this plant must be taking carefully.

*Polygonum aviculare*. PR - *Polygoni avicularis herba*. Plant has diuretic effect. Herbal infusion *Common knotgrass Herb* is dealing at pharmacies of Lithuania. Mostly it is recommending as diuretic preparation, but is not recommending as preparation for treatment of hypertension (Kažemėkaitis, Mekienė, 2004).

There were no stated the species included in EPh only and there were stated 4 species included into RPh only. 3 first species enumerated bellow are using for treatment of heart and circulation disorders. Remaining 3 species enumerated bellow is using for other purposes:

*Convallaria majalis*. PR - *Herba Convallariae, Folia Convallariae, Flores Convallariae*. Plant has cardiogenic effect, AC – convallatoxin and other cardiac glycosides; *Convallaria majalis* is included into composition of plant preparation *Cardiol C* (drops) that is producing by Herbapol Wrocław. Drops are using for treatment of heart diseases (Kažemėkaitis, Mekienė, 2004).

*Gnaphalium uliginosum*. PR - *Herba Gnaphalii uliginosi*. Plant has hypotensive effect. AC – volatile oil, taninns;

*Capsella bursa-pastoris*. PR - *Herba bursae pastoris*. Plant has hemostatic effect.

*Viburnum opulus*. PR - *Cortex Viburni*. This PR has diuretic effect; PR - *Fructus Viburnum*. This PR has diaphoretic and inflammatory effects.

Remaining 3 species (*Fragaria vesca, Viscum album, Berberis vulgaris*) are not described neither to EPh, nor to RPh. *Viscum album* is included into composition of food supplement Česnakas® (Bional). It can help to maintain normal function of heart and circulation system (Kažemėkaitis, Mekienė, 2004).

Comparative analysis revealed, that in pending case (heart and circulation disorders) Lithuanian authors indicated 2 species (*Convallaria majalis, Gnaphalium uliginosum*) included into RPh only and 1 species (*Crataegus monogyna*) included into EPh and RPh.

As hypertension mostly is starting to treat with diuretics, it should be noted, that diuretic effect are characteristic to preparations produced from *Polygonum aviculare* herb (included into EPh and RPh) and from *Viburnum opulus* bark (included into RPh).

Often herbal preparations with *Valeriana officinalis, Leonurus cardiaca, Hypericum perforatum* (they are included into EPh and RPh) operating nerve system and mentality are prescribing to cardiology patients as additional medicines. Another species (*Capsella bursa-pastoris*) is included into RPh only. It is recommended as hemostatic preparation (to stop haemorrhoids bleeding too).

5 species (*Leonurus cardiaca, Crataegus monogyna, Valeriana officinalis, Hypericum perforatum, Polygonum aviculare*) mostly recommended by Lithuanian authors for treatment of heart and circulation disorders are included into EPh and RPh. Another 4 species (*Convallaria majalis, Gnaphalium uliginosum, Capsella bursa-pastoris, Viburnum opulus*) mostly recommended by Lithuanian authors are included into RPh only. Other 3 mostly recommended species - *Fragaria vesca, Viscum album, Berberis vulgaris* - are not included neither into EPh nor into RPh.

Remaining 94 species recommended by Lithuanian authors got recommendation points less than 7 (Table 1). But they could be significant reserve for seeking new drugs for treatment of heart and circulation disorders for same reasons:

1) Publications of Lithuanian authors summarized in the paper involve quite long period of medicinal plant using in Lithuania (1927-2015);

2) Authors of publications made use of local folk medicine experience about medicinal plants and Lithuania and adjacent countries information sources of one's time too.

### Conclusions

On base of data notified in 14 publications on medicinal plants of Lithuania the list, which consist of 107 species of autochthonous medicinal plant species of Lithuania recommending for treatment of heart and circulation disorders was made.

Lithuanian authors mostly recommend for treatment of heart and circulation disorders medicinal plant belonging to 12 species: *Leonurus cardiaca, Convallaria majalis, Crataegus monogyna, Valeriana officinalis, Gnaphalium uliginosum, Fragaria vesca, Capsella bursa-*

*pastoris*, *Hypericum perforatum*, *Viscum album*, *Polygonum aviculare*, *Berberis vulgaris*, *Viburnum opulus*.

9 species of medicinal plants mostly recommended for treatment of hypertension are *Leonurus cardiaca*, *Crataegus monogyna*, *Gnaphalium uliginosum*, *Viscum album*, *Capsella bursa-pastoris*, *Berberis vulgaris*, *Oxycoccus palustris*, *Fragaria vesca*, *Viburnum opulus*.

10 species of medicinal plants mostly recommended for treatment and prophylaxis of atherosclerosis are *Viscum album*, *Crataegus monogyna*, *Fragaria vesca*, *Leonurus cardiaca*, *Taraxacum officinale*, *Convallaria majalis*, *Berberis vulgaris*, *Plantago major*, *Sorbus aucuparia*, *Urtica dioica*.

5 species (*Leonurus cardiaca*, *Crataegus monogyna*, *Valeriana officinalis*, *Hypericum perforatum*, *Polygonum aviculare*) mostly recommended by Lithuanian authors for treatment of heart and circulation disorders are included into EPh and RPh. Another 4 species (*Convallaria majalis*, *Gnaphalium uliginosum*, *Capsella bursa-pastoris*, *Viburnum opulus*) mostly recommended by Lithuanian authors are included into RPh only. Other 3 mostly recommended species - *Fragaria vesca*, *Viscum album*, *Berberis vulgaris* - are not included neither into EPh nor into RPh.

