



# Traditional dentistry knowledge among Serbs in several Balkan countries

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## ABSTRACT

**Background/Aim:** There are still unrevealed treasures of traditional dental medicine, that is, the reason to investigate and present various ways in treatment of oral and orofacial tissues, as well as magic and religious elements involved in representative areas among Serbs. **Materials and Methods:** Information was collected from the elderly non-professional folk dentists and herbalists with the additional help of local physicians and dentists that was done through questionnaire and personal interviews. **Results:** Classified and prepared material consists of total 1038 inquiry sheets. The 41 data were averagely obtained by inquiry form, i.e. 41,984 information for the whole research. The most voluminous was the group of 64 recipes, including 39 for gums diseases and 25 for toothache, while only seven ones were mentioned for magic way of treatment. Among them, 18 prescriptions were of nonherbal origin. The study revealed 84 herbal original prescriptions, including 67 plant species (29 families) including local name, synonyms, and preparation mode. Traditional healers used predominantly herbal recipes to treat painful tooth, gum disease, blisters - herpetic ulcers/lips and mouth/, stomatitis/painful mouth, ptyalismus/, maxillary sinusitis, bad breath, teeth cleaning and bleaching. Very few methods of treatment appeared as inadequate (magical practice), whereas majority were noted as beneficial ones (herbal medicine). Still many people in distant nonurban areas use various plant recipes, especially as the first aid in oral disease healing. **Conclusions:** The significance of plants obtained from unpolluted areas, whose active ingredients have not yet been used in dental pharmaceuticals, should be further investigated in the future.

**KEY WORDS:** Dental ethnopharmacology, ethnomedicine, medicinal plants, phytotherapy, traditional dentistry

## INTRODUCTION

Plants and other natural means have been used in traditional dental medicine for several millennia in the Balkan countries, as well as other ways of treatment. In the Balkan countries ethnodontistry (ETD), part of the ethnomedicine has been developed simultaneously by ethnopharmacy and ethnoveterinary medicine, presenting the branches of folk health culture [1-4]. ETD is to be considered interdisciplinary and composite field of science. Data obtained from investigation should be assumed much wider, i.e. systematically through the prism of archeology, history, general medicine, pharmacy, sociology, and tradition of the Balkan regions [5]. Based on the clinical and laboratory tests on the scope of phytotherapy, ETD investigations have been performed all over the world, mostly collecting the

folk prescriptions in the large and middle-developed, but densely populated countries (China, Brazil, and India). Two of these (China and India) had the strong influence on the rest of the world in regard to traditional medicine, as well as dental medicine, having a long recorded history in the field of materia medica [6]. The reason for doing so was still high participation of traditional dental medicine in everyday life there, still cheap and more important, reachable and very applicable even in urban areas, where a high level of dentistry exists nowadays [6-19]. Investigations in those countries encouraged scientists to study the hidden recipes and active substances in medicinal herbs, useful to the modern man exposed to stresses and suffering from incurable diseases throughout its entire life. Contemporary studies conducted in the previous decade (India, Pakistan, Saudi Arabia, China, Japan, South America, etc.,) were directed to assess the

benefits of hundreds of traditional remedies, proofed by current medicine [6].

To study traditional medicine, as well as common customs of wild tribes and rarely investigated ethnical minorities of distant regions, comparative analysis can be applied around the globe. It was exposed as useful for the study in Eskimos, Papua Islands, East Africa, and Amazonian Brazil regarding ethnomedicine [11]. Although there were no comparative analyses among ETD studies done in the Balkan countries, unilateral studies provided encouraging results [20-22]. It was characteristic for all of them that people in rural areas would apply knowledge and experience of folk dentistry due to the lack of educated dentists [20-26], like in Serbia and Montenegro (SM), and areas where Serbs live [16,27,28]. Hence, compound interventions have been applied only on the establishment of independence of Serbia principality and wider where Serbs lived (middle of the 19<sup>th</sup> century), when advanced culturally population and many educated doctors of dentistry schooled abroad began to return home [29].

In the past centuries, folk dentistry played an important role concerning many wars, wounds, diseases, and injuries left behind. Thus, the book *The Serbian Dictionary* described around 130 medicinal plants from the 19<sup>th</sup> century [27]. However, the deeply studious and large pioneer investigation began only in 1972 through the Belgrade School of Dental Medicine (BSDM) [1].

Concerning methodology, a preliminary study was designed to find a good way for data collection. Students in their final years of BSDM were included into the research from 1976 onward, through the summer field work. Some of them collected the data used inquiry on return to their domicile regions. All activities were conducted and supervised by dentistry professors, including newly trained associate members (lecturer's staff), where beginners' mistakes were dismissed [30]. There was a need to record the ancestors' dental medicine tradition as credibly as possible, due to the strong and modern influence of the West, East, and Mediterranean regions, which threatened to erase that ample canon of folk dentistry. Here was author Tucakov to say: "...It would be a great irresponsibility on history's part not to collect such precious folk medicine treasure created through the sufferings, pains, and tears...[30]." Moreover, around developed countries, a great amount of medical and dentistry drugs were of herbal origin, as well as their extracts that exposed high financial benefit [3]. Concerning the aforementioned, the close aims of this study were:

- Collecting the folk tradition knowledge about mouth and tooth ailments and diseases (dental care, oral hygiene, and preventive deeds).
- Study of specific folk dental practice (professional traditional dentists, their curing doctrine and instruments, dentistry trade teaching, level of dental health culture, sorcerers and witch-doctors, patients' attitude toward folk dentists and contemporary dentistry).
- Study of influence of magic and religious elements to the folk dentistry.

## MATERIALS AND METHODS

### Study Area

Geographical area where Serbs live, i.e., SM lies between 46°11" to 41°52" North latitudes and 18°26" to 23°00" East longitude, encompassing area of 102350 km<sup>2</sup>, embracing Mediterranean and continental climate types.

