

Primljen/ Recived on:03.02.2015.  
Revidiran/ Revised on:09.02.2015.  
Prihvaćen/ Accepted on:17.03.2015.

KLINIČKI RAD  
CLINICAL ARTICLE  
doi:10.5937/asn1571443M

## ANALIZA TROŠKOVA LEČENJA ALVEOLITISA

### ANALYSIS OF THE COSTS OF TREATING DRY SOCKET

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#### Sažetak

**Uvod:** Alveolit is predstavlja poremećaj u zarastanju rane nastale nakon vađenja zuba, što je praćeno upornim, intenzivnim bolom i odsustvom vitalnog krvnog ugruška. Cilj ove studije bio je da utvrdi i analizira troškove lečenja alveolita posle vađenja zuba, jer do sada u Srbiji nije bilo adekvatne procene visine rashoda, strukture troškova i usluga u zbrinjavanju bolesnika sa alveolitisom.

**Materijal i metode** Troškovi lečenja analizirani su na uzorku od 455 odraslih osoba sa potvrđenom dijagnozom alveolitisom. Svi ispitanici bili su pregledani i lečeni na Odeljenju za oralnu hirurgiju Zavoda za stomatologiju Kragujevac tokom 2012. godine. Evidentirani su i obrađeni direktni troškovi lečenja po pacijentu za nabavku lekova i potrošnih medicinskih sredstava, kao i troškovi pružene stomatološke usluge, preuzeti iz šifrnika Republičkog fonda za zdravstveno osiguranje. **Rezultati:** Od ukupno 12.652 izvađena zuba, kod 455 pacijenata, tj. 3,6%, dijagnostikovana je pojava alveolitisa. Iznos ukupnih vrednosti troškova lečenja alveolitisa za 2012. godinu po pacijentu bio je 1298,58 ± 468,93 RSD, od toga je 1065,16 RSD ± 394,49 RSD (82,02%) činilo ukupnu cenu stomatološke usluge lečenja alveolitisa, a 1298,58 ± 468,93 RSD (17,98%) je utrošeno za lekove i potrošna stomatološka sredstva.

**Zaključak** Stvarni opseg troškova lečenja alveolitisa u Srbiji u eri ekonomske krize, kada smo suočeni sa manjkom sredstava za finansiranje zdravstvene zaštite, nameće potrebu za primenom odgovarajućih preventivnih mera u cilju suzbijanja ove komplikacije, kao i za razvojem metodologije određivanja vrednosti stomatoloških usluga. Rezultati pokazuju da alveolitis, kao jedna od najučestalijih postekstrakcionih komplikacija zuba, relativno bezazlena sa aspekta kliničkog ishoda, predstavlja dodatni ekonomski gubitak za Srbiju.

**Ključne reči:** alveolitis, troškovi i analiza troškova, Srbija

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#### Abstract

**Background:** Dry socket is a disturbance in the healing of tooth extraction, characterized by the absence of blood clot and persistence of intense pain. The aim of this study was to determine the costs of treating dry socket, as in Serbia, until now, there has been no adequate estimation of the expenses and cost structure for treating patients with dry socket.

**Material and Methods:** The costs of treating dry socket were analyzed on the sample of 455 adults with confirmed diagnosis of dry socket. All the patients were treated at the Oral Surgery Department, Institute of Dental Medicine in Kragujevac, during 2012. Direct costs per patient, concerning the acquisition of medicines and medical supplies, as well as medical services, were recorded in accordance with the Blue Code Book of the National Health Insurance Fund.

**Results:** Out of total 12.652 teeth extracted, 455 patients (3.6%) were diagnosed with dry socket. Total direct cost for treating dry socket in 2012 was 1.298,58 ± 468.93 RSD per patient, of which 1.065,16 RSD ± 394.49 RSD (82.02%) was the total price of the service and 1. 298,58 ± 468.93 RSD (17.98%) was spent on dental supplies.

**Conclusion:** The actual cost of treating dry socket in Serbia shows that there is a need for the implementation of the relevant preventive measures. Global economic crisis, worsens the constant lack of available resources in dental healthcare services. Dry socket, as one of the most frequent post-extraction complications, although quite harmless in terms of clinical prognosis represents substantial economic loss for Serbia.

**Key words:** dry sockets, costs and cost analyses, Serbia

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## Uvod

Alveolitis, u literaturi poznat pod nazivima „dry socket“, alveolarni osteitis, lokalizovani osteomijalitis, fibrinolitički alveolitis, dolor post extracionem, najčešća je postekstrakciona komplikacija zuba<sup>1-5</sup>. Bez obzira na širok spektar sinonima, suština ovog oboljenja je poremećaj u zarastanju rane nastale nakon ekstrakcije zuba, što je praćeno upornim, intenzivnim bolom i odsustvom vitalnog krvnog ugruška<sup>6,7</sup>.

