

Evaluation of local anesthesia knowledge levels of specialist/PhD dentists in Türkiye

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ABSTRACT

Aims: This study aims to evaluate the knowledge levels of specialist/PhD dentists about local anesthetic agents, application techniques, and complications related to local anesthesia.

Methods: An electronic survey was distributed to specialized/PhD dentists employed in 8 different departments of dentistry. The survey consisted of 25 questions about knowledge of local anesthesia. Knowledge level was determined based on the number of correct answers. In the statistical evaluation, descriptive statistics for continuous variables were reported as mean, standard deviation, median, minimum, and maximum values. Categorical variables were expressed as frequency and percentage. For continuous variables, the data was assessed using the Shapiro-Wilk test. For independent group comparisons involving more than two groups, the Kruskal-Wallis variance analysis test was employed. In subgroup comparisons, the Bonferroni-adjusted Mann-Whitney U test was utilized. For comparisons between two independent groups, the Mann-Whitney U test was applied. The statistical significance level was set at 0.05.

Results: This study involved 200 participants, comprising 35.5% males and 64.5% females, with an average age of 35.91 years. Participants were categorized based on their years of service, with the majority having 5-10 years of experience. A significant portion (60.5%) had received specialized training, and 87.0% were employed in the public sector. Knowledge levels regarding local anesthesia varied among different dental specialties, with oral and maxillofacial surgery showing the highest proficiency. While no significant differences in knowledge were found based on gender, years of experience, or educational degree, a notable distinction emerged among those with PhDs or specializations, particularly favoring oral and maxillofacial surgery. Conversely, prosthodontics specialists exhibited lower knowledge levels compared to several other fields.

Conclusion: Dentists' knowledge of local anesthesia varies across specialty/PhD fields, with oral and maxillofacial surgeons having the highest scores and Prosthodontists having the lowest, highlighting the need for continuous training.

Keywords: Local anesthesia, knowledge, survey, specialization, PhD

INTRODUCTION

Local anesthesia is defined as the temporary loss of sensation in a specific area of the body by suppressing the stimulation in the nerve endings or by blocking the conduction process in peripheral nerves.^{1,2} Local anesthesia can be provided by several mechanisms, including electrical nerve stimulation, cryotherapy, and low-level laser, in addition to traditional local anesthetic drugs.³ The most common method for pain management in dental practice is the use of reversible local anesthetic agents.⁴

Local anesthesia in dentistry is usually applied topically or by injection.⁵ Topical anesthetics are agents that block the conduction of nerve impulses in superficial nerves, causing a loss of sensation in the mucosa or skin. They are available in various forms, such as spray, cream, and gel, and are

recommended for use in mild clinical conditions, including aphthous ulcer treatment and reducing needle pain during injection.⁶ Injectable local anesthetics are divided into amide and ester groups based on their chemical structures, enabling many dental procedures, such as tooth extraction, pulp treatments, restorative procedures, periodontal and surgical interventions, to be performed safely and comfortably (Table 1).^{7,8} However, other components, such as vasoconstrictors found in the local anesthetic solutions, are of great importance during local anesthetic application.⁹ Vasoconstrictors such as epinephrine cause constriction in the surrounding vascular structures, limiting the absorption of the local anesthetic agent into the bloodstream and thus prolonging its duration of action.¹⁰ When calculating the maximum dose for medically

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compromised patients and children, factors such as age and weight, as well as the vasoconstrictor content of the anesthetic solution, should be considered. Repeated injections after inadequate anesthesia may cause neurological and cardiac complaints due to local drug concentration reaching high levels in a short time.¹¹

Table 1. Classification of local anesthetic agents based on chemical structure

Ester group	Amide group
Cocaine	Lidocaine
Chloroprocaine	Mepivacaine
Procaine	Prilocaine
Tetracaine	Bupivacaine
Benzocaine	Etidocaine
	Articaine

Local anesthetics are safe and effective drugs, but they can cause several local and systemic complications that dentists should be aware of.¹² Local complications include paresthesia, pain, trismus, infection, and ocular complications such as double vision or temporary blindness. Rare systemic complications, including allergic reactions, systemic toxicity, and methemoglobinemia, may lead to life-threatening conditions.¹³⁻¹⁵