### Data Collection

This research was conducted during June-September period from 1981 to 1991 on the small groups of domicile population, to whom traditional dentistry was not official profession, several folk herbalists/healers/, folk dentists, as well as old persons. Informants were 30-80 years old. They were from small towns and distant villages and settlements, who dealt with folk dentistry long in the past and at the moment of the study. Subjects were asked to show and describe the plants used (their parts) on site, explain the period of collection. The investigators collected information on local names of plants, preparation way, and administration. The herbs were identified through botanical taxonomy. Collected data from all of them were recorded from memory, i.e., through the family background, unfortunately without written papers, which means that data arised from their own practice and lessons from teachers. Data from certain regions gave doctors of dentistry, general practioners and pharmacists, who secondarily gathered them from local traditional healers and old experienced persons-patients, folk-dentists, and herbalists. This collecting method was proposed to be authentic enough for all studied regions.

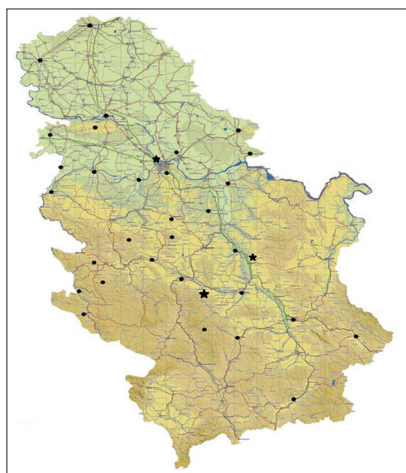
The preliminary study pointed out that the most appropriate way of data collecting was immediate terrain method, whether it was individual or team work. That method assumed direct data obtaining from all of the pooled subjects through a previously designed questionnaire. The research was conducted with the help of the trained pollsters: Doctors of dentistry and students of BSDM (final academic years), where pharmacists participated in the plant identification. Data gatherers were warned about language during the poll, where inquiry answers should be respected in the sense of exact noting in the local dialect. Doing so, the original idioms could be regularly and linguistically interpreted and explained.

The data were obtained from 39 representative places around SM [Figures 1 and 2]. The neighboring regions of Serbia were also investigated by the same methodology where Serbs are prevailing, by the help of BSDM students who originated from those places for further comparative analysis [Figure 3].

The research is still in progress in the areas of East Serbia and Banat to accomplish the whole country. The study was conducted by a questionnaire (Sheet 1) contained plain Serbian folk language considered five groups.

Sheet 1 - Five groups of questions that were requested from the subjects:

- I. Recipes about oral, teeth and gum hygiene, teeth bleaching, tooth eruption and replacement and correspondent folk terminology
  - II. Recipes about mouth sore (thrush, cold sore, aphthae, and herpes) diseases of the lips, the tongue and the skin around the mouth, and related folk expressions
  - III. Recipes and ways of treatment of tooth, gum and jaw diseases, and related folk terms
  - IV. Data about profession of folk dentist, training and their instruments and practice
  - V. Magical (sorcery) rituals about tooth eruption care of sound and treatment of rotten teeth.
- The filled in lists of questionnaire were classified by places [Table 1] displayed by Figure 1 (Serbia) and Figure 2 (Montenegro).



**Figure 1:** Map of studied places in Serbia (•) and headquarters (Belgrade, Krusevac, and Cuprija) (★)

The most inquiry lists were harvested in the region of Sumadija highlands, where the highest number of research points were situated on, especially during summer training course and voluntary masses. The rest Serbian regions gave just a few inquiries of mostly plain terrains (Vojvodina).

The results of the collected and partially worked out data were stored at the Department for History of Dentistry (FSB). The classified and prepared material consisted of total 1038 inquiry sheets - 1025 for Serbia and 13 for Montenegro, collected during the investigation period. 41 pieces of data were obtained on average per inquiry form, i.e., 41984 pieces of information for the whole research.

Upon deep and patient analysis of herbal names (synonyms) obtained from various regions, the list of corresponding botanical names was arranged, which were previously translated into English.



**Figure 2:** Inquired places (black crosses) in Montenegro (coastal and landlocked areas)

**Table 1: Distribution of 1038 classified questionnaires by enquired places around Serbia and Montenegro (Montenegrin places are underlined)**

Localities in the study area	No.
Fruska Gora, Pancevo, Sabac, Bukulja/Vencac, Loznica, Pozarevac, Bogatic, Smederevs, Palanka, Tara, Cacak, Nis, Vranje, Kursumlija, Kopaonik, Prijepolje	2
Divcibare, East Srem, Obrenovac, Pirot, Priboj, Rudnik, Sombor, Subotica, Vrsac, Zlatibor	3
Kraljevo	7
Bela Crkva	11
Novi Sad	13
Beograd	34
Cuprija	297
Krusevac	649
Podgorica	3
Kotor	3
Herceg Novi	7
Niksic	3
Zabljak	2
BijeloPolje	2
Pljevlja	2
Total	1038

Taxonomic identification was conducted by the authors, and plant nomenclature followed the Flora Europaea [31], the Angiosperm Phylogeny Group III system, and the plant list database (The Plant List [Version 1.1] 2013) [32].

## RESULTS

### Recipes of Mostly Nonherbal Origin

Analyzing seven categorized groups of oral ailments/diseases, eighteen prescriptions were noted mostly for toothache (five) as dominant mouth problem, that was expected [Table 2 and Figure 4].

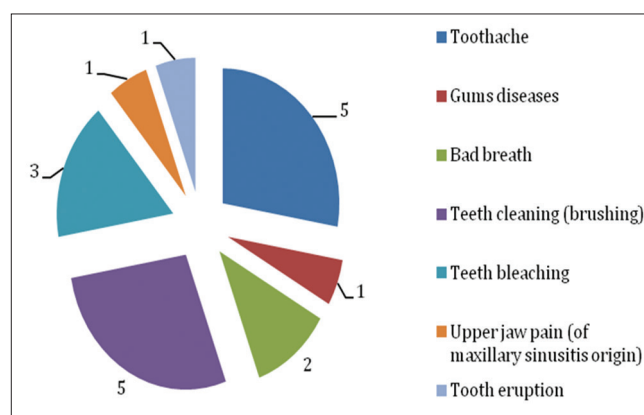
### Prescriptions Consist of Mostly Herbal Origin

The list of collected traditional recipes includes the used plant parts, modes of preparation and usage, and vernacular names (English and Serbian), displayed in Table 3.

