



## The Economic Burden of Selected Analgesic Drugs Prescription by Dentists in Slovakia


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### Abstract

**Objective:** To analyse economic burden of selected analgesic drugs prescription by dentists in Slovakia over a 24-month period. **Material and Methods:** In this economic burden study, the data were provided from the largest public health insurance company in Slovakia. It was analysed 23,256 prescriptions of selected analgesic drugs (Acetylsalicylic Acid, Diclofenac, Nimesulide, Tramadol and Metamizole Sodium) by dentists in Slovakia. **Results:** The highest analgesics prescription by dentists was found in Diclofenac in 2016 with 11.2% prescription increase in 2017. The significant decrease of analgesic drug prescription by dentists in 2017 was observed in Tramadol (-29.9%). The economic burden of selected analgesic drugs by patients were €33,926 in 2017 with 21.3% significant decrease of average percentage differences (APD) in Tramadol and 84.6% significant increase of APD in Metamizole sodium in 2017. Patients participated 65.5% share in payment of selected analgesic drugs and Health Insurance Company participated only 34.5% share in payment of selected analgesic drugs in 2017. It was found increase of percentage analgesic drugs prescription in Diclofenac and Nimesulide and decrease of percentage drug prescription in Metamizole sodium from 1/2016 to 12/2017. **Conclusion:** Economic burden on analgesic drugs prescribed by dentist was low per Slovak inhabitant in calculated. Diclofenac was most frequent prescribed analgesic drug with the highest economic burden. We recommend prescribing cheaper analgesic drugs with a lower economic burden and with the same effect.

**Keywords:** Costs and Cost Analysis; Cost of Illness; Drug Prescriptions.

## Introduction

Orally effective opioids, acetaminophen, acetylsalicylic acid (aspirin) and non-steroidal anti-inflammatory drugs (NSAIDs) remain the main stay of analgesic therapy of acute orofacial pain [1]. The current opioid abuse crisis highlights an urgent need for better paradigms for dental education and treatment of acute and chronic pain and addiction [2].

In the world, 69,000 people die in consequence of opioid overdose annual and 15 million population is opioid dependence [3]. 31.0% of dentists prescribe of opioids for patients 10-19y. [4]. Estimating the prevalence, incidence of opioid misuse is challenging, because of variable definitions [5]. NSAIDs and opioid analgesics are often misused as drugs [6-8]. Opioids are the most effective psychoactive substance for the pain treatment and suffering [9]. The adverse effects of opioids are drowsiness, vomiting, nausea, constipation and fatal overdoses [10]. Most opioids prescribed by dentists are associated with surgery [11]. Globally, Tramadol is most consumed opioid in Slovakia [12].

Dental pain is evaluated varied instruments: Dental Pain Questionnaire [13], Oral Health Impact Profile [14] and others. Dental pain is associated with worse socioeconomic status [15] and it is one of the most frequent dental discomforts [16].

The total economic burden of prescription opioids abuse, fatal overdose and dependence are estimated to be \$78.5 billion in USA in 2013 [17]. There is a limited number of economic burden studies analysing of analgesic drugs prescription by dentists.

The aim of this study was economic burden analyse of selected analgesic drugs prescription by dentists in Slovakia over a 24-month period.

## Material and Methods

### Study Design

In this economic burden study, the data were provided from the largest public health insurance company in Slovakia.

It was analysed 23,256 prescription of selected analgesic drugs by dentists in Slovakia. Selected drugs were: Acetylsalicylic Acid, Diclofenac, Nimesulide, Metamizole Sodium (NSAIDs) and weak opioid Tramadol.

### Statistical Analysis

The statistical analyse of proportion, average percentage differences (APD) and economic burden of selected analgesic drugs prescription by dentists was evaluated by IBM SPSS Statistics for Windows Software, version 24 (IBM Corp., Armonk, NY, USA).

The average percentage differences (APD) was calculate based on share number on equation:  $APD = n_1 * 100 / n_2 - 100$ , where,  $n_1$  is number analgesic drugs prescription in 2017 and  $n_2$  is number analgesic drugs prescription in 2016.

## Results

The selected analgesic drugs prescription by dentists in Slovakia and APD, 2016-2017 can be seen in the Table 1. The highest analgesic drug prescription by dentists was found in Diclofenac in 2016 with 11.2% prescription increase in 2017. The significant decrease of analgesic drug prescription by dentists in 2017 was observed in Tramadol (-29.9%).

