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### Ethnobotanical study of medicinal plants used for prevention and treatment of Covid-19 in Northeastern Bulgaria. Part 1: The source of phytotherapy knowledge and safety concerns

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**Abstract:** *The present survey was designed to find out the attitudes of selected informants from Northeastern Bulgaria – persons who confirmed that use medicinal plants, towards phytotherapy in the context of the COVID-19 pandemic. The aim of the first part of our survey was focused on the source of information of herbal utilization, the way of obtaining of medicinal plants, safety concerns and influence of demographic features of the participants. The survey revealed that people who used herbal remedies rely on new informative sources as internet and mass media. As can be expected, the sex and the level of education influenced the respondents' statement about herbal safety. Amongst the demographic features, the place of residence exerted impact on answers to several questions – the way of obtaining of herbs, their possible side effects and the possibility to replace synthetic drugs. An alarm are the hesitant answers to the questions about the herbal side effects and the control of production of herbal preparations. Moreover, the present survey revealed new focus groups for providing of information about the safe production of herbal medicines – students and single living persons.*

**Keywords:** phytotherapy, COVID-19 pandemic, herbal medicines safety

## Introduction

Coronavirus disease 19 (COVID-19) was declared as a pandemic by the World Health Organization (WHO) because of its rapid transmission and infection rates all over the world [1]. During the pandemic medicinal plants were used worldwide [2, 3]. Studies on utilization of herbal medicines in the case of covid disease reported variability of traditional knowledge between different countries and cultures [4]. From this point of view, more attention should be devoted to studying different health systems transmitted by the traditional routes of knowledge. Additionally, in the modern society important sources of knowledge become other pathways, such media (TV, Internet, social networks) [5].

Different approaches have been used in order to collect ethnobotanical data. Some studies are provided with health healers, others with random respondents or recovered patients. Current ethnobotanical studies are also focused on the safety of herbal medicines. Natural products are considered to be safe and a high usage of herbs in the EU are reported. The usage of herbal remedies has led to an increase of adverse reactions [6]. Wang et al. [7] described the importance of control of herbal product production. Muyumba et al. [8] underlined that control of herbal medicines quality is extremely important for their safety. In recent years ethnobotanical studies in Bulgaria are also focused on herbal safety [9, 10].

Tradition in using medicinal plants for treatment of various conditions in Bulgaria dates from the ancient times. The present survey was design to find out the attitudes of selected informants from Northeastern Bulgaria – persons who confirmed that use medicinal plants, towards phytotherapy in the context of the COVID-19 pandemic. The aim of the first part of our survey was to find out: 1) the source of information of herbal utilization; 2) the form of utilization and a way of obtaining of medicinal plants; 3) the attitudes towards herbal medicines safety and necessity of control of their production; 4) the statement whether the herbs can replace conventional drugs; 5) how the specific demographic features of the participants related to their attitudes towards herbal utilization.

## Materials and Methods

The research was conducted by collecting information during semi-structured interviews with people, who declared that used traditional remedies. Ethnobotany Club bachelor student members (Faculty of Natural Sciences, University of Shumen, Bulgaria) carried out the survey. Voluntary participation (informed consent obtained) was documented in questionnaires. The demographic features of the people who accepted to participate were determined. The questionnaire includes questions about the source of traditional knowledge, the mode of herbs utilization, the way of obtaining medicinal plants. Attention was paid on the safety of herbal remedies. Further, the informants listed medicinal plants used by them in prevention or treatment of COVID-19 (presented in the second part of this survey).