The survey presented 84 herbal original prescriptions, including overall 61 plant taxa from 27 families, which are listed by alphabetical order, including local name and synonyms, as well as preparation mode and usage. Some of them were reported for use concerning two or more oral ailments/diseases (for an example toothache and gum bleeding). The most frequently used plants belong to family Compositae (10), Lamiaceae (9), Rosaceae (7), Leguminosae (4), Amaryllidaceae (3), and Amaranthaceae (3), like all others they were presented with two or one species. The first three families cover 42.6% from established plants. Half of the plants is cultivated (C), 39.6% from wild localities (W), and 10.3% may be collected whether as wild or cultivated (W/C). This study did not identify the folk names that directly show the use of plants in the care of teeth.



**Figure 3: Investigated areas around Balkan countries (small blue stars: BiH – Republika Srpska, FYROM) and headquarters spots - Serbia**



**Figure 4: Prescriptions of dominant nonherbal origin**

Traditionally used medicinal plants were within reach from early spring to the end of autumn as fresh ones and in conserved form for the winter season (dry, cream, tincture, etc.). According to traditional beliefs, picking up the herbs was done only during the daylight period.

The most frequently used part of plants for medicinal preparations were their leaves, as well as the other parts (bark, fruit, seed, flower, stems, and roots).

The preparation mode for dental treatment in descending order teas was decoction, infuse, maceration, juices, dishes, pastes, as well as fresh plants. The noted mode of use was drinking/gargling, rubbing into the gums, inserting into the tooth cavity, inhalation, etc.

Some plants, such as *Achillea millefolium* and *Hypericum perforatum*, were noted as panacea for many diseases (not only oral).

A lot of recipes consisted of herbal parts mixed with other artificial materials, univivid or inorganic substances (alcohol,

Table 2: Established recipes of mostly nonherbal origin

Component	Diseases/symptoms	Mode of usage
Ants	Alleviate pain in gums	Chewing
Bee wax	Alleviate pain in gums	Chewing
Bread	Teeth cleaning	Brushing by crumbled overbaked bread and rinsing by cold water
Bread from corn (proya dish)	Gums massage	Chewing
Cattle dung ash or dried dung	Teeth cleaning	Brushing by fingers or wollen peace
Coal powder	Teeth cleaning	+ Baking soda: Then crumble, permit to dry out and brush the teeth
	Teeth bleaching	
Clay powder	Teeth bleaching	Brushing
	Swollen gums	Gums massage
Flaxen textile	Tooth eruption	Rub the place where tooth is to erupt
Gasoline	Teeth cleaning	Brushing
	Teeth bleaching	
Honey	Toothache	+ Cinnamon (1:3): Dense cream rub of and around the painful tooth
Milk	Bad breath, after hard smoking	Gargling
Plant ash	Teeth cleaning	Brushing by fingers or woolen peace
Propolis	Upper jaw pain of maxillar sinusitis origin	Instilling drops of propolis
	Tooth eruption	Rub the place where tooth is to erupt
Rain water	Bad breath, after hard smoking	Gargling
Salt	Toothache without swelling	+ Perfume liquid: Place into the tooth decayed cavity+ Alum powder (1:1): Pack in the tooth cavity and around for 4-5 times a day
	Throbbing toothache	

Table 3: List of 84 herbal prescriptions including 61 plant taxa from 27 families

Taxon, family and voucher specimen code	Recorded local name (s)	English name	Status	Plant part (s) used	Treated pathology (-ies) Recorded preparation Medicinal use (s)
<i>Achillea millefolium</i> L. s.l. Compositae	Stolisnik, hajducka trava	Common yarrow	W	Aerial parts	<ul style="list-style-type: none"> <li>• Bad gums; oral ulcers (aphtae)</li> <li>• Brandy tincture; infuse</li> <li>• Rinse mouth; rinse mouth and drink</li> </ul>
<i>Allium cepa</i> L. Amaryllidaceae	Crni luk	Onion	C	Bulb	<ul style="list-style-type: none"> <li>• Toothache</li> <li>• Smashed bulb</li> <li>• Bandage where pulse is to be found (over the veins of the left hand) until the dental pain alleviates</li> </ul>
<i>Allium sativum</i> L. Amaryllidaceae	Cesnjak, beli luk	Garlic	C	Bulb	<ul style="list-style-type: none"> <li>• Toothache; mouth blisters, ulcers; painful gums, toothache</li> <li>• Place smashed garlic clove inside the external ear canal until the toothache passed away, add salt in the smashed clove or eau de Cologne and apply in the tooth cavity; soaking of clove garlic juice; fresh cloves; tea</li> <li>• To place smashed garlic clove inside the external ear canal until the toothache passed away; Add salt in the smashed clove or eau de Cologne and apply in the tooth cavity; both halves of garlic clove to place into each nostrils fixed by honey; mouth gargle of juice made of smashed garlic and sea salt</li> </ul>
<i>Allium ursinum</i> L. Amaryllidaceae	Divlji luk, sremus	Wild garlic	W	Leaf, bulb	<ul style="list-style-type: none"> <li>• Painful gums and mouth</li> <li>• Fresh</li> <li>• Massage and chewing</li> </ul>
<i>Antennaria dioica</i> (L.) Gaertn. Compositae	Smilje, srcopuc, zecje nozice	Cat's foot	W	Leaf, corymb	<ul style="list-style-type: none"> <li>• Gums bleeding; toothache</li> <li>• Decoct; cigarette</li> <li>• Mouth wash; cigarette smoking</li> </ul>
<i>Arctium lappa</i> L. Compositae	Veliki cicak, repuh, lopuh	Common burdock	W	Root	<ul style="list-style-type: none"> <li>• Oral abscess, gums bleeding</li> <li>• Extract, decoct</li> <li>• Mouth wash</li> </ul>
<i>Armoracia rusticana</i> P. Gaertn., B. Mey and Scherb Brassicaceae	Ren, hren-pitomi	Horse radish	C	Root	<ul style="list-style-type: none"> <li>• Bleeding gums, toothache</li> <li>• Finely chopped row root</li> <li>• Chewing</li> </ul>
<i>Artemisia vulgaris</i> L. Compositae	Pelin divlji	Mugwort	W	Aerial parts	<ul style="list-style-type: none"> <li>• Bad gums</li> <li>• Brandy tincture</li> <li>• Rinse mouth</li> </ul>
<i>Beta vulgaris</i> L. Amaranthaceae	Blitva	Beet	C	Leaf, root	<ul style="list-style-type: none"> <li>• Bleeding and swelling gums</li> <li>• Boiled</li> <li>• Consume</li> </ul>
<i>Beta vulgaris</i> L. var. <i>rubra</i> Amaranthaceae	Cvekla, Cikla	Chard	C	root	<ul style="list-style-type: none"> <li>• Bleeding and swelling gums</li> <li>• Chopped row</li> <li>• Chewing long</li> </ul>