### References

1. Budnikas V, Obelevičius K. Vaistažolės. Kaunas: Vitae Litera; 2015.
2. Dudėnas H, Grinevičius J, Gudanavičius S. Vaistingieji augalai (katalogas). Vilnius: Mokslas; 1976.
3. European Pharmacopoeia (Ph. Eur.) 9th Edition. European Directorate for the Quality of Medicines & HealthCare (EDQM). Available from: www.EDQM.eu.
4. Grybauskas K. Vaistingieji Lietuvos laukų augalai ir jų pritaikymas. Kaunas; 1927.
5. Grybauskas K. Lietuvos TSR miškų sumedėję vaistingieji augalai. Kaunas; 1946.
6. Grybauskas K, Movšovičius J. Lietuvos vaistinių augalų sąrašas. Kaunas: Spindulys; 1941.
7. Gudanavičius S. Vaistiniai augalai. Vilnius; 1960.
8. Gudžinskas Z. Lietuvos induočiai augalai. Vilnius: Botanikos instituto leidykla; 1999.
9. Gudžinskas Z, Balvočiūtė J. Lietuvos vaistiniai augalai. Kaunas: Šviesa; 2008.
10. Jaskonis J. Augalai - mūsų gyvenimas. Vilnius: Algimantas; 1996.
11. Kalasauskienė SM. Vaistiniai augalai: gydymui, kosmetikai, kulinarijai (enciklopedinis žinynas). Vilnius: Asveja; 2009.
12. Kaunienė V, Kaunas E. Vaistingieji augalai (žinynas). Kaunas: Varpas; 1991.
13. Kažemėkaitis A, Mekienė RG. Natūraliųjų vaistinių preparatų žinynas. Vilnius: Vaistų žinios; 2004.
14. Motiekaitytė V, Venckus Z. Kvėpavimo takų ligų gydymui vartojami vaistiniai augalai savaime augantys Lietuvoje. Miestų želdynų formavimas. Mokslo darbai. 2018,1(15):199–204.
15. Petkov V. (vyr. red.). Sovremennaya fitoterapiya. Sofia: Medicina i fizkultūra; 1988.
16. Pipinys J. (vyr. red.). Vaistiniai augalai. Vilnius: Mintis; 1973.
17. Ragažinskienė O, Rimkienė S, Sasnauskas V. Vaistinių augalų enciklopedija. Kaunas: Lututė; 2005.
18. Sasnauskas V. Vaistinių augalų žinynas (Pievų ir laukų augalai, jų gydamosios savybės). Kaunas: Aušra; 2002.
19. Sasnauskas V. Vaistinių augalų žinynas (Miškų augalai, jų gydamosios savybės ir receptai). Kaunas: Aušra; 2002.
20. Shikov AN, Pozharitskaya ON, Makarov VG, Wagner H, Verpoorte R, Heinrich M. (Medicinal Plants of the Russian Pharmacopoeia: their history. Journal of Ethnopharmacology. 2014;154:481–536.
21. The State Pharmacopoeia of the USSR, 11th ed., part 2, Moscow: Medicina; 1990.
22. Urbonavičiūtė A, Jakštas V, Kornyšova O, Janulis V, Maruška A. Capillary electrophoretic analysis of flavonoids in single-styled hawthorn (*Crataegus monogyna* Jacq.) ethanolic extracts. J. Chromatogr A. 2006 Apr 21;1112 (1-2):339–44.
23. Van Wyck BE, Wink M. Medicinal plants of the World. Timber Press. Portland, London; 2010.
24. Vasiliauskas J. Augalai ir sveikata. Vilnius: Mokslas; 1991.
25. Vasiliauskas J. Gamtos vaistinė. Vilnius, Alma litera; 2015.

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## REPORT

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# IMPORTANCE OF INDIVIDUAL ORAL HYGIENE IN ORAL HEALTH MAINTENANCE: SCIENTIFIC LITERATURE REVIEW

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### Annotation

*The aim of the study, based on scientific literature review, is to reason the importance of individual oral hygiene in prevention of oral diseases. Both the patient and dental professional should play an active role in controlling the plaque build-up by maintaining good oral hygiene. The best method for cleaning the oral spaces that are difficult to access must be defined for each patient individually. Efficient tooth brushing is the first step towards dental care and is a conveniently accessible dental device which helps prevent dental problems.*

*The significance of good oral hygiene in order to prevent oral diseases is indisputable. Evaluating individual needs and conditions and weighing them together with scientific support should be the basis for instructions and recommendations, thus creating the best possible foundation for patient compliance and long-lasting oral health.*

**Key words:** *individual oral hygiene, oral health maintenance.*

### Introduction

Poor oral hygiene refers to presence of deposits in and around the gums and on teeth which lead to inflammation of gums causing gingivitis. Bad breath, bleeding gums and salty taste are symptoms of gum disease. When left untreated this eventually lead to periodontitis. Brushing is the most practiced oral hygiene method for plaque removal. Although the toothbrush is successful in removing plaque at the buccal, lingual, and occlusal surfaces, it can't completely remove plaque from the interproximal surfaces of adjacent teeth. These regions are protected against the natural cleaning mechanisms of the oral tissues; thus, emphasis should be placed on the importance of the devices used to facilitate oral hygiene in these areas. Different types of interdental cleaning aids that have been developed for this purpose include dental floss and tape, toothpicks, interdental and bottle brushes and water irrigation units. This wide range of commercially available interdental cleaning aids make various claims for their beneficial effects in terms of reduction in plaque scores and gingival inflammation [1].

Careful plaque removal techniques can modify both the quantity and the composition of the gingival plaque, changing the composition of the microbiota of the pocket and reducing the percentage of periodontal bacteria [2].

For patients with fixed orthodontic appliances it is particularly difficult to achieve good oral hygiene because the appliances can be an obstruction to mechanical brushing – food can often get trapped around the brackets and under the arch wires after eating, and for patients whose treatment is lengthy it can be a challenge to maintain good oral health and avoid enamel demineralisation, periodontal disease, halitosis and teeth staining [3].

In recent years there has been an increase in interest to the subject. In 2017 the number of publications on PubMed (Medline) related to the topic reached 89 compared to 78 in 2014. However, there is still a lack of knowledge on how to ensure personalized oral care for each patient.

**Aim of the study** – to analyse scientific literature and reason the importance of individual oral hygiene in prevention of oral diseases.

### Role of dental plaque biofilm in oral disease development

Research over the past decade has led to the recognition of dental plaque as a biofilm – a highly organized accumulation of microbial communities attached to an environmental surface. Biofilms are organized to maximize spatial arrangements, communication, and continuity of the community of microorganisms. Biofilm formation enables single-cell organisms to assume a temporary multicellular lifestyle, in which “group behaviour” facilitates survival in adverse environments. What was once defined as the formation of a community of microorganisms attached to a surface has come to be recognized as a complex developmental process that is multifaceted and dynamic in nature. The transition from planktonic growth to

biofilm occurs in response to environmental changes, and involves multiple regulatory networks, which translate signals to concerted gene expression changes thereby mediating the spatial and temporal reorganization of the bacteria [4-7]. This cellular reprogramming alters the expression of surface molecules, nutrient utilization, and virulence factors and equips bacteria with an arsenal of properties that enable their survival in unfavourable conditions [8-15; 6].

Within the biofilm, bacteria are cocooned in a self-produced extracellular matrix, which accounts for ~90% of the biomass [16]. The slimy extracellular matrix encloses the microbial community and protects it from the surrounding environment, including attacks from chemotherapeutic agents. Chemotherapeutic agents have difficulty penetrating the polysaccharide matrix to reach and affect the microorganisms. Thus, the matrix helps protect bacteria deep within the biofilm from antibiotics and antiseptics, increasing the likelihood of the colonies' survival. Furthermore, the extracellular matrix keeps the bacteria banded together, so they are not flushed away by the action of saliva and gingival crevicular fluid. Mechanical methods, including tooth brushing, interdental cleaning, and professional scaling procedures, are required to regularly and effectively disrupt and remove the plaque biofilm. Antiseptics, such as mouthwashes, can help to control the biofilm but must be formulated so as to be able to penetrate the plaque matrix and gain access to the pathogenic bacteria [2].

