

DİŞ HEKİMLERİNİN DİŞ ÇIKARMA JELLERİ İLE İLGİLİ YAKLAŞIMLARI VE BİLGİ DÜZEYLERİ

THE DENTISTS' ATTITUDES AND KNOWLEDGE LEVEL ABOUT TEETHING GELS

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ÖZET

AMAÇ: Çalışmanın amacı, bir grup Türk diş hekiminin diş çıkarma jelleri konusundaki yaklaşımlarını ve bilgi düzeylerini değerlendirmektir.

GEREÇ VE YÖNTEM: Bu kesitsel çalışma için, iletişim bilgilerine ulaşılabilen diş hekimlerine (n=1829) üç bölüm ve yirmi sorudan oluşan bir anket gönderilmiştir. Reçete edilen her diş çıkarma jelinin içeriği, dozu ve yan etkileri için ayrı kategoriler oluşturulmuştur. Reçete edilen tüm jeller dikkate alınarak, diş hekimlerinin bilgi düzeyinin yüzdesi hesaplanmıştır.

BULGULAR: Çalışmaya toplam 484 diş hekimi dahil edildi. Araştırmaya katılan diş hekimlerinin yaklaşık yarısı (%51,2) ayda en az bir diş çıkarma jeli reçete ettiğini bildirdi. En çok reçete edilen diş çıkarma jelleri lidokain bazlı jeller (%70,9) olurken, bunu hyaluronik asit bazlı (%61,4) ve bitkisel bazlı jeller (%36) izledi. Diş hekimlerinin diş çıkarma jellerinin etken maddesi, dozu ve yan etkileri hakkındaki bilgi düzeyi medyanları sırasıyla %50, %25 ve %20 olduğu bulundu. Meslekteki yılı fazla olan dişhekimleri, jellerin etken maddesi ve yan etkileri hakkında mesleğe yeni başlayanlara göre daha fazla bilgiye sahipti (p<0.05). Yaşları 20-30 arasında olan diş hekimleri jel dozajı konusunda daha fazla bilgiye sahipti (p<0.05). Pedodontistler ve oral cerrahların jellerin yan etkileri konusundaki bilgi düzeylerinin diğer branşlara göre daha yüksek olduğu bulundu. (p<0.05). Uzman olmayan diş hekimlerinin diş çıkarma jelleri hakkındaki bilgi düzeyleri, uzman diş hekimlerine göre anlamlı düzeyde daha düşüktü (p<0.05).

SONUÇ: Sonuç olarak, diş hekimlerinin diş çıkarma jelleri hakkında yetersiz bilgiye sahip olduğu bulunmuştur. Diş hekimlerinin, bu jellerin yanlış ve kontrolsüz kullanımını önleyebilmek için daha fazla eğitime ihtiyacı bulunmaktadır.

ANAHTAR KELİMELEER: Diş hekimleri, Lidokain, Diş çıkarma jelleri, Diş sürmesi.

ABSTRACT

OBJECTIVE: The aim of the study was to evaluate a group of Turkish dentists' attitudes and level of knowledge about teething gels.

MATERIAL AND METHODS: For this cross-sectional study, a questionnaire consisting of three parts and twenty questions was sent to dentists (n=1829) whose contact information could be reached. Separate categories were created for ingredients, dosage, and side effects of each prescribed teething gel. The percentages of the knowledge level of the dentists were calculated considering all prescribed gels.

RESULTS: A total of 484 dentists were included in the study. Approximately half of the dentists (51.2%) participating in the study reported that they prescribed at least one teething gel per month. The most commonly prescribed teething gels were lidocaine-based gels (70.9%), followed by hyaluronic acid-based (61.4%) and herbal-based gels (36%). The medians of the knowledge level of dentists about active ingredients, dosage, and side effects of teething gels were 50%, 25%, and 20%, respectively. Dentists with more years in the profession have more knowledge about the active ingredient and side effects of gels than those who are newer in the profession (p<0.05). Dentists with the aged between 20-30 years had more knowledge about the dosage of gels (p<0.05). It was found that the knowledge level of pediatric dentists and oral surgeons about the side effects of gels was higher than other branches. (p<0.05). The knowledge level about teething gels of non-specialist dentists was significantly lower than specialists (p<0.05).