(Contd...)

Table 3: (Continued...)

Taxon, family and voucher specimen code	Recorded local name (s)	English name	Status	Plant part (s) used	Treated pathology (-ies) Recorded preparation Medicinal use (s)
<i>Brassica oleracea</i> L. Brassicaceae	Kupus	Cabbage	C	Leaf	<ul style="list-style-type: none"> <li>• Toothache, bleeding gums; painful mouth at ptialismus</li> <li>• Leaves brain; third strained water of boiled bran</li> <li>• Rinse mouth; gargling</li> </ul>
<i>Calendula officinalis</i> L. Compositae	Neven, zutelj	Marigold	W, C	Corymb	<ul style="list-style-type: none"> <li>• Painful gums, aphtae, ptialismus</li> <li>• Decoct</li> <li>• Mouth wash</li> <li>• Toothache</li> </ul>
<i>Cinnamomum verum</i> J. Presl Lauraceae	Cimet	Cinnamon	C	Bark	<ul style="list-style-type: none"> <li>• Mix: Cinnamon powder, honey, dense cream</li> <li>• Rubbing and spread around the painful tooth</li> <li>• Swollen gums; mouth/lips ulcers, apthae</li> </ul>
<i>Citrus limon</i> (L.) Osbeck Rutaceae	Limun	Lemon	C	Oil, fruit	<ul style="list-style-type: none"> <li>• White clay powder mixture of the olive oil and lemon juice; mixture from lemon and eucalyptus oil</li> <li>• Massage the gums; Soaking the painful and ulcerous places by cotton ball dipped in the mixture</li> </ul>
<i>Clinopodium nepeta</i> subsp. <i>glandulosum</i> (Req.) Govaerts. (syn. <i>Calamintha officinalis</i> Moench) Lamiaceae	Bosiljak divlji	Calamint	W	Aerial parts	<ul style="list-style-type: none"> <li>• Bleeding gums</li> <li>• Brandy tincture</li> <li>• Rinse mouth</li> </ul>
<i>Corylus avellana</i> L. Betulaceae	Lesnik	Walnut	W, C	Leaf	<ul style="list-style-type: none"> <li>• Ptyalismus, oral blisters</li> <li>• Cold decoct</li> <li>• Gargling</li> </ul>
<i>Equisetum arvense</i> L. Equisetaceae	Rastavic, preslica	Field horsetail	W	Aerial parts	<ul style="list-style-type: none"> <li>• Tooth abscess, gums bleeding</li> <li>• Decoct</li> <li>• Mouth wash</li> </ul>
<i>Eucalyptus globulus</i> Labill. Myrtaceae	Eukaliptus	Eucalyptus	C	Leaf	<ul style="list-style-type: none"> <li>• Upper jaw toothache, maxillary sinusitis; painful and ulcerous places; oral blisters</li> <li>• Infuse; mixture (eucalyptus oil and lemon)</li> <li>• Inhalation; soaking painful and ulcerous places by cotton ball dipped in the mixture</li> </ul>
<i>Fragaria × ananassa</i> (Duchesne ex Weston, Duchesne ex Rozier) Rosaceae	Jagoda bastenska	Strawberry	C	Fruit	<ul style="list-style-type: none"> <li>• Mouth blisters, ulcers; inflamed gums/oral mucosa, bad breath</li> <li>• Fresh, juice; leaves decoct</li> </ul>
<i>Fraxinus excelsior</i> L. Oleaceae	Jasen beli	European ash	W, C	Branch	<ul style="list-style-type: none"> <li>• Enormous gargling and juice consumption; rinse mouth</li> <li>• Bad breath</li> <li>• Fresh</li> </ul>
<i>Genista tinctoria</i> L. Leguminosae	Zutilovka	Dyer's broom	W	Aerial part	<ul style="list-style-type: none"> <li>• Interdental cleaning</li> <li>• Painful gums</li> <li>• Herbal tea, monocomponent or + CuSO<sub>4</sub></li> <li>• Gargling</li> </ul>
<i>Geum urbanum</i> L. Rosaceae	Blazenak, zecja stopa, srcenik	Wood avens	W	Root	<ul style="list-style-type: none"> <li>• Painful oral diseases, bad breath, mouth ulcers</li> <li>• Decoct</li> <li>• Gargling</li> </ul>
<i>Glycine max</i> (L.) Merr. Leguminosae	Soja	Soya	C	Seed	<ul style="list-style-type: none"> <li>• Lip and mouth ulcers</li> <li>• Dishes with hot pepper</li> <li>• Consume</li> </ul>
<i>Glycyrrhiza glabra</i> L. Leguminosae	Slatko drvce, sladic	Licorice	W	Leaf	<ul style="list-style-type: none"> <li>• Painful gums</li> <li>• Herbal tea</li> <li>• Gargling and drink</li> </ul>
<i>Helianthus annuus</i> L. Compositae	Suncokret	Sunflower	C	Oil, achene	<ul style="list-style-type: none"> <li>• Jaw joint pain; bad breath</li> <li>• Oil; mixture of coal powder, rose petal and sunflower mixed with honey</li> <li>• Placed inside the external ear canal of nonpainful side of the head; chewing the mixture</li> </ul>
<i>Helichrysum arenarium</i> (L.) Moench Compositae	Smilje	Immortelle	W	Leaf	<ul style="list-style-type: none"> <li>• Bleeding gums</li> <li>• Decoct of white wine</li> <li>• Gargling</li> </ul>
<i>Hyoscyamus niger</i> L. Solanaceae	Bunika, balam, svinjarac	Henbane	W	Leaf	<ul style="list-style-type: none"> <li>• Toothache</li> <li>• Infuse-tea</li> <li>• Gargling</li> </ul>
<i>Hypericum perforatum</i> L. Hypericaceae	Kantarion, borodicina trava, sentjanzevka, gospino zelje	St John's worth	W	Aerial parts	<ul style="list-style-type: none"> <li>• Bleeding, swollen gums, ulcers, apthae</li> <li>• Brandy tincture of mixture (plantain, yarrow, klamath weed, sweet basil or savory)</li> <li>• Rinse mouth</li> </ul>