Dosadašnje studije su ukazale na različitu učestalost ove komplikacije. U jednoj prospektivnoj studiji sprovedenoj u Jordanu pokazano je da zastupljenost ove komplikacije nakon ekstrakcije svih zuba, osim trećeg molara, iznosi 2%, dok učestalost ovog simptoma nakon ekstrakcije trećeg molara iznosi 20%<sup>8</sup>. Alveolitis najčešće nastaje nakon vađenja pulpitičnih i gangrenoznih zuba, i to češće kod muškaraca nego žena, češće u donjoj, nego u gornjoj vilici. U najvećem broju slučajeva javlja se s proleća<sup>9-13</sup>. Brojne studije su pokušale da objasne etiologiju ove komplikacije koja je multifaktorijalna. U literaturi se nalaze istraživanja koja pokazuju da faktori rizika koji takođe utiču na pojavu alveolitisa mogu biti: herpes infekcije, traumatska ekstrakcija zuba<sup>14</sup>, prethodno postojanje lokalne infekcije zuba<sup>15</sup>, loša oralna higijena<sup>16</sup>, sistemske bolesti, pušenje i konzumiranje alkoholnog pića<sup>17</sup>.

U literaturi postoje vrlo oskudne procene troškova lečenja alveolita. Prospektivna ekonomska studija, sprovedena u Nemačkoj, pokazala je da od ukupnog broja ekstrahovanih zuba, koji je iznosio oko tri miliona, kod 90.000 pacijenata došlo je do pojave komplikacije u vidu alveolitisa (3%), što je bio ekonomski gubitak od 18,1 milion maraka u vremenskom periodu od godinu dana za državni budžet Nemačke<sup>18</sup>. Alveolitis, kao postekstrakciona komplikacija, utiče na kvalitet života pacijenata i povećava troškove lečenja<sup>19</sup>. Lečenje ove komplikacije može se znatno produžiti u obliku čestih poseta stomatologu, što može dovesti do nepovoljnog uticaja na psihu pacijenata<sup>20</sup>. Može se reći da su komplikacije posle vađenja zuba prisutne, ali u manjem procentu<sup>21</sup>. Pacijenti sa alveolitisom kao postekstrakcionom komplikacijom značajni su korisnici zdravstvenih usluga i potrošači značajnog dela raspoloživih resursa iz zdravstvenog budžeta.

## Introduction

Dry socket, in literature also known as alveolar osteitis, localized osteomyelitis, fibrinolytic alveolitis, dolor post extraction etc., is a relatively frequent post-extraction tooth complication<sup>1-5</sup>. Regardless of the wide range of its synonyms, it is actually a disorder in healing the extraction wound, which is followed by persistent, intense pain without blood clot<sup>6,7</sup>.

Until now, studies have pointed out the different incidence of this complication. In a prospective study in Jordan, it has been shown that the incidence of this complication after the extraction of all teeth, except third molar, is 2%, whereas the incidence of this symptom after the extraction of third molar is 20%<sup>8</sup>. Dry socket most frequently appears after the extraction of pulpitic and gangrenous teeth, it appears more frequently among men than women, and more frequently in the mandible than in the maxilla. In the largest number of cases it appears during spring<sup>9-13</sup>. Numerous studies have tried to explain the etiology of this multi-caused complication. In the works on this topic, various studies have been mentioned showing that risk factors responsible for dry socket can be the following: herpes infections, traumatic tooth extraction<sup>14</sup>, the previous existence of local tooth infection<sup>15</sup>, poor oral hygiene<sup>16</sup>, systemic diseases, smoking and alcohol consumption<sup>17</sup>.

Until now in the literature there has not been much estimation of dry socket treatment costs. Prospective economic study carried out in Germany showed that from the total number of about 3 million of extracted teeth, 90.000 patients had complications in the form of dry socket (3%) and this meant the loss of 18.1 million of German marks in one year for state budget in economic terms<sup>18</sup>. Dry socket affects patient's life quality and enhances treatment costs<sup>19</sup>. The treatment of this complication can be prolonged to a significant degree because of frequent visits to the dentist, which can lead to the adverse impact on the patient's life<sup>20</sup>.

The percentage of complications that occur after tooth extraction is generally small, but nonetheless evident<sup>21</sup>. Patients with dry socket, as a post-extraction complication, are very important users of healthcare services and spenders of the significant part of health budget resources.

Kako do sada u Srbiji nije bilo adekvatne procene visine rashoda, strukture troškova i usluga u zbrinjavanju pacijenata sa alveolitom, ova studija ima za cilj da analizira troškove lečenja alveolitisa posle vađenja zuba.