The discovery that communication between cells in biofilm communities occurs has been a key in understanding how dental plaque acts as a single unit. Communication can occur in a variety of ways, including gene expression, cell-cell signalling (ex. quorum sensing), and antibiotic resistance, among others. Specific bacteria within the biofilm community are able to act with other species to both help and impair the host, in addition to providing a positive cooperation between the different species of the biofilm. Further, the patterns observed of microbial colonization and co-aggregation appear to be primarily unidirectional, thus indicating that many of the bacterial species in dental biofilms require an environment that has been previously habituated by other microbiota in order to properly colonize. These specific cell-cell interactions have proven to be very important topics of current research involving dental plaque biofilms [17].

The growth and development of biofilm are characterized by 4 stages: initial adherence, lag phase, rapid growth, and steady state. Biofilm formation begins with the adherence of bacteria to a tooth surface, followed by a lag phase in which changes in genetic expression (phenotypic shifts) occur. A period of rapid growth then occurs, and an exopolysaccharide matrix is produced. During the steady state, the biofilm reaches growth equilibrium. Surface detachment and sloughing occur, and new bacteria are acquired.

Bacterial communities living in a biofilm possess resourceful survival strategies, including a broader habitat for growth, nutrition, waste elimination, and new colonization; environmental niches for safety; barriers to thwart antimicrobial drug therapy; protection from the host's defence system including phagocytosis; and enhanced pathogenicity. These strategies account for the ongoing challenge of successfully controlling periodontal infection and disease progression [16]. As the biofilm matures and proliferates, soluble compounds produced by pathogenic bacteria penetrate the sulcular epithelium. These compounds stimulate host cells to produce chemical mediators associated with the inflammatory process.

The result of this chronic inflammation is a breakdown of gingival collagen and accumulation of an inflammatory infiltrate, leading to the clinical signs of gingivitis. In some individuals, the inflammatory process will also lead to the breakdown of collagen in the periodontal ligament and resorption of the supporting alveolar bone. It is at this point that the lesion progresses from gingivitis to periodontitis, continuing the same challenge from proinflammatory mediators as with chronic gingivitis [2].

Thus, controlling dental plaque biofilm is essential to preventing and reversing gingivitis as well as preventing and managing periodontitis.

### **Scientific evidence-based advantages and disadvantages of manual and electric toothbrushes**

The first true bristled toothbrush was originated in China at around 1600 AD. The first modern toothbrush was reinvented in the late 18<sup>th</sup> and early 19<sup>th</sup> centuries. The first patent for a toothbrush was credited to H. N. Wadsworth in 1857, in the United States, but due to the high price of the hog bristle, the mass production of the product in America only started in the end of the 19<sup>th</sup> century. The first electric toothbrush, an attempt to offer the public a brush that could simulate the action of a manual brush, was developed in 1939 in Scotland, but did not appear on the market until the 1960s. During recent years, synthetic plastic materials have taken the place, almost completely, of all other materials for the stock or body of the toothbrush. They are entirely satisfactory from every standpoint and superior in many particulars [18].

One of the advantages of powered brushes in general is their ability to remove a greater amount of plaque in a given period of time than manual brushes. Robinson et al. [19] conducted a meta-analysis of manual and powered toothbrushes categorized by mode of action, finding that the rotation-oscillation brushes reduced plaque and gingivitis more than the manual brushes, with a 7% reduction in plaque index and a 17% reduction in bleeding-upon-probing index. Sonic toothbrushes work just like ordinary ones: they move back and forth over the surface of the teeth at high speed, scrubbing away the plaque. The most obvious difference is the speed of the movement: sonic brushes typically vibrate at about 260 Hz (260 times per second), which translates into 31,000 brush strokes per minute – about 10 times faster than ordinary electric toothbrushes. In a normal electric toothbrush, the very top part of the brush rotates back and forth thanks to a little cam unit just above the motor. The rest of the brush head is stationary. With sonic toothbrushes, the entire brush head vibrates very quickly – and the manufacturers claim this produces a different type of cleaning action that makes them more effective [20].

The ultrasonic toothbrushes use ultrasonic waves to clean the teeth. In order for a toothbrush to be considered "ultrasonic" it has to emit a wave at a minimum frequency of 20,000 Hz or 2,400,000 movements per minute. Typically, ultrasonic toothbrushes approved by the U.S. Food and Drug Administration (FDA) operate at a frequency of 1.6 MHz, which translates to 192,000,000 movements per minute [1]. Ultrasonic toothbrushes emit vibrations that are very high in frequency but low in amplitude. These vibrations break up bacterial chains that make up dental plaque and remove their methods of attachment to the tooth surface up to 5 mm below the gum line.

Costa et al. [21] studied plaque and gingival indices for reductions with either manual or sonic/ultrasonic brushes. Both types were found to provide reductions; however, for orthodontic and dental implant patients, a greater reduction was found with sonic brushes.

One study compared the volume of dental biofilm and fluoride retention following brushing with a rotation-oscillation, sonic or manual brush or a manual brush plus flossing. Sonic brushing resulted in the least remaining plaque, with a 43% to 65% reduction compared to all other treatments. With respect to fluoride retention, use of a sonic brush resulted in greater fluoride retention from the first day, and after a week resulted in 40% greater fluoride concentration than any other treatment, the least effective being manual brushing and flossing [22].

Research findings suggest the importance of brushing time. The recommended duration often is 2 minutes, and some models of power toothbrushes have 2-minute timers to encourage adherence. The average brushing time is 1 minute or less but evidence indicates that, as brushing times increase, efficacy also increases. There is no standard recommendation for how many times per day persons should brush. From a practical view-point, patients are told to brush their teeth at least twice daily to control plaque biofilm (i.e., in the morning and at night). However, decisions about when and how often to brush must be made through a shared decision-making process based on clinical findings and patient's preferences [20].

Most literature on force applied during tooth brushing has focused on its association with damaging soft and hard tissues. It has been reported that poor oral hygiene and abrasive brushing are cause or risk factors that favour the gingival recession.

The study carried out in the South of Chile revealed that in relation to the method of brushing teeth and toothbrush type, the combined method and the use of manual brush were the variables that showed a higher frequency of gingival recession. The brushing technique less associated with gingival recession was horizontal (1.1%), in contrast to the combined technique (60.6%) which was mostly associated with gingival recession of the total affected teeth. Additionally, it was noted that 64.1% of the affected teeth was related to brushing frequency of 3 or more times a day [23].

It does not really matter whichever technique and brush are used as long as the patient is removing plaque effectively without causing any damage. Good oral hygiene and oral care at home are a key element to prevent any form of dental disease. The efficient tooth brushing is the first step towards dental care and is a conveniently accessible dental device which helps to prevent dental problems.

### **Effects of toothpastes in prevention of oral diseases**

Dentifrices come in powders, liquid gels, gels, pastes, foams and gel-paste combinations and are selected to meet particular patient needs. Since the late 1960s, following the introduction of widespread use of fluoridated dentifrices, there has been a substantial decrease in caries within Western populations. Toothpastes have been widely used since ancient times as cleaning agents. But it was only in the last century that effective therapeutics, mainly

fluoride, were incorporated into their formula [24]. Therefore, more than merely cosmetic products, toothpastes have become essential for oral health maintenance.