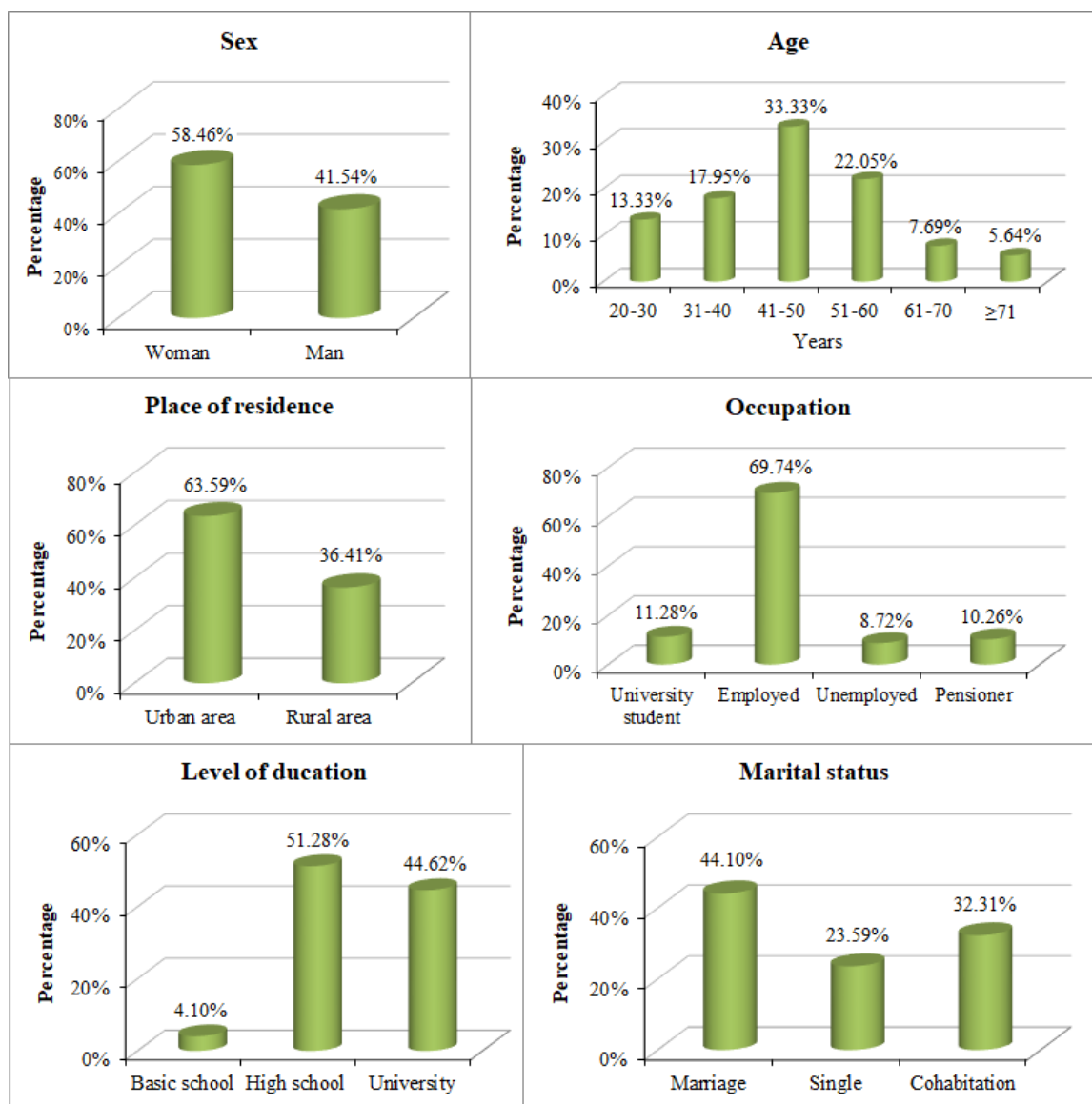
A descriptive statistic procedure like percentage and frequency distribution were employed for data analysis. A simple linear coefficient test (Pearson correlation) was calculated to determine the correlation between answers to the questions and demographic features of the informants. Depending on the values of the Pearson's contingency coefficient ( $r$ ) the following types of correlation were differentiated:  $r = 0$  lack of correlation,  $0 < r \leq 0.3$  weak correlation,  $0.3 < r \leq 0.5$  moderate correlation,  $0.5 < r \leq 0.7$  significant correlation,  $0.7 < r \leq 0.9$  strong correlation,  $0.9 < r < 1$  very strong correlation,  $r = 1$  means functional dependence.

## Results and Discussion

### Demographic features of the respondents

One approach to collect ethnobotanical information is purposive sampling of informants [11]. In present survey a total of 195 face to face interviews were conducted in the region of Shumen, North-Eastern Bulgaria. The respondents were selected – individuals who confirmed that use medicinal plants.

The demographic features of the participants in the present survey are presented in Figure 1.