### ***Materijali i metode***

Istraživanje je dizajnirano kao klinička opservaciona, neinterventna studija tipa studije preseka, u kojoj će retrospektivnim pristupom biti analizirani troškovi lečenja alveolita u Zavodu za stomatologiju Kragujevac tokom 2012. godine. Istraživanje je obuhvatilo sve odrasle pacijente sa potvrđenom dijagnozom alveolitisa posle ekstrakcije zuba (engleski „dry socket“). Isključujući kriterijumi su bili nekompletna medicinska i finansijska dokumentacija, kao i započeto lečenje alveolitisa u privatnim stomatološkim ustanovama. Ukupan broj pacijenata obuhvaćenih ovom studijom bio je 455.

U studiji su praćene sledeće varijable: starost ispitanika, pol ispitanika, vreme koje prođe od intervencije do pojave alveolitisa, najučestalija vrsta zuba sa ovom komplikacijom, prosečan broj poseta jednog pacijenta sa potvrđenom dijagnozom alveolita, vid osiguranja pacijenta sa komplikacijom, lekar koji je ekstrahovao zub i lekar koji je lečio alveolitis (lekar opšte stomatološke prakse, specijalista oralne hirurgije, godine iskustva), potrošna medicinska sredstva, [upotreba brizgalica, igala, anestetika, gaza, rukavica, rendgen snimaka, fiziološkog rastvora, Alvogyl-a® (aktivne supstance: lidokain 5,00 g, eugenol 15,00 g, pomoćne supstance: maslinovo ulje, prirodna aroma nane, natrijum lauril sulfat, kalcijum karbonat, Penghawar Djambi (biljna vlakna), prečišćena voda; Septodont, Francuska)], mesto stanovanja ispitanika (ruralna ili urbana sredina), vremenski period (godišnje doba) lečenja alveolitisa, gde će se na osnovu ovih podataka dobijenih uvidom u medicinsku dokumentaciju ispitanika analizirati ukupno lečenje alveolita u 2012. godini u Zavodu za stomatologiju Kragujevac.

Svi potrebni podaci prikupljeni su uvidom u medicinsku dokumentaciju pacijenata (dnevnika rada Odeljenja oralne

As there has not been an adequate estimation of costs, cost structure and services of taking care of patients with dry socket in Serbia so far, the aim of this study was to analyze the costs of treating dry socket after tooth extraction.

### ***Materials and methods***

This research was designed as a clinical observational cross-sectional study with retrospective approach, which analyzes the costs of treating dry socket at the Institute of Dental Medicine in Kragujevac, in 2012. The research included all adult patients with confirmed diagnosis of dry socket after tooth extraction and complete medical and financial documentation. The total number of patients included in this study was 455.

The following variables were observed in the study: the age and sex of the examinees, time between tooth extraction and the occurrence of dry socket, the type of the extracted tooth, the average number of visits of the patient with the confirmed diagnosis of dry socket, the type of the insurance of the patient with the complication, the doctor who extracted the tooth and the doctor who treated dry socket (General Dental Practitioner, Specialist in Oral Surgery), as well as their years of experience, disposable medical supplies the use of nozzles, needles, anesthetics, gauzes, gloves, x-rays, saline solution, Alvogyl paste® (active ingredients: lidokain 5,00 g and 13.70 g of eugenol; other ingredients: olive oil, spearmint oil, sodium lauryl sulphate, calcium carbonate, penghawar djambi and purified water; Septodont, France)], examinees' place of residence (rural or urban area), the period of time (season) when dry socket occurred, and the total volume of costs of treating dry socket at the Institute of Dental Medicine in Kragujevac, in 2012.

All the data was gathered from medical documentation of the examinees (the log book of the Oral Surgery Department, patient's protocol, medical service cards, specialists' reports etc.), and the documentation of the Department of Plan, Analysis, Medical Statistics and Social Medicine with Informatics of the Institute of Dental Medicine. Financial parameters were presented in national currency (RSD) and

hirurgije, protokol bolesnika, zdravstvenih kartona, specijalističkih izveštaja i dr.) i dokumentaciju Odeljenja plana i analize, medicinske statistike i socijalne medicine sa informatikom Zavoda za stomatologiju Kragujevac. Finansijski parametri su iskazani u nacionalnoj valuti (RSD), koristeći pri obračunu zvanični kurs Narodne banke Srbije sredinom fiskalne 2012. godine. Detaljno su zabeleženi svi direktni troškovi lečenja (nabavka lekova, pružene usluge, potrošna medicinska sredstva) tokom fiskalne 2012. godine po pacijentu sa potvrđenom dijagnozom alveolitisa, prosečna razlika u troškovima lečenja ekstrahovanih zuba komplikovanih alveolitom, u odnosu na ekstrahovane zube bez ove komplikacije i količina i vrsta potrošenih lekova i medicinskih sredstava u terapiji alveolitisa.