CONCLUSIONS: In conclusion, it was found that dentists had insufficient knowledge about teething gels. Dentists need more education to prevent misuse and uncontrolled use of these gels.

KEYWORDS: Dentists, Lidocaine, Teething gels, Tooth eruption.

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INTRODUCTION

Teething gels can be used for various purposes such as treating oral aphthous ulcers, providing anti-inflammatory activity in periodontal diseases, and accelerating healing in the post-oral surgery period, as well as teething symptoms (1 - 4). There are numerous types of teething gels. These gels can contain local anesthetic agents such as lidocaine and benzocaine, analgesic substances such as choline salicylate, and substances in the basic structure of the body such as hyaluronic acid. Today, the increasing interest in healthy living has led to an increase in the demand for products with natural ingredients, so many natural-containing teething gels such as black mulberry, clove, aloe vera, peppermint, calendula or chamomile extracts have been introduced to the market (5). Especially, when using products that claim to be natural, there is a strong misconception that there are no side effects and no dosage adjustment is necessary. Information on the prospectuses of these products, which can be accessed without a prescription, is also missing. However, numerous studies and case reports regarding the side effects of these products have been found in the literature (4, 6, 7). Unconscious use of teething gels can cause severe consequences of a chemical burn, aspiration, methemoglobinemia, allergy, seizures, or cardiac arrest (8, 9).

Today, although there is not sufficient scientific evidence to support the effectiveness of teething gels, both parents and health professionals frequently preferred these products (5, 10). Wake et al. (10) reported that dentists, nurses, pharmacists, and pediatricians were widely recommended for teething gels. The rate of recommending the use of teething gels by healthcare professionals was 19.3% in a study (11). This rate was reported as 30% in another study considering pediatricians (12). These gels can be prescribed by health professionals, and they can also be sold without a prescription. In a study, it was reported that the majority of pharmacists still recommend a benzocaine-containing product incorrectly (13). When the parent surveys conducted in various countries are

examined, it is found that the use of teething gels varies between 4.4% and 73.4% (14 - 18).

There are limited studies in the accessible literature focusing on teething gels (8, 19-22). To the best of the authors' knowledge, there is no study on the knowledge level of dentists about teething gels. The aim of the study is to evaluate a group of dentists' approaches and knowledge about teething gels.

MATERIAL AND METHODS

The study was a cross-sectional survey using an online researcher-made questionnaire on Google Forms to investigate the self-reported knowledge and attitudes of dentists about teething gels.

Participants were recruited from the population of qualified dentists working in Türkiye. E-mails from dentists were reached through various channels (Turkish Dental Association, government/private hospitals websites, university websites, and social media). The invitation to participate included information outlining the research and a link to the online questionnaire. The inclusion criteria were dentists who agreed to participate in the study via an online questionnaire link and who have prescribed teething gels at least once in the past year. The dentists who work in Türkiye (n=1829) and whose contact information was provided were invited to participate in the survey. The e-mail invitations were sent on 4th February 2022. A reminder was sent two weeks after the initial invitation. The questionnaire link was accessible to invited participants for two months and closed on 4th April 2022.

The questionnaire was written in the Turkish language. The questionnaire was self-constructed and piloted with a small group of dentists (n=20) before implementation and modified according to the feedback received. The pilot study applied to participants, including 8 specialist dentists, 8 research assistants from all branches, and 4 general dentists. In addition, supervision was received from a statistician and a pharmacologist for validity. Participants made comprehensive suggestions so that the con-

tent of the questionnaire reflects the purpose of the research. The content of the questionnaire was reviewed in line with these feedbacks.

The questionnaire comprises 3 parts and 20 questions in total. In the first part, there are 6 questions about the demographic characteristics of the participants, 10 questions in the second part that evaluate the practice and approaches of dentists about teething gels, and in the third part one self-reported question 'Which teething gels do you prescribed?'; and according to this question answers, 3 questions that measure their knowledge level about content, dosage and side effects of each teething gels which they reported prescribing. A scoring system has been determined by the researchers. Separate categories have been created for the ingredients, dosage and side effects of each prescribed teething gel. One (1) point was given if they knew the active ingredient / dosage/side effect of each teething gel. Zero (0) point was given if they stated they did not know the active ingredient/dose/side effect of each teething gel or if the answers were wrong. For dentists' level of knowledge about all the teething gels they prescribed the overall total score constituted the denominator, the score obtained with the defined criteria is placed on the numerator and the "percent (%)" of the knowledge level of the dentist was calculated.

