

## KNOWLEDGE OF MEDICINAL PLANTS AND THEIR USES AMONG SECONDARY AND GRAMMAR SCHOOL STUDENTS: A CASE STUDY FROM SLOVENIA

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*Abstract* - The use of medicinal plants has been decreasing gradually. Our main objective was to determine whether young people today are still familiar with medicinal plants, and whether traditional knowledge, which forms part of the cultural heritage, has been lost or is still being passed on to new generations. In our study, we found that the majority of 19-year-olds used medicinal plants occasionally. They mostly buy dried plants or products based on medicinal plants; they rarely grew plants themselves. Their general knowledge concerning the use and effects of using these plants was not satisfactory. Students were only able to identify correctly a few medicinal plants, and most were not able to recognize poisonous plants. It was proposed that more time in school should be devoted to this topic because pupils did show interest in medicinal plants. This could be in the form of an elective module in the frame of an open curriculum that would also include growing plants in a school garden.

*Key words*: Medicinal plants, curriculum, students, knowledge, Slovenia

### INTRODUCTION

The rapid pace of life, stressors, excessive pollution and unhealthy lifestyle make more and more people appreciate the importance of being healthy and staying healthy in the long term. The media remind us of the harmful effects of pollutants, unhealthy diet and lifestyle, and also recommend what we can do ourselves to maintain our health. Among other things, they recommend the use of remedies prepared from medicinal plants (Liebold, 1990).

People have always used medicinal plants for various purposes and the tradition has been passed down from generation to generation. Self-medication is most common in developed countries, particularly in the U.S., Japan, Sweden, Switzerland, Germany

and Canada. In 1995, worldwide sales of OTC drugs amounted to 45.8 billion USD, representing 20% of the total medicine market. In general, all sources indicate an upward trend of OTC medicine sales. The prevalence of self-medication depends on many factors (Pohorec, 1997), namely, individual responsibility for one's health, knowledge of health problems (influence of the mass media, medical literature for non-specialists), availability of products suitable for self-medication, a person's time and financial savings, health insurance budget savings (mainly because these kinds of medicinal products are not included in insurance schemes) and the commercial interests of pharmacies.

The last decade has seen a large increase in the use of complementary medicine. In the United States,

two consecutive national surveys were conducted tracing the trends of alternative medicine use. One thousand five hundred and thirty nine randomly selected persons were included in the 1991 survey and 2055 in the 1997 survey. A comparison of the results showed that in this period, the use of at least one of the 16 complementary medicine methods covered in the survey increased from 33.8% to 42.1%. The largest increase was seen in herbal medicine, various massage techniques, vitamin supplements, self-help groups, energy therapy, and homeopathy (Eisenberg et al., 1998).

The use of medicinal plants in Slovenia is regulated by law (*Pravilnik o razvrstitvi ...*, 2008). However, there is a centuries-old tradition of medicinal plants usage in Slovenia (Jagodič, 2004, Janžekovič, 2002, Saupe, 1996). A negative consequence is that people feel they have sufficient knowledge to self-medicate and to advise others. Because of their natural origin, medicinal plants give users a sense of security. Simultaneous use of medicinal herbs and other medicinal substances can lead to interactions though, which can cause an increase or decrease in the pharmacological or toxic effects of the active ingredients of synthetic or plant origin. It is a cause for concern that patients use products of natural origin together with prescribed or OTC medicines without informing their doctor (Kac and Mlinarič, 2004).

With the development of the pharmaceutical industry, the use of medicinal plants decreased. Our main objective was to determine whether young people today are still familiar with medicinal plants, and whether the traditional knowledge, which forms part of the cultural heritage, has been lost or is still being passed on to new generations (Klemenc-Ketiš and Verovnik, 2004, Mihelčič, 1991). It was therefore decided to investigate the attitude of young people towards medicinal plants, what their habits and experience regarding these plants are, and how well they are acquainted with them and their usage as a constitutional part of generic competences (Šorgo, 2011). An additional question was whether the secondary medical school students' knowledge of medicinal plants is better than that of grammar school students'.

In accordance with the research objectives, we set the following hypotheses: 1. at least half of each group of respondents occasionally uses medicinal plants; 2. the total number of species and species variety of medicinal plants used by the families of students of secondary medical school is greater than in the families of grammar school students; 3. when treating mild diseases, students of secondary medical school use chemical drugs less frequently than students of grammar school, and 4. secondary medical school students' level of knowledge of medicinal plants and their benefits is higher than that of grammar school students, in part due to different objectives in the technical and science curricula.