Za obračun vrednosti utrošenih resursa korišćeni su važeći cenovnici Zavoda za stomatologiju Kragujevac. Cene lekova i potrošnog sintetskog materijala uzete su u skladu sa cenama koje priznaje Republički zavod za zdravstveno osiguranje Srbije (RZZO) i koje se nalaze u Pravilniku o utvrđivanju cena zdravstvenih usluga za prevenciju, preglede i lečenje bolesti usta i zuba za 2012. godinu<sup>21</sup>. Finansijski parametri iskazani su u nacionalnoj valuti (RSD), koristeći pri obračunu zvanični kurs Narodne banke Srbije sredinom fiskalne 2012. godine.<sup>22</sup>

Statistička obrada podataka je rađena uz pomoć statističkog programa SPSS 19.0 za Windows. Podaci su prvo bili obrađeni deskriptivno; za kontinuirane varijable su određene mere centralne tendencije i mere varijabiliteta, a za kategorijske varijable učestalost pojedinih kategorija. Značajnost razlika u vrednostima kontinuiranih varijabli testirana je studentovim T-testom za nezavisne uzorke (ako postoji normalna raspodela vrednosti na osnovu Kolmogorov-Smirnovljevog testa) ili Man-Vitnijevim testom (ako nema normalne raspodele), ako se ispituje razlika između dve grupe, a ukoliko je bilo više grupa, koristio se ANOVA ili Kruskal – Valisov test. Značajnost razlike u procentualnoj zastupljenosti pojedinih kategorija testiran je Hi-kvadrat testom (ili Fišerovim testom kod male učestalosti pojedinih kategorija). Za analizu međusobne korelacije parametra korišćene su metode

considered in accordance with the official exchange rate of the National Bank of Serbia in the middle of the fiscal year 2012.

A detailed record about all the direct costs of treatments were made (acquisition of medicines, medical services, disposable medical supplies) during the fiscal year 2012 per patient with the confirmed dry socket diagnosis and the average difference in costs of treating this complication, in comparison to tooth extraction without this complication, as well as the quantity and type of the medicines and medical supplies used in the treatment.

The current price list of the Institute of Dental Medicine in Kragujevac was used for the calculation of the resources used. The prices of medicines and synthetic material were in accordance with the prices acknowledged by the National Health Insurance Fund, that are listed in the Blue Code Book on pricing of health services for prevention, examination and treatments of mouth and teeth diseases in 2012<sup>21</sup>. Financial parameters were presented in national currency (RSD) and calculated according to the official exchange rate of the National Bank of Serbia, in the middle of the fiscal year 2012<sup>22</sup>.

Statistical data were analyzed using statistical program SPSS 19.0 for Windows. The data were first processed descriptively, then, the measures of central tendency and variability were determined for continuous variables, and the frequency of some categories for categorical variables. The importance of the value difference of continuous variables was tested by the Student's t-test for independent samples (if there was normal distribution of values based on Kolmogorov-Smirnov's test) or Mann-Whitney's test (if there was no normal distribution), if what was examined was the difference between two groups, and if there were more groups, ANOVA or Kruskal Wallis test were used. The significance of difference in the percentage of frequency of some categories was tested by the Chi-square test (or Fisher's test in case of small frequency of some categories). Methods of linear progression and multiple regression were used for the analysis of the parameter correlation to estimate the connection of some determinants with the total costs of treating dry socket. The value of statistical significance in all the tests was  $p < 0.05$ .

linearne regresije i korelacije i multiple regresije za procenu povezanosti pojedinih determinanti sa ukupnim troškovima lečenja alveolitisa. U svim testovima statistička značajnost određena je vrednošću  $p < 0,05$ .

## Rezultati

Od ukupno 12 652 izvađena zuba na Odeljenju oralne hirurgije Zavoda za stomatologiju Kragujevac tokom 2012. godine, ukupan broj pacijenata sa dijagnozom alveolitisa, kao jednom od najčešćih postekstrakcionih komplikacija, iznosio je 455 pacijenata. Učestalost pojave alveolitisa za 2012. godinu iznosila je 3,61%. Češće se javljao u donjoj, 68,80%, u odnosu na gornju vilicu, 31,20%, i to najčešće u predelu donjeg desnog umnjaka, 23,30%, a zatim u predelu donjeg levog umnjaka, 11,40%, donjeg desnog prvog i drugog molara, 6,40%, i gornjeg levog umnjaka, 6,40%. Učestalost kod muškaraca i žena na našem uzorku za 2012. godinu je bila jednaka, 50,10% kod ženskog, a 49,90% kod muškog pola. Prosečna starost pacijenata kod kojih se javlja alveolitis je  $47,16 \pm 16,65$  godine. Uočili smo da je vreme koje prođe od ekstrakcije zuba do ponovnog javljanja pacijenata, uzrokovano bolom u rani, različito. Najkraće vreme koje prođe od ekstrakcije zuba do ponovnog javljanja lekaru zbog alveolitisa iznosilo je jedan dan, a najduže vreme dvanaest dana, tako da prosečna vrednost i najčešći period ponovnog javljanja pacijenta uzrokovanog alveolitom iznosi tri dana. Uočili smo da su pacijenti više puta dolazili zarad iste komplikacije, od jednom (80/17,60%) do pet puta (14/3,10%), pri čemu je najčešći broj ponovnih poseta stomatologu bio tri puta (238/52,30%). Takođe je uočeno da se veća učestalost ove komplikacije javlja kod doktora stomatologije opšte prakse i to 80,70%, naspram doktora specijaliste oralne hirurgije 19,30%, koji dalje i nastavljaju lečenje ove komplikacije odgovarajućom terapijskom procedurom. U odnosu na godišnje doba, najveća učestalost je u proleće i to 304/66,80%, zatim leto, 83/18,20%, a najmanja učestalost je u jesen, 26/5,70%. Takođe, interesantno je da je znatno veća učestalost ove komplikacije kod pacijenata iz grada, 285/61,4%, u odnosu na pacijente sa sela, 173/37,70%.