Ethical Committee

The Local Ethics Committee of the Faculty of Medicine (Afyonkarahisar Health Sciences University, approval no. 2022/2-213) approved the study.

Statistical Analysis

The data were tabulated on a Microsoft Excel spreadsheet and then imported into IBM SPSS Statistics Package Program (version 26; Inc., Chicago, USA). The demographic data of this study were tabularized in number and percentage. The Kolmogorov-Smirnov test was done for verifying the normality of the data distribution. Comparison of the knowledge scores between genders was done with independent samples Mann-Whitney U test, other subgroups were done with the Kruskal-Wallis H test. A significant level was considered as $p < 0.05$.

RESULTS

A total of 484 dentists (286 female, 198 male), met the inclusion criteria and completed the questionnaire. Of the dentists who sent a questionnaire for the study, 53.1% (n=971) did not respond, 18.4% (n=336) reported that they did not prescribe any teething gel, and 2.1% (n=38) were excluded because they filled the forms incompletely. Most of the respondents were general dentists (34.7%) and pediatric dentists (24%). According to the working place of dentists, 56.6% of them work in a university hospital, 25% in private clinic/hospital, and 18.4% in government hospitals. The distribution of the participants according to their demographic characteristics is shown in **Table 1**.

Table 1: Demographic status of participants

		Number (n)	Percentage (%)
Gender	Female	286	59.1
	Male	198	40.9
Age	20-30	300	62.0
	30-40	120	24.8
	>40	64	13.2
Year of profession	0-5 years	287	59.3
	5-10 years	111	22.9
	>10 years	86	17.8
Profession	Oral and maxillofacial radiology	15	3.1
	Oral and maxillofacial surgery	68	14.0
	General dentist	168	34.7
	Endodontics	11	2.3
	Orthodontics	21	4.3
	Pediatric Dentistry	116	24.0
	Periodontology	50	10.3
	Prosthetic Dentistry	10	2.1
	Restorative Dentistry	25	5.2
Specialty	Not specialist	188	38.8
	Specialist	136	28.1
	Research assistant	160	33.1
Work place	Government hospital	89	18.4
	Private clinic/ hospital	121	25.0
	University hospital	274	56.6

Attitudes of the dentists towards teething gels were shown in **Table 2**. Nearly half of the dentists (51.2%) stated that they prescribed teething gels once a month. The most prescribed teething gels were lidocaine-based gels (70.9%), followed by hyaluronic acid-based (61.4%) and herbal-based gels (36%). The active ingredients and dosage of these teething gels were shown in **Table 3**. In the study, 80.4% of the dentists stated they received no feedback from their patients after prescribing teething gels.

The answers of the dentists to the question 'Which teething gel or gels do you prefer?' varied between 1 to 6 different trademarks and

16.1% of the dentists choose one teething gel, 27.9% of dentists choose two, 29.8% of the dentists choose three, 16.1% of the dentists choose four, 7.6% of the dentists choose five, and 2.5% choose six different teething gels. For each selected teething gel, their active ingredients, dosage, and side effects were asked. The median knowledge level of the dentists about the active ingredient of teething gels was 50%, about dosage was 25%, and the side effects were 20%.

Dentists with more years in the profession have more knowledge about the active ingredient and side effects of gels than those who are newer in the profession ($p < 0.001$). Dentists between the age of 20-30 years have more knowledge about the dosage of gels ($p = 0.001$). It was found that the knowledge level of pediatric dentists and oral surgeons about the side effects of gels was higher than other professions ($p < 0.001$). The knowledge level about teething gels of non-specialist dentists was significantly lower than specialists ($p < 0.05$). The distribution of knowledge levels according to different subgroups is shown in **Table 4**.