## MATERIALS AND METHODS

### *Students*

A total of 294 fourth grade students (aged 19 years) of medical secondary (N = 139) and grammar schools (N = 155) took part in the study. Comparison of biology education at both schools showed no significant differences. The only difference was the number of hours devoted to botany. The grammar school dedicates around 25 hours to this subject, while the secondary medical school dedicates only approximately 15 hours. Students of secondary medical school have additional subjects in pharmacology, nursing and first aid, where they might acquire information on medicinal plants; however, the curriculum does not include such content. Therefore, the assumption was formed by us that the grammar school and secondary medical school students acquired the same background knowledge of medicinal plants during schooling.

Just over half of each group of students surveyed were from a rural environment (52.9% grammar school students and 51.8% secondary medical school students), while the others were from an urban environment.

### *Plant material*

The knowledge of medicinal plants was tested using

dry samples and pictures of medicinal plants. The material consisted of most typical plant parts (stems with leaves, flowers or fruits or subterranean parts), which contain the active ingredient and are suitable for domestic use.

Knowledge was examined of the medicinal plants that are, according to national pharmacists, the most-purchased in Slovenia: elder (*Sambucus* sp.), hip (*Rosa* sp.), chamomile (*Chamomilla recutita*), sage (*Salvia officinalis*), arnica (*Arnica montana*), peppermint (*Mentha* sp.), thyme (*Thymus* sp.), milfoil (*Achillea millefolium*), common St. Johns Wort (*Hypericum perforatum*), calendula (*Calendula officinalis*), rosemary (*Rosmarinus officinalis*), balm (*Melissa officinalis*), gentian (*Gentiana lutea*), lime (*Tilia* sp.) and centaury (*Centaureum* sp.).

#### Questionnaire

The questionnaire given to the students contained 16 questions, of which 11 were closed and 5 open. The first set of questions was designed to examine the students' views about the medicinal plants, and to inquire about their use in their family. The second set of questions examined the technical knowledge of medicinal plants and their uses.

#### Workflow

The surveys were conducted in the classroom and lasted approximately one school period (45 minutes). Each student was given a questionnaire and a set of plant material, and was then asked to complete the questionnaire.

To determine the possible statistically significant differences, the survey results were tested using the two-tailed t-test.

## RESULTS AND DISCUSSION

### *The use of medicinal plants in the students' households*

The results showed that for both schools 85% of

students' households occasionally use medicinal plants, which represents a high percentage of medicinal plants used in everyday life. When our results are compared with the previous year's results gathered from people of Velenje by Klemenc-Ketiš and Verovnik (2004), it was found that the percentage of medicinal plant users among the respondents in Velenje is slightly lower (72%). The percentage of daily users of medicinal plants in grammar schools is, according to the survey, 7.1%, while daily users among medical technicians represent 10.8% of students.

Slightly less than 70% of students from both schools intended to use medicinal plants in the future to the same extent as they did at the time of the surveys. This percentage indicates a relatively high degree of confidence in herbal medicine among young people. It is worth noting that among the students of secondary medical school, the preference to use herbal medicine is as much as 8.9% higher than among grammar school students. This is probably due to information and knowledge acquired through the education in medical school, or to the social patterns acquired in the home environment.

Families of secondary medical school students use on average 8.2 species of medicinal plants, which is 1.1 species more than the families of grammar school students (Table 1). The diversity of medicinal plants used by the families of secondary medical school students is also larger; they mentioned 58 different species of plants, as opposed to only 51 in families of grammar school students. As for the most commonly used medicinal plants, both groups of students indicate chamomile (*Chamomile* sp.), hip (*Rosa* sp.), and sage (*Salvia officinalis*).

Individual families of secondary medical school students use up to 24 species of medicinal plants, while the families of grammar school students use up to 20. Secondary medical school students, therefore, use a larger number of species of medicinal plants (58) and the species diversity is also larger (8.2).

**Table 1.** Number of species of medicinal plants and the average number of medicinal plant species used in households of grammar school and secondary medical school students.

	Medicinal plants used	
	Number of species	Average
Grammar school	51	7.1
Secondary medical school	58	8.2

### *Students' knowledge of medicinal plants*

The first part of the survey established that young people use medicinal plants, and in the second part, we attempted to ascertain whether they have proper knowledge of the use of these plants.