## Results

From the total number of 12.652 of teeth extracted at the Oral Surgery Department, Institute of Dental Medicine in Kragujevac during 2012, the total number of patients who were diagnosed with dry socket was 455 (the incidence being 3.61%). It occurred more frequently in the mandible 68.80% in comparison to the maxilla-31.20%, in the region of mandibular right third molar - 23.30%, and mandibular left third molar - 11.40%, mandibular right first and second molar 6.40% and maxillary left third molar 6.40%. The incidence among men and women in our sample in 2012 was equal, 50.10% among women, a 49.90% among men. The average age of patients who experienced dry socket was  $47.16 \pm 16.65$ . The period of time between the tooth extraction and patient's visit to the dentist, caused by the pain in the wound, was different. The shortest period between tooth extraction and dry socket occurrence was one day, and the longest twelve days, the average time being three days. We noticed that the number of patients' visits to the doctor because of the same complication varied, from one (80/17; 60%) to five times (14/3; 10%), most frequently three times (238/52; 30%). It was also noticed that this complication was more frequent if tooth extraction was performed by general dental practitioners (80.70%) than by oral surgeons (19.30%). The highest frequency of dry socket was in spring (304/66; 80%), then summer (83/18; 20%) and the smallest in autumn (26/5; 70%). Also, it is interesting that the frequency of this complication is much higher among patients from urban (285/61; 4%) than among patients from the rural areas (173/37; 70%).

The amount of the total costs of treating dry socket in 2012 per patient was  $1.298,58 \pm 468.93$ -RSD, where  $1.065,16$  RSD  $\pm 394.49$  RSD (82.02%) was the total price of the dental service of treating dry socket, and the rest of  $233.42 \pm 72.33$  RSD (17.98%) was spent for medicines and disposable medical supplies. From the total quantity of the disposable medical supplies that were used,  $60.81 \pm 22.44$  RSD (4.68%) was spent on local anesthetics,  $24.43 \pm 9.02$

Iznos ukupnih vrednosti troškova lečenja alveolitisa za 2012. godinu po pacijentu bio je  $1\,298,58 \pm 468,93$  RSD, od toga je  $1\,065,16 \pm 394,49$  RSD (82,02%) činilo ukupnu cenu stomatološke usluge lečenja a  $233,42 \pm 72,33$  RSD (17,98%) je utrošeno za lekove i potrošna stomatološka sredstva. Od ukupno potrošenih stomatoloških sredstava po pacijentu, za lokalne anestetike utrošeno je  $60,81 \pm 22,44$  RSD (4,68%), za PVC špricave i igle  $24,43 \pm 9,02$  RSD (2,33%), za tampon gaze  $1,06 \pm 0,39$  RSD (0,08%), medicinske rukavice i maske  $44,43 \pm 16,42$  RSD (3,42%), za Alvogyl®  $65,31 \pm 24,10$  RSD (5,03%), za retroalveolarne rendgen snimke  $28,46 \pm 0,00$  RSD (2,19%), za upotrebu fiziološkog rastvora  $3,10 \pm 0,00$  RSD (0,23%).

Ukupan broj izvađenih zuba na Odeljenju oralne hirurgije Zavoda za stomatologiju Kragujevac tokom 2012. godine iznosio je 12 652, od toga, 5 683 je prošlo bez komplikacija (44,92%). Vađenje zuba sa komplikacijama bilo je 2 983 (23,58%), a hirurški izvađenih zuba bilo je 2 868 (22,67%), najzad, hirurški izvađenih impaktiranih umnjaka bilo je 1 124 (8,88%).

Na osnovu statističke obrade uočava se da nema značajne razlike u pogledu troškova u zavisnosti od pola ( $p=0,734$ ), vrste zuba ( $p=0,97$ ), gornje ili donje vilice ( $p=0,80$ ), lekara koji je lečio alveolitis ( $p=0,300$ ), lekara koji je ekstrahovao zub ( $p=0,597$ ), godišnjeg doba ( $p=0,828$ ), urbane ili ruralne sredine ( $p=0,686$ ) ( tabela 2).