(Contd...)

Table 3: (Continued...)

Taxon, family and voucher specimen code	Recorded local name (s)	English name	Status	Plant part (s) used	Treated pathology (-ies) Recorded preparation Medicinal use (s)
<i>Juniperus communis</i> L. Cupressaceae	Kleka, smreka, borovac	Juniper	W	Galbula	<ul style="list-style-type: none"> <li>• Bad breath</li> <li>• Raw</li> <li>• Chewing</li> </ul>
<i>Lavandula angustifolia</i> subsp. <i>pyrenaica</i> (DC.) Guinea (syn. <i>Lavandula vera</i> DC.) Lamiaceae	Lavanda	Levander	C	Flower	<ul style="list-style-type: none"> <li>• Bleeding gums</li> <li>• Decoct</li> <li>• Rinse mouth</li> </ul>
<i>Malus domestica</i> Borkh. Rosaceae	Domaca jabuka	Apple	W, C	Fruit	<ul style="list-style-type: none"> <li>• Mouth blisters, ulcers</li> <li>• Fresh, juice</li> <li>• Slowly chewing and garling</li> </ul>
<i>Matricaria chamomilla</i> L. Compositae	Bolovac, milica, milanka titrica, milica-trava, milanka	German (wild) chamomile	W, C	Aerial parts	<ul style="list-style-type: none"> <li>• Sinusitis</li> <li>• Infuse</li> <li>• Gargling, inhalation</li> </ul>
<i>Matricaria chamomilla</i> L. (syn. <i>M. recutita</i> ) Compositae	Kamilica, gorcak, gamilica, ramenak, kamil-tej, kokosnjak	Chamomile	W, C	Corymb	<ul style="list-style-type: none"> <li>• Mild toothache, gums bleeding, swollen (sore) gums, oral linings, painful mouth/tongue diseases, teething, bad breath, lip ulcers</li> <li>• Infuse</li> <li>• Gargling and drinking</li> </ul>
<i>Melissa officinalis</i> L. Lamiaceae	Maticnjak, limun trava, pcelinjak	Lemon balm	W	Leaf	<ul style="list-style-type: none"> <li>• Bleeding gums, oral blisters; bad breath</li> <li>• Infuse; oil</li> <li>• Gargling; oil soaking</li> </ul>
<i>Mentha</i> × <i>Piperita</i> L. Lamiaceae	Nana pitoma	Peppermint	C	Leaf	<ul style="list-style-type: none"> <li>• Bleeding gums, bad breath; bad breath</li> <li>• Infuse; fresh leaves</li> <li>• Rinse mouth; chewing the leaves</li> </ul>
<i>Nicotiana tabacum</i> L. Solanaceae	Duvan, duhan	Tobacco	C	Leaf	<ul style="list-style-type: none"> <li>• Bad breath</li> <li>• Cigarette of tobacco leaves and wild rabbit excrement foiled by newspaper</li> <li>• Hard smoking by keeping the smoke inside the mouth</li> </ul>
<i>Nigella sativa</i> L. Ranunculaceae	Curukot, curekot, Mackov brk, cupava kata	Black seed	C	Oil, seed	<ul style="list-style-type: none"> <li>• Toothache</li> <li>• Oil of seed dissolve into the hot water</li> <li>• Mouth rinse, rubbing with oil</li> </ul>
<i>Ocimum basilicum</i> L. Lamiaceae	Bosiljak pitomi	Sweet basil	C	Aerial parts	<ul style="list-style-type: none"> <li>• Bleeding gums</li> <li>• Brandy tincture</li> <li>• Rinse mouth</li> </ul>
<i>Olea europaea</i> L. Oleaceae	Maslina	Olive	C	Oil	<ul style="list-style-type: none"> <li>• Swollen gums</li> <li>• Mixture of the olive oil and lemon juice</li> <li>• Gums massage</li> </ul>
<i>Phaseolus vulgaris</i> L. Leguminosae	Pasulj	Bean	C	Seed	<ul style="list-style-type: none"> <li>• Oral blisters</li> <li>• Boiled</li> <li>• Chewing for a long and eat</li> </ul>
<i>Pinus sylvestris</i> L. Pinaceae	Beli bor	Scots pine	W, C	Resin	<ul style="list-style-type: none"> <li>• Bad breath; very painful tooth with swelling</li> <li>• Pine resin; decoct of the stumps; pine incense</li> <li>• Chewing around 10-15 min; teeth brushing; hot piece of pine incense placed into the tooth decayed cavity provokes swollen and rupture of tooth structure relieving exudate and pain</li> </ul>
<i>Piper nigrum</i> L. Piperaceae	Papar crni, biber	Pepper	C	Fruit	<ul style="list-style-type: none"> <li>• Bleeding gums</li> <li>• Alcohol tincture (mint and pepper); dried fruits</li> <li>• Gums massage; chewing</li> </ul>
<i>Plantago lanceolata</i> L. Plantaginaceae	Uskolisna (muska) bokvica	Plantain	W	Leaf	<ul style="list-style-type: none"> <li>• Toothache</li> <li>• Brandy tincture of the plantain, yarrow, klamath weed, sweet basil or savory</li> <li>• Gargling</li> </ul>
<i>Prunus domestica</i> L. Rosaceae	Modra sljiva	Common plum	C	Fruit	<ul style="list-style-type: none"> <li>• Swallowed painful tooth</li> <li>• Several freshly extracted plum pits</li> <li>• Press by tongue in oral cavity thus abscessed tooth relieves pus then cold compress over the skin</li> </ul>
<i>Pyrus communis</i> L. Rosaceae	Kruska domaca	Common pear	C	Fruit	<ul style="list-style-type: none"> <li>• Mouth blisters; mouth blisters, ulcers</li> <li>• Fresh fruits;</li> <li>• Chewing for long; enormous garling and consummation of juice</li> </ul>