**Figure 1.** Demographic features of the respondents

Female informants (58.46%) predominated in the study. The age of the informants ranged from 20 to over 71 years old, more than the half of the informants aged between 31 and 60 years old. The majority of the respondents are well educated – only 4.1% of them had not finished a secondary school. A matter of interest is also the place of residence – in present study citizens predominate over the rural residents. The existence of traditional knowledge could be influenced also by the occupation and the marital status of the respondents [12]. The most of the respondents are workers (69.74%). Single living persons are only 23.59%, the others are married or cohabitated (live together as a couple).

#### **A source of information about traditional medicine**

Nowadays a matter of interest is modern society's influence on folk medicine. So, the questionnaire includes the source of information – preserved traditional knowledge (relatives and friends) and information from the specialized literature, mass media and internet (Table 1). The half of the respondents declared that have used as a source of information internet (42.05%) and mass media (11.79%). Friends and relatives were pointed from 38.97% of the respondents. About one third of the respondents (33.33%) acquires information from a specialized literature. These results show the impact of the modern society on the herbal utilization and the dynamics of the traditional knowledge. The growing responsibility of institutions for provision of an appropriate information during internet and mass media are obvious. Recent survey in Bulgaria [10] also revealed that the Internet was the most preferred source of information about herbal medicines and concluded, that there is necessity of warning of misinformation for herbal utilization.

**Table 1.** The source of information about herbal utilization

| <b>Answers</b>         | <b>n (%)</b> |
|------------------------|--------------|
| Relatives and Friends  | 76 (38.97%)  |
| Internet               | 82 (42.05%)  |
| Mass media – TV, radio | 23 (11.79%)  |
| Specialized literature | 65 (33.33%)  |

\* – The percent differs from 100% since more than one answer was marked

#### **Form of herbal utilization and a way of obtaining of medicinal plants**

In current survey are included only the informants who declared to be interested in the medicinal plants' utilization. About the half of the respondents preferred to use medicinal plants as a dried herb. The question “In

what form do you prefer to use the herbs?” is tightly connected with the questions about the way of obtaining of medicinal plants. The Bulgarian flora is remarkable for its diversity [13]. In our survey 47.69% of respondents reported to gather herbs only from natural habitats and 37.44% gather herbs from natural habitats or purchased them (Table 2). These data confirmed other observations, that the most of the herbs are still gathered from wild habitats [14]. It must be noticed that the majority of the respondents preferred to purchase herbs from verified sources – pharmacies and supermarkets, where trustworthy firms sell their products.

**Table 2.** A mode of utilization and a source of obtaining of medicinal plants

| Questions/Answers                                   | n (%)       |
|-----------------------------------------------------|-------------|
| <i>In what form do you prefer to use the herbs?</i> |             |
| Dry herb                                            | 94 (48.21%) |
| Dietary supplement purchased from a pharmacy        | 46 (23.59%) |
| Tea in a filter bag                                 | 87 (44.62%) |
| <i>From where do you obtain herbs?</i>              |             |
| Self-gathered from natural habitats                 | 29 (47.69%) |
| Purchased                                           | 93 (14.87%) |
| Self-gathered or purchased                          | 73 (37.44%) |
| <i>From where do you purchase herbs?</i>            |             |
| Pharmacy                                            | 99 (50.77%) |
| Market                                              | 55 (28.21%) |
| Supermarket                                         | 44 (22.56%) |
| No answer                                           | 29 (14.87%) |

\* – The percent differs from 100% since more than one answer was marked

### Herbal medicines safety and control of their production

In recent years scientific researches on the herbal safety received increasing attention. There is strong evidence that different chemical constituents of the herbal medicines could exert toxic or adverse effects [9, 10]. Taking this into account, in our survey we included a question about the respondents' statement of possible side effects of herbs. Similarly, to our previous survey [15], the great proportion of respondents reported that herbs are safe (37.95) or that are not familiar with these effects (20.00%). So, despite the progress in medicine and

informative sources during past ten years, there is no positive tendency in this respect. Only 33.33% of respondents declared that the control of the production of synthetic drugs and herbal preparations should be the same. These results represent an alarm for institutions, because, as pointed by Nenkova et al. [10] such attitudes pose a real risk for human health.