Table 2: Attitudes of the dentists towards teething gels

Questions	Answers	Number of dentists (n)	Percentage %
Q1. How often do you prescribe teething gels?	Once a week	4	0.8
	Two or more times a week	1	0.2
	Once a month	248	51.2
	Two or more times a month	29	6
	Rarely (once or twice a year)	202	41.7
Q2. For which problem/problems do you prescribe teething gels?	Teething symptoms	316	65.3
	Oral ulcers	194	40.1
	Wound healing after oral surgery	39	8.1
	Reducing pain	304	62.8
Q3. What is your purpose in prescribing teething gels?	Reducing inflammation	211	43.6
	Promote wound healing	39	8.1
	Reducing swelling	25	5.2
	Reducing irritability	21	4.3
	Reducing saliva	5	1
	Reducing fever	5	1
	Reducing itching	3	0.6
Q4. What is the most important factor affecting your choice of a teething gel?	Active ingredient of the gel	274	56.6
	Patient's feedback	84	17.3
	Cost of the gel	82	16.9
	Advertisement of the gel	48	9.9
Q5. Which source/sources do you use for teething gel prescription?	Taste of the gel	22	4.5
	Pharma representatives	124	25.6
	Internet/social media promotions	122	25.2
	Scientific articles	101	20.9
	Colleague comments	87	18
	Meetings/ congresses	33	6.8
Q6. Which teething gel/gels do you prescribe?	Patient request	22	4.5
	Lidocaine-based gels	343	70.9
	Benzocaine-based gels	39	8.1
	Choline salicylate-based gels	96	19.8
	Hyaluronic acid-based gels	297	61.4
	Herbal-based gels	174	36
Q7. Do you inform your patients about the dosage of teething gel?	Always	61	12.6
	Often	83	17.1
	Occasionally	102	21.1
	Rarely	231	47.7
Q8. Do you inform your patients about the usage of teething gel?	Never	7	1.4
	Always	89	18.4
	Often	127	26.2
	Occasionally	65	13.4
Q9. Do you inform your patients about the side effects of teething gel?	Rarely	199	41.1
	Never	4	0.8
	Always	3	0.6
	Often	25	5.2
Q10. How was the feedback of the patients you prescribed teething gel?	Occasionally	37	7.6
	Rarely	227	46.9
	Never	192	39.7
	Positive feedback	78	16.1
	Negative feedback	17	3.5
	No feedback	389	80.4

Table 3: The active ingredients and dosage of different teething gels prescribed by the dentists in the study

Teething gel	Active ingredient	Dosage in prospectus
Calgel® teething gel (GlaxoSmithKline, UK)	Lidocaine-based teething gel	Apply gel as big as chickpeas. Do not apply repetitively for more than three hours. It should not be used no more than 6 times in a day.
Dentinox® teething gel (Abdi Ibrahim, TURKEY)	Lidocaine-based teething gel	Apply 2-3 times a day
Aftamed® teething gel (Bioplax Pharma, UK)	Hyaluronic-acid based teething gel	Apply 3-6 times a day
Gengigel® teething gel (Dentocare, UK)	Hyaluronic-acid based teething gel	Apply 3-6 times a day
Dencol ¹ teething gel (Berko Pharma, TURKEY)	Choline-salicylate based teething gel	Apply 1 puff 4 times a day
Tetagil ¹ teething granule (Medfors Pharma, TURKEY)	Herbal-based teething gel	It is recommended to use the granules in the sachet every two hours orally, up to a maximum of 6 sachets per day.
Jack N' Jill® teething gel (Jack N'Jill, AUSTRALIA)	Herbal-based teething gel	Apply 4 times daily