#### *Are medicinal plants an effective treatment?*

Most respondents from both schools (78.1% and 83.5%) correctly assume that medicinal plants effectively treat only certain conditions. Students in secondary medical school value herbal medicine more realistically as they gave 5.4% more correct answers than the grammar school students. The results show that 9.7% grammar school students and some (4.3%) secondary medical school students do not know whether medicinal plants are an effective treatment.

It is encouraging that approximately three quarters of all respondents chose the option of using medicinal plants only for minor diseases and disorders in well-being. None of the respondents would treat a serious disease with herbal medicine. Both answers indicate a confidence in conventional treatment when it comes to serious illnesses. There were no statistically significant differences ( $p > 0.05$ ) among the answers.

Surprisingly high and equally distributed is also the percentage (20%) of both groups of respondents who believe in a sensible use of medicinal plants for normal daily lives. It is our opinion that students should be made more aware of the fact that excess consumption of products from medicinal plants may lead to overdosing and the occurrence of contami-

nating effects in the body (Baričević, 1996, Kac and Mlinarič, 2004).

Eighty two % of secondary medical school students and 61.9% of grammar school students know that medicinal plants can be damaging. The fact that as many as 20% more secondary medical school students are aware of the dangers of non-expert use of medicinal plants is highly statistically significant ( $p < 0.001$ ). This difference is welcome because the secondary medical school students will be able to warn their patients of the risks. Since the consequences of unsafe use of medicinal plants can also be fatal, it is felt that it would be beneficial to offer more knowledge of this subject not only to secondary medical school students but also to other students in general.

#### *Recognition of medicinal plants*

Our aim was to establish how many dried medicinal plants the students are able to identify by appearance, smell and touch. Students were given the following 15 species of medicinal plants: elder (*Sambucus* sp.), hip (*Rosa* sp.), chamomile (*Chamomilla recutita*), sage (*Salvia officinalis*), arnica (*Arnica montana*), peppermint (*Mentha* sp.), thyme (*Thymus* sp.), milfoil (*Achillea millefolium*), common St. Johns Wort (*Hypericum perforatum*), calendula (*Calendula officinalis*), rosemary (*Rosmarinus officinalis*), balm (*Melissa officinalis*), gentian (*Gentiana lutea*), lime (*Tilia* sp.) and centaury (*Centaurium* sp.).

By identifying the 15 dried medicinal plants, the secondary medical school students showed statistically significant higher recognition ( $p < 0.001$ ,  $p < 0.01$ ,  $p < 0.05$ ) of 7 of them (sage, peppermint, thyme, common St. Johns Wort, rosemary and centaury), while recognition of the remaining 8 plants