**Table 1. The selected analgesic drugs prescription by dentists in Slovakia and average percentage differences, 2016-2017 (n=23,256).**

Selected Analgesic Drugs	2016		2017		APD <sup>1</sup> (%)
	N	%	N	%	
Acetylsalicylic Acid	115	1.0	94	0.8	-18.3
Diclofenac	5,289	46.0	5,882	50.8	11.2
Nimesulide	2,361	20.5	2,557	22.1	8.3
Tramadol	418	3.6	293	2.5	-29.9*
Metamizole Sodium	3,317	28.8	2,930	25.3	-11.7

<sup>1</sup>Average percentage differences; \*p<0.05.

The economic burden of selected analgesic drugs prescription by dentists in Slovakia according to payment by patients, payment by health insurance company and APD, 2016-2017 can be seen in the Table 2.

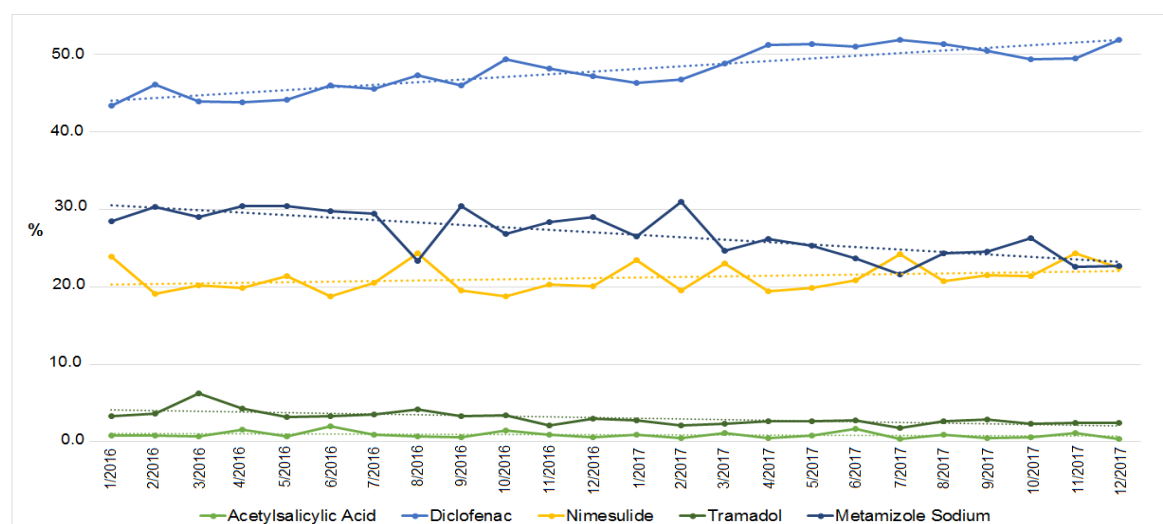
**Table 2. The economic burden of selected analgesic drugs prescription by dentists in Slovakia according to payment by patients, payment by health insurance company and average percentage differences, 2016-2017 (n=23,256).**

Selected Analgesic Drugs	2016 (€)	2017 (€)	APD <sup>1</sup> (%)	2016 (€)	2017 (€)	APD <sup>1</sup> (%)
	Payment by Patients			Payment by Health Insurance Company		
Acetylsalicylic Acid	207	196	-5.1	331	221	-33.3*
Diclofenac	18,824	20,801	10.5	5,552	6,274	13.0
Nimesulide	7,749	8,876	14.5	2,955	3,301	11.7
Tramadol	442	348	-21.3*	4,188	2,757	-34.2*
Metamizole Sodium	2,007	3,705	84.6*	8,343	5,309	-36.4*

<sup>1</sup>Average percentage differences; \*p<0.05.

The economic burden of selected analgesic drugs by patients were €33,926 in 2017 with 21.3% significant decrease of APD in Tramadol and 84.6% significant increase of APD in Metamizole sodium in 2017. The economic burden of selected analgesic drugs by health insurance company were €17,862 in 2017 with significant decrease of APD in Acetylsalicylic acid (-33.3%), Tramadol (-34.2%) and Metamizole sodium (-36.4%) in 2017. Patients participated 65.5% share in payment of selected opioids and health insurance company participated only 34.5% share in payment of selected analgesic drugs in 2017.