The answers to the question “Do you think that the herbs can replace the synthetic drugs?” revealed that traditional medicine is considered as a supplementary to conventional medicine – only 35.90% of respondents provided a positive answer. Really, despite of the recent scientific data about the cure properties of numerous herbs, especially in the case of chronic metabolic disorders, this practice is clinically weak applied [16].

**Table 3.** Answers to the questions about herbal medicines safety

| Questions/Answers                                                                                           | n (%)       |
|-------------------------------------------------------------------------------------------------------------|-------------|
| <i>Do you think that the herbs have side effects?</i>                                                       |             |
| Yes                                                                                                         | 82 (42.05%) |
| No                                                                                                          | 74 (37.95%) |
| I don't know                                                                                                | 39 (20.00%) |
| <i>Should the control of the production of the synthetic drugs and the herbal preparations be the same?</i> |             |
| Yes                                                                                                         | 65 (33.33%) |
| No                                                                                                          | 61 (31.28%) |
| I don't know                                                                                                | 69 (35.38%) |
| <i>Do you think that the herbs can replace the synthetic drugs?</i>                                         |             |
| Yes                                                                                                         | 70 (35.90%) |
| No                                                                                                          | 86 (44.10%) |
| I don't know                                                                                                | 38 (19.49%) |
| No answer                                                                                                   | 1 (0.51%)   |

\* – The percent differs from 100% since more than one answer was marked

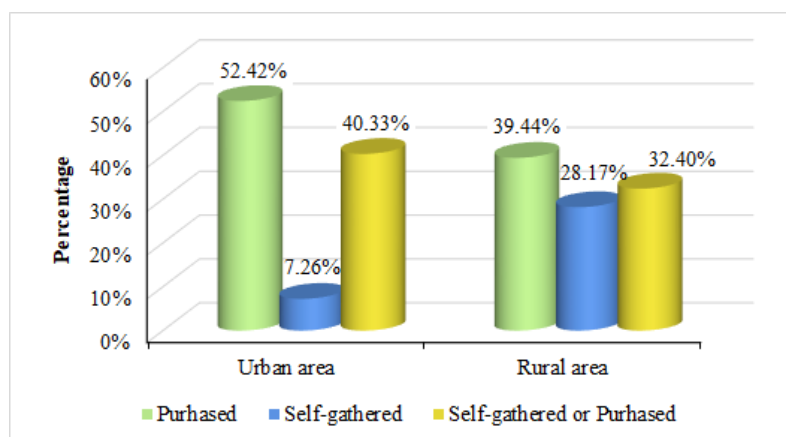
The influence of the demographic variables of the participants on the responses to the questionnaire was presented in Table 4. In order to determine the correlation between items questioned and the demographic variables standardized Pearson correlation coefficient was calculated.

**Table 4.** Influence of demographic variables of the respondents to their responses to the questions

| Questions                                                                                             | Sex   | Age   | Level of education | Occupation | Place of residence | Marital status |
|-------------------------------------------------------------------------------------------------------|-------|-------|--------------------|------------|--------------------|----------------|
| What is your source of ethnobotanical knowledge?                                                      | 0.11  | 0.33  | 0.21               | 0.22       | 0.07               | 0.23           |
| In what form do you prefer to use the herbs?                                                          | 0.07  | 0.32  | 0.08               | 0.24       | 0.23*              | 0.09           |
| From where do you obtain herbs?                                                                       | 0.08  | 0.26  | 0.19               | 0.18       | 0.39*              | 0.12           |
| From where do you purchase herbs?                                                                     | 0.19  | 0.37* | 0.28*              | 0.3        | 0.38*              | 0.19           |
| Do you think that the herbs have side effects?                                                        | 0.31* | 0.31  | 0.31*              | 0.22       | 0.35*              | 0.14           |
| Should the control of the production of “the synthetic drugs and the herbal preparations be the same? | 0.29* | 0.25  | 0.23               | 0.31*      | 0.22               | 0.30*          |
| Do you think that the herbs can replace the synthetic drugs?                                          | 0.2   | 0.26  | 0.18               | 0.25       | 0.42*              | 0.14           |