(Contd...)

Table 3: (Continued...)

Taxon, family and voucher specimen code	Recorded local name (s)	English name	Status	Plant part (s) used	Treated pathology (-ies) Recorded preparation Medicinal use (s)
<i>Quercus robur</i> L. Fagaceae	Hrast luznjak	Oak	W	Leaf	<ul style="list-style-type: none"> <li>• Painful mouth</li> <li>• Decoct, leaves: water: vinegar 1:1</li> <li>• Gargling</li> </ul>
<i>Rosa</i> spp. Rosaceae	Ruza	Rose	C	Flower	<ul style="list-style-type: none"> <li>• Painful gums; mouth blisters; bad breath</li> <li>• Infuse of red rose petal; rose oil; mixture of coal powder, rose petal and sunflower mixed with honey</li> <li>• Gargling; soaking; chewing the mixture</li> </ul>
<i>Rubus caesius</i> L. Rosaceae	Kupina	Blackberry	W	Leaf, fruit, root	<ul style="list-style-type: none"> <li>• Loose teeth; bad gums/oral mucosa</li> <li>• wine decoct root or fruit; decoct of leaves</li> <li>• Long rinse</li> </ul>
<i>Salvia officinalis</i> L. Lamiaceae	Zalfija, kadulja, pitomi pelin	Sage	W, C	Leaf	<ul style="list-style-type: none"> <li>• Bleeding gums, toothache</li> <li>• Decoct</li> <li>• Gargling</li> </ul>
<i>Satureja hortensis</i> L. Lamiaceae	Cubar vrtni	Savory	C	Aerial part	<ul style="list-style-type: none"> <li>• Bleeding gums</li> <li>• Brandy tincture</li> <li>• Gargling</li> </ul>
<i>Spinacia oleracea</i> L. Amaranthaceae	Spanac, Spinat	Spinach	C	Leaf	<ul style="list-style-type: none"> <li>• Bad gums, mouth ulcers</li> <li>• Cooked, spinach dish</li> <li>• Chew long</li> </ul>
<i>Symphytum officinale</i> L. Boraginaceae	Gavez, volovski jezik		W	Root	<ul style="list-style-type: none"> <li>• Swollen gums, painful mouth</li> <li>• Tea</li> <li>• Gargling</li> </ul>
<i>Syzygium aromaticum</i> L. Merr&L.M.Perry Myrtaceae	Karanfilic, klincic	Clove	C	Flower bud	<ul style="list-style-type: none"> <li>• Bad breath; toothache</li> <li>• Dried; extracted oil</li> <li>• Chewing; put into tooth cavity</li> </ul>
<i>Taraxacum</i> sp. Compositae	Maslacak, vetrokaz mlecac, mislovka popino guvno	Dandelion	W	Leaf, root	<ul style="list-style-type: none"> <li>• Toothache; bleeding and swelling gums</li> <li>• Latex from root; boiled leaves</li> <li>• Soaking by gauze and place in painful tooth cavity; chewing leaves</li> </ul>
<i>Thymus serpyllum</i> L. Lamiaceae	Majcina dusica, babja dusica, tamjanika, vrisak, divlji bosiljak, materinka, papric, bukovica	Wild thyme	W	Aerial part	<ul style="list-style-type: none"> <li>• Oral mucosa ulcers (aphtae)</li> <li>• Infuse</li> <li>• Rinse mouth</li> </ul>
<i>Thymus vulgaris</i> L. Lamiaceae	Timijan vrtni	Garden thyme	C	Aerial part	<ul style="list-style-type: none"> <li>• Oral ulcers (aphtae)</li> <li>• Infuse</li> <li>• Rinse mouth, gargling, drink</li> </ul>
<i>Tilia tomentosa</i> Moench Malvaceae	Lipa	Lime tree	W, C	Branch	<ul style="list-style-type: none"> <li>• Bad breath</li> <li>• Fresh</li> <li>• Interdental cleaning by small branch</li> </ul>
<i>Urtica dioica</i> L. Urticaceae	Kopriva, zara	Nettle	W	Leaf	<ul style="list-style-type: none"> <li>• Bleeding/swelling gums</li> <li>• Boiled leaves</li> <li>• Chewing and eat</li> </ul>
<i>Vaccinium vitis-idaea</i> L. Ericaceae	Brusnica	Cowberry	W	Fruit	<ul style="list-style-type: none"> <li>• Gums diseases</li> <li>• Raw</li> <li>• Long chewing</li> </ul>
<i>Vitis vinifera</i> L. Vitaceae	Crno/Belo grozdje	Common grape	C	Fruit	<ul style="list-style-type: none"> <li>• Toothache, bleeding gums; mouth blisters, ulcers</li> <li>• Immortelle wine decoct; Press grains</li> <li>• Gargling; long and mouth juice gargling</li> </ul>
<i>Zea mays</i> L. Poaceae	Kukuruz	Maize	C	Grain	<ul style="list-style-type: none"> <li>• Toothache; painful gums/teeth; stomatitis, ptyalismus</li> <li>• Boiled water of the white unripened maize grains; Boiled white unripened grains with CuSO<sub>4</sub>; third strained water of the boiled maize bran</li> <li>• Gargling</li> </ul>