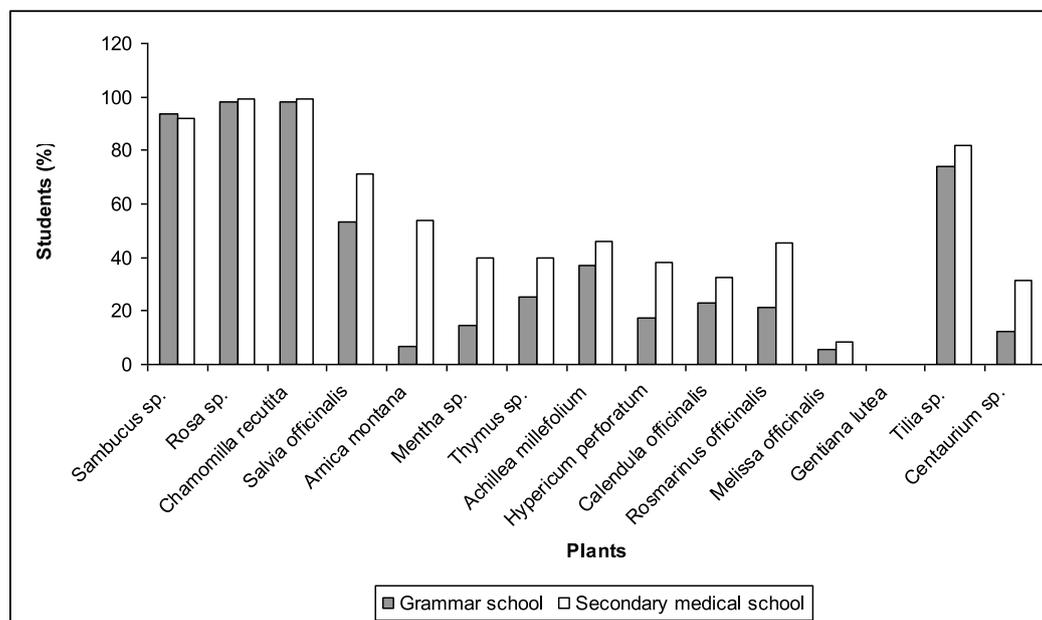


Fig. 1. Percentages of grammar school and secondary medical school students who successfully identified selected medicinal plants.

was almost identical in both groups (Fig. 1). These results were not surprising considering the fact that only a few elementary schools in Slovenia grow plants on their premises and use them in teaching (Konec-Majcen, 1993).

#### *Which medicinal plant to use?*

Of the grammar and secondary medical school students, 56.8% and 44.6% students respectively, would be successful in helping to accelerate the process of wound healing. They correctly chose the following plants for this purpose: plantain, arnica, chamomile, calendula, milfoil and common St. Johns Wort. A poorer performance by 12.2% by the secondary medical school students in accelerating wound healing with medicinal plants is most likely due to the precise instructions on wound care given in the subjects of health care and first aid. They have acquired certain knowledge of wound care and, therefore, disfavor herbal medicine. It is also interesting that they did not mention chamomile. Numerous doctors discourage rinsing the mouth with chamomile after tooth extraction and this is possibly the reason secondary medical school students did not chose it.

Of the grammar and secondary medical school students, 54.8% and 59% of the students respectively, chose the appropriate plant for reducing anxiety. They would most frequently use peppermint, chamomile, balm, green tea, valerian, hop and rosemary.

Only less than a third of the respondents from both schools correctly answered the question on how to accelerate sweating and reduce fever, and they would use chamomile, red beet, lime and hip. The low result is probably due to the habits in the families where fever is often reduced with the use of antipyretics, as indicated by the answers in the second part of the survey. The families of secondary medical school students are likely to reduce fever with additional methods (water bath), with which students become acquainted whilst learning about health care and first aid. Grammar school students can on average treat 2.3 diseases, while secondary medical school students can cure 2.7; this difference is not significant.

It is to be assumed that the level of knowledge of secondary medical school students on medicinal plants and their benefits would be higher than the knowledge of grammar school students, in part

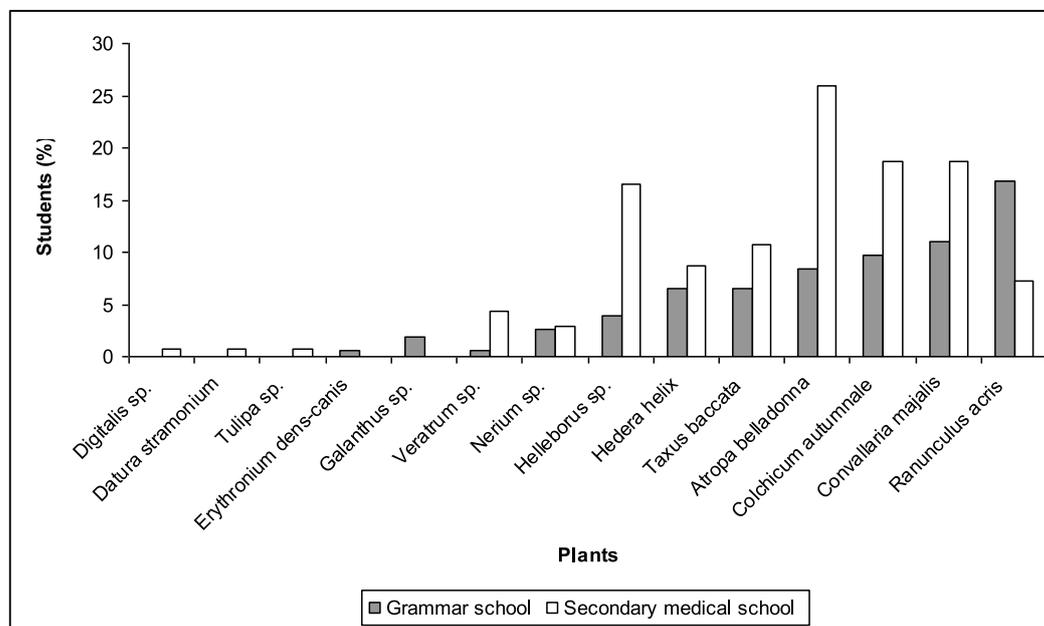


Fig. 2. Responses of grammar school and secondary medical school students to the question: Which toxic plants do you know?