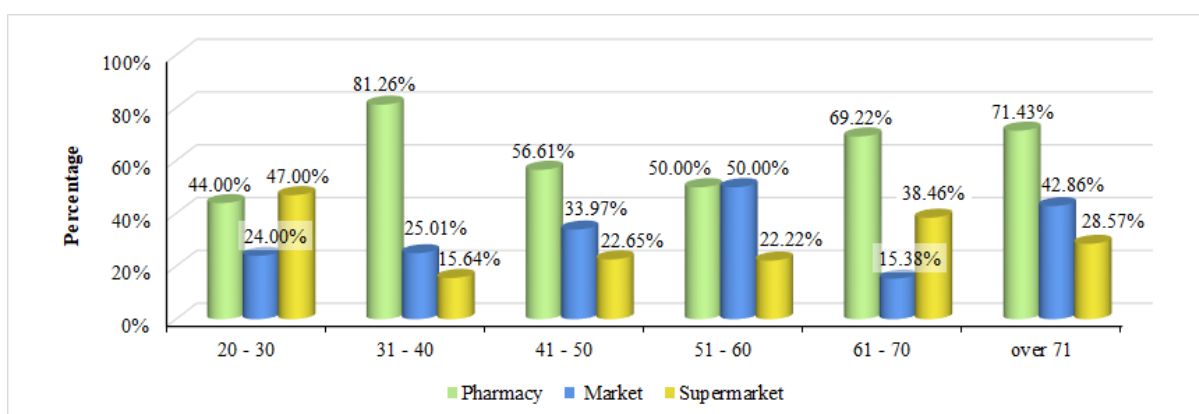
r – Pearson’s contingency coefficient:  $r=0$  lack of correlation,  $0 < r \leq 0.3$  weak correlation,  $0.3 < r \leq 0.5$  moderate correlation,  $0.5 < r \leq 0.7$  significant correlation,  $0.7 < r \leq 0.9$  strong correlation,  $0.9 < r < 1$  very strong correlation,  $r = 1$  functional dependence; \* –  $P \leq 0.05$

Attention should be paid to the level of moderate correlation above 0.30\*. As can be seen from Table 4, the demographic variables have no significant impact on the source of ethnobotanical knowledge and the form of herbs use. As could be expected, self-gathering of herbs is preferred by the rural inhabitants ( $r = 0.39^*$ ) (Figure 2).



**Figure 2.** Cross-relationship between the demographic variable place of residence and the respondents' answers to the question "From where do you obtain herbs?"

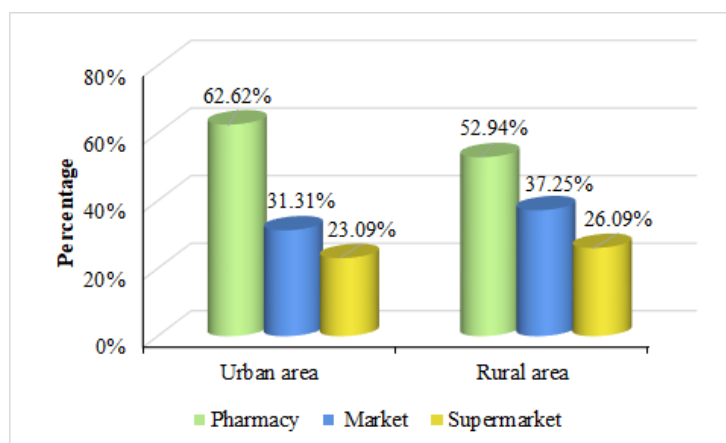
The data analysis shows a moderate impact of the demographic variable age ( $r = 0.37^*$ ) and place of residence ( $r = 0.38^*$ ) on responses to the question "From where do you purchase herbs?". Pharmacies are preferred by all of the informants. Supermarkets are the first choice of the younger respondents – aged 20-30. Being interested in the herbal utilization, market is pointed as a source of achievement of herbs mainly from the respondents aged 51-60 years (50.00%) (Figure 3).



**Figure 3.** Cross-relationship between the demographic variable age and the respondents' answers to the question "From where do you purchase herbs?"