Recently available local anesthetic agents and anesthesia delivery equipment provide dentists with numerous options to manage pain associated with dental procedures effectively.¹⁶ To achieve successful local anesthesia, the dentist should possess precise knowledge of the drugs, relevant neuroanatomy, anesthesia techniques, and equipment, as well as the ability to diagnose and treat possible complications promptly.¹⁷

This study aims to evaluate the knowledge levels of specialist/PhD dentists about local anesthetic agents, application techniques, and complications related to local anesthesia. Thus, if there are any deficiencies in the local anesthesia knowledge level of specialist/PhD dentists, this will contribute to the studies on eliminating these deficiencies. The hypothesis of this study is that there is no difference in the level of local anesthesia knowledge among specialist/PhD dentists.

METHODS

The study protocol was approved by the Non-interventional Researches Ethics Committee of Tekirdağ Namık Kemal University (Date: 28.01.2025, Decision No: 2025.21.01.21). Throughout the study, ethical standards for research and publication were strictly followed. Participants completed the research surveys between March 1, 2025, and March 14, 2025. All procedures were carried out in accordance with the ethical rules and the principles of the Declaration of Helsinki.

This study was conducted through electronically distributed surveys targeting dentists actively practicing in clinics affiliated with public or private universities, as well as in public or private oral and dental health centers and hospitals within our country. Participants were required to have completed a PhD or specialization training in various dental disciplines. Dentists who did not possess a PhD or specialization, or

those who were not treating patients at the time of the survey, were excluded from the study. Data were collected through responses to a survey (Google Forms) accessed via an email link. The survey began with a statement outlining the purpose of the study and a question asking whether participants agreed to participate. Participants who responded to this question and completed the survey were considered to have provided voluntary informed consent.

A power analysis was conducted to determine the appropriate sample size. It was found that with an alpha level of 0.05 and a power set at 80%, a small effect size (effect size=0.20) requires a sample size of 368, while a medium effect size (effect size=0.50) requires 72 participants.¹⁸ In this study, eight groups were utilized: group 1 (oral and maxillofacial surgery), group 2 (oral and maxillofacial radiology), group 3 (endodontics), group 4 (orthodontics), group 5 (pedodontics), group 6 (periodontology), group 7 (prosthodontics), and group 8 (restorative dentistry). Consequently, the sample size for the eight groups was accepted as 200, corresponding to an effect size of 0.27 (n=25). A total of 200 individuals participated, with 25 participants from each group. The completed questionnaires collected demographic information, including age, gender, education level, work experience, and training status, as well as responses to 25 questions assessing knowledge of local anesthesia. The survey questions were selected from the questions already prepared by the authors of the textbook written by Koçak et al.¹⁹

Knowledge level evaluations were determined based on the number of correct answers given by individuals in the surveys. The classifications were as follows: weak (fewer than 13 correct answers out of 25 questions), moderate (13-18 correct answers out of 25 questions), and good (more than 18 correct answers out of 25 questions).

Statistical Analysis

In this study, the level of knowledge was examined as the primary characteristic. Due to the nature of online surveys, where questions and answers are predetermined and survey data is not recorded in the system when responses are missing, there was no loss of respondents. For the emphasized characteristics, descriptive statistics for continuous variables were reported as mean, standard deviation, median, minimum, and maximum values. Categorical variables were expressed as frequency and percentage. For continuous variables, the normality of the data was assessed using the Shapiro-Wilk test. Since normality was not met for independent group comparisons involving more than two groups based on categorical variables, the Kruskal-Wallis variance analysis test was employed. In subgroup comparisons, the Bonferroni-adjusted Mann-Whitney U test was utilized. For comparisons between two independent groups, the Mann-Whitney U test was applied. The statistical significance level was set at 0.05, and the computations were performed using the SPSS statistical Software package (version 21).