Among the components of toothpaste formulations, two deserve further discussion given their important role in the mode of action of toothpastes – abrasives and therapeutic agents. Abrasive agents are used to clean and polish teeth to the smooth, lustrous surface and their origins are natural or synthetic.

If abrasive capacity of dentifrice abrasive agent is too low, the abrasive agent is less effective in removing the soft deposits and stains. If it is too high, it may increase abrasion of tooth structure and restored tooth surfaces, especially with excessive tooth brushing force.

Mohs Hardness Scale rates the hardness of materials, with 1 being the softest and 10 being the hardest. The Scale is useful for understanding abrasiveness of cleaning and polishing agents. For example, the threshold of 2 to 4 is equal to the hardness of cementum or dentin, often exposed because of gingival recession. Dentifrices whose level of abrasiveness is 2 or less are recommended to avoid tooth structure loss on exposed roots. Children can use a more abrasive dentifrice when their tooth enamel is mature [25].

Common fluorides found in daily-use dentifrice formulas include  $\text{SnF}_2$ , NaF, MFP, and  $\text{SnF}_2$ -sodium hexametaphosphate. A dentifrice with 0.24% NaF has an efficacy equivalent to a dentifrice containing 0.76% MFP. These two concentrations differ because the agents don't have the same molecular weight. Fluoride levels in dentifrices vary among countries. In Europe dentifrices may contain from 250 ppm to 10 000 ppm of fluoride. In North America, the levels are between 400 ppm (for children) and 5000 ppm of fluoride. Most products contain about 1000 ppm [26].

Where fluoride concentration in toothpastes is concerned, a long debate can be observed in the literature regarding the anticaries effect of low-fluoride toothpastes (e.g. 500 ppm of fluoride). Originally marketed to overcome potential fluorosis risks due to inadvertent ingestion of toothpaste by young children during tooth brushing [27-29], low-fluoride toothpastes are available in many countries and are even endorsed by some governmental oral health agencies. However, their anticaries effect has not been confirmed in systematic reviews [30]. In experiments designed to evaluate the anticaries effect of low-fluoride toothpastes under different cariogenic conditions, it was demonstrated that, for caries-active children or for those subject to a high cariogenic challenge (biofilm accumulation and exposure to sugar 6–8 times/day), low-fluoride toothpaste is significantly less effective than conventional fluoride toothpaste (1100 ppm) in controlling caries progression. Considering the data currently available on the anticaries effect of toothpastes with different fluoride concentrations on children and adolescents or on primary dentition of preschool children, the only scientific-based recommendation is that a small amount of toothpaste with at least 1000 ppm be used, irrespective of child's age [28; 30].

A Cochrane review stated that there was evidence to support that toothpastes with 1000 ppm were associated with a higher risk of fluorosis when used in children aged 5-6 years [3]. They did, however, caveat this statement by indicating that the benefit of caries prevention may well outweigh the risk of aesthetically objectionable fluorosis. It was also noted that fluoride toothpastes above 1450 ppm should be usually restricted to individuals aged over 6 years and, in most jurisdictions, are prescribed by health professionals following an appropriate risk assessment. Young children lack complete mastery of the swallowing reflex and children under the age of 6 years may ingest 25-65% of the dentifrice which is placed on the toothbrush [31].

When root caries is a concern, since dentine is more soluble than enamel, fluoride toothpaste is expected to be less effective in controlling dentin caries than in controlling enamel caries. Therefore, high fluoride toothpastes (e.g. 5000 ppm) marketed to control root caries have been shown by clinical trials to have a higher effectiveness than conventional-concentration toothpastes (1000–1500 ppm) [32].

Leon (2018) et al. [33] also found and demonstrated in a clinical study with 5000 ppm fluoride toothpaste that it is significantly better at remineralizing primary root caries lesions than one containing 1100 ppm of fluoride. Singh and Purohit (2018) [34] compared the efficacy between daily use of two toothpastes, one with 5000 ppm and the other containing 1450 ppm of fluoride on patients older than 75 years for 8 months. The 5000 ppm fluoride toothpaste showed significantly better effect in controlling root caries development supporting the hypothesis that higher fluoride concentrations in toothpaste may be beneficial for the control of root caries.

Although fluoride is the cornerstone of the anticaries agents in toothpastes, there is more than just fluoride. A number of co-adjutant anticaries agents have been tested and made available in toothpaste formulations, with evidence of effectiveness. One of the most tested is triclosan. Formulations containing triclosan/copolymer have been shown to significantly reduce gingival inflammation and the progression of gingivitis to periodontitis, calculus and halitosis [35]. Stannous fluoride toothpastes were also shown to have a significant effect on biofilm

reduction and gingivitis [36]. Regarding dentin hypersensitivity, the evidence to support potassium-containing toothpastes is not sound enough. More recent formulations, such as arginine-based toothpastes, have shown promising results in clinical trials to be confirmed by systematic reviews of the literature [37]. The control of calculus formation by toothpastes is based on evidence, especially for formulations containing pyrophosphates, zinc compounds and co-polymers [32].

Some ingredients in toothpaste can affect the overall health of people who suffer from allergies or intolerance: for example, dyes, natural flavours (e.g. strawberries or cinnamon), milk derivatives, eggs, and even derivatives of aspirin (acetylsalicylic acid as methyl hydroxybenzoate). In addition, there may be negative effects of certain ingredients. Toothpaste ingredients that are not safe for ingestion may be ingested, especially by children or people with learning disabilities. Some ingredients may contribute to damage to hard tissues (abrasion, staining) and occasionally soft tissues.

Consequently, the choice of toothpaste is an important element to be considered by the healthcare professional because this product has a direct impact on dental health, overall health, and quality of life of the patient.

### **Importance of interdental cleaning in prevention of oral diseases**

It has been shown that a manual toothbrush used alone on average reduces plaque scores by 42% and will not reach the interdental surfaces [22]. Consequently, an additional interdental cleaning device is always needed. Several such tools are available on the market; i.e., floss, toothpicks, interdental brushes, oral irrigator etc. There is not one single interdental cleaning device which suits all patients and interdental spaces; therefore, the choice recommended for a specific patient needs to be based on clinical experience and scientific knowledge.

Not all interproximal contact areas, whether natural or restored, have the same configuration. In order to accommodate these differences, several types of floss are available. These vary from thin unwaxed varieties to thicker waxed types and include variable thickness floss. Clinical trials have shown no significant differences in the cleaning ability between waxed and unwaxed floss [38]. Wax residue has not been found on tooth surfaces cleaned with waxed floss. Unwaxed silk floss was first produced in 1882, by Codman & Shurtleff, but it was Johnson & Johnson who made silk floss widely available from 1887, as a by-product of sterile silk leftover from the manufacture of sterile sutures. Unwaxed floss is frequently recommended because it is thin and slips easily through tight contact areas. However, it can fray and tear when contacting rotated teeth, heavy calculus deposits, or defective and overhanging restorations. For such conditions, waxed, lightly waxed resistant floss are recommended. Waxed dental tape, unlike round dental floss, is broad and flat, and may be effective in an interproximal space without tight contact points [39].