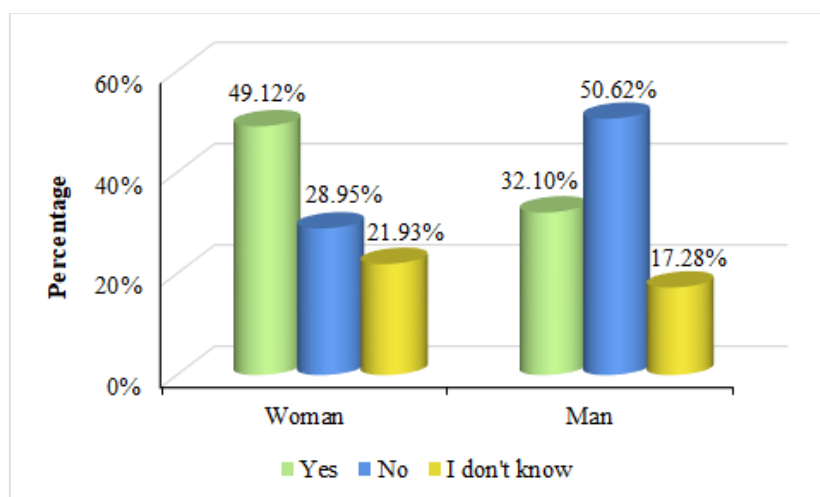
Pharmacies as a place to purchase medicinal plants are the first choice for many of the respondents, but especially for the citizens (Figure 4). Markets are the second choice of both groups. Really, in Bulgaria markets still are place where people offer gathered from the natural habitats or grown in the garden's herbs.





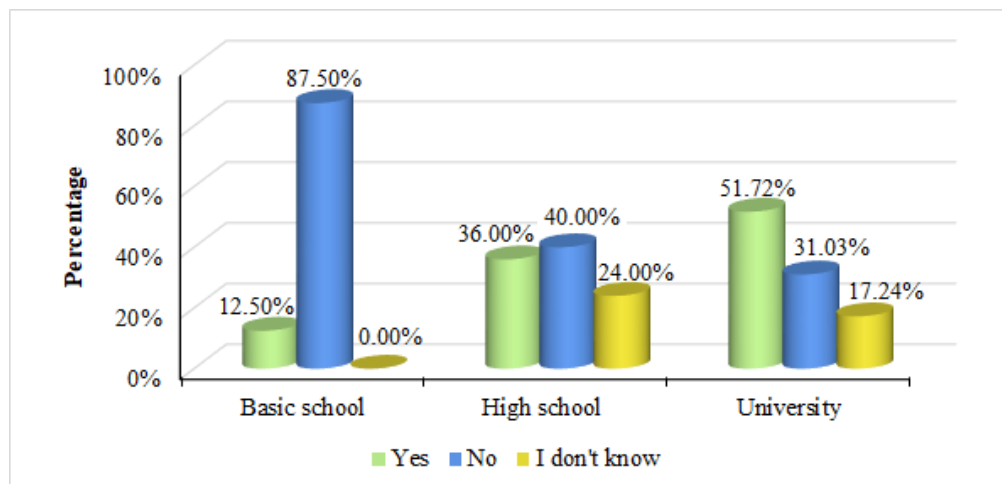
**Figure 4.** Cross-relationship between the demographic variable place of residence and the respondents' answers to the question "From where do you purchase herbs?"

The statement about the possible side effects of herbs was mainly influenced by sex ( $r = 0.31^*$ ), level of education ( $r = 0.31^*$ ) and place of residence ( $r = 0.35^*$ ). Striking are the negative answers – a half of the male informants didn't know that herbs may have adverse effects. A positive answer was done by 49.12% of the female informants (Figure 5). All over the world women are more familiar with traditional medicine. There are different aspects of this gendered ethnobotanical division [17, 18]. In the respect of maintaining good health, *women* are *less risk-taking* than man [19].



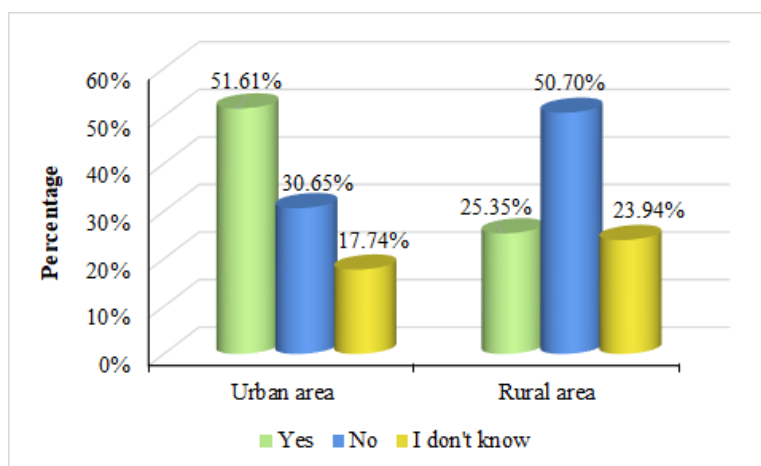
**Figure 5.** Cross-relationship between the demographic variable sex and the respondents' answers to the question "Do you think that the herbs have side effects?"