RESULTS

Among the 200 individuals who participated in the study, 71 (35.5%) were male and 129 (64.5%) were female, with an

average age of 35.91±6.20 years. Each group consisted of 25 individuals. When evaluated according to their years of service, the proportions of participants with 0-2 years, 3-4 years, 5-10 years, 11-15 years, and more than 16 years of service were 21.0%, 23.0%, 32.0%, 14.5%, and 9.5%, respectively. Additionally, 60.5% of the survey participants had received specialized training, and 87.0% were employed in the public sector (**Table 2**).

Table 2. Descriptive statics		
Age	Mean±SD	35.91±6.20
	Median	35.00
	Min-max	27-58
Frequency (%)		
Gender	Male	71 (35.50)
	Female	129 (64.50)
Education	PhD	79 (39.50)
	Specialty	121 (60.50)
Area of PhD/specialty	Oral and maxillofacial surgery	25 (12.5)
	Oral and maxillofacial radiology	25 (12.5)
	Endodontics	25 (12.5)
	Orthodontics	25 (12.5)
	Pedodontics	25 (12.5)
	Periodontology	25 (12.5)
	Prosthodontics	25 (12.5)
	Restorative dentistry	25 (12.5)
	0-2	42 (21.00)
	3-4	46 (23.00)
Work experience (years)	5-10	64 (32.00)
	11-15	29 (14.50)
	16+	19 (9.50)
Workplace	Public employee	174 (87.00)
	Private practice	26 (13.00)

SD: Standard deviation, %: percent, Min: Minimum, Max: Maximum

When evaluating the responses of the groups examined in the study, the following groups demonstrated a good level of knowledge regarding local anesthesia: oral and maxillofacial surgery (24 individuals), pedodontics (19 individuals), orthodontics (16 individuals), oral and maxillofacial radiology (15 individuals), restorative dentistry (15 individuals), periodontology (14 individuals), endodontics (13 individuals), and prosthodontics (9 individuals). While individuals with medium level of local anesthesia knowledge were present in all groups, those with a weak level of local anesthesia knowledge were found only in the prosthodontics (4 individuals) and orthodontics (1 individual) groups (**Table 3**). The most frequently incorrect response given by the participants (81.5%) was to the question about the vitamin that plays the most significant role in repairing nerve damage whereas the question that 99% of the participants answered correctly, was about the branches of the cranial nerve anesthetized for pain control in the oral cavity and facial region.

Table 3. The groups' levels of knowledge regarding local anesthesia			
Area of PhD/specialty	Number of participants		
	Good (%)	Medium (%)	Weak (%)
Oral and maxillofacial surgery	24 (96)	1 (4)	0 (0)
Oral and maxillofacial radiology	15 (60)	10 (40)	0 (0)
Endodontics	13 (52)	12 (48)	0 (0)
Orthodontics	16 (64)	8 (32)	1 (4)
Pedodontics	19 (76)	6 (24)	0 (0)
Periodontology	14 (56)	11 (44)	0 (0)
Prosthodontics	9 (36)	12 (48)	4 (16)
Restorative dentistry	15 (60)	10 (40)	0 (0)

Weak: Less than 13 correct answers out of 25 questions, Medium: 13-18 correct answers out of 25 questions, Good: More than 18 correct answers out of 25 questions, %: percent

There was no significant difference in the evaluation of knowledge levels regarding local anesthesia among the study participants based on gender, years of work experience, or educational degree ($p>0.05$). However, when assessing the knowledge levels of local anesthesia among individuals according to their PhD or specialization fields, a significant difference was observed ($p=0.000$) (**Table 4**). Specifically, participants with a PhD or specialization in oral and maxillofacial surgery demonstrated higher levels of knowledge in local anesthesia compared to those in the fields of endodontics, orthodontics, periodontology, prosthodontics, and restorative dentistry. Furthermore, individuals with a PhD or specialization in prosthodontics exhibited lower levels of knowledge about local anesthesia compared to those in the fields of oral and maxillofacial radiology, pedodontics, periodontology, and restorative dentistry.