RSD (2,33%) on PVC syringes and needles,  $1.06 \pm 0.39$  RSD (0,08%) on tampon gauze,  $44.43 \pm 16.42$  RSD (3,42%) on medical gloves and masks,  $65.31 \pm 24.10$  RSD (5,03%) on Alvogyl®,  $28.46 \pm 0.00$  RSD (2,19%) on retroalveolar x-rays and  $3.10 \pm 0.00$  RSD (0,23%) on the use of saline solution (Table 1).

The total number of the teeth extracted at the Oral Surgery Department, Institute of Dental Medicine in Kragujevac, in 2012 was 12.652 and 5.683 interventions went without complications (44.92%). There were 2 983 (23.58%) interventions with complications during tooth extraction; the number of surgically extracted teeth was 2 868 (22.67%) and the number of surgically extracted impacted third molars was 1 124 (8.88%).

Based on the statistical data it can be seen that there is no significant difference between the costs depending on the sex ( $p=0.734$ ), tooth type ( $p=0.97$ ), maxilla or mandible ( $p=0.80$ ), doctor who treated dry socket ( $p=0.300$ ), doctor who extracted tooth ( $p=0.597$ ), season ( $p=0.828$ ), urban or rural area ( $p=0.686$ ) (Table 2).

**Tabela 1. Evidencija troškova pruženih stomatoloških usluga i potrošnih sredstava po pacijentu****Table 1. The record of dental service and disposable supplies costs per patient**

Usluge / Services	Prosečni troškovi za godinu dana na nivou grupe (RSD) / The average costs for a period of a year on a group level (RSD)
<b>Stomatološka usluga lečenja alveolitisa - The cost of treating dry socket</b>	1065,16 ± 394,49
<b>Medicinska sredstva / Medical supplies</b>	
Lokalni anestetik / Local anesthetic	60,81 ± 22,44
PVC špric + igle / PVC syringes + needles	24,43 ± 9,02
Tampon gaza / Tampon gauze	1,06 ± 0,39
Medicinske maske i rukavice / Medical masks and gloves	44,43 ± 16,42
Fiziološki rastvor / Saline solution	3,10 ± 0,00
Alvogyl® / Alvogyl paste®	65,31 ± 24,10
RTG snimak / x-ray	28,46 ± 0,00
<b>Ukupno / Total</b>	<b>233,42 ± 72,33</b>
<b>Svega / All</b>	<b>1298,58 ± 468,93</b>

**Tabela 2. Troškovi lečenja alveolitisa u zavisnosti od karakteristika pacijenata**  
**Table 2. The costs of treating alveolitis depending on the patients' characteristics**

Karakteristika pacijenta / Patient's characteristics	Troškovi lečenja (RSD) / Treatment costs (RSD)										P vredno st / P value
Pol / Sex	Muškarci / Males					Žene / Females					0,734
	1294,87 ± 480,00					1302,28 ± 480,00					
Vrsta zuba* / Type of tooth*	17	18	26	28	36	37	38	46	47	48	0,97
	1235,21±	1365,96±	1345,11± 414,48	1370,98± 432,34	1368,70±	1230,43±	1248,88±	1238,70±	1302,37±	1374,30±	
	574,74	478,60			374,835	474,73	506,63	436,904	473,837	440,68	
Gornja i donja vilica / Maxilla and mandible	Gornja / Maxilla					Donja / Mandible					0,80
	1359,25 ± 468,82					1271,06 ± 467,13					
Doktor koji je lečio alveolitis / Dentist who treated dry socket	Specijalista / Specialist					Lekar opšte prakse / General dental practitioner					0,300
	1286,79 ± 476,42					1345,11 ± 437,46					
Doktor koji je ekstrahovao zub / Dentist who extracted the tooth	Specijalista / Specialist					Lekar opšte prakse / General dental practitioner					0,597
	1328,45 ± 449,042					1291,42 ± 473,87					
Urbana i ruralna sredina / Urban or rural areas na	Urbana sredina / Urban area					Ruralna sredina / Rural area					0,686
	1302,13 ± 452,10					1292,80 ± 496,43					
Godišnje doba / Season	Proleće / Spring		Leto / Summer			Jesen / Autumn		Zima / Winter			0,828
	1311,16±468,32		1285,32±435,61			1303,96±541,26		1230,43±499,60			

Vrsta zuba (sa najvećom učestalošću alveolitisa): 17-gornji desni drugi molar; 18-gornji desni treći molar; 26-gornji levi prvi molar; 28-gornji levi treći molar; 36-donji levi prvi molar; 37-donji levi drugi molar; 38-donji levi treći molar; 46-donji desni prvi molar; 47-donji desni drugi molar; 48-donji desni treći molar (sistem FDI-stalna denticija). Rezultati su prikazani kao srednja vrednost ± standardna devijacija..