Similarly, the level of education significantly influenced the statement about the herbal side effects – the half of respondents with higher education are familiar with the possible side effects of herbs (Figure 6). On the opposite statement were 87.50% of people with primary education. This observation is not unexpected and once again confirmed the necessity of provision of information about the safe use of traditional remedies.



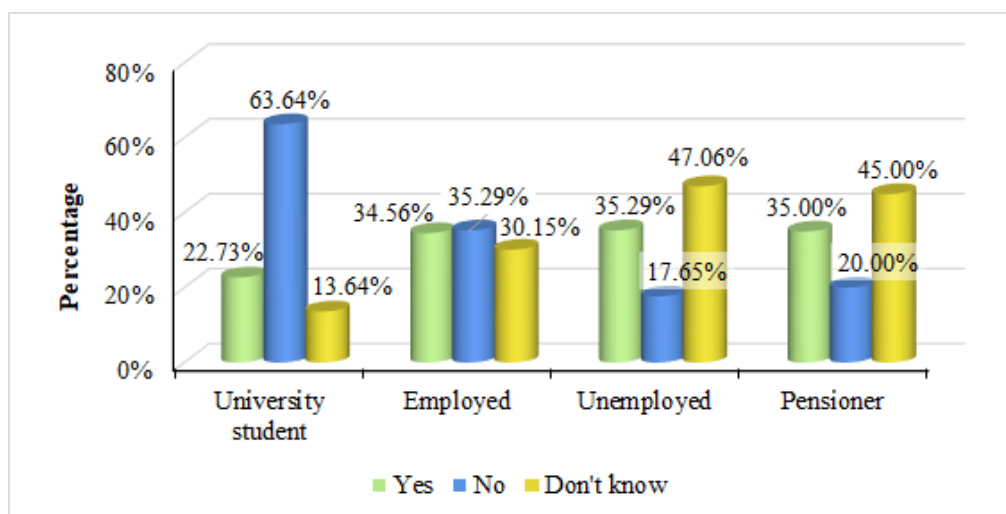
**Figure 6.** Cross-relationship between the demographic variable level of education and the respondents' answers to the question "Do you think that the herbs have side effects?"

The one half of the citizens (51.61%) and only 25.35% of the villagers are informed about the adverse effects of the herbs (Figure 7). An alarm is the great proportion (50.70%) of the rural inhabitants that pointed the negative answer. A lot of current studies are focused on potential adverse effects of herbs, but obviously more public information should be provided.



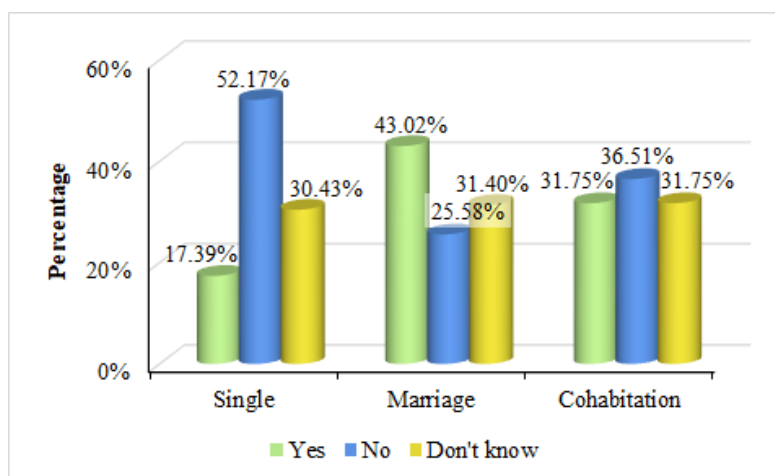
**Figure 7.** Cross-relationship between the demographic variable place of residence and the respondents' answers to the question "Do you think that the herbs have side effects?"