DISCUSSION

In this survey-based, cross-sectional study, the knowledge levels of dentists from different fields regarding local anesthetics were measured. The survey was distributed through online channels and via email. When the level of knowledge among the fields of specialization was evaluated, the dentists in the field of oral and maxillofacial surgery were found to be statistically significantly more successful with more correct answers compared to other fields (21.68±1.95). These results indicate that the level of knowledge of Oral and maxillofacial surgeons regarding nerve anatomy, local anesthetic agents, and pain control is higher compared to other fields. On the other hand, prosthodontists showed significantly lower success rates compared to other fields (16.24±4.06). Similarly Tadin et al.¹⁷ reported that a higher knowledge level was associated with specialization in oral surgery while a lack of confidence in using various local anesthetic techniques was also associated with specialization in orthodontics. It was also indicated that the knowledge level of local anesthesia were higher in females.¹⁷ In our study there were no significant difference between participants regarding to gender and years of work experience. In consistent with our results Bani-Hani et al.²⁰ demonstarated that gender and level of experience did not significantly influence specialists' practice or their knowledge of local anesthesia.

Table 4. Comparison of the total number of correct answers in the level of knowledge about local anesthesia according to gender, years of work experience, educational degree, and position

		Number of participants	Mean level of knowledge $\pm$ SD (n)	Min-max (n)	Median (n)	p
Gender	Male	71	18.80 $\pm$ 3.60	6-25	19.00	0.849
	Female	129	19.02 $\pm$ 2.70	11-24	19.00	
Work experience (years)	0-2	42	18.52 $\pm$ 2.82	12-24	19.00	0.523
	3-4	46	19.24 $\pm$ 3.20	6-24	19.50	
	5-10	64	19.33 $\pm$ 2.95	11-24	20.00	
	11-15	29	18.66 $\pm$ 3.06	11-25	19.00	
	16+	19	18.26 $\pm$ 3.44	12-23	20.00	
Education	PhD	79	18.39 $\pm$ 3.68	6-24	19.00	0.141
	Specialty	121	19.30 $\pm$ 2.49	13-25	20.00	
	Oral and maxillofacial surgery	25	21.68 $\pm$ 1.95	17-25	22.00	
	Oral and maxillofacial radiology	25	19.56 $\pm$ 2.63 ^{al}	15-24	19.00	
Area of PhD/ specialty	Endodontics	25	18.48 $\pm$ 2.00 ^{al}	14-23	19.00	0.000
	Orthodontics	25	18.52 $\pm$ 3.29 ^{bl}	12-24	19.00	
	Pedodontics	25	19.48 $\pm$ 2.08 ^{cl,gl}	16-24	20.00	
	Periodontology	25	18.76 $\pm$ 2.65 ^{hl}	14-24	19.00	
	Prosthodontics	25	16.24 $\pm$ 4.06 ^{dl}	6-23	16.00	
	Restorative dentistry	25	18.80 $\pm$ 2.61 ^{el,il}	13-23	19.00	

^a Oral and maxillofacial surgery-endodontics, ^b Oral and maxillofacial surgery-orthodontics, ^c Oral and maxillofacial surgery-pedodontics, ^d Oral and maxillofacial surgery-prosthodontics, ^e Oral and maxillofacial surgery-restorative dentistry, ^f Prosthodontics-oral and maxillofacial radiology, ^g Prosthodontics-pedodontics, ^h Prosthodontics-periodontology, ⁱ Prosthodontics-Restorative dentistry, ^p <0.05, SD: Standard deviation, n: Number of correctly answered questions, Min: Minimum, Max: Maximum

In the recent study the highest number of incorrect answers to the question about treating the nerve damage occurred as a complication of local anesthesia may be attributed to a decline in dentists' knowledge, as vitamin B complex is commonly prescribed for cases of paresthesia. However, it was found that participants answered the fundamental knowledge question related to the anesthesia applied to the branches of the N. Trigemini for pain management during dental procedures correctly at a high rate. Accordingly, the need for different levels of anesthesia in the daily clinical practice of physicians in different fields may have ensured the continuity of the theoretical knowledge they acquired. Additionally, it is thought that these differences may also stem from the variations in course content provided during specialization/ PhD training. There is no standard regarding the content of courses offered in PhD and specialization programs at universities in the specialized fields of dentistry. Therefore, it is not possible to directly attribute the intergroup differences to the educational content. However, it is recommended to update the training programs for dentists in the field of Prosthodontics and to place greater emphasis on topics such as nerve anatomy, local anesthetic knowledge, and pain control. Additionally, organizing interactive training programs that encourage the sharing of knowledge and experience among dentists working in this field may be beneficial.