The type of tooth (with the highest frequency of dry socket): 17-maxillary right second molar; 18-maxillary right third molar; 26-maxillary left first molar; 28-maxillary left third molar; 36-mandibular left first molar; 37-mandibular left second molar; 38-mandibular left third molar; 46-mandibular right first molar; 47-mandibular right second molar; 48-mandibular right third molar (FDI system-permanent dentition). Results are represented as middle value ± standard deviation.



## Diskusija

Do sada je mali broj studija objavljen u domaćoj i stranoj naučnoj literaturi o obimu i strukturi zdravstvenih troškova lečenja alveolitisa. Jedina studija koja se bavila ekonomskim aspektom alveolita jeste prospektivna studija na nacionalnom nivou sprovedena u Nemačkoj, u kojoj je 1990. godine ukupan finansijski teret terapije lečenja alveolitisa iznosio 18,1 miliona maraka. U ovoj studiji je pokazano da je od ukupnog broja ekstrahovanih zuba, koji je iznosio skoro tri miliona, kod 90.000 pacijenata došlo do pojave komplikacija u vidu alveolitisa (3%), što je bio značajan ekonomski gubitak i za razvijenu zemlju sa visokim standardom kakva je Nemačka, zarad samo jedne uobičajne stomatološke komplikacije<sup>18</sup>.

Sa ekonomsko-finansijske tačke gledišta, koristeći zvanični kurs Narodne banke Srbije iz 1990. godine (01.01.1990., 1 DEM = 7 RSD, 1:10 000), izračunali smo da je 18,1 milion DEM, koji je tada bio utrošen u terapiji lečenja alveolitisa na teritoriji Nemačke, iznosio 126,7 miliona RSD, ili po pacijentu 1 407,78 RSD. Interesantno je da je u Zavodu za stomatologiju Kragujevac utrošena suma za lečenje alveolitisa po pacijentu bila 1 298,58 RSD sredinom fiskalne 2012. godine, što je blisko pomenutim troškovima u Nemačkoj, koja spada u grupu visoko ekonomski razvijenih zemalja<sup>24</sup>. Pošto najveći udeo u troškovima lečenja alveolitisa u Srbiji čini nadoknada za uslugu koju pruža stomatolog, tj. vrednost rada stomatologa koju priznaje RFZO, proizilazi da je rad stomatologa veoma slično vrednovan kod nas i u razvijenim zemljama kakva je Nemačka.

RFZO formira cene usluga na način koji nije dovoljno transparentan ni za korisnike, ni za pružaoce usluga, jer kriterijumi za formiranje cena usluga nisu nigde javno objavljeni. Mi smo pokušali da preračunamo vrednost usluge na osnovu vrednosti satnice stomatologa. Ako uzmemo da pacijent sa alveolitisom u proseku dolazi tri puta i da se za njegovo lečenje utroši najviše po 10 minuta svaki put, to bi značilo da se za lečenje jednog alveolitisa potroši prosečno oko 30 minuta.

## Discussion

So far, a small number of studies have been published in national and international literature dealing with the volume and structure of costs due to dry socket treating. The only study that dealt with economic aspect of dry socket was the prospective study conducted in Germany in 1990, on the national level, and it showed that the total financial weight of therapies for treating dry socket was 18.1 million German marks. This study showed that the total number of extracted teeth was almost 3 million, and that 90.000 patients had complications in the form of dry socket (3%), which was a significant financial loss for a developed country with high standard, such as Germany, caused by an ordinary dental complication<sup>18</sup>.

From the economic and financial point of view, using the official exchange rate of the National Bank of Serbia from 1990 (1 DEM = 7 RSD), we calculated that 18.1 million German marks, used for the dry socket treating in Germany was approximately 126.7 million RSD, or 1 407.78 RSD per patient. It is interesting to mention that at the Institute of Dental Medicine in Kragujevac, during the middle of the fiscal year 2012, the sum spent for dry socket treatment per patient was 1 298.58 RSD, which is less than in Germany, a country in the group of highly-developed countries from the economic point of view<sup>24</sup>. Since the biggest part of the dry socket treatment costs in Serbia is for dentist's service, i.e. the cost of dentist's work acknowledged by the National Health Insurance Fund, it can be concluded that dentist's work is valued in a similar way, both in our country and in developed countries.