Table 4: Knowledge level of the dentists about teething gels

		KNOWLEDGE ABOUT ACTIVE INGREDIENT	P VALUE	KNOWLEDGE ABOUT DOSAGE	P VALUE	KNOWLEDGE ABOUT SIDE EFFECTS	P VALUE
GENDER	Female	66.7 (0 - 100)	<0.001	0 (0 - 100)	NS	0 (0 - 100)	0.004
	Male	33.3 (0 - 100)		33.3 (0 - 100)		29.2 (0 - 100)	
AGE	20-30	50 (0 - 100) ^a	0.003	25 (0 - 100) ^a	0.001	0 (0 - 100) ^a	<0.001
	30-40	50 (0 - 100) ^a		0 (0 - 100) ^a		20 (0 - 100) ^a	
	>40	75 (0 - 100) ^a		0 (0 - 100) ^a		50 (0 - 100) ^a	
YEAR OF PROFESSION	0-5	50 (0 - 100) ^a	<0.001	25 (0 - 100) ^a	0.001	0 (0 - 100) ^a	<0.001
	5-10	33.3 (0 - 100) ^a		0 (0 - 100) ^a		0 (0 - 100) ^a	
	>10	66.7 (0 - 100) ^a		0 (0 - 100) ^a		80 (0 - 100) ^a	
BRANCHES	Oral and maxillofacial radiology	0 (0 - 100) ^a	<0.001	0 (0 - 100) ^a	<0.001	0 (0 - 100) ^a	<0.001
	Oral and maxillofacial surgery	41.7 (0 - 100) ^a		33.3 (0 - 100) ^a		50 (0 - 100) ^a	
	General dentist	0 (0 - 100) ^a		0 (0 - 50) ^a		0 (0 - 100) ^a	
	Endodontics	40 (0 - 66.7) ^{ab}		0 (0 - 50) ^a		0 (0 - 50) ^a	
	Orthodontics	0 (0 - 50) ^a		0 (0 - 50) ^a		0 (0 - 50) ^a	
	Pediatric Dentistry	100 (0 - 100) ^a		50 (0 - 100) ^a		50 (0 - 75) ^a	
SPECIALITY	Periodontology	66.7 (0 - 100) ^a		0 (0 - 100) ^a		0 (0 - 100) ^a	
	Prosthetic Dentistry	50 (0 - 100) ^a		50 (0 - 50) ^a		0 (0 - 100) ^a	
	Restorative Dentistry	33.3 (0 - 100) ^a		0 (0 - 40) ^a		0 (0 - 40) ^a	
	Not specialist	33.3 (0 - 100) ^a	<0.001	0 (0 - 100) ^a	0.046	0 (0 - 83.3) ^a	<0.001
	Specialist	66.7 (0 - 100) ^a		33.3 (0 - 100) ^a		50 (0 - 100) ^a	
	Research assistant	50 (0 - 100) ^a		25 (0 - 100) ^a		33.3 (0 - 100) ^a	
WORK PLACE	University hospital	66.7 (0 - 100) ^a	0.024	25 (0 - 100)	NS	50 (0 - 100) ^a	<0.001
	Private clinic/hospital	66.7 (0 - 100) ^a		0 (0 - 100)		33.3 (0 - 100) ^a	
	Government hospital	50 (0 - 100) ^a		25 (0 - 100)		0 (0 - 100) ^a	

NOTE: Kruskal-Wallis H test. NS: Non-significant ($p > 0.05$). ** : Each subscript letter denotes a subset of group categories whose column properties do not differ significantly from each other at the 0.05 level.

DISCUSSION

Teething gels can be used for various purposes, such as providing anesthesia, analgesia, sedation, or a combination of all of them. Teething gels can be used in the treatment of oral aphthae, and mucosal ulcers and in the healing process of mouth sores, as well as relieving teething symptoms (1-3, 23). In this study, 65.3%

of the dentists stated they used gels for teething symptoms, 40.1% for oral ulcers, and 8.1% for wound healing after oral surgery. Although warnings from the Food and Drug Administration (FDA) and American Academy of Pediatrics Dentistry (AAPD) about the unconscious use of gels, it was found that dentists preferred to prescribe them, especially for teething symptoms of babies (24, 25). Because of the limited number of studies on teething gels in the accessible literature, this study aimed to evaluate the current approaches and knowledge levels of dentists about teething gels (8, 19-22).

There are numerous types of teething gels. They may vary in terms of ingredients, taste, texture, and functional characteristics. In this study, 56.6% of the dentists reported they focused on the active ingredient of the teething gel while prescribing. The most prescribed teething gels were lidocaine-based gels (70.9%), followed by hyaluronic acid-based (61.4%). However, the median of the knowledge level of dentists about active ingredients of teething gels was 50%. The limited number of patients who consult dentists with teething complaints and the insufficient experience in pharmacological treatments can explain the result (26 - 28). In the present study, the level of knowledge about teething gels of non-specialist dentists was significantly lower than specialists and research assistants. Unfortunately, this result also shows the inadequacy of continuous dentistry education programs and not following up-to-date literature and new product information. As another result of the study, the knowledge of female dentists about the dosage and side effects of teething gels were found insufficient. It can be associated with the effect of advertisements or social media by female dentists only caring about the ingredient of teething gels. Teething gels can be sold without a prescription, and it has been reported that topical products can be applied to babies by parents for months or even years during this period (29). In most of the prospectus of these products, there is no sufficient information about the pharmacokinetic and pharmacodynamic properties, possible side effects, or appropriate