In this study, a weak level of knowledge was detected among all participating dentists, with a rate of 2.5%. Although this rate is low, it is unacceptable because it includes the application of local anesthesia, which is a fundamental practice for human health. As suggested by Kaira and Dabral,¹¹ it is recommended that dentists receive further education and keep their knowledge up to date in critical applications.

In this study, the correct answer rate of all participants to the knowledge questions was 75.7%. In a study evaluating the knowledge level of physician research assistants regarding local anesthetics and their toxicity, the correct answer rate among participants was reported as 74.4%, similar to the rate observed in this study.¹⁵ In another study evaluating the knowledge level of dentists regarding safe local anesthetic practices, the correct answer rate was reported to be 40.4%.²¹ The reason for the lower correct answer rate compared to the rate reported in this study may be that more topic-specific questions were asked about local anesthetic systemic toxicity (LAST).

In a study examining the level of knowledge regarding local anesthetic doses, a comparison was made between specialists and dentists; however, the level of knowledge across different specialties was not compared.¹¹ To the authors' knowledge, no study in the current literature has evaluated the differences in general knowledge level of local anesthesia among the specialties of dentistry. Future studies should concentrate on assessing the knowledge and practice levels of dentists across various specialties. This approach is expected to contribute to the development of postgraduate education programs and enhance treatment success rates.

According to the results of this study, the hypothesis that there is no difference in the level of local anesthesia knowledge among specialist/PhD dentists was rejected because a difference was detected between the groups.

Limitations

There are a few issues regarding the limitations of the present study. The surveys were not conducted face-to-face and distributing the survey solely through online channels and

e-mail may have led to sampling bias due to the exclusion of professionals who do not use these platforms. In addition, a relatively small sample size could limit the extent of our findings to be extrapolated in a larger population.

CONCLUSION

There are notable differences in the knowledge of local anesthesia among dentists across various specialty/PhD fields. Oral and maxillofacial surgeons achieved the highest scores, while prosthodontists obtained the lowest scores. Although the percentage of weak level of knowledge is low (2.5%), this is unacceptable because it includes the application of local anesthesia, a critical practice in dental health. Therefore, graduate dentists should be provided with online training through associations/unions or face-to-face training at congresses/symposiums to ensure they keep their knowledge up-to-date. Studies involving more participants are recommended.

ETHICAL DECLARATIONS

Ethics Committee Approval

The study protocol was approved by the Non-Interventional Researches Ethics Committee of Tekirdağ Namık Kemal University (Date: 28.01.2025, Decision No: 2025.21.01.21).

Informed Consent

All patients signed and free and informed consent form.

Referee Evaluation Process

Externally peer-reviewed.

Conflict of Interest Statement

The authors have no conflicts of interest to declare.

Financial Disclosure

The authors declared that this study has received no financial support.

Author Contributions

All of the authors declare that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.