because of the different objectives in technical and science curricula, but the responses to 3 questions showed no statistically significant differences between the groups, while responses to 4 questions did. The results also show that for mild disorders, such as abdominal pain or nausea, secondary medical school students use chemical drugs more frequently (38.9%) than grammar school students (25.8%).

#### Knowledge of poisonous plants

It is of concern that high school students know little about toxic plants in their environment. A secondary medical school student knows of 1.2 species of toxic plants on average, while a grammar school student knows of 0.7 species. As many as 56.8% grammar school students and 32.4% medical secondary school students could not specify a single toxic plant (Fig. 2). Together, the former listed 12 and the latter 11 species of toxic plants (Fig. 2). Grammar school students listed: dog tooth violet (*Erythronium dens-canis*), snowdrop (*Galanthus sp.*), veratrum (*Veratrum sp.*), oleander (*Nerium oleander*), hellebore (*Helleborus sp.*), ivy (*Hedera helix*), yew (*Taxus baccata*), belladonna (*Atropa belladonna*), colchicum (*Colchicum*

*autumnale*), lily of the valley (*Convallaria majalis*) and buttercup (*Ranunculus acris*), and secondary medical school students listed: foxglove (*Digitalis sp.*), datura (*Datura stramonium*), tulip (*Tulipa sp.*), veratrum (*Veratrum sp.*), oleander (*Nerium sp.*), hellebore (*Helleborus sp.*), ivy (*Hedera helix*), yew (*Taxus baccata*), belladonna (*Atropa belladonna*), colchicum (*Colchicum autumnale*), lily of the valley (*Convallaria majalis*) and buttercup (*Ranunculus acris*). The most often named poisonous plants were hellebore (*Helleborus sp.*), ivy (*Hedera helix*), yew (*Taxus baccata*), belladonna (*Atropa belladonna*), colchicum (*Colchicum autumnale*), lily of the valley (*Convallaria majalis*) and buttercup (*Ranunculus acris*).

#### CONCLUSIONS

The results show that just over half (51.8% and 52.9%) of both groups of respondents come from a rural environment, while the rest are from an urban environment. It was concluded that the living environment does not affect the level of knowledge, as there were no significant differences between the two groups in this respect. It was found that 85% of all respondents occasionally use medicinal plants, which confirmed

our first hypothesis that at least half of both groups of respondents occasionally use medicinal plants.

It was also possible to confirm our second hypothesis, which was that the total number of species and species diversity of medicinal plants used by the families of secondary medical school students is higher than in the families of grammar school students.

Our third hypothesis, that for mild disorders, students of medical secondary schools less frequently use chemical drugs than students of grammar schools, was rejected since the results showed the opposite is true.

The hypothesis that the level of knowledge of secondary medical school students of medicinal plants and their benefits is higher than that of students of grammar school could only be partly confirmed, as a statistically significant difference was shown only for certain questions.

It was also found that about 80% of all students believe that they acquired the majority of their knowledge of medicinal plants from parents and relatives, while very little or nothing of the subject was learned at school. This was also confirmed by our analysis of the curricula, which shows that the scope of knowledge, recognition and use of medicinal plants are not included in the teaching. Some information is given only to secondary medical school students in subjects such as pharmacology, nutrition and dietetics, and nursing and first aid, as well as in hospitals during their work placements. Interestingly, the majority of students in both groups (94.2% and 85.2%) would like more instruction on medicinal plants. We propose that more time is devoted to this topic at school. This could be done in the form of an elective module in the frame of an open curriculum that could also include growing medicinal plants in a school garden.

The level of knowledge of the respondents is not at an enviable level, and therefore there is, in our opinion, a great, untapped potential for improving

education in the subjects of pharmacology, dietetics, pharmacognosy and patient care. Since the majority of students wish to receive more information and knowledge about medicinal plants in school, it is worth considering the optional elective subjects of herbal medicine and/or pharmacognosy.

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