Flosses impregnated with a variety of agents have been introduced; examples of these include floss treated with baking soda, fluoride, herbal extracts, antimicrobial agents, or abrasives for whitening. Fluoride impregnated floss has been marketed but lacks efficacy data for affecting the caries rate [38]. A limitation of flossing is the inability to conform to a concave interproximal surface such as the mesial of maxillary premolars. Other interproximal devices clean those surfaces more effectively.

Certain organisations, for example the American Dental Association, recommend that children's teeth are flossed as soon as they have two teeth that touch. However, studies that measure compliance show that few children have their teeth flossed or use floss: a study in West Virginia found that only 21% of children had their teeth flossed [40]. When measures are taken to increase compliance, for example using behavioural change techniques, then the proportion of adolescent flossing increase. Since dental floss is able to remove some interproximal plaque, it is thought that frequent regular dental flossing will reduce the risk of periodontal disease and interproximal caries [41].

Daily dental flossing in combination with tooth brushing for the prevention of periodontal disease and caries is frequently recommended. The results of the study conducted by Grellmann et al. [42] revealed that flossing detects more bleeding at proximal sites than did gingival bleeding index in subjects without periodontal attachment loss and periodontal pockets. Flossing rubbed against the gingival tissue appears to be a more appropriate method for the diagnosis of gingivitis. The differences in the evaluation methods were largest at posterior sites.

Originally, interdental brushes were recommended by dental professionals to patients with large embrasure spaces between the teeth [22], caused by the loss of interdental papillae mainly due to periodontal destruction. Patients who had interdental papillae that filled the embrasure space were usually recommended to use dental floss as an interdental cleansing tool. However, with the greater range of interdental brush sizes and cross-sectional diameters

now available, they are considered a potentially suitable alternative to dental floss for patients who have interdental papillae that fill the interdental space [39]. Slot et al. (2008) [22] showed that interdental brushes as an adjunct to brushing remove more dental plaque than tooth brushing alone. The evidence suggests that interdental brushing is the most effective method to interdentally remove plaque. When the papilla fills the interdental space, floss has the potential to reach the involved tooth surfaces. However, when any papillary recession has occurred an interdental brush size should be selected which fits snugly into the entire space to encourage maximum contact between the brush bristles and the tooth surface. Because only scant evidence exists, no systematic reviews are available concerning differences in brush handles (straight or angled), brush shape, filament type, and durability or method of brush insertion into the interproximal site.

Thus, according to numerous clinical experiments brushes efficiently remove plaque from sites where a direct contact between filaments and tooth surfaces takes place. Therefore, the size of the contact area between the filaments of an interdental brush and the approximal surfaces is crucial. Hence, it can be assumed that the cleaning performance is the better the more contacts with a tooth surface are established by the filaments. Guiding the patient in regard to choosing the correct interdental brush size/sizes is of utmost importance; all interdental space varieties in the individual need to be considered.

### **Comparative efficacy of different individual dental hygiene aids in controlling interproximal biofilm**

In adults, most studies have demonstrated that conventional toothbrushes are not as effective in plaque removal as would be expected. The results of clinical study [43] showed that most individuals remove only 50% of plaque with conventional brushing, whereas Lang (1973 and 2014) [44; 45] asserted that most people do not properly perform oral hygiene and most likely carry much plaque on their teeth, although they brush their teeth at least once a day.

Dental floss and interdental brushes are the most commonly recommended, advertised and available aids for cleaning between the teeth. In early August 2016 dental flossing hit the mainstream news headlines following news that the United States Department of Health has removed daily flossing from its list of dental recommendations. Despite American dentists having recommended the use of floss to patients since the 1800s, a report by the Associated Press (AP) has found that "there's little proof that flossing works". This report sent a shock wave through the dental community. It brought back to the surface the debate between flossing and its alternatives.

Several studies have compared dental floss and interdental brushes in respect to their influence on plaque and gingivitis. Patient preference is also a factor that has been evaluated.

In an examiner-blinded, randomized split-mouth clinical trial, interdental brushes were shown to significantly reduce bleeding sites in subjects with Type I embrasures [39]. In addition, a systematic review concluded that interdental brushes are an effective alternative to dental floss for reducing interproximal bleeding and plaque, also in subjects with Type I embrasures [46].

A significant proportion of the research conducted to evaluate and to compare interdental cleaning devices is performed on subjects with embrasure Type II or III [47].

Interdental brushes are shown to have a positive effect on parameters such as bleeding, plaque and pocket reduction. They are also superior to other manual interdental cleaning devices in subjects, who either suffered from periodontitis or were included in a maintenance program after periodontal treatment [48-52].

A systematic review based on nine randomised controlled trials (RCTs), showed a positively significant difference in using interdental brushes with respect to plaque scores, bleeding scores, and probing pocket depth, compared to other interdental cleaning devices. An essential difference favouring interdental brush use on plaque was observed for all three RCTs comparing interdental brushing to brushing alone, for five of the eight RCTs comparing interdental brushes to floss, and for one of the two RCTs comparing interdental brushes to woodsticks. Two out of three RCTs found a favourable effect for interdental brushes on pocket depth compared to floss. Thus, the majority of trials showed a positive significant difference in plaque index for interdental brushes compared to floss [22]. The findings of Christou et al. (1998) [49] and Jackson et al. (2006) [51] also statistically demonstrated a significantly lower rate of plaque with the use of interdental brushes compared with dental floss.

Christou [49] demonstrated that patients with moderate to severe periodontitis who used an interdental brush (to remove plaque and reduce periodontal pockets) obtained a higher efficacy than those individuals who used dental floss. Jackson [51], in his most recent work, observed a significant greater reduction in all parameters (plaque index, level of papillae and

probing depth) in the group using interdental brushes compared with the group that used dental floss, after 12 weeks of observation.

A meta-review done by Sälzer et al. (2015) [53] concluded that there is consistent evidence for interdental brushes being the most effective devices for interdental plaque removal. This is also stated in the report of the 11th European Workshop in Periodontology on primary prevention of periodontitis [54]. According to the working group, interdental brushes are the preferred choice for interdental cleaning. Floss can be an alternative only when sites are too narrow for the interdental brush and show gingival and periodontal health.

The February 2012 issue of the Canadian Journal of Dental Hygiene presented a systematic review in which they narrowed 62 publications to seven studies that met their criteria for evaluating interdental brushes and floss effectiveness. From this systematic review, a flow chart of guidelines for patients with inflamed gingiva was created in which it was recommended that as well as for patients with good dexterity and Type 1 embrasures, interdental brushes should be the product of choice for interproximal cleaning. The systematic review also concluded that interdental brushes were superior to floss in the reduction of bleeding and plaque within a 4- to 12-week time period.