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REFERENCES

- Ogle OE, Mahjoubi G. Local anesthesia: agents, techniques, and complications. *Dental Clinics*. 2012;56(1):133-148. doi:10.1016/j.cden.2011.08.003
- Ghafoor H, Haroon S, Atique S, et al. Neurological complications of local anesthesia in dentistry: a review. *Cureus*. 2023;15(12):e50790. doi:10.7759/cureus.50790
- Patel BJ, Surana P, Patel KJ, Patel B. Recent advances in local anesthesia: a review of literature. *Cureus*. 2023;15(3):e36291. doi:10.7759/cureus.36291
- Bahl R. Local anesthesia in dentistry. *Anesth Prog*. 2004;51(4):138-142.
- Pahade A, Bajaj P, Shirbhate U, John HA. Recent modalities in pain control and local anesthesia in dentistry: a narrative review. *Cureus*. 2023;15(11):e48428. doi:10.7759/cureus.48428
- Franz-Montan M, Ribeiro LNDM, Volpato MC, et al. Recent advances and perspectives in topical oral anesthesia. *Expert Opinion on Drug Delivery*. 2016;14(5):673-684. doi:10.1080/17425247.2016.1227784
- Haas DA. An update on local anesthetics in dentistry. *J-Canadian Dent Assoc*. 2002;68(9):546-552.
- Hawkins JM, Moore PA. Local anesthesia: advances in agents and techniques. *Dent Clin*. 2002;46(4):719-732. doi:10.1016/s0011-8532(02)00020-4
- Decloux D, Ouanounou A. Local anaesthesia in dentistry: a review. *Int Dent J*. 2021;71(2):87-95. doi:10.1111/idj.12615
- Pinheiro AC, Marques JF, Vieira MS, Branco-De-Almeida LS. Dentists' knowledge regarding signs and symptoms of the systemic toxicity of local anesthetic solutions. *RGO-Rev Gaúch Odontol*. 2015;63:41-46. doi:10.1590/1981-863720150001000062962
- Kaira LS, Dabral E. A survey to access knowledge and practice among dentists regarding local anesthetic dosage in three cities of Uttarakhand. *Eur J Gen Dent*. 2014;3:105-108. doi:10.4103/2278-9626.134832
- Cummings DR, Yamashita DDR, McAndrews JP. Complications of local anesthesia used in oral and maxillofacial surgery. *Oral Maxillofac Surg Clin North Am*. 2011;23(3):369-377. doi:10.1016/j.coms.2011.04.009
- Ho JPT, Van Riet TC, Afrian Y, et al. Adverse effects following dental local anesthesia: a literature review. *J Dent Anesth Pain Med*. 2021;21(6):507-525. doi:10.17245/jdapm.2021.21.6.507
- Mangal SK, Ravindra V. Knowledge and awareness on administration of local anesthesia and its various complications faced by undergraduate and postgraduate dental students-a cross-sectional study. *JETT*. 2022;13(6):103-115. doi:10.47750/jett.2022.13.06.011
- Karasu D, Yılmaz C, Özgünay ŞE, Dayıoğlu M, Baytar Ç, Korfaı G. Knowledge of the research assistants regarding local anaesthetics and toxicity. *Turk J Anaesthesiol Reanim*. 2016;44:201-205. doi:10.5152/TJAR.2016.53138
- Saxena P, Gupta SK, Newaskar V, Chandra A. Advances in dental local anesthesia techniques and devices: an update. *Natl J Maxillofac Surg*. 2013;4:19-24. doi:10.4103/0975-5950.117873
- Tadin A, Aleric K, Jerkovic D, Gavic L. Knowledge, practice and self-reported confidence level of croatian dentists in the use of local anesthesia: a cross-sectional study. *Healthcare*. 2023;11(14):2006. doi:10.3390/healthcare11142006
- Cohen J. Statistical power analysis for the behavioral sciences (2nd ed.). Routledge; 1988. doi:10.4324/9780203771587
- Koçak Berberoğlu H, Gürkan Köseoğlu B, Kasapoğlu Ç. Diş Hekimliğinde lokal anestezi. *Quintessence*; 2007.
- Bani-Hani T, Al-Fodeh R, Tabnjh A, Leith R. The use of local anesthesia in pediatric dentistry: a survey of specialists' current practices in children and attitudes in relation to articaine. *Int J Dent*. 2024;2024:2468502. doi:10.1155/2024/2468502
- Bassiyoni L, Alshehri M, Sindi M, Elias A, Nassar A. Dental practitioners' knowledge, behavior, and attitude toward safe local anesthesia practice in Jeddah. *J Complement Med Res*. 2022;13:9-15. doi:10.5455/jcmr.2022.13.05.02