As described by Muyumba et al. [8], despite the growing market of herbal medicines, data on quality and safety are scarce. This leads to inclusion of the question “Should the control of the production of the synthetic drugs and the herbal preparations be the same?”. Occupation ( $r = 0.31^*$ ) and marital status ( $r = 0.30^*$ ) of the respondents have impact on their statement about the necessity of control of herbal preparations’ production. An alarm is the negative answer of 63.64% of the students (Figure 8). It can be speculated that the life experience has impact on the awareness of the respondents of uncontrolled production.



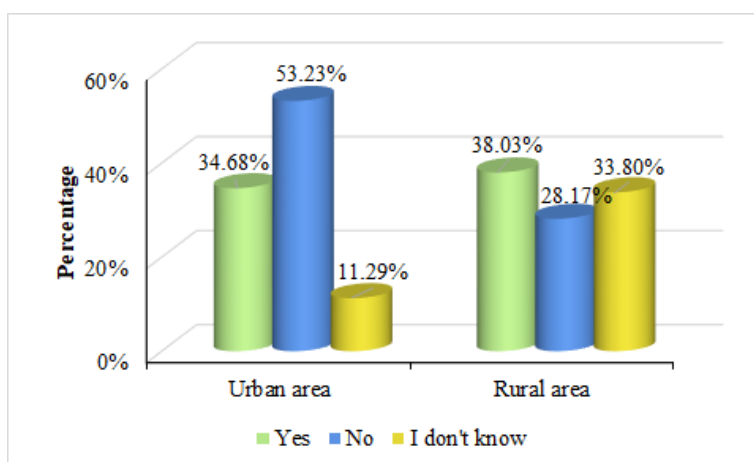
**Figure 8.** Cross-relationship between the demographic variable occupation and the respondents’ answers to the question “Should the control of the production of the synthetic drugs and the herbal preparations be the same?”

Marital status also exerts impact on the statement about the necessity of control of herbal medicines production (Figure 9). Few studies discussed a health risk for single living persons, but there is evidence that they are less interested in maintaining a good health [20]. In our previous survey we discussed that several groups of population more susceptible to herbal side effects – pregnant and nursing women, children and infants, the elderly with chronic diseases [15]. In present survey the lack of information about the necessity of control of herbs remedies revealed a new focus group for providing of appropriate information – single living persons (52.17% pointed a negative answer).



**Figure 9.** Cross-relationship between the demographic variables occupation and marital status and the respondents' answers to the question "Should the control of the production of the synthetic drugs and the herbal preparations be the same?"

Interestingly, the analysis revealed that the place of residence has significant impact ( $r = 0.42^*$ ) on the answer to the question "Do you think that the herbs can replace the synthetic drugs?" (Figure 10).



**Figure 10.** Cross-relationship between the demographic variable place of residence and the respondents' answers to the question "Do you think that the herbs can replace the synthetic drugs?"

A negative answer was done by 53.23% of citizens and only by 28.17% % of villagers. A possible explanation is predominant relay on conventional medicine in urban areas. On the opposite, in rural areas people

have more personal accessibility to medicinal plants. In our previous study before Covid-19 pandemic amongst a random sample of respondents, this demographic variable has weak and non-significant influence [15]. This observation once again underlines the dynamics of traditional knowledge and the influence of the design of the ethnobotanical surveys on the results.

## Conclusion

Different approaches have been used in order to collect ethnobotanical data. The selection of the informants and the goal of this survey, focused mainly on the safe use of herbs during Covid-19 pandemic, have an impact on the results. The survey revealed that people who used herbal remedies rely on new informative sources as internet and mass media. This observation confirmed the conclusion of other authors about the responsibility of the institutions for provision of information about the appropriate use of the medicinal plants. As can be expected, the sex and the level of education influenced the respondents' statement about herbal safety. Amongst the demographic features, the place of residence exerted impact on answers to several questions – the way of obtaining of herbs, their possible side effects and the possibility to replace synthetic drugs. An alarm are the hesitant answers to the questions about the herbal side effects and the control of production of herbal preparations. Moreover, the present survey revealed new focus groups for providing of information about the safe production of herbal medicines – students and single living persons.

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