C: Cultivated plants, W: Wild plants, W/C: Wild or cultivated plants

clay, wood derivatives, salt, spiritus, milk, CuSO<sub>4</sub>, excrements, honey, propolis, baking soda, etc.), enabling adjuvant and corrective function.

The storage of materia medica was done by woolen textile, paper, leather or linen bags, and clay, wooden or glass vessels.

The common mouth and teeth problems for treatment were dental pain, swelling around tooth, gums bleeding/swelling, and painful tooth eruption.

The most inquiry lists were harvested in the region of Sumadija (Serbia), where the highest number of research points were



situated, especially during summer training course and voluntary masses - 1000 (96.3%). Precisely, the most plentiful Sumadija spots, i.e., headquarters were Krusevac (649) and Cuprija (297) that involved mostly woodland areas [Figure 3]. The plain Vojvodina region gave just a few inquiries - 2.7%.

Montenegrin research locations were just a few, presenting 13 inquired subjects - 1.3% out of all inquiries [Table 1 and Figure 2].

### Data for the Five Groups

The most answers (27 from Group I) were more or less similar by their ingredients. These recipes and those from Group II and III could be summarized as tea (decoction, infusion, and macerate), extract, herbal mixture with or without combination of edible fruits, tea combined of mineral ingredients and/or woody parts of plants, herbal mixtures with addition of pure chemicals (alcohol and methylated spirit) or Mediterranean or subtropics fruits (lemon, lavender, rosemary, clove, coffee grains, and cinnamon) and some animal products (milk, honey, and cattle excrement).

The ample sources of stomatitis treatment exhibited Group II - 26 recipes. Those were healing recipes of herbal mixtures and dietetic dishes. They were required to be the longer, the better in contact to oral mucosa to expose salutary remedy effect. Many idioms were recorded for variants of mouth sore conditions.

Based on the gathered data, the most voluminous was Group III (64 recipes). That goes without saying if consider the great significance of dental/gingival pain for common peasant, who was away even from provincial city and occupied by everyday farmer chores, having no time for a qualified dentist visit. Although the most of those remedies just numb the pain and do not point to the cause, they used referred recipes to help them even for a while. This group consisted of the recipes mostly for gum diseases (39) and toothache (25). Those pathologies were noted as dominant for traditional healers in the study around Burkina Faso [13].

Considering Group IV, nine folk dental therapists (men) were enquired about their way of treatment. They were classified into four character types: (a) Dental trade that was a well-kept secret learned from their ancestors, handing on to succeeding generation within the family (4 subjects). They are believed that trade secret discovering out of the family would bring the loss of curing power; (b) dental trade learned from the “teacher,” handing down to the others (one answer); (c) type was like type b, but it kept healing secret only for itself (three enquired persons); (d) self-taught dental skillfulness, where “secret of treatment” confided only to its close relatives (one inquired). If someone else had discovered the secret of dental trade, the power was believed to vanish.

Some of them learned dental treatment interventions during war or military service, especially extractions in position of doctor’s assistant (apprentice). In peacetime, at homeland,

they used their own instruments (forceps) made of iron or combined with wooden handle, or equipment brought from military ambulance. There were “operators” who charged for the services by reasonable prices, some used compensation payment, while others treated free of charge.

Group V contained only seven different “recipes of magic power” (5.5% out of all). Some of those included: Buying a white present (upon first milky tooth eruption), or placing the first milky extracted tooth under the home bearing beam, or white pillow, giving it to a dog to eat it, etc., All those habits were to stress the whiteness as sound tooth color and home beam and dogs as symbols for power. The majority of those answers pointed out to the high rate of failure by that way of treatment, among the people who was more and more enlightened, even in isolated spots. They gave up more and more magic remedies, accepting new therapy methods, but still preserved the custom of folk traditional substantial prescriptions (Group I, II, and III recipes) empirically approved as beneficial ones.

### DISCUSSION

The authors of this study put the great effort into the interpretation of medicinal herbs names and their synonyms, as well as for classification on the similar, slightly varied prescriptions by composition and preparation mode that might be useful for botanical classification/systematization of the species possessing phytotherapeutical role.

Considering the study as a whole, the aim of this research was to explain the good and bad ways of traditional treatment and remedies used throughout the centuries and to distinguish the medically correct doctrine from what was unscientific, wrong and harmful to one’s health inefficient, even toxic.

Sorcery and magic rituals could be noted as bad ways of treatments. These options have been used only if the substantial (mostly herbal) or operative mode failed. Precisely, dysfunction of feeding (chewing and swallowing), as well as accompanied pain of well innervated orofacial region was often unbearable for the patient, who then decided to ask for suggestive/hypnotic episodes by the help of sorcerers. Having been alleviated of oral troubles by these ways just for a while, the end solution would be extraction or incision of pus collection.

The copious resulting material might be of confidential origin, due to voluminous results and the direct method of data collecting, immediately obtained from the subjects such as “folk therapists” - healers and common people, often illiterate ones, even from isolated highlanders, and plainsmen.

The contemporary dental pharmacology and pharmacognosy should benefit from recorded recipes, using herbs from still unpolluted areas of investigated regions. The similar situation has already occurred in India on completion of ETD research done in 2004, where 16 brand new herbal species were discovered for the treatment of dental pain, aphthae, alveolar pyorrhea, dental plaque, and dental caries prevention. Those plants, up

to that time, had not been recognized and classified in Indian ethnobotanical and phytotaxonomical literature [14,33].