It was found increase of percentage analgesic drugs prescription in Diclofenac and Nimesulide and decrease of percentage opioids prescription in Metamizole sodium from 1/2016 to 12/2017 (Figure 1).



**Figure 1. The percentage of selected analgesic drugs prescription by dentists in Slovakia from 1/2016 to 12/2017 (n=23,256).**

## Discussion

Acetylsalicylic acid (aspirin) is one from the analysed analgesic drugs which is available as over-the-counter (OTC) drug (without prescribing by a doctor) in Slovakia. All specialized doctors prescribed 1,561,486 packages (0.29 package per capita) of acetylsalicylic acid and without prescribing by a doctor it was bought 1,234,267 packs (0.23 package per capita) in Slovakia in 2017 [18]. In our study, acetylsalicylic acid was prescribed only 94 packages by dentists. It can be partly explained that acetylsalicylic acid is often self-medicated with OTC drugs in Slovakia and lower use compared with that the newer NSAIDs in clinical practice in patients suffering from dental pain.

Diclofenac was prescribed 524,644 packages by all specialized doctors (0.10 package per capita) in Slovakia in 2017 [18]. The highest analgesics prescription with the highest price of one pack (payment by patients: €3.54 per package) was found in Diclofenac by dentists. It can be partly explained that diclofenac is a well-proven and commonly prescribed analgesic drug with anti-inflammatory and antipyretic properties and extensive research shows that the diclofenac pharmacological activity includes action novel mechanisms [19].

In a previous study it was found association between increased risk of liver toxicity and Nimesulide [20] nevertheless in our study it was observed high Nimesulide prescription (22.1%) with high price of one pack (payment by patients: €3.47 per pack) by dentists in 2017.

In economic burden study [21] which analysed selected opioids prescribed by dentists in Brazil, it was found that expenditure share of Tramadol prescribed by dentist was 12.4%. These results are not corresponding with our study where expenditure share of Tramadol prescribed by dentist was 6.0% in 2017. It can be explained different demographic and cultural factors in pain therapy what it was confirmed in a previous study [22].

It was observed the highest the average percentage differences of payment by patients in Metamizole sodium, in spite of the decrease average percentage differences of payment by health insurance company in Metamizole sodium in 2017.

## Conclusion

Economic burden on selected analgesic drugs prescribed by dentists was low per Slovak inhabitant in calculated. Diclofenac was most frequent prescribed analgesic drug with the highest economic burden. We recommend prescribing cheaper analgesics with a lower economic burden and with the same therapeutic effect.

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**Conflict of Interest:** The authors declare no conflicts of interest.