Interdental brushes and dental floss have been also compared from a patient preference perspective, in favour of the interdental brush [49; 54; 55]. Studies have shown that most patients preferred the interdental brush over floss, that they felt the interdental brush to be both more efficient and easier to use, and that they were more willing to use the interdental brush. These factors may all contribute to enhancing the individual's oral self-care compliance.

Another study conducted by Särner et al. [56] questioned the differences in effectiveness not only between floss and interdental brushes but also between toothpicks. The investigators acknowledged the idea that proximal sides of teeth usually have some curvature or concavity present. Therefore, when using the different methods, the effectiveness would vary, although at the very least, some proximal plaque would be removed with each approach. In order to complete the comparisons, investigators simulated the presence of bacterial plaque on the surfaces of extracted teeth and observed the differences in effectiveness of each device. Their findings showed that floss and toothpicks encountered more significant limitations on removing plaque, especially on the surfaces of the teeth that had concavities. Floss could be effective on flatter areas. Toothpicks, while potentially able to reach within the concavities, were limited by patients' ability to maneuver them between adjacent teeth and by challenges of individuals with manual dexterity. Interdental brushes were most effective as some of the bristles could press against the outer areas while other bristles could extend into the concavities as they are manipulated back and forth against the surfaces of neighbouring teeth. The largest plaque reduction was produced by the interdental brush (83%), followed by toothpicks (74%) and dental floss (73%).

When talking about oral irrigator, the Waterpik® Water Flosser has been compared to dental floss in three different studies. The first study by Lyle et al. [57], published in 2016, compared a water flosser plus either a powered toothbrush or a manual toothbrush to a manual toothbrush and string floss. The 4-week study showed that regardless of the toothbrush used, the water flosser was significantly better at reducing bleeding and gingivitis than a manual toothbrush and string floss.

The most recent study was published in 2011. Over a 4-week period, subjects used either a water flosser with a traditional jet tip, a water flosser plus a jet tip with three tufts of bristles, or string floss. All subjects brushed using a manual toothbrush twice a day. In both water flosser groups, bleeding was significantly reduced compared with the string floss group. At 2 weeks, the traditional tip was shown to be twice as effective as string floss. At the end of the study, the differences were even greater [58].

Thus, considering all the subsequent reviews of the available literature, the evidence does not demonstrate an advantage of flossing over other interproximal oral hygiene methods in terms of periodontal or tooth surface (anti-caries) health [41; 53; 59]. It was concluded that "a routine instruction to use floss is not supported by scientific evidence" [60]. In fact, other methods of patient driven debridement may be more effective than flossing. Effective interproximal hygiene requires a device that affects as much of the exposed tooth surface as possible [53].

It was concluded that motivation was a key element and that the ease of use of a product would affect one's motivation. Although the interdental brush was noted to bend and buckle, study participants preferred the one handed method and time efficiency compared to the efforts required for dental flossing [39]. In other words, interdental plaque removal requires individualised planning, instruction and support to be effective. The focus should be on the desired outcome, rather than the process, kit/technique.

A toothpaste can prevent or control an oral disease or condition when it provides a therapeutic function. It also can be a risk factor if it causes dentine hypersensitivity, erosion, or abrasion. Therefore, dentifrices must be selected to meet the needs of each patient.

Cleaning in between the teeth is particularly important for vulnerable patients, such as the elderly, the very young and those with auto-immune disease who are all more susceptible to infections from the bacteria in their mouth. When recommending an interdental cleaning method many factors such as the contour and consistency of gingival tissues, the size and form of the interproximal embrasure, tooth position, and alignment and patient ability should be taken into consideration.

### Conclusions

1. Dental biofilm is a complex, organized microbial community that is the primary etiologic factor for the most frequently occurring oral diseases, dental caries and periodontal diseases. Its formation enables bacterial pathogens to colonize a wide variety of host niches and persist in harsh environments. Although the dental biofilm can't be eliminated, it can be controlled with comprehensive mechanical and chemotherapeutic oral hygiene practices. In the healthy state, both plaque biofilm and adjacent tissues maintain a delicate balance and a harmonious crosstalk between the two counterparts.

2. Effective plaque control by tooth brushing is a key self care strategy for maintaining oral health. Patients routinely use toothbrushes to remove supragingival dental plaque, but toothbrushes are unable to penetrate the interdental area where periodontal disease first develops and is prevalent. It necessitates the application of interdental plaque control measures to supplement the toothbrush such as floss, toothpicks, interdental brushes and oral irrigator. There is not one single interdental cleaning device which suits all patients and interdental spaces; therefore, all recommendations need to be tailored and need to be based on clinical experience and scientific knowledge. The choice of interdental cleaning aid will depend on the size of the space and the ability of the patient to use it.

3. Dental floss and interdental brushes are the most commonly recommended, advertised and available aids for cleaning between the teeth. Several studies have compared dental floss and interdental brushes in respect to their effectiveness on the clinical parameters of periodontal inflammation. The analysis of the results of those studies demonstrated that interdental brushes have more positive effect on parameters such as bleeding, plaque and pocket reduction compared to dental floss. Interdental brushes and dental floss have been also compared from a patient preference perspective, in favour of the interdental brush which is considered to be both more efficient and easier to use.

4. Dental disease being a major preventable public health challenge, is both universally prevalent and a significant burden for children and adults. Predictors of oral disease prevalence include public awareness of oral health and dental disease, use of dental services, and self-care which includes daily interdental cleaning and brushing with a fluoride-containing dentifrice. Nowadays there is increasing public awareness of the value of personal oral hygiene but dental compliance is still very often much affected by patients' unwillingness to perform oral self-care, stressful life events, a lack of understanding of the advice and poor perception of oral health problems, a lack of motivation, low socio-economic status and poor dental health beliefs.

### References

1. Collins F. Toothbrush technology, dentifrices and dental biofilm removal. 2009. Available from: [https://www.dentalacademyofce.com/courses/2076/pdf/1103cei\\_toothbrush\\_rev1.pdf](https://www.dentalacademyofce.com/courses/2076/pdf/1103cei_toothbrush_rev1.pdf)
2. Gurenlian JA. The role of dental plaque biofilm in oral health. *J Dent Hyg.* 2007; 81(5).
3. Mei L, Chieng J, Wong C, Benic G, Farella M. Factors affecting dental biofilm in patients wearing fixed orthodontic appliances. *Progress in Orthodontics.* 2017; 18:4.
4. Prigent-Combaret C, Brombacher E, Vidal O, Ambert A, Lejeune P, Landini P, Dorel C. Complex regulatory network controls initial adhesion and biofilm formation in *Escherichia coli* via regulation of the *csgD* gene. *J Bacteriol.* 2001; 183: 7213–7223.
5. Parsek MR, Singh PK. Bacterial biofilms: An emerging link to disease pathogenesis. *Annu Rev Microbiol.* 2003; 57: 677–701.
6. Lenz AP, Williamson KS, Pitts B, Stewart PS, Franklin MJ. Localized gene expression in *Pseudomonas aeruginosa* biofilms. *Appl Environ Microbiol.* 2008;74:4463–4471.
7. Monds RD, O'Toole GA. The developmental model of microbial biofilms: Ten years of a paradigm up for review. *Trends Microbiol.* 2009;17:73–87.
8. Whiteley M., Bangerla MG, Bumgarner RE, Parsek MR, Teitzel GM, Lory S, Greenberg EP. Gene expression in *Pseudomonas aeruginosa* biofilms. *Nature.* 2001; 413:860–864.