Usefulness of comparative analysis showed the ethnomedicinal studies in the regions of Eskimos, Papua Island's tribes, East Africans, Amazonian Brazilians, etc., [6,12]. Hence, the similarity in dental recipes was found in literature: Italian ethnologists conducted the same work recorded several herbal recipes in Albanian immigrant population in South Italy, unknown up to then. The added animal constituents, what they used [9], were similar to the Serbian mixture prescriptions which probably came from the Albanian nation from Kosovo into central Serbian regions. The second example was the case when plain population, mostly villager and farmers, were compelled to use cheap and "within reach" medicaments, what was amazingly similar between Serbian [34] and Dinka population (African mostly Christian Ethiopian tribe). (To remember that Orthodox Christianity in Ethiopia was established in the 4<sup>th</sup> century). Both populations used ash mixture of burned cow dung for teeth cleaning by fingers. The third case was copper sulfate mixed by herbs powder as a common recipe for toothache and painful gums relief in Serbia [34], as well as in India [14,33].

Some of the recorded plants in our ETD study had the similar beneficial effect like sage. What a pity they are still not in use, concerning the presence of sage extracts in many dental products for oral care, exposing even six useful effects, such as antioxidant, antimicrobial, antifungal, astringent, anti-inflammatory, and odorant drugs. Those plants might be categorized into several pharmacological groups, namely, sialogogues, antisecretolytics, tonics, adstringents, styptics, antiseptics, sedatives, antineuralgics, anesthetics, vulneraries, antibiotics, and corrigenses. They exposed useful effect in dental medicine through the following active principles: Alkaloids, heterosides, saponins, essential oils of aromatic herbs, tannins, flavonoids, mucinous matters, phytocides, vitamins, etc., most of them demonstrated antioxidant, immunostimulate, and anticancer effects.

According to our best knowledge, beside mineral substances, the following plant species were noted in this ETD study: Broom, rosemary, coltsfoot flower, yellow iris, licorice, marigold, black grapes, cranberry, spinach, henbane, celandine, walnut leaf, onion, petal and oil of red rose, immortelle, garlic, root/leaf of blackberry, dandelion juice, yarrow, nettle, plantain, basil, chips of pine log, madder, common mallow, radish, grape hyacinth, rue, bilberry, blueweed, barberry, elder, calamus, hedge bindweed, pine marten resin, grain brandy, and incense. These species have not been yet applied nor their derivatives in the recent dental phytotherapy. The benefit of the study might be attributed to botany, botanic terminology, pharmacognosy, and ethnopharmacy.

As far as the wrong mode of traditional dental treatment, the most of sorcery and magic curing was noted in rural and isolated places. Nowadays, in those regions more and more experienced advantageous herbal prescriptions are in use even near contemporary dental offices. However, traditional dental recipes are often adjuvant and even competitive to modern

ones, because they are cheap and previously experienced as very effective ones.

Unfortunately, there are still no ways to collect the ETD treasure from Kosovo and Metohija region. That region would be of great interest due to the existence of numerous isolated settlements with preserved customs in time interval too distant from contemporary life, concerning ethnical and religious aspect of mixed population situated there.

It is appropriate to quote the urgent and pressing words of Serbian pioneers in ETD, ethnomedicine and ethnopharmacy directed to generations to come. They pointed out even in 1976 of necessity to speed up the data analysis of ETD research in much detail because "...there is a need to record the grandfather's medicine as soon as possible and authentically because accelerating urban changes threaten all of that heritage bring out of oblivion up to the end of the 20<sup>th</sup> century..." The confirmation of aforementioned note could be found in Prof. K. Todorovic foreword of book "700 years of medicine in Serbs." Here he wrote "...Serbs were going through the history through the different phases of military glory and power, advanced social structure and cultural ascent, then fall and internal trouble, discord, and mutual rivalry and clashes, military ups and downs as well as long slavery, migrations and suffering where even bare existence of the nation was sometimes endangered...[30]."

Besides mainly biological aspects of ETD in this study, sociocultural focus might be of great importance for social science (ethnolinguistics, history, etc.) analyzed by professional persons in those fields. The recorded data in our investigation frequently showed the union of religious elements and herbal healing treatment. Overall mentioned points to the significance of performed ETD research and data operations, what altogether calls for further extension of our study, encompass the multidisciplinary approach and comparative analysis thoroughly.

The above-mentioned findings should be supported for industrial utilization of some herbs, which can be useful for dental pharmaceuticals due to the opulent biodiversity of Balkan regions. They might present a significant source of export earnings. Having in mind that around 80% of the world's population use herbal-based recipes, this cheap way of treatment, especially in the Third World countries, should be stressed.

The majority of collected interesting folk terminology data ("folk dental idioms") have still not worked out and should be classified by specific methodology (further research is under way).

Furthermore, there were many folk jargons recorded about anatomical dental terms in all questionnaire groups, as well as for diseases and medicinal plants [34] that are interesting material for further ethnolinguistical research.

The obtained data from the neighboring countries (Republika Srpska, FYROM – Macedonia), i.e., spots where Serbs are prevailed, have not yet been operated in the scope of comparative analysis. That would be useful for the study of

immigrant change of life conditions and adaptation to new environments, similarity and differences of folk dental medicine knowledge in the studied areas and abroad where Serbs live, among neighboring nations, ethnic, and religious groups.

## CONCLUSION

We should emphasize the significance of plants obtained from unpolluted areas, whose active ingredients have not yet been used in dental pharmaceuticals, which can be a promising field for further researches.

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Hereby, we pay a tribute to Prof. Dr. Vera Gavrilovic – Doctor of dentistry (In memoriam) who began this study as early as 1972 as pioneer in ethnostomatological research around Balkan peninsula and ran a great deal of this investigation in the past decades.

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