## References

- [1] Dionne RA, Gordon SM. Changing paradigms for acute dental pain: Prevention is better than PRN. *J Calif Dent Assoc* 2015; 43(11):655-62.
- [2] Shaefer J, Barreveld AM, Arnstein P, Kulich RJ. Interprofessional education for the dentist in managing acute and chronic pain. *Dent Clin North Am* 2016; (4):825-42. <https://doi.org/10.1016/j.cden.2016.05.003>
- [3] World Health Organization. Management of substance abuse. Information sheet on opioid overdose. Geneva: WHO, 2014. Available from: [http://www.who.int/substance\\_abuse/information-sheet/en/](http://www.who.int/substance_abuse/information-sheet/en/). [Accessed 20 January 2018].
- [4] Bree R. Dental guideline on prescribing opioids for acute pain management. Olympia: AMDG, 2017. Available from: [http://www.agencymeddirectors.wa.gov/Files/20171026/FINALDentalOpioidRecommendations\\_Web.pdf](http://www.agencymeddirectors.wa.gov/Files/20171026/FINALDentalOpioidRecommendations_Web.pdf). [Accessed 20 January 2018].
- [5] Strassels SA. Economic Burden of Prescription Opioid Misuse and Abuse. *J Manag Care Pharm* 2009; 15(7):556-62. <https://doi.org/10.18553/jmcp.2009.15.7.556>
- [6] Corelli RL. Therapeutic and Toxic Potential of Over-the-Counter Agents. In: Katzung BG, Masters SB, Trevor AJ. *Basic and Clinical Pharmacology Twelfth*. New York: McGraw Hill; 2012. p.1115-1124.
- [7] Rang HP, Dale MM, Ritter JM, Flower RJ, Henderson G. *Rang and Dale's Pharmacology*. 7<sup>th</sup>. ed. London: Elsevier Churchill Livingstone; 2012.
- [8] Peter RM, Patel S, Swift RM. Pharmacology of Drug Abuse. In: Golan DE, Tashjian AH Jr., Armstrong EJ, Armstrong AE. *Principles of Pharmacology. The Pathophysiologic Basis of Drug Therapy*. 3<sup>rd</sup>. ed. Philadelphia: Lippincott William and Wilkins; 2012. p. 284-309.
- [9] Rosenblum A, Marsch LA, Joseph H, Portenoy RK. Opioids and the treatment of chronic pain: Controversies, current status, and future directions. *Exp Clin Psychopharmacol* 2008; 16(5):405-16. <https://doi.org/10.1037/a0013628>
- [10] Moeller J, Farmer J, Quiñonez C. Patterns of analgesic use to relieve tooth pain among residents in British Columbia, Canada. *PLoS One* 2017; 12(5):e0176125. <https://doi.org/10.1371/journal.pone.0176125>
- [11] Gupta N, Vujicic M, Blatz A. Opioid prescribing practices from 2010 through 2015 among dentists in the United States: What do claims data tell us? *J Am Dent Assoc* 2018; 149(4):237-245.e6. <https://doi.org/10.1016/j.adaj.2018.01.005>
- [12] Hudec R, Bozekova L, Foltan V, Tisonova J, Kriska M. 5 most consumed opioid analgesics in Slovakia in the year 2006-comparison to five other countries (Finland, Norway, Denmark, Spain, Australia). *Bratisl Med J* 2009; 110(5):316-8.
- [13] Ferreira AMB, Colares V. Validation of the Brazilian version of the Fear of Dental Pain Questionnaire - Short Form (S-FDPQ). *Pesqui Bras Odontopediatria Clin Integr* 2011; 11(2):275-279. <https://doi.org/10.4034/PBOCI.2011.112.20> [Article in Portuguese]
- [14] Rocha EKTG, Vanderlei AD, Ribeiro CMB, Lima ALO, Santos AF, Filho EMT. Impact of tooth loss on quality of life. *Pesqui Bras Odontopediatria Clin Integr* 2016; 16(1):69-78. <https://doi.org/10.4034/PBOCI.2016.161.08>

- [15] Hack-Comunello SM, Michel-Crosato E, Biazevic MGH, Crosato E. Dental pain and socioeconomic conditions: A census study among schoolchildren. *Pesqui Bras Odontopediatria Clin Integr* 2008; 8(1):63-67. <https://doi.org/10.4034/1519.0501.2008.0081.0012>
- [16] Rodrigues LV, Moreira MSC, Oliveira CR, Medeiros JJ, Neto EAL, Valença AMG. Factors associated with toothache in patients affected by hereditary coagulopathies. *Pesqui Bras Odontopediatria Clin Integr* 2017; 17(1):e3699. <https://doi.org/10.4034/PBOCI.2017.171.37>
- [17] Florence C, Luo F, Xu L, Zhou C. The economic burden of prescription opioid overdose, abuse and dependence in the United States, 2013. *Med Care* 2016; 54(10):901-6. <https://doi.org/10.1097/MLR.0000000000000625>
- [18] National Health Information Center. Consumption of Human Medicines and Health Care in 2017 (in Slovak). Bratislava: NHIC, 2018. Available from: <http://www.nczisk.sk/Aktuality/Pages/Spotreba-humannych-liekov-a-zdravotnickych-pomocok-v-SR-2017.aspx>. [Accessed 20 June 2018]
- [19] Gan TJ. Diclofenac: An update on its mechanism of action and safety profile. *Curr Med Res Opin* 2010; 26(7):1715-31. <https://doi.org/10.1185/03007995.2010.486301>
- [20] Cazacu I, Mogosan C, Loghin F. Safety issues of current analgesics: An update. *Clujul Med* 2015; 88(2):128-36. <https://doi.org/10.15386/cjmed-413>
- [21] Nogueira TE, Lino PA, Martins MAP, Silva MES, Leles CR, Abreu MHNG. The economic burden of opioid prescription by dentists: A 12-month survey of consumer expenditure in Brazil. *J Public Health Dent* 2017; 77(4):285-9. <https://doi.org/10.1111/jphd.12231>
- [22] O'Callaghan JP. Evolution of a rational use of opioids in chronic pain. *Eur J Pain* 2001; 5(Suppl A):21-6.