dosage. During the application of the gel into the oral cavity, it mixes rapidly with the saliva, and the risk of swallowing increases. Therefore, it is difficult to determine the correct dosage (8). Incorrect dosage is the most frequently reported type of medication error in pediatric patients. In addition, differences in children's weight, body surface area, and organ development may affect the metabolism and excretion of high-dose drug intake from the body. As children's renal, immune, and hepatic functions continue to develop, it causes younger children to tolerate drug dose errors less (30).

In the present study, the dosage information of teething gels was found to be insufficient (25%). In order to prevent life-threatening overdoses, manufacturers should provide detailed information about the dose, dentists should increase their knowledge about the dosage and convey this information to their patients. Besides that, in this study the decrease in drug dose information with increasing age and the fact that the dose information of non-specialists is less than that of specialists indicates it is necessary to update the existing information of dentists.

Although there is not enough evidence about the therapeutic effects of teething gels in previous studies, most of the authors emphasized the side effects of them (4, 7, 8, 31). Topical anesthetics can cause iatrogenic oral mucosal trauma, sensitivity, or choking. Ingestion of these gels also numbs the child's mucous membranes and increases the risk of aspiration. Aspirated anesthetic agents will be absorbed directly through the respiratory tract and circulate to the central nervous system without undergoing liver metabolism (25, 32, 33). Lidocaine-based teething gels, which were the most commonly prescribed teething gels among dentists in this study (70.9%), can cause paresthesia, hypotension, seizures, bradycardia, and cardiac arrest (8, 9). In 2011, FDA issued a warning to avoid using gels containing benzocaine, due to the risk of methemoglobinemia (34). In a study in England, it was determined that sucrose and alcohol can be found in teething gels and it was also reported that sucrose in gels may lead to the formation of caries, and the alcohol content may cause

developmental problems (6). Various pediatricians and pharmacists advocate avoiding choline salicylate-based teething gels because of the risk of Reye's syndrome, salicylate poisoning, chemical burn, congestive heart failure, and metabolic acidosis (5). Symptoms can appear after the first dose or after several uses of these gels (8). Despite serious side effects were reported in the previous studies, it was found that the knowledge level of the dentists about side effects of teething gels was quite inadequate in the present study (20%). This result can be associated with the fact that dentists mostly use the recommendations of pharmaceutical company representatives or online product advertisements as a source for gel selection. Scientific articles were used as a knowledge source by only 20.9% of the dentists. The fact that no feedback was received from most of the patients is thought to be one reason for not getting sufficient data about the effects of gels. Besides the insufficient knowledge of dentists about the side effects of gels, almost half of the dentists (46.9%) in the study stated that they rarely warn patients about this issue. These gels should be used under medical supervision, due to the risk of side effects, which can be serious although rare.

The limitation of the study was the sampling because the study group did not represent sufficient populations. In the study, only the knowledge level of a group of Turkish dentists who prescribed teething gels was discussed. However, these gels can be prescribed by other medical doctors or sold without a prescription. Therefore, a more sophisticated survey with a larger population size that includes other professions and multiple geographical areas is required. However, the study can serve as a baseline for future more extensive community-based research. In future studies, it will be more beneficial to include over-the-counter folkloric teething mixtures. In conclusion, the level of knowledge of dentists about teething gels is incomplete. There is a gap in the literature on the efficacy, appropriate dosage, cytotoxicity, genotoxicity, or allergy potential of teething gels. Dentists should have the education to change the misconceptions and uncontrolled use of the teething gels.

Using these gels should be limited and carefully monitored, drug interactions should be evaluated, and patients should be informed about the dosage. Especially, pediatric dentists and pediatricians who usually deal with young children should also convey the correct information about these gels, which can be accessed without a prescription, to the parents.

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