9. Schembri MA, Kjaergaard K, Klemm P. Global gene expression in *Escherichia coli* biofilms. *Mol Microbiol*. 2003;48:253–267.
10. Stanley NR, Britton RA, Grossman AD, Lazazzera BA. Identification of catabolite repression as a physiological regulator of biofilm formation by *Bacillus subtilis* by use of DNA microarrays. *J Bacteriol*. 2003;185:1951–1957.
11. Bagge N, Hentzer M, Andersen JB, Ciofu O, Givskov M, Hoiby N. Dynamics and spatial distribution of  $\beta$ -lactamase expression in *Pseudomonas aeruginosa* biofilms. *Antimicrob Agents Chemother*. 2004;48:1168–1174.
12. Beloin C, Valle J, Latour-Lambert P, Faure P, Kzreminski M, Balestrino D, Haagenen JA, Molin S, Prensier G, Arbeille B. Global impact of mature biofilm lifestyle on *Escherichia coli* K-12 gene expression. *Mol Microbiol* 2004;51:659–674.
13. Vuong C, Voyich JM, Fischer ER, Braughton KR, Whitney AR, DeLeo FR, Otto M. Polysaccharide intercellular adhesin (PIA) protects *Staphylococcus epidermidis* against major components of the human innate immune system. *Cell Microbiol*. 2004;6:269–275.
14. Zhang L, Mah TF. Involvement of a novel efflux system in biofilm-specific resistance to antibiotics. *J Bacteriol*. 2008;190:4447–4452.
15. Klebensberger J, Birkenmaier A, Geffers R, Kjelleberg S, Philipp B. SiaA and SiaD are essential for inducing autoaggregation as a specific response to detergent stress in *Pseudomonas aeruginosa*. *Environ Microbiol*. 2009;11:3073–3086.
16. Flemming HC, Wingender J. The biofilm matrix. *Nat Rev Microbiol*. 2010; 8: 623–633.
17. Seneviratne C, Zhang C, Samaranyake L. Dental plaque biofilm in oral health and disease. *The Chinese Journal of Dental Research*. 2011;14(2):87–94.
18. Kumar G, Jalaluddin M, Singh D. Tooth brush and brushing technique. *Journal of Advances in Medicine*. 2013;2(1):65–76.
19. Robinson E. A comparative evaluation of the scrub and bass methods of toothbrushing with flossing as an adjunct (in fifth and sixth graders). *AJPH*. 1976;66(11):1078–1081.
20. Walsh M, Darby L. (2014). Dental hygiene: theory and practice. Available from: [https://books.google.co.uk/books?id=K\\_ULBAAQBAJ&dq=manual+toothbrush+characteristics&source=gbs\\_navlinks\\_s](https://books.google.co.uk/books?id=K_ULBAAQBAJ&dq=manual+toothbrush+characteristics&source=gbs_navlinks_s)
21. Costa MR., da Silva VC, Miqui MN, Colombo AP, Cirelli JA. Effects of ultrasonic, electric, and manual toothbrushes on subgingival plaque composition in orthodontically banded molars. *Am J Orthod Dentofacial Orthop*. 2010;137(2):229–235.
22. Slot D, Dörfer C, Van der Weijden G. The efficacy of interdental brushes on plaque and parameters of periodontal inflammation: A systematic review. *Int J Dent Hygiene*. 2008;6(4):253–264.
23. Beltran V, De La Roza G, Wilckens M, Fuentes R, Padilla M, Aillapan E, Navarro P, Cantin M. Effects of manual toothbrushing on gingival recession in an adult population sample in south of Chile. *Int. J. Odontostomat*. 2014;8(3):461–467.
24. Addy M, Hunter ML. Can tooth brushing damage your health? Effects on oral and dental tissues. *Int Dent J*. 2003;53 Suppl 3:177–86.
25. Wiegand A, Schlueter N. The role of oral hygiene: does toothbrushing harm? *Monogr Oral Sci*. 2014;25:215–219.
26. Bellamy PG, Harris R, Date RF, Mussett AJ, Manley A, Barker ML, Hellin N, West NX. In situ clinical evaluation of a stabilised, stannous fluoride dentifrice. *Int Dent J*. 2014 Mar;64 Suppl 1:43–50. doi: 10.1111/idj.12102.
27. Carey C. Focus on fluorides: update on the use of fluoride for the prevention of dental caries. *J Evid Based Dent Pract*. 2014;14:95–102.
28. Cury J, Tenuta L. Evidence-based recommendation on toothpaste use. *Braz Oral Res*. 2014;28(1):1-7.
29. Azevedo M, Goettems M, Torriani D, Demarco F. Factors associated with dental fluorosis in school children in southern Brazil: Across-sectional study. *Braz. Oral Res*.2014;28(1):1–7.
30. Walsh T, Worthington HV, Glenny AM, Appelbe P, Marinho VC, Shi X. Fluoride toothpastes in different concentrations for preventing dental caries in children and adolescents. *Cochrane Database Syst Rev*. 2010;20(1): CD007868. doi: 10.1002/14651858.CD007868.pub2.
31. Tay HL, Zainudin IS, Jaafar N. Fluoride toothpaste utilization behaviour among preschool children in Perlis, Malaysia. *Community Dent Health*. 2009;26(4):211-5.
32. Davies R, Scully C, Preston AJ. Dentifrices - an update. *Med Oral Patol Oral Cir Bucal*. 2010;15(6): e976–82.