National Health Insurance Fund forms the prices of the services in a manner that is not transparent enough, neither for the users nor the providers of the service, because the criteria for pricing are not published. We tried to calculate the cost of service based on the cost of dentist's hourly work. If we suppose that a patient with dry socket comes three times on the average and that every time the treatment lasts 10 minutes at most, it would mean that treatment of a dry socket lasts about thirty minutes. Since the average salary of general dental practitioner in Serbia is 59 313 RSD, and of

Pošto je prosečna zarada stomatologa za lekara opšte prakse 59 313 RSD, a za specijalistu oralne hirurgije 71 200 RSD, a mesečno oni imaju 174 radna sata, iz ovoga proizilazi da 30 minuta rada stomatologa opšte prakse vredi 681,76 RSD, a 30 minuta rada specijaliste vredi 818,39 RSD. Dakle, stvarna vrednost rada je manja od vrednosti usluge lečenja alveolitisa koju plaća RFZO na osnovu fakturiranih usluga (1 065,16 RSD u proseku) . To znači da bi troškovi lečenja alveolitisa bili manji po RFZO ukoliko bi ta ustanova realno vrednovala usluge stomatologa. Republički fond za zdravstveno osiguranje bi trebalo da ustanovi preciznu metodologiju određivanja vrednosti usluga koje pružaju zdravstveni radnici, kako bi se izbegli nepotrebni troškovi, ili na drugoj strani, nedovoljna nadoknada za rad u slučaju da je vrednost usluge potcenjena.

Dosadašnje studije su ukazale na različitu učestalost ove komplikacije. U literaturi se godišnja incidencija alveolitisa kreće od 1-20%, i to od 1-3% u visoko ekonomski razvijenim zemljama, do 3-20% u srednje i nisko razvijenim zemljama.<sup>8,9,18</sup> U našoj studiji, učestalost alveolitisa kao postekstrakcione komplikacije iznosila je 3,6%, iz čega možemo zaključiti da je naša zemlja po učestalosti u grupi zemalja srednje i niske ekonomske razvijenosti, ali sa tendencijom da se približimo učestalosti zabeleženoj u zemaljama visoke ekonomske razvijenosti.

Nažalost, nema dovoljno publikovanih studija sa kojima bi se poredili rezultati naše studije, ali ona zato može poslužiti kao osnova za sprovođenje novih studija troškova lečenja komplikacija stomatoloških intervencija i kod nas i u drugim zemljama. Takođe, uvid u strukturu troškova lečenja alveolitisa prikazan u ovoj studiji treba da posluži fondu zdravstvenog osiguranja kao osnova za realnije određivanje cena stomatoloških usluga. Glavni nedostatak ove studije je taj što nisu uzeti u obzir i evidentirani indirektni troškovi lečenja sa stanovišta finansijera zdravstvene zaštite, s obzirom da je studija retrospektivna. Na osnovu ovog podatka, buduće studije i istraživanja na ovu temu bi trebalo da uključe i takve troškove, kako bi validnost date studije bila veća.

the oral surgeon 71 200 RSD, and they need to work 174 working hours for that salary, this leads to a conclusion that thirty minutes of a general dental practitioner's work cost 681.76 RSD, and thirty minutes of a specialist 818.39 RSD. Therefore, the actual cost is less than the amount of treating dry socket that National Health Insurance Fund pays for the service (1 065.16 RSD on the average). It means that the costs of treating dry socket should be smaller for National Health Insurance Fund, if it is valued in a more realistic manner. National Health Insurance Fund should establish a more precise methodology for pricing medical services in order to avoid unnecessary costs.

Recent studies have pointed out different incidence of this complication. The incidence of dry socket is 1%-20%, on animal level, 1%-3% in economically highly developed countries, and 3-20% in the developing countries<sup>8,9,18</sup>. In our study the incidence of dry socket was 3.6%, which is close to the incidence reported in developing countries.

Unfortunately, there are not enough published studies to compare our results with, but our study can be regarded as a basis for conducting other studies on the costs of the treatment during dental interventions, both in Serbia and in other countries. Also, the insight into the cost structure of treating dry socket shown in this study should serve to the National Health Insurance Fund as basis for a more realistic pricing of dental services. The main flaw of this study is the fact that it did not take into consideration recorded indirect treating costs from the aspect of health protection financiers, because the study is retrospective. Based on these data, future studies and researches on the topic should include such expenses as well in order to enhance their validity.

## Zaključak

Rezultati ove studije su pokazali da alveolitis kao jedna od najučestalijih postekstrakcionih komplikacija zuba relativno bezazlena sa aspekta kliničkog ishoda, predstavlja dodatni ekonomski gubitak za našu zemlju, što u eri ekonomske krize, kada smo suočeni sa manjkom sredstava za finansiranje zdravstvene zaštite i ulaganje u zdravstvo, nameće potrebu za primenom odgovarajućih preventivnih mera u cilju suzbijanja ove komplikacije, kao i za razvojem metodologije određivanja vrednosti stomatoloških usluga.

## Conclusion

The results of this study showed that dry socket, as one of relatively frequent post-extraction complications, relatively harmless in terms of clinical outcome, represents additional economic loss for Serbia, and this, in a period of economic crisis, indicates the needs for the implementation of appropriate preventive measures, with the aim of managing this complication, as well as for the development of the methodology of pricing dental services.

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