33. León S, Rivera M, Payero S, Correa-Beltrán G, Hugo FN, Giacaman RA. Assessment of oral health-related quality of life as a function of non-invasive treatment with high-fluoride toothpastes for root caries lesions in community-dwelling elderly. *Int Dent J*. 2018 Jul 20. doi: 10.1111/idj.12415.
34. Singh A, Purohit BM. Caries Preventive Effects of High-fluoride vs Standard-fluoride Toothpastes - A Systematic Review and Meta-analysis. *Oral Health Prev Dent*. 2018;16(4):307–314.
35. Cagetti MG, Strohmer L, Basile V, Abati S, Mastroberardino S, Campus G. Effect of a toothpaste containing triclosan, cetylpyridinium chloride, and essential oils on gingival status in schoolchildren: a randomized clinical pilot study. *Quintessence Int*. 2015;46(5):437-45.
36. Cheng X, Liu J, Li J, Zhou X, Wang L, Liu J, Xu X. Comparative effect of a stannous fluoride toothpaste and a sodium fluoride toothpaste on a multispecies biofilm. *Arch Oral Biol*. 2017;74:5–11.
37. Magno MB, Nascimento GC, Da Penha NK, Pessoa OF, Loretto SC, Maia LC. Difference in effectiveness between strontium acetate and arginine-based toothpastes to relieve dentin hypersensitivity. A systematic review. *Am J Dent*. 2015;28(1):40–44.
38. Hiremath S. Textbook on preventive and community dentistry. 2011. Available from: [https://books.google.co.uk/books?id=Tz9cWJ3yUycC&pg=PA421&lpg=PA421&dq=toothpick+in+dentistry&source=bl&ots=PzaOQreBRX&sig=UmMzvr-JDvuCq7JyCSDgJO0UjO4&hl=en&sa=X&ved=0ahUKewj84bLyvP\\_WAhWrAJokHYGGBog4FBDoAQhEMAA#v=onepage&q=toothpick%20in%20dentistry&f=false](https://books.google.co.uk/books?id=Tz9cWJ3yUycC&pg=PA421&lpg=PA421&dq=toothpick+in+dentistry&source=bl&ots=PzaOQreBRX&sig=UmMzvr-JDvuCq7JyCSDgJO0UjO4&hl=en&sa=X&ved=0ahUKewj84bLyvP_WAhWrAJokHYGGBog4FBDoAQhEMAA#v=onepage&q=toothpick%20in%20dentistry&f=false)
39. Johnson T, Worthington H, Clarkson J, Poklepovic P, Sambunjak D, Imai P. Mechanical interdental cleaning for preventing and controlling periodontal diseases and dental caries. *Cochrane Database of Systematic Reviews*. 2015, Issue 12. doi: 10.1002/14651858.CD012018.
40. Wiener RC, Crout RJ, Wiener MA. Toothpaste use by children, oral hygiene, and nutritional education: an assessment of parental performance. *J Dent Hyg*. 2009;83(3):141–145.
41. Hujuel PP, Cunha-Cruz J, Banting DW, Loesche WJ. Dental flossing and interproximal caries: a systematic review. *J Dent Res*. 2006;85(4):298–305.
42. Grellmann A, Kantorski K, Ardenghi T, Moreira C, Danesi C, Zanatta F. Dental flossing as a diagnostic method for proximal gingivitis: A validation study. *Braz. Oral Res*. 2016;30(1):e68.
43. Braun A, Krause F, Frentzen M, Jepsen S. Efficiency of subgingival calculus removal with the Vector-system compared to ultrasonic scaling and hand instrumentation in vitro. *J Periodontol Res*. 2005;40(1):48–52.
44. Lang NP, Cumming BR, Löe H. Toothbrushing frequency as it relates to plaque development and gingival health. *J Periodontol*. 1973 Jul;44(7):396–405.
45. Lang T, Stauffer S, Jennes B, Gaengler P. Clinical validation of robot simulation of toothbrushing-comparative plaque removal efficacy. *BMC Oral Health*. 2014;4:14–82.
46. Bourgeois D, Carrouel F, Llodra J, Bravo M, Viennot S. A colorimetric interdental probe as a standard method to evaluate interdental efficacy of interdental brush. *Open Dent J*. 2015; 9:431–437.
47. Nordland WP, Tarnow DP. A classification system for loss of papillary height. *J Periodontol* 1998; 69(10):1124–1126.
48. Kiger RD, Nylund K, Feller RP. A comparison of proximal plaque removal using floss and interdental brushes. *J Clin Periodontol*. 1991;18(9):681–684.
49. Christou V, Timmerman MF, Van der Velden U, Van der Weijden FA. Comparison of different approaches of interdental oral hygiene: interdental brushes versus dental floss. *J Periodontol*. 1998; 69(7):759–764.
50. Jared H, Zhong Y, Rowe M, Ebisutani K, Tanaka T, Takase N. Clinical trial of a novel interdental brush cleaning system. *J Clin Dent*. 2005;16(2):47–52.
51. Jackson MA, Kellett M, Worthington HV, Clerehugh V. Comparison of interdental cleaning methods: a randomized controlled trial. *J Periodontol*. 2006;77(8):1421–1429.
52. Rösing CK, Aass AM, Mavropoulos A, Gjermo P. Clinical and radiographic effects of enamel matrix derivative in the treatment of intrabony periodontal defects: a 12-month longitudinal placebo-controlled clinical trial in adult periodontitis patients. *J Periodontol*. 2005;76(1):129–133.
53. Sälzer S, Slot DE, Van der Weijden FA, Dörfer CE. Efficacy of inter-dental mechanical plaque control in managing gingivitis-a meta-review. *J Clin Periodontol*. 2015;42 Suppl 16: 92–105.

54. Chapple IL, Van der Weijden F, Doerfer C, Herrera D, Shapira L, Polak D, Madianos P, Louropoulou A, Machtei E, Donos N, Greenwell H, Van Winkelhoff AJ, Eren Kuru B, Arweiler N, Teughels W, Aimetti M, Molina A, Montero E, Graziani F. Primary prevention of periodontitis: managing gingivitis. *J Clin Periodontol.* 2015 Apr;42 Suppl 16: 71–6.
55. Noorlin I, Watts TL. A comparison of the efficacy and ease of use of dental floss and interproximal brushes in a randomised split mouth trial incorporating an assessment of subgingival plaque. *Oral Health Prev Dent.* 2007;5(1):13–18.
56. Särner B, Birkhed D, Andersson P, Lingström P. Recommendations by dental staff and use of toothpicks, dental floss and interdental brushes for approximal cleaning in an adult Swedish population. *Oral Health Prev Dent.* 2010;8(2):185–194.
57. Lyle DM, Goyal CR, Qaqish JG, Schuller R. Comparison of Water Flosser and Interdental Brush on Plaque Removal: A Single-Use Pilot Study. *J Clin Dent.* 2016;27(1):23–26.
58. Rosema NA, Hennequin-Hoenderdos NL, Berchier CE, Slot DE, Lyle DM, van der Weijden GA. The effect of different interdental cleaning devices on gingival bleeding. *J Int Acad Periodontol.* 2011;13(1):2–10.
59. Sambunjak D, Nickerson JW, Poklepovic T, Johnson TM, Imai P, Tugwell P, Worthington HV. Flossing for the management of periodontal diseases and dental caries in adults. *Cochrane Database Syst Rev.* 2011 Dec 7;(12):CD008829. doi: 10.1002/14651858.CD008829.pub2.
60. Berchier CE, Slot DE, Haps S, Van der Weijden GA. The efficacy of dental floss in addition to a toothbrush on plaque and parameters of gingival inflammation: a systematic review. *Int J Dent Hyg.* 2008;6(4